



KANSIL'S

LIST OF PUBLICATIONS

Math



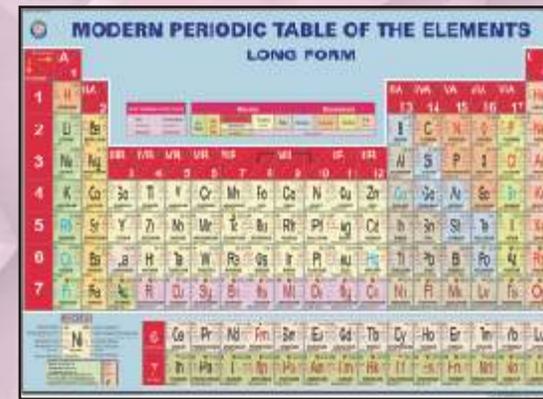
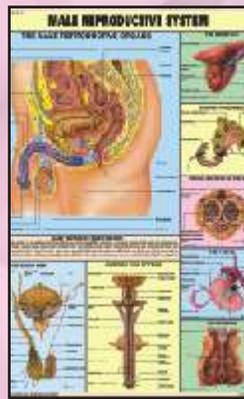
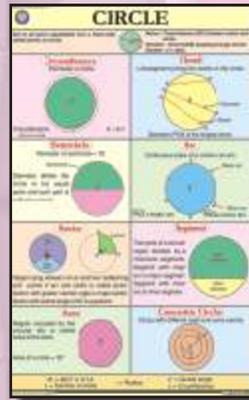
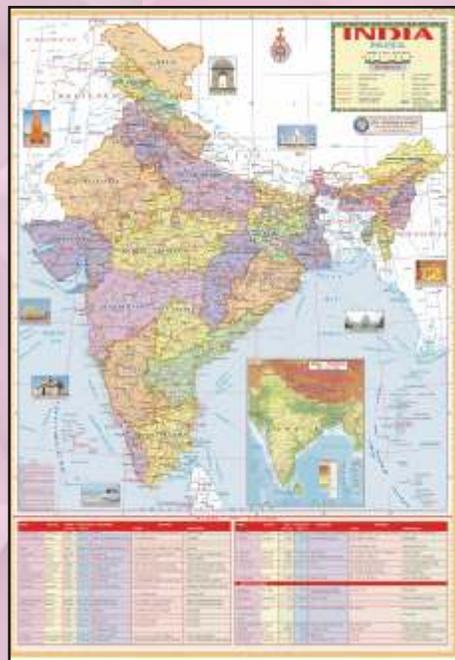
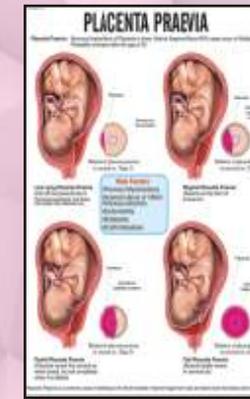
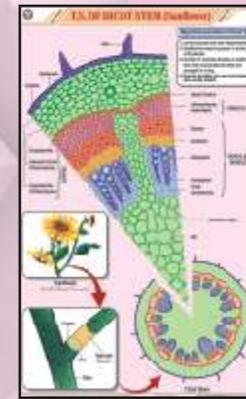
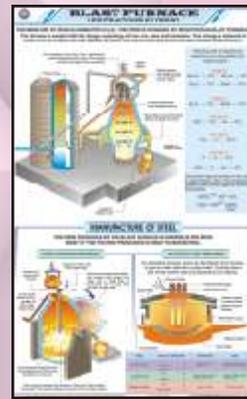
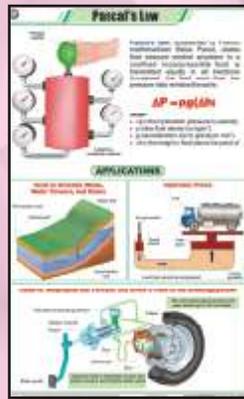
Science

VOL. 09/22

Primary

Social Studies

Medical



Students are able to infer meanings from the pictures quicker than from text. This well known fact itself is the testimony of importance of charts and maps for teaching. Our charts and maps produced under the expert guidance catalyse the understanding of large and complex topics.

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STB01 : Plant Kingdom

Plant Kingdom

Classification of plants was first proposed by Linnaeus. Presently, the plant kingdom is divided into two subkingdoms - Cryptogams and Phanerogams. Fungal members of the Monera and Protista having cell walls have been excluded from Kingdom Plantae.

PLANT KINGDOM

- CRYPTOGAMIA** (Non-flowering plants)
 - Algae
 - Bryophytes
 - Phanerogams
- PHANEROGAMIA** (Flowering plants)
 - Gymnosperms
 - Angiosperms

Cryptogams
Cryptogams are non-flowering or seedless plants.

- Algae**: The algae are divided into three main groups: Green Algae, Brown Algae and Red Algae. The main body is not differentiated into stem, root or leaves etc. in vascular system is present.
- Bryophytes**: Bryophytes have a thalloid body that is not differentiated into stem, root and leaf. They are divided into three groups: Liverworts, Mosses and Hornworts. They are the first land plants to have evolved an embryo.
- Phanerogams**: Phanerogams are all seed bearing plants.
 - Gymnosperms**: Gymnosperms have naked seeds, which are not enclosed in a fruit.
 - Angiosperms**: Angiosperms have seeds enclosed in a fruit that develops from the ovary.
 - Dicotyledons**: Dicotyledons generally have two cotyledons in the seed and two main leaves developed by the stem.

STB02 : Typical Plant

Typical Plant

Plants can be divided into two broad categories - non-flowering and flowering plants.

Non-flowering Plants

Plants such as algae, mushrooms and mosses do not bear flowers. These are called non-flowering plants.

Flowering Plants

Most flowering plants have two main systems - root and shoot.

Other Methods of Classification

- By Habitat**: Terrestrial (Land plants), Aquatic (Water plants).
- By Structure**: Unicellular (Algae), Multicellular (Mosses, Fungi, Liverworts, Hornworts).
- By Reproduction**: Asexual (Algae, Mosses, Fungi), Sexual (Liverworts, Hornworts, Flowering plants).

STB03 : Typical Plant Cell

Typical Plant Cell

Cell Wall: A thick, rigid layer of cellulose surrounding the cell membrane.

Chloroplasts: Organelles where photosynthesis takes place. They contain chlorophyll.

Large Central Vacuole: A large, fluid-filled space that maintains turgor pressure and stores nutrients.

Other organelles shown: Nucleus, Mitochondrion, Golgi apparatus, Endoplasmic reticulum, Cytoplasm, Cell membrane.

STB04 : Plant Cell Organelles

Plant Cell Organelles

- Chloroplast**: Site of photosynthesis.
- Mitochondrion**: Site of cellular respiration.
- Nucleus**: Contains genetic material (DNA).
- Large Central Vacuole**: Maintains cell turgidity.
- Cell Wall**: Provides structural support.
- Cell Membrane**: Controls the entry and exit of substances.
- Golgi Apparatus**: Involved in the transport of materials.
- Endoplasmic Reticulum**: Network of membranes for protein synthesis.
- Cytoplasm**: Gel-like substance where organelles are suspended.

STB05 : Plant Tissues

Plant Tissues

Tissues are a kind of cellular fabric that occur in a living being's body. Usually a body has several kinds of tissues which can be distinguished on the basis of functions. Such tissues are called specialized kinds of cells.

Meristematic Tissue

These are the tissues in which the cells are capable of undergoing cell division throughout their life. They are present in the growing tips of roots and stems, in the cambium, in the vascular tissue and in the meristems of leaves.

Permanent Tissue

These are the tissues that are formed from meristematic tissue and do not divide further. They are of two types: Simple Permanent Tissue and Complex Permanent Tissue.

Simple Permanent Tissue

- Parenchyma**: Most common, thin-walled cells for photosynthesis and storage.
- Collenchyma**: Thickened corners for mechanical support.
- Sclerenchyma**: Thickened walls for mechanical support.
- Sclerids**: Thickened walls for mechanical support.

Complex Permanent Tissue

- Xylem**: Transfers water and minerals from roots to leaves.
- Phloem**: Transfers food materials from leaves to other parts of the plant.

Secretory Tissue

These are the tissues that secrete substances. They are found in the leaves, stems, and roots.

STB06 : Plant Cell Mitosis

Plant Cell Mitosis

Mitosis is a kind of cell division in which the chromosomes are duplicated and distributed equally to the daughter cells. It occurs in somatic cells.

Stages of Mitosis

- I. Interphase**: The parent cell grows and prepares for division.
- II. Prophase**: Chromosomes condense and become visible.
- III. Metaphase**: Chromosomes align at the equatorial plate.
- IV. Anaphase**: Sister chromatids separate and move to opposite poles.
- V. Telophase**: Nuclear envelopes reform around the two sets of chromosomes.

STB07 : Plant Cell Meiosis

Plant Cell Meiosis

Meiosis is a process in which the number of chromosomes in the cell is halved. It occurs in reproductive cells and is a part of the life cycle of many organisms.

Stages of Meiosis

MEIOSIS I

- Prophase I**: Chromosomes condense and synapse.
- Metaphase I**: Homologous chromosomes align at the equatorial plate.
- Anaphase I**: Homologous chromosomes separate.
- Telophase I**: Nuclear envelopes reform.

MEIOSIS II

- Prophase II**: Chromosomes condense again.
- Metaphase II**: Chromosomes align at the equatorial plate.
- Anaphase II**: Sister chromatids separate.
- Telophase II**: Nuclear envelopes reform, resulting in four haploid daughter cells.

STB08 : T.S. Stem-Monocot

T.S. Stem-Monocot

MAIZE STEM

Microscopic View

- Cuticle**: The outermost protective layer.
- Epidermis**: A single layer of cells.
- Hypodermis**: A layer of cells below the epidermis.
- Phloem**: Tissue for food transport.
- Metaxylem**: Tissue for water transport.
- Protoxylem lacuna (water cavity)**: A cavity in the protoxylem.
- Ground tissue**: The bulk of the stem.

As seen under the Microscope

The diagram shows the arrangement of vascular bundles in a monocot stem, which are scattered throughout the ground tissue. The vascular bundles are closed, and the cambium is absent.

STB09 : T.S. of Dicot Stem (Sunflower)

T.S. OF DICOT STEM (Sunflower)

Major Characteristics of Dicot Stem

1. Dicot stem has an oval or hexagonal shape.
2. Secondary growth may be present in some dicot stems.
3. Vascular bundles are arranged in a ring.
4. Vascular bundles are arranged in a ring.
5. Vascular bundles are arranged in a ring.

Major Characteristics of Dicot Stem

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2. Secondary growth may be present in some dicot stems.
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4. Vascular bundles are arranged in a ring.
5. Vascular bundles are arranged in a ring.

STB10 : T. S. Root - Monocot

T. S. Root - Monocot

Monocot Root

In this, the central part of the ground tissue is very large and well developed. For example, in the roots of plants like maize, pea, orchids, grass and lily.

Transverse Section of a Portion of Maize Root

Monocot Root Cross Section

STB11 : T. S. of Dicot Root

T. S. of Dicot Root

Major characteristics of Dicot Roots

1. Dicot roots are thick and woody.
2. Dicot roots are thick and woody.
3. Dicot roots are thick and woody.
4. Dicot roots are thick and woody.

STB12 : T. S. Leaf - Monocot

T. S. Leaf - Monocot

Monocot leaf is mostly leafless. It is equally illuminated on both the surfaces.

T.S. of C4 Grass Leaf

In the leaves of C4 grasses, the mesophyll cells and bundle sheath cells typically form two concentric layers around the vascular bundles. The compactly arranged bundle sheath cells of the C4 grasses are very large parenchyma cells that contain many large conspicuous chloroplasts. In

T.S. of C3 Grass Leaf

In the leaves of C3 grasses, the mesophyll cells and bundle sheath cells are not concentrically arranged. The relatively small cells of the parenchymatous bundle sheaths in these plants have rather small chloroplasts. In C3 grasses, more than four small mesophyll cells intervene between adjacent bundle sheaths.

STB13 : T. S. Leaf - Dicot

T. S. Leaf - Dicot

T.S. of Dicot Leaf (Mango)

Dicot leaf is dorsiventral. A dorsiventral leaf is more strongly illuminated on the upper surface than the lower surface. In the internal structure, there is a good deal of difference between the two sides.

T.S. of Hydrophytic Dicot Plant Leaf

Water lily, a magnoliid, floats on the surface of water and has stomata in the upper epidermis only. Vascular tissue is much reduced, especially the xylem. The palisade parenchyma consists of several layers of cells above the spongy parenchyma. The large intercellular spaces add buoyancy to this floating leaf.

T.S. of Xerophytic Dicot Plant Leaf

Neem tree, a xerophyte, have very thick cuticle, covering the multiple epidermis on the upper and lower surfaces of the leaf. The stomata and trichomes are restricted to invaginated portions of the lower epidermis, called stomatal crypts.

STB14 : Types of Leaves

Types of Leaves

Simple Leaves

Consist of one blade and a petiole. In this, the blade and petiole are not divided into separate leaflets or leaflets.

Compound Leaves

The leaf blade is divided into two or more leaflets. The petiole and blade are not separate leaflets or leaflets.

Heterophylly

More than one size of leaves are present on the same plant. Heterophylly is seen in plants like Eichhornia and Salvinia.

Phyllotaxy

Hydrophytic leaves with large arrangement of veins.

1. Alternate type
2. Opposite type
3. Whorled type

Parallel Venation

1. Parallel Veinlets
2. Parallel Veinlets
3. Parallel Veinlets

Reticulate Venation

1. Reticulate Veinlets
2. Reticulate Veinlets
3. Reticulate Veinlets

STB15 : Root Systems

Root Systems

TAP ROOT SYSTEM

Taproot develops from the radicle of the seed which forms the primary root. It grows vertically downwards from which smaller lateral roots branch. These roots may further branch to form nodules. Example: carrot, radish and turnip.

FIBROUS ROOT SYSTEM

A root system in which both primary and lateral roots are fairly divided without an enlarged central root. It is usually formed by thin, moderately branching roots growing from the stem. Most monocots have a fibrous root system. Grasses are an example of fibrous root systems.

ADVENTITIOUS ROOT SYSTEM

Some roots arise from parts of the plant other than the radicle. Such roots are called adventitious roots. Mosses and lichens have supporting roots coming out of the lower nodes of stem. These are called stilt roots. Hanging roots of banyan tree are also an example of adventitious roots.

STB16 : Structure of Flower

Structure of Flower

Flower is a modified shoot meant essentially for the reproduction of the plant.

Parts of a Typical Flower

Symmetry of Flower

- Floral Diagram
- Floral Diagram
- Floral Diagram

Position of Floral Organs on the Thalamus

- Hypogynous
- Perigynous
- Epigynous

STB17 : Calyx and Corolla

CALYX MODIFICATIONS

The outermost green and leaf like floral whorl consisting of sepals is calyx. However, it is modified into following forms in some plants.

| | | |
|---|--|--|
| Pappus Example - <i>Sonchus, Galium</i> | Spurred Example - <i>Datura</i> | Leafy Example - <i>Mussaenda</i> |
| Spinous Example - <i>Trapa</i> | Hood Like Example - <i>Asclepias</i> | Blabiate Example - <i>Oxalis, Salvia</i> |

SHAPES OF COROLLA

The second coloured and leafy floral whorl consisting of petals is corolla. Following are the common shapes of corolla.

| | | | |
|---|---|---|---|
| Cruciform Example - <i>Brassicaceae</i> | Caryophyllaceous Example - <i>Caryophyllaceae</i> | Rosaceous Example - <i>Rose</i> | Campanulate Example - <i>Campanula</i> |
| Tubular Example - <i>Solanum</i> | Bilabiate Example - <i>Oxalis, Salvia</i> | Hypocretiform Example - <i>Mussaenda</i> | Rotata Example - <i>Rose</i> |
| Infundibuliform Example - <i>Passiflora</i> | Personate Example - <i>Asclepias</i> | Ligulate Example - <i>Solanum, Garden egg</i> | Papilionaceous Example - <i>Phaseolus</i> |

STB18 : Inflorescences

RACEMOSE INFLORESCENCES

| | | |
|---|--|---|
| Raceme Inflorescence axis is upright, elongated and bears axillary flowers (e.g. Mustard) | Panicle Inflorescence axis is branched & flowers are borne axillary or interaxillary | Spike Some axillary flowers borne in spike |
| Catkin It is a spike with reduced bracts or involucres (e.g. Almond) | Spadix It is a spike with fleshy or woody axis or involucre (e.g. Amaranth) | Goryth The axis is short and the lower bracts are larger than the upper ones. Fruit of flowers come to the same level (e.g. Cucumber) |

CYMOSE INFLORESCENCES

| | | | |
|--|---|--|--|
| Monochasial Scorpioid The main axis bears flowers in a single line (e.g. <i>Passiflora</i>) | Monochasial Helicoid The main axis bears flowers in a single line with a curve (e.g. <i>Asplenium</i>) | Dichasial Two opposite branches develop at upper end of the main axis (e.g. <i>Asplenium</i>) | Polychasial Many branches develop at upper end of the main axis (e.g. <i>Asplenium</i>) |
|--|---|--|--|

STB19 : Fruits

PARTS OF A FRUIT

TRUE FRUIT: When only ovary takes part in the formation of fruit.

FALSE FRUIT: When other floral parts such as thalamus, calyx, etc. form a major part of the fruit.

CLASSIFICATION OF FRUITS

Dry SIMPLE FRUITS

| | | |
|---|---|---|
| Fleshy Drupe (Orange), Pome (Apple), Berry (Watermelon) | Aggregate Fruits Cluster of Follicles (Strawberry), Cluster of Achenes (Blueberry), Cluster of Drupes (Raspberry) | Composite Fruits Syconium (Fig), Sorosis (Jack Fruit) |
|---|---|---|

STB20 : The Seed : Structure and Germination

TYPICAL STRUCTURE OF A SEED

CONDITIONS NECESSARY FOR GERMINATION

Water, Air, Temperature

EPIGEAL GERMINATION

HYPOGEAL GERMINATION

STB21 : Germination of Seed - Bean & Pea

Germination of Pea Seed (Hypogeal)

- Cotyledons do not come out of the soil surface.
- Cotyledons elongate pushing the plumule out of the soil.
- Cotyledons grow upward and the first root comes out of the cotyledon.
- The radicle forms the primary root which is soon replaced by secondary roots.

Germination of Bean Seed (Epigeal)

Cotyledons are brought above the ground due to the elongation of the hypocotyl.

STB22 : Dispersal of Fruits & Seeds

Fruits and Seeds can not move independently from one place to another. They are transported to new areas by the external agencies according to which their dispersal is categorised into following types:

Dispersal by Wind

| | |
|--|---|
| Light Weight & Minute Seeds Light & very small seeds are carried. | Winged Seeds & Fruits Winged structures are present in many fruits and seeds. |
| Balloon Like Appendages In some plants balloon like parts are present which help in dispersal. | Parachute Mechanism Parachute like structures are present in some fruits and seeds. |

Dispersal by Animals

| | | |
|---|---|---|
| Hooked Fruits & Seeds Hooked fruits and seeds are carried by animals. | Sticky Fruits & Seeds Sticky fruits and seeds are carried by animals. | Edible Fruits & Seeds Edible fruits and seeds are carried by animals. |
|---|---|---|

STB23 : Photosynthesis

Process of manufacturing food by green plants with the help of water, carbon dioxide, sunlight and chlorophyll is called photosynthesis. Oxygen is released in this process.

$$6CO_2 + 12H_2O \xrightarrow[\text{Chlorophyll}]{\text{Light}} C_6H_{12}O_6 + 6H_2O + 6O_2$$

Requirements for Photosynthesis

- Light**
- Leaves a green plant.
- Keep one leaf in the sun, with a dish with black paper and keep the plant in sunlight again.
- Decolourise the leaf by boiling it in alcohol.
- The covered part does not turn blue-black while the original white portion does turn blue-black with iodine solution.
- This shows that light is necessary for photosynthesis.
- Chlorophyll**
- Decolourise a green plant with methyl alcohol.
- Put it in sunlight for 3-4 days.
- Take a leaf from that plant and decolourise it by boiling it in alcohol.
- The originally green part turns blue-black while the originally white portion does not turn blue-black with iodine solution.
- This shows that chlorophyll is necessary for photosynthesis.
- Carbon Dioxide**
- Place half of a leaf of a plant in a bottle containing KOH (which absorbs CO₂ present in the bottle).
- Leave the setup for 3-4 days in light.
- Test the leaf with iodine solution. The portion of leaf which has chlorophyll does not turn blue-black.
- The other portion turns blue-black.
- This shows that CO₂ is necessary for photosynthesis.

STB24 : Plant Diseases

| | | |
|--|---|---|
| Black Rot of Crucifers Caused by <i>Alternaria brassicae</i> | Late Blight of Potato Caused by <i>Phytophthora infestans</i> | Bacterial Wilt of Tomato Caused by <i>Burkholderia solanaceae</i> |
| Hill Bunt (Stunt) of Wheat Caused by <i>Tilletia tritici</i> | Brown Spot of Rice Caused by <i>Blumeria oryzae</i> | Tobacco Mosaic Virus Disease Caused by Tobacco Mosaic Virus |
| Leaf (Brown) Rust of Wheat Caused by <i>Puccinia striiformis</i> | Yellow Mosaic of Okra Caused by <i>Tomato Yellow Mosaic Virus</i> | Red Rot of Sugarcane Caused by <i>Sclerotium sacchari</i> |
| Bacterial Blight of Cowpea Caused by <i>Burkholderia fabae</i> | Powdery Mildew of Wheat Caused by <i>Blumeria tritici</i> | Leaf Curl of Chili Caused by <i>Tomato Yellow Mosaic Virus</i> |

STB25 : Reproduction in Plants

Reproduction in Plants

VEGETATIVE REPRODUCTION IN PLANTS

TUBER (Potato), OFFSET (Pine), CORM (Colocasia), LEAF BUD (Ginger), BULB (Onion), RHIZOME (Banana), RUNNER (Onion)

REPRODUCTION BY SPORE FORMATION

Found in Bryophytes and Pteridophytes

SEXUAL REPRODUCTION OF FLOWERING PLANTS

FLOWER, POLLINATION, FERTILIZATION, SEED GERMINATION, FRUIT

STB26 : Pollination

Pollination

Transfer of pollen from the anther of a flower to the stigma of another flower is known as pollination. Pollination is a prerequisite for fertilisation.

ACCORDING TO MEDIUM OF POLLINATION

ACCORDING TO AGENTS INVOLVED

STB27 : Double Fertilization

Double Fertilization

The process of double fertilization involves the joining of a female gametophyte with two male gametes (sperm). A pollen grain pushes its pollen tube through the micropyle to release the two sperms. One sperm fertilizes the egg cell to form a diploid zygote and the other sperm combines with the two polar nuclei to form a triploid nucleus (some plants may form polyploid nuclei).

Megasporogenesis (egg development), Microsporogenesis (sperm development)

STB28 : Artificial Vegetative Propagation

Artificial Vegetative Propagation

Tissue Culture: The scientific propagation of plants in vitro. It involves the principle that plant cells can regenerate.

Cuttings: Parts of plants removed from a parent plant and rooted in a growing medium are called cuttings.

A. Leaf cutting, B. Stem cutting

Layering: Method of rooting a new plant from the stem of a plant attached to the parent plant.

A. Simple layering, B. Air layering

Grafting: Joining two plant parts together. The cambium of the upper part must line up with the cambium of the lower part and should make good contact. This union must be kept firm during and until the graft "takes".

STB29 : Stem Modification

Stem Modification

UNDERGROUND STEM MODIFICATION

Stem is a modified part of an underground branch which grows from the part of a stem that is below the ground.

STEM MODIFICATION

Change in the morphology of stem is known as modification of stem. The changes may occur in order to perform special functions like protection, vegetative propagation and food storage. The modified stems may be grouped under three types i.e. underground, subaerial and aerial.

STEM MODIFICATION

Stems are modified into various forms to perform different functions. Some of the modifications are:

- Underground stems: Rhizome, Corm, Bulb, Tuber, etc.
- Subaerial stems: Runner, Stolon, etc.
- Aerial stems: Leaf bud, etc.

STB30 : Root Modification

Root Modification

MODIFICATION OF TAP ROOT

Tap root is a primary root which grows from the plumule of the embryo. It grows vertically downwards into the soil.

MODIFICATION OF ADVENTITIOUS ROOT

Adventitious roots are roots which arise from the stem or other parts of the plant other than the plumule of the embryo.

MODIFICATION OF ROOTS FOR ADDITIONAL SUPPORT

Some plants have roots that are modified to provide additional support to the plant.

STB31 : Hydrophytes

Hydrophytes

External Features

- Roots are extremely short or poorly developed.
- Stem is long, slender, spongy and flexible.
- Leaves are large and floating, the stems are long and often spongy or fleshy.
- Flowering stems are long, erect, and often spongy or fleshy.
- The leaves are large and often spongy or fleshy.

Anatomical Characters

- All hydrophytes are prostrate or have a very short stem.
- Hydrophytes are prostrate or have a very short stem.
- Stems are spongy and often spongy or fleshy.
- Stems are spongy and often spongy or fleshy.

STB32 : Mesophytes

Mesophytes

GENERAL DESCRIPTION

- Mesophytes are the plants that grow under average conditions of temperature and moisture.
- The soil in which they grow is neither very wet nor very dry.
- The response of these plants to high transpiration is to wilt.
- Mesophytes are the plants that grow under average conditions of temperature and moisture.

EXTERNAL FEATURES

- The root system is well developed.
- Leaves are the flattened and provided with veins.
- The stem is spongy and often spongy or fleshy.
- There are small and often spongy or fleshy.

ANATOMICAL CHARACTERS

- Mesophytes are the plants that grow under average conditions of temperature and moisture.
- The stem is spongy and often spongy or fleshy.
- The stem is spongy and often spongy or fleshy.
- The stem is spongy and often spongy or fleshy.

STB33 : Xerophytes

Xerophytes

Xerophytes occur in regions where the amount of water in the soil is very less.

External Features of Xerophytes

- The root system is well developed; primarily located at a greater depth.
- Thorns occur in a great number.
- Thick cuticle generally occurs in them.
- Leaves are usually small and succulent.
- They may also be fleshy and generally succulent.
- Some plants have modified stems, for example, in Opuntia, stems become a leaf and are called cladophylls. In Asparagus, the stems are called cladophylls and bear small clubbed thorns.
- Leaves may fall and be called deciduous.
- Leaves covered with hairs in *Tillandsia*.
- Leaves are smaller in size and reduced in *Mesquites*.
- Leaves are reduced to *Phyllocladus*.

Succulent stem

Opuntia

Characteristics: Green in color, thick skin or waxy cuticle, succulent and fleshy.

Example: *Euphorbia*, *Opuntia*, etc.

Succulent stem

Euphorbia

Opuntia

Euphorbia

Anatomical Characters of Xerophytes

- Reduction in the rate of transpiration.
- Presence of leaves which can rotate their axes.
- Presence of thick cuticular layer and mucopolymers.
- Reduced mesophyll tissues.
- Stomach mesophyll.
- A thick covering of hairs on epidermis and several waxy cuticles.
- Indivisible veins are only a few and strongly veined.
- Reduced leaves like cladophylls and cladodes are well developed.
- Muscular tissue is present in large amount.

STB34 : Insectivorous Plants

Insectivorous Plants

The autotrophic plants growing in nitrogen deficient conditions and fulfilling their nitrogen requirement by digesting insects. They are divided into four groups on the basis of insect trapping mechanism.

Plants with sensitive glandular hairs on the surface of leaves secreting sweet sticky liquid.

Drosera (Dewey)

Plants having sensitive trigger hairs on the leaf surface.

Venus Fly-trap (Dionaea)

Plants with leaves modified into pitchers.

Pitcher Plant (Sarracenia)

Plants having segmented leaves with some of the segments modified into blades.

Bladderwort (Utricularia)

STB35 : Fungi

Fungi

Fungi is a unique group of organisms that include moulds, yeasts, rusts, smuts, mushrooms and lichens.

Classification of Fungi

| | | | |
|-------------|-----------|------------|-----------------|
| Truff Fungi | Sea Fungi | Club Fungi | Imperfect Fungi |
|-------------|-----------|------------|-----------------|

Symbiotic Relationships

Autotrophic: They synthesize their own food from inorganic carbon dioxide and water using sunlight.

Parasitic: Live on or inside a host organism and derive their nutrients from it.

Saprophytic: Feed on dead and decaying organic matter.

Economic Importance

| | | | | |
|---|---|--|---|--|
| Antibiotics : Penicillin, streptomycin, tetracycline, etc. | Food : Cheese, wine, beer, bread, etc. | Alcoholic fermentation : Ethanol, vinegar, etc. | Plant's defense : Root rot, etc. | Genetic studies : Penicillium, etc. |
|---|---|--|---|--|

Harmful Effects

| | | | |
|-----------------------|------------------------|---------------------------|------------------------|
| Scabies in man | Ringworm in man | Ringworm in cattle | Rust in cereals |
|-----------------------|------------------------|---------------------------|------------------------|

Fungal Diseases (Plants)

| | | |
|------|-------------|--------------|
| Rust | Wheat Blast | Downy Mildew |
|------|-------------|--------------|

Fungal Diseases (Human)

| | | |
|----------|---------|-------------|
| Ringworm | Scabies | Trichinosis |
|----------|---------|-------------|

STB36 : Algae

Algae

Algae are chlorophyll bearing the food plants. The study of algae is known as Algology. Professor M.O.P. Yenker is known as father of Modern Indian Algology.

Classification

| Unicellular | | Multicellular | |
|---------------|------------|---------------|----------|
| Chlorella | Volvox | Spirogyra | Ulva |

Uses

| | | | |
|------------------|------------|----------------------|--------------------|
| Food for animals | Fertilizer | Production of oxygen | Water purification |
|------------------|------------|----------------------|--------------------|

Harms

| | | | |
|----------------------|--------------------|---------------------|---------------------|
| Algal bloom in water | Algal bloom in air | Algal bloom in soil | Algal bloom in food |
|----------------------|--------------------|---------------------|---------------------|

STB37 : Viruses

Viruses

Dr. W. Stanley: He was the first one to isolate virus from infected tobacco leaf.

Classification Based on Shape

| | | | |
|-------------------------|-----------------------|------------------------|------------------------|
| Spherical (Icosahedral) | Helical (Cylindrical) | Spherical (Helicoidal) | Spherical (Polyhedral) |
|-------------------------|-----------------------|------------------------|------------------------|

Classification Based on Composition

| | |
|--------------------------------------|--------------------------------------|
| Core Containing Nucleic Acid and RNA | Core Containing Nucleic Acid and DNA |
|--------------------------------------|--------------------------------------|

Classification Based on Their Hosts

| | |
|---------------------------------|-------------|
| Bacteriophage (Bacterial Virus) | Plant Virus |
|---------------------------------|-------------|

Classification Based on Growing

| | |
|----------|-------------|
| Obligate | Facultative |
|----------|-------------|

Virus Diseases

| | |
|-----------------|----------------|
| Animal Diseases | Plant Diseases |
|-----------------|----------------|

STB38 : Bacteria

Bacteria

Bacteriology, was traditionally known as bacteriology. It is the study of bacteria. The bacteria added to almost every part of our life.

Classification of Bacteria

| | | | |
|----------|---------------|---------|-------------|
| Bacteria | Cyanobacteria | Archaea | Prokaryotes |
|----------|---------------|---------|-------------|

Cell Shape

| | | | |
|------------------|-----------------|----------------|----------------------|
| rod-like bacilli | Spherical cocci | Spiral bacilli | Comma-shaped vibrios |
|------------------|-----------------|----------------|----------------------|

Respiration in Bacteria

| | |
|---------------------------|-------------------------------------|
| aerobic (requires oxygen) | anaerobic (does not require oxygen) |
|---------------------------|-------------------------------------|

Chemical Nature of Cell Wall

| | |
|------------------------|----------------------|
| Gram-Positive (Purple) | Gram-Negative (Pink) |
|------------------------|----------------------|

Bacterial Growth and Reproduction

| | | |
|----------------|-------------|-----------------|
| Binary Fission | Conjugation | Spore formation |
|----------------|-------------|-----------------|

Useful Activities

| | | |
|--------------------|----------------|-------------------|
| Lacto-fermentation | Methanogenesis | Biogas production |
|--------------------|----------------|-------------------|

Some Bacterial Diseases

| | | | |
|---------|-----------|---------|---------------|
| Typhoid | Dysentery | Cholera | Scarlet fever |
|---------|-----------|---------|---------------|

STB39 : Life Cycle of Fern

Life Cycle of Fern

Ferns are spore producing plants that alternate generations.

SPOROPHYTES: Sporangia or spore cases, appear on the back of leaf (the fern leaf).

COMMON BRACKEN: Common bracken forms dense growths in woods and fields.

SPORES: Spores are blown away from spore cases.

FERTILIZATION: Sperm from the antheridium swim to the archegonium.

GAMETOPHYTE: The spores grow into heart-shaped gametophytes called protonema.

STB40 : Life Cycle of Moss

Life Cycle of Moss

The life cycle of a moss is dominated by the green, leafy gametophyte (haplophase). The sporophyte (diplophase) consists only of the ascending stalk and capsule.

Zygote: Fertilization results in a zygote.

Meiosis: Occurs in the sporophyte to produce haploid spores.

Fertilization: Haploid sperm fertilizes the haploid egg to form a diploid zygote.

STB41 : Spirogyra

Spirogyra

Spirogyra is a filamentous freshwater green alga having spiral arrangement of the chloroplast. There are more than 400 species of Spirogyra in the world.

| | | | |
|-------------|-----------------|-----------|--|
| Kingdom | — Plantae | Structure | |
| Sub-Kingdom | — Thallophyta | | |
| Class | — Chlorophyceae | | |
| Order | — Zygnematales | | |
| Family | — Zygnaceae | | |
| Genus | — Spirogyra | | |

Reproduction

Vegetative reproduction takes place by the process of fragmentation.

Asexual (Known only in some species)

Sexual (Lateral Conjugation)

Sexual Reproduction: Involves the formation of gametes (macrozooids and microzooids) and their fusion to form a zygote. The zygote develops into a thick-walled, oval-shaped zygospore.

Sexual Reproduction (continued): Shows the process of lateral conjugation between two adjacent cells, the formation of a conjugation tube, and the transfer of genetic material.

Sexual Reproduction (continued): Shows the development of a zygote from the fusion of gametes, followed by the formation of a zygospore.

STB42 : Life Cycle of a Mushroom

Life Cycle of a Mushroom

Mushrooms are unable to photosynthesize. Mushrooms feed off decaying matter, such as rotting logs, fallen leaves, and wilted grass. Some, however, grow on live plants, and others thrive on nutrient-rich animal droppings. They develop in all sorts of environments, especially damp and poorly lit places. They reproduce by means of spores. Mushrooms have relatively simple structures with no roots, stems or leaves. Their cell walls contain the polysaccharide chitin. The fleshy body consists of a stalk (pedicel) made of densely packed hyphae which are attached to a buried mycelium and covered with a broad cap (pileus). The cap protects the delicate spore-bearing layer.

Life Cycle: Shows the cycle from a spore to a baby mushroom, then to a mature mushroom with a death cap, and back to spores. It includes the formation of primary and secondary mycelia and the process of secondary mycelium division.

STB43 : Leaf Modifications

Leaf Modifications

Leaves are the most important vegetative organs borne on the stems for photosynthesis. However, some plant species have leaves with adaptations to perform various functions other than photosynthesis.

| | | |
|--|--|--|
| TENDRILS Modified for climbing | SPINES Modified to decrease water loss | THORNS Modified to defend |
| BRACTS Modification with colorful pigmentation to attract pollinators | FLESHY LEAVES Modified to store food, water and vitamins | ADHESIVE DISC Modified for attachment to other plants |
| REPRODUCTIVE LEAF Modification for asexual reproduction to occur on these leaves | PHYLLODE Petioles are modified into flattened green leaf structures to synthesize food | INSECTIVORY Modified to extract insects to fulfil the plant's need for nitrogenous compounds |

STB44 : Parasitic Plants

Parasitic Plants

Parasitic plants are vascular plants with specialised organs (haustorium) that penetrate the tissues of other vascular plants (hosts) and absorb water, minerals and sometimes products of photosynthesis.

HOLOPARASITES: These are also known as 'obligate parasites' because of their obligation to find a host to order to survive. Holoparasites are total parasites and depend on the host plant.

| | | |
|----------------------|-------------------------|--------------------|
| RAFFLESIA | IVY BROODMOP | CUSCUTA |
|----------------------|-------------------------|--------------------|

HEMIPARASITES: These are also known as 'facultative parasites' because they are not completely parasitic. They are capable of both hemiparasitism and autotrophy. Hemiparasites lack the haustorium.

| | | |
|------------------------------|----------------------|-------------------------|
| INDIAN PAINTBRUSH | MISTLETOE | OWL'S CLOVER |
|------------------------------|----------------------|-------------------------|

STB45 : Mucor Structure & Reproduction

Mucor - Structure & Reproduction

Mucor is a saprophytic fungus which grows on stale moist bread, rotten fruits, decaying vegetables, animal dung and other organic media. It is composed of a mass of white, delicate, cottony threads known as mycelium. It is always very much branched but is coenocytic (septate and multinucleate). Each individual thread of the mycelium is known as the hyphae (pl. hyphae).

Asexual Reproduction: Shows the development of sporangia and the formation of spores. It includes the process of sporangium formation and the release of spores.

Sexual Reproduction: Shows the formation of zygospores. It includes the process of gamete formation and the fusion of gametes to form a zygote, which then develops into a zygospore.

STB46 : Regions of the Root

Regions of the Root

Root is the descending organ of the plant. Primary root is the direct prolongation of the radicle. Root ends in and is protected by the root cap. Root bears unicellular hairs in a cluster all over the tender part of the young root. Lateral roots are endogenous. Nodes and inter nodes are absent in the root.

Regions of the Root:

- Region of Maturation:** The cells in this region undergo maturation and differentiate into various types of root cells.
- Region of Elongation:** The cells in this region undergo rapid elongation and contribute to the growth of the root.
- Region of Cell Division:** The cells in this region undergo cell division and give rise to new cells.

Labels: Lateral root, Pericycle, Endodermis, Root hair, Cortex, Epidermis, Phloem, Xylem, Pith, Apical meristem, Root cap.

STB47 : Vascular Bundle

Vascular Bundle

VASCULAR BUNDLES are the transport tissues that are grouped together for the transport of water, organic and inorganic substances.

XYLEM: Xylem transports water and dissolved nutrients. It contains vessel elements called tracheids, fibres, parenchyma and tracheids. The tracheids are long narrow tubular cells with thick and pits for water to move between them. The tracheids are able to reach up to all parts of the plant and to transport water to other parts of the plant.

PHLOEM: Phloem transports photosynthetic products to all parts of the plant. It consists of sieve tubes, companion cells and phloem fibres. Sieve tubes are stacked cells with perforated end walls between the cells for movement of sap. The perforations in the end walls are called sieve plates. The phloem fibres are thick-walled cells that provide mechanical support.

STB48 : Secondary Growth

Secondary Growth

Most dicotyledonous plants exhibit an increase in girth called secondary growth. The tissues involved in secondary growth are **Vascular Cambium** and **Cork Cambium**.

Stages of Secondary Growth:

- The vascular cambium becomes active and begins to cut off secondary xylem and secondary phloem.
- The vascular cambium becomes active and begins to cut off secondary xylem and secondary phloem.
- The vascular cambium becomes active and begins to cut off secondary xylem and secondary phloem.

Annual Rings (Growth Rings): The vascular cambium produces secondary xylem and secondary phloem. The secondary xylem is made up of tracheids and vessels. The secondary phloem is made up of sieve tubes and companion cells. The vascular cambium produces a continuous ring of vascular cambium.

STZ01 : Animal Kingdom

Animal Kingdom

Animals are classified into several phyla on the basis of their levels of cell organization and presence or absence of a body cavity.

| | | | |
|---|--|--|--|
| Phylum Porifera They are the simplest animals. They have no definite shape and are provided with a water canal system. They are found in both fresh water and sea water. | Phylum Cnidaria They are the simplest animals with a definite body plan. They have a body cavity and a water canal system. They are found in both fresh water and sea water. | Phylum Mollusca They have a soft body and a shell. They are found in both fresh water and sea water. | Phylum Arthropoda They have a hard body and a jointed leg. They are found in both fresh water and sea water. |
| Phylum Echinodermata They are the simplest animals with a definite body plan. They have a body cavity and a water canal system. They are found in both fresh water and sea water. | Phylum Annelida They are the simplest animals with a definite body plan. They have a body cavity and a water canal system. They are found in both fresh water and sea water. | Phylum Mollusca They have a soft body and a shell. They are found in both fresh water and sea water. | Phylum Arthropoda They have a hard body and a jointed leg. They are found in both fresh water and sea water. |
| Phylum Chordata They are the simplest animals with a definite body plan. They have a body cavity and a water canal system. They are found in both fresh water and sea water. | Phylum Chordata They are the simplest animals with a definite body plan. They have a body cavity and a water canal system. They are found in both fresh water and sea water. | Phylum Chordata They are the simplest animals with a definite body plan. They have a body cavity and a water canal system. They are found in both fresh water and sea water. | Phylum Chordata They are the simplest animals with a definite body plan. They have a body cavity and a water canal system. They are found in both fresh water and sea water. |

STZ02 : Animal Cell

Animal Cell

The cell is the smallest unit of life. It is the basic structural and functional unit of an organism. It is the smallest unit of life that can exist on its own.

Plasma Membrane: It is the outermost layer of the cell. It is made up of phospholipids and proteins. It is selectively permeable.

Nuclear Envelope: It is the double membrane layer that surrounds the nucleus. It has nuclear pores.

Nucleus: It is the control center of the cell. It contains DNA and RNA.

Mitochondria: It is the power house of the cell. It produces energy in the form of ATP.

Golgi Apparatus: It is a stack of flattened sacs. It is involved in the transport of proteins and lipids.

Endoplasmic Reticulum: It is a network of membranes. It is involved in the synthesis of proteins and lipids.

Cilia and Flagella: They are hair-like structures. They are used for movement.

Centrioles: They are cylindrical structures. They are involved in cell division.

Lysosomes: They are small organelles. They are involved in the digestion of waste.

Cytoskeleton: It is a network of fibers. It provides structural support.

Mitochondria: It is the power house of the cell. It produces energy in the form of ATP.

STZ03 : Animal Cell Organelles

Animal Cell Organelles

The cell is the smallest unit of life. It is the basic structural and functional unit of an organism. It is the smallest unit of life that can exist on its own.

Nucleus: It is the control center of the cell. It contains DNA and RNA.

Mitochondria: It is the power house of the cell. It produces energy in the form of ATP.

Golgi Apparatus: It is a stack of flattened sacs. It is involved in the transport of proteins and lipids.

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Cytoskeleton: It is a network of fibers. It provides structural support.

Mitochondria: It is the power house of the cell. It produces energy in the form of ATP.

STZ04 : Animal Tissues

Animal Tissues

Tissues are the groups of cells having a common origin and performing similar functions. Animal tissues are classified into four groups - Epithelial, Connective, Muscular and Nervous tissues.

Epithelial Tissues: Epithelial tissue is the covering tissue. It is made up of cells closely packed and arranged in one or more layers. It is separated from the underlying connective tissue by a thin layer of basement membrane.

Connective Tissues: Connective tissues join different parts of the body. They are made up of different types of cells and fibers. They are found in various parts of the body.

Muscular Tissues: Muscular tissue is the tissue that contracts. It is found in various parts of the body. It is made up of muscle fibers.

Nervous Tissues: Nervous tissue is the tissue that carries messages. It is found in the brain, spinal cord, and nerves. It is made up of nerve cells.

STZ05 : Animal Cell Mitosis

Animal Cell Mitosis

Mitosis is the process of cell division in which the two daughter cells are identical. It is a type of cell division that results in two daughter cells that are genetically identical to the parent cell.

I. INTERPHASE: The cell grows in size. It synthesizes proteins. It replicates its DNA.

II. EARLY PROPHASE: Chromosomes condense. Nuclear envelope breaks down. Nucleolus disappears.

III. LATE PROPHASE: Spindle fibers form. Chromosomes align at the equator.

IV. METAPHASE: Chromosomes align at the equator. Spindle fibers attach to the centromeres.

V. ANAPHASE: Sister chromatids separate. They move toward opposite poles.

VI. TELOPHASE: Nuclear envelopes reform. Nucleoli reappear.

VII. CYTOKINESIS: The cell membrane pinches inward. Two daughter cells are formed.

STZ06 : Animal Cell Meiosis

Animal Cell Meiosis

Meiosis is the process of cell division in which the two daughter cells are not identical. It is a type of cell division that results in four daughter cells that are genetically different from the parent cell.

MEIOSIS I:

- PROPHASE I:** Chromosomes condense. Homologous chromosomes pair up.
- METAPHASE I:** Homologous chromosomes align at the equator.
- ANAPHASE I:** Homologous chromosomes separate.
- TELOPHASE I:** Nuclear envelopes reform. Two daughter cells are formed.

MEIOSIS II:

- PROPHASE II:** Chromosomes condense. Spindle fibers form.
- METAPHASE II:** Chromosomes align at the equator.
- ANAPHASE II:** Sister chromatids separate.
- TELOPHASE II:** Nuclear envelopes reform. Four daughter cells are formed.

STZ07 : Gametogenesis in Animals

Gametogenesis in Animals

Gametogenesis is the process of formation of gametes. It involves meiosis and cytokinesis.

OOGENESIS: The process of formation of ova. It occurs in the ovary. It results in one large ovum and three small polar bodies.

SPERMATOGENESIS: The process of formation of sperm. It occurs in the testis. It results in four equal-sized sperm.

STZ08 : Fertilization in Animals

Fertilization in Animals

Fertilization is the fusion of a sperm and an ovum to form a zygote. It is the process by which two haploid gametes fuse to form a diploid zygote.

Gametes in Animals: Sperm and ovum are the gametes. They are haploid cells.

Fertilization Process: The sperm penetrates the ovum. The nuclei fuse. The zygote is formed.

STZ09 : Protozoa

Protozoa

The term Protozoa was coined by Goldfuss in 1820. The phylum protozoa includes the unicellular organisms that have animal-like characteristics. The word protozoa literally means 'first animals' or 'primitive animals'. The phylum Protozoa is divided, according to the structures they possess, for locomotion into four classes.

Rhizopoda

Protozoa that move by means of pseudopodia are classified as Rhizopoda.

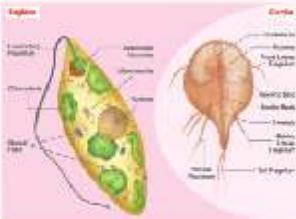
For e.g., amoeba. Amoeba is a single celled protozoa that can constantly change its shape. Some of them also cause amoebiasis/dysentery in humans.



Mailigophora

Protozoa that move by means of flagella are classified as Mailigophora.

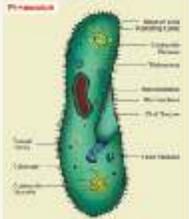
For e.g., Euglena, Giardia, etc. Euglena is considered as the connecting link between the plant kingdom and the animal kingdom. Giardia causes dysentery in human beings.



Ciliophora

Protozoa that move by means of cilia are classified as Ciliophora.

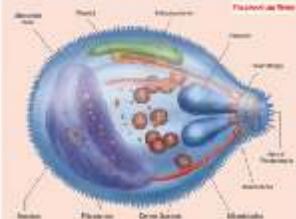
For e.g., paramecium.



Sporozoa

Protozoa that do not possess locomotory organs are classified as Sporozoa.

For e.g., plasmodium vivax.



STZ10 : Amoeba

Amoeba

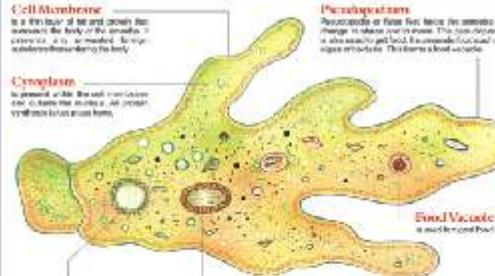
Amoeba is one of the simplest living animals, consisting of a single cell and belonging to the protozoa group.

Cell Membrane

is a thin layer of fat and protein that surrounds the body of the amoeba. It controls the entry and exit of water and other substances into and out of the body.

Pseudopodiums

Projections or false feet like structures used to move. The amoeba is also able to get food by extending its false feet into the agar medium. This is called amoeboid movement.



Cytoplasm

is present inside the cell membrane that contains the organelles. It is composed of a thin layer of water and other substances.

Food Vacuole

is used for storing food.

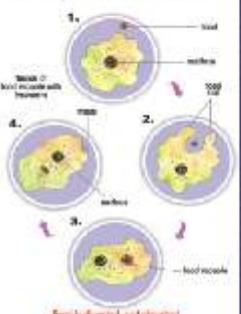
Contractile Vacuole

is used for removing excess water. It is found in the body of the amoeba. It contracts and expands to remove excess water.

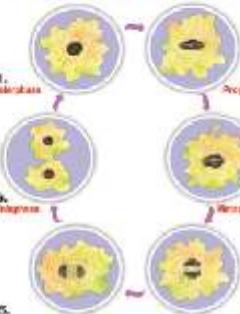
Nucleus

is the most prominent part which controls all the activities of the cell. It is found in the center of the cell. It contains DNA and RNA.

Nutrition in Amoeba



Reproduction in Amoeba

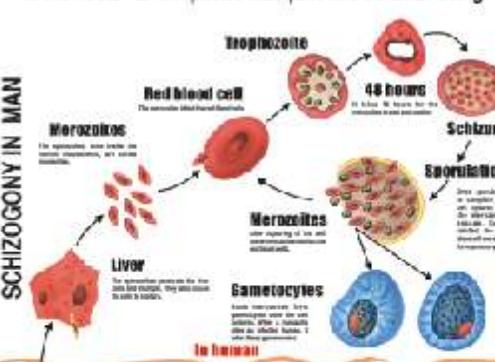


STZ11 : Malaria Parasite

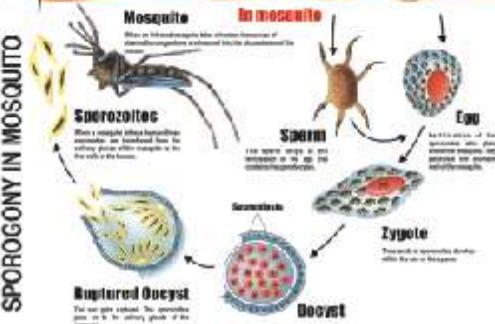
Malaria Parasite

The life cycle of the malaria parasite, plasmodium, takes place in two hosts - an anopheles mosquito and a human being.

SCHIZOGONY IN MAN



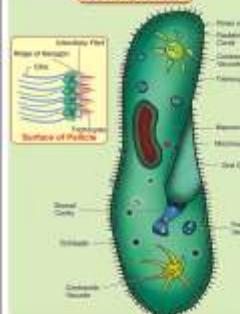
SCHIZOGONY IN MOSQUITO



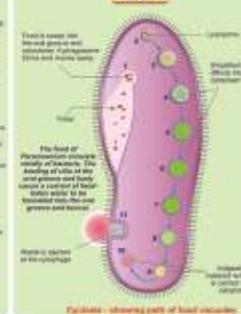
STZ12 : Paramecium

Paramecium

Paramecium caudatum



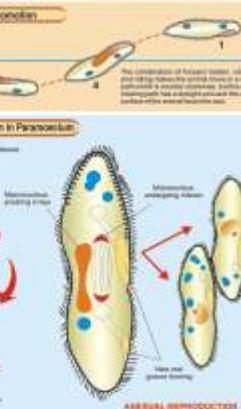
Multicell



Reproduction in Paramecium



Reproduction in Amoeba

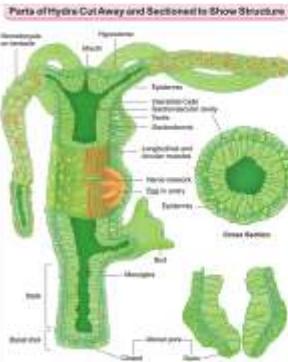


STZ13 : Hydra

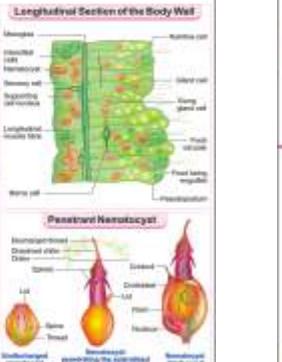
Hydra

Hydra is a simple coelenterate, commonly found in freshwater ponds and streams.

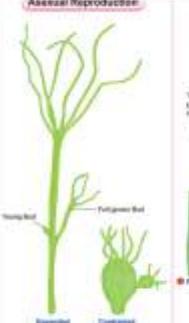
Parts of Hydra Cut Away and Sectioned to Show Structure



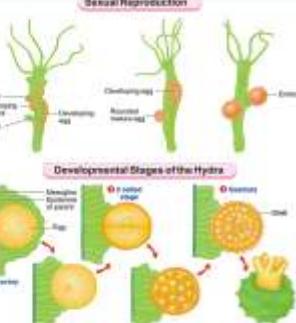
Longitudinal Section of the Body Wall



Asexual Reproduction



Sexual Reproduction



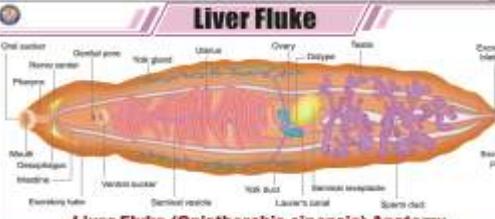
Developmental Stages of the Hydra



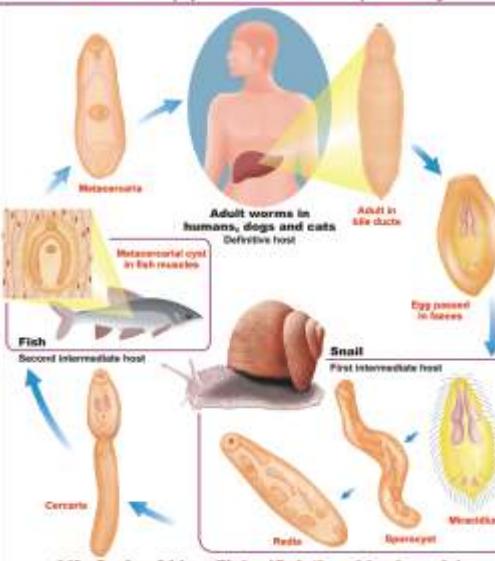
STZ14 : Liver Fluke

Liver Fluke

Liver Fluke (Opisthorchis sinensis) Anatomy



Life Cycle of Liver Fluke (Opisthorchis sinensis)



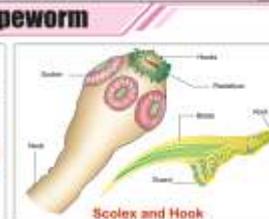
STZ15 : Tapeworm

Tapeworm

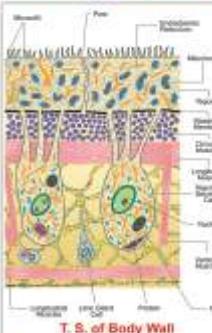
Morphology of Taenia Solium



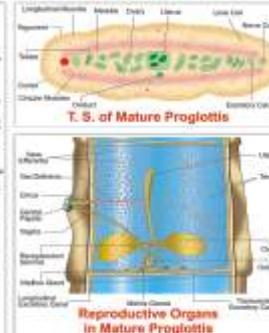
Scolex and Hook



T. S. of Mature Proglottis



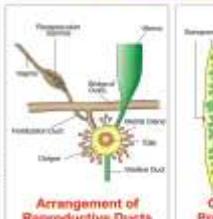
Reproductive Organs in Mature Proglottis



Excretory System



Arrangement of Reproductive Ducts



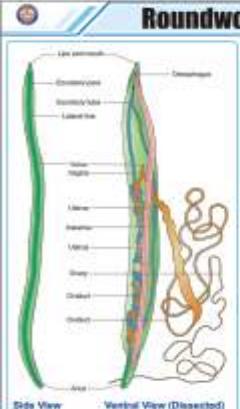
Gravid Proglottis



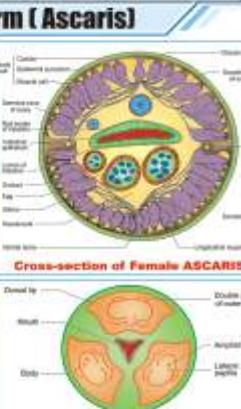
STZ16 : Roundworm (Ascaris)

Roundworm (Ascaris)

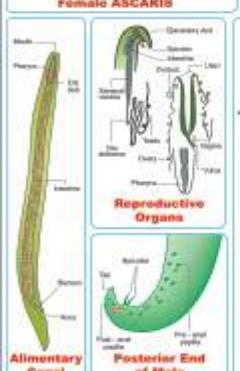
Side View



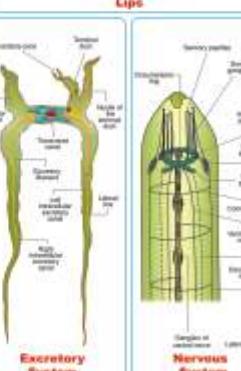
Cross-section of Female ASCARIS



Female ASCARIS



Male ASCARIS



STZ17 : Hookworm

Hookworm

Characteristics of Hookworm

- The intestinal nematode parasites attach to the intestinal epithelium of mammalian host blood.
- Females are 12 to 15 cm long and bear up to 100,000 eggs.
- They possess a pair of suckers at the anterior end for feeding on the host's blood.
- There is a large buccal capsule with 2 pairs of large teeth (dorsal and ventral) and a pair of sharp teeth (dorsal and ventral) for penetrating the host's skin.
- Eggs passed with human excreta and latrine soil.
- The proventriculus (gizzard) comes to the surface and penetrates the human skin through the skin.
- Anthelmintic medicines cause itching and inflammation of the skin, which promotes infection or even parasites.
- They cause severe anemia in adults and retard physical and mental development in children.

Hookworms Embryo (Four cells)

Hookworm (Male)

Bursa of Male

Life Passage of Hookworm

STZ18 : Life History of Mosquito

Life History of Mosquito

Mosquitoes complete their life cycle in stagnant water. The life cycle of a mosquito consists of four stages – egg, larva, pupa and adult.

A female mosquito has needle like parts of its mouth. It feeds on blood to develop her eggs. Mosquitoes are seen as nuisance in the evening.

A female mosquito lays her eggs in or around water. It can deposit several hundred eggs in each round meal.

Widespread in 7-10 days, larvae change to pupa. The growing mosquito stays on still water for a few minutes to dry. Larvae are from fly, blowfly.

The eggs hatch within 24-48 hours and release larvae. Larvae are commonly known as 'wigglers'. Larvae lay eggs on the surface of water.

STZ19 : Life Cycle of Butterfly

Life Cycle of Butterfly

Metamorphosis of a Monarch Butterfly

Coloured patterns on the wings help the butterfly to find a mate and food predators.

Adult Butterfly
Adults live for only a short time. They cannot eat. They only drink through their straw-like upper proboscis. They will fly, mate, and reproduce.

Egg
The adult female lays an egg that will be fertilized by the male.

Larva (Caterpillar)
The egg hatches into a tiny larva (Caterpillar). This is a new-born black, oval-shaped caterpillar feeding on eggshells. This is often a caterpillar's first meal.

Pupa (Chrysalis)
Inside the pupa, the caterpillar changes into a butterfly. Pupae are often camouflaged to hide from predators.

Emergence
A fully-grown adult butterfly emerges from the chrysalis.

Green Pupa
The caterpillar attaches itself to a leaf and forms a hard outer shell.

Caterpillar
The caterpillar eats and grows to a tremendous amount.

STZ20 : Life History of Housefly

Life History of Housefly

Adult
A housefly has reached its full size when it comes out of the pupal case. In about 2-3 days, the adult housefly is able to reproduce. Houseflies ingest only liquid food. They regurgitate saliva onto solid food to dissolve it.

Eggs
Adult female lays many eggs that allow production of many eggs (100-250). After mating, eggs are laid in protein rich site such as damp manure or decaying grain under.

Puparium
The pupa does not feed and remains inactive. Inside the pupal case, the larva continues to change and takes on the shape of the adult housefly. In another 3-6 days, the adult housefly becomes.

Full Grown Larva
Larvae thus produced feed on protein diet & grow rapidly. At the end of growth phase,

STZ21 : Life History of Frog

Life History of Frog

Frogs are amphibians meaning that they can live both in water and on land. There are 24 different families of frogs which entails more than 5000 species.

Eggs
Frogs lay their eggs in large masses called clumps, in various situations.

ADULT FROG
An adult frog jumps easily to avoid its enemies and uses its webbed feet, an adult frog can swim easily.

YOUNG FROG
After a period of 2 weeks, the tadpoles are released and they disperse. The froglets are born from the eggs.

LARVA (TADPOLE)
The tadpoles are hatched from the eggs and start swimming. Their tails help them to swim.

ADULT FROG
Frogs are not true swimmers, the external gills disappear and the internal gills become large into the respiratory system.

LARVA (TADPOLE)
Tadpoles develop external gills and a long swimming tail as well as internal respiratory system.

STZ22 : Human Blood

Human Blood

FUNCTIONS OF BLOOD

- Transportation of oxygen, carbon dioxide, nutrients, hormones, heat, and wastes.
- Regulation of pH, body temperature, and water content of cells.
- Protection against blood loss through clotting and against disease through phagocytic white blood cells and antibodies.

BLOOD FLOWING IN BLOOD VESSEL

COMPONENTS OF BLOOD

Plasma (55-60%)
Water (90%)
Proteins (7-8%)
Electrolytes (1%)
Other solutes (1-2%)

Buffy Coat (1-2%)
Leucocytes
Erythrocytes
Platelets

RBC STRUCTURE
Red blood cells are biconcave discs. They have a large surface area for exchange of gases. They contain haemoglobin, a protein that carries oxygen.

BLOOD GROUP

| System | Antigen | Antibody | Can Donate Blood To | Can Receive Blood From |
|--------|---------|----------|---------------------|------------------------|
| A | A | B, AB, O | A, AB | A, O |
| B | B | A, AB, O | B, AB | B, O |
| AB | A, B | O | AB | A, B, AB, O |
| O | None | A, B | A, B, AB, O | O |

BLOOD CLOTTING
Blood clotting is a process by which blood changes from a liquid to a gel. It is a natural process that helps to stop bleeding and heal wounds.

STZ23 : Body's Defence

Body's Defence

Ability of the body to fight against disease causing organisms is called **immunity**. **White Blood Cells** or **Leucocytes** are the cells of the immune system defending the body against both infectious diseases and foreign materials. White blood cells are produced in the bone marrow known as **Haematopoietic Stem Cell**. Leucocytes are found throughout the body including the blood and lymphatic system.

Vaccination is the administration of antigenic material (the vaccine) to produce immunity to a disease. Vaccines can prevent from the effects of infection by a pathogen.

Types of Leucocytes

- Neutrophils
- Lymphocytes
- Monocytes
- Eosinophils
- Basophils

VACCINATION
Vaccination is most effective method of preventing infectious diseases.

STRUCTURE OF AN ANTIBODY MOLECULE

BODY'S IMMUNE MECHANISM (ACQUIRED IMMUNITY)

STZ24 : Harmful Insects

Harmful Insects

Locust
Locusts are destructive crops and cause major agricultural damage.

Head Louse
Responsible for itchy scalp leading to dermatitis and infection.

Aphid
Quite destructive as it feeds plant sap & spreads viruses.

Bedbug
Causes skin rashes, allergic & psychological effects.

Female Anopheles Mosquito
Transmits malaria.

Flea
Causes flea allergy dermatitis. Also transmits bubonic plague, typhus, typhoid fever and other diseases.

Termites
Can cause great damage to ungrouted wooden buildings and wooden structures.

Rice Weevil
Causes damage to harvested and stored grains. It's larvae eat the stored grain kernels.

Silverfish
Can damage books, documents, sugary products, carpet, clothes, leatherware etc.

Scorpion
Vector of Leishmaniasis. Also source of the venomous bite.

Female Aedes Mosquito
Transmits Dengue and yellow fever.

Housefly
Dangerous carrier of pathogens like typhoid, cholera, dysentery, salmonellosis etc.

STZ25 : Beneficial Insects

Beneficial Insects

- Praying Mantis**
Lined for biological pest control.
- Dragonfly**
Feed on harmful insects like mosquitoes, flies, bees and ants.
- Bumble Bee**
For important pollination.
- Ladybird**
Feed on aphids and leaf insects.
- Cactus Moth**
Feed on cactus species.
- Green Lacewing**
Larvae become voraciously kill pests of leaf insects, arachnids and green flies.
- Fig Wasp**
Pollinate figs.
- Honey Bee**
Primary producer of honey, beeswax and propolis.
- Leaf Insect**
Producer of silk yarn.
- Silkworm**
Primary producer of silk.

STZ29 : Earthworm - I (External Morphology & Reproduction)

Earthworm - I (External Morphology & Reproduction)

- Cross Section of Earthworm:** Shows dorsal blood vessel, coelom, circular muscles, longitudinal muscles, nephridia, and other internal organs.
- Anterior End of Earthworm:** Shows the mouth, pharynx, and esophagus.
- REPRODUCTION:** Shows the clitellum, ovaries, and testes.
- Reproductive System:** Detailed diagram of the male and female reproductive organs.
- Population in Earthworm:** Shows the arrangement of nephridia and other structures.

STZ26 : Food Habits of Birds

Food Habits of Birds

Birds eat assorted foods that are rich in energy and proteins. Many species eat more than one type of food whereas some birds feed entirely on a single kind of food. Birds also have seasonal changes in their diet to guarantee their survival.

- Feeding on Piny (Raptorial):** Birds that eat small birds or other animals. Example: Hawk, Eagle, Falcon, Kestrel.
- Feeding on Carrion (Scavenging):** They eat dead animals and garbage waste. Example: Vulture, Magpie, Crow.
- Feeding on Insects (Insectivorous):** They eat various insects. Example: Blue Jay, Kingfisher, Warbler.
- Feeding on Fish (Piscivorous):** They eat fish. Example: Kingfisher, Osprey, Cormorant.
- Feeding Mainly on Fruits (Fruugivorous):** They eat mainly fruits. Example: Parrot, Toucan, Oriole.
- Feeding on Grains & Seeds (Granivorous):** They eat mainly grains and seeds. Example: Dove, Pigeon, Quail.
- Feeding on Nectar/Pollen/Sap (Nectarivorous):** They eat nectar and pollen. Example: Hummingbird, Honey Sucker.
- Feeding on Green Vegetation:** They eat mainly green vegetation. Example: Parrot, Parakeet.
- Unrestricted feeding (Omnivorous):** They eat almost anything. Example: Raven, Crow, Magpie.
- Filter Feeding:** They filter food from water. Example: Kingfisher.

STZ30 : Earthworm - II (Blood Circulation, Respiratory & Nervous System)

Earthworm - II (Blood Circulation, Respiratory & Nervous System)

- Circulatory System of First 14 Segments:** Shows the anterior part of the circulatory system.
- Circulatory System of 15th Segment Onwards:** Shows the posterior part of the circulatory system.
- Anterior End Showing Cerebral Ganglion & Larger Nerves:** Shows the brain and nerves.
- Sensory & Motor Nerves of Ventral Nerve Cord:** Shows the ventral nerve cord.
- Structure of Valve Between Dorsal and Typhlosole Vessels:** Shows the valve between the dorsal and typhlosole vessels.
- RESPIRATION THROUGH MOIST SKIN:** Shows the process of gas exchange.
- T.S. of Ventral Nerve Cord Ganglion:** Shows a transverse section of the nerve cord.
- Epidermis Showing Sense Organs:** Shows the sense organs on the skin.

STZ27 : Fish Anatomy

Fish Anatomy

- Bony Fish:** Shows the skull, brain, heart, and other internal organs.
- General Anatomy:** Shows the external features like fins, scales, and gills.
- Skeletal System:** Shows the internal skeleton.
- Cartilaginous Fish:** Shows the cartilaginous skeleton.
- Gill Structure:** Shows the gills and their blood supply.

STZ31 : Earthworm - III (Digestion, Skin & Excretion)

Earthworm - III (Digestion, Skin & Excretion)

- Alimentary Canal:** Shows the path of food from mouth to anus.
- T.S. Through Gizzard:** Shows the internal structure of the gizzard.
- T.S. of Body Wall:** Shows the layers of the body wall.
- Excretory System:** Shows the nephridia and their function.

STZ28 : Birth of a Bird's Chick

Birth of a Bird's Chick

- 1. Fertilization:** The egg and sperm fuse.
- 2. Cleavage:** The zygote divides into cells.
- 3. Blastoderm:** The cells form a single layer.
- 4. Blastoderm:** The blastoderm invaginates to form a gut.
- 5. CRACKING:** The chick starts to break through the egg shell.
- 6. CRACKING:** The chick is fully formed and ready to hatch.
- 7. CRACKING:** The chick is fully formed and ready to hatch.
- 8. CRACKING:** The chick is fully formed and ready to hatch.

STZ32 : Cockroach - I (Morphology & Reproduction)

Cockroach - I (Morphology & Reproduction)

- EXTERNAL FEATURES:** Shows the body structure, legs, and antennae.
- HEAD (posterior view):** Shows the mouthparts and antennae.
- LEG:** Shows the structure of a leg.
- ABDOMEN SEGMENTS (posterior end side view):** Shows the different segments of the abdomen.
- REPRODUCTIVE SYSTEM:** Shows the male and female reproductive organs.

STZ33 : Cockroach - II (Blood Circulation, Respiratory & Nervous System)

Cockroach-II (Blood Circulation, Respiratory & Nervous System)

Circulatory System of Cockroach

- Heart (13-segmented dorsal vessel)
- Septal transverse blood vessels
- Open circulatory system

Working of the Valves

- Anterior valves: Allow blood to flow forward into the heart.
- Posterior valves: Allow blood to flow backward into the heart.

Respiratory System of Cockroach

- Tracheal spiracles (10 pairs)
- Tracheal tubes
- Tracheolar network

Autonomic or Sympathetic Nervous System

- Brain
- Sub-oesophageal ganglion
- Sub-gut ganglion
- Sub-sternal ganglion
- Sub-abdominal ganglia (6 pairs)

STZ34 : Cockroach - III (Digestion, Excretory, Skin & Muscles)

Cockroach-III (Digestion, Excretory, Skin & Muscles)

Digestive System

- Salivary gland
- Salivary reservoir
- Proventriculus or gizzard
- Midgut
- Malpighian tubules
- Rectum
- Anal opening

Excretory System

- Malpighian tubules
- Rectum
- Anal opening

Structure of Integument

- Epidermis
- Sub-epidermal layer
- Chitinous cuticle
- Microvilli
- Sensory nerve cells
- Epithelial cells or papillae
- Chloragogenous cells
- Heart

Ultrastructure of Epicuticle

- Chitin layer
- Procuticle layer
- Cuticle layer
- Thin layer
- Thin layer

Muscles

- Longitudinal muscles
- Transverse muscles
- Oblique muscles
- Diaphragmatic muscles
- Sub-abdominal muscles

STZ35 : Vertebrate Classes

Vertebrate Classes

Principal classes of vertebrates having living representation are :-

- CLASS - PROTOSTOMES**
 - Coelom: Protocoelom
 - Body cavity: Protocoel
 - Excretion: Protonephridia
 - Respiration: Protobranchia
 - Reproduction: Protostomy
- CLASS - NEUROSTOMES**
 - Coelom: Metacoelom
 - Body cavity: Metacoel
 - Excretion: Metanephridia
 - Respiration: Metabranchia
 - Reproduction: Neotostomy
- CLASS - CIRCOSTOMES**
 - Coelom: Metacoelom
 - Body cavity: Metacoel
 - Excretion: Metanephridia
 - Respiration: Metabranchia
 - Reproduction: Neotostomy
- CLASS - AMPHIBIANS**
 - Coelom: Metacoelom
 - Body cavity: Metacoel
 - Excretion: Metanephridia
 - Respiration: Metabranchia
 - Reproduction: Neotostomy
- CLASS - REPTILIA**
 - Coelom: Metacoelom
 - Body cavity: Metacoel
 - Excretion: Metanephridia
 - Respiration: Metabranchia
 - Reproduction: Neotostomy
- CLASS - AVES**
 - Coelom: Metacoelom
 - Body cavity: Metacoel
 - Excretion: Metanephridia
 - Respiration: Metabranchia
 - Reproduction: Neotostomy
- CLASS - MAMMALS**
 - Coelom: Metacoelom
 - Body cavity: Metacoel
 - Excretion: Metanephridia
 - Respiration: Metabranchia
 - Reproduction: Neotostomy

STZ36 : Sense Organs

SENSE ORGANS

Human sense organs contain receptors that relay information through sensory neurons to the appropriate places within the nervous system.

Receptors (Senses in Sense Organs)

- EYE: "SIGHT"** - Rods and cones
- EAR: "SOUND"** - Cochlea and vestibular system
- TONGUE: "TASTE"** - Taste buds
- SKIN: "TOUCH"** - Mechanoreceptors
- NOSE: "SMELLING"** - Olfactory receptors

STZ37 : General Dissection of Rabbit

General Dissection of Rabbit

Rabbits are mammals in the family Leporidae of the order Lagomorpha. There are eight different genera in the family.

Dissection of a Female Rabbit (a mammal)

STZ38 : Neuron

Neuron

The basic parts of a neuron are:

- Cell body (Soma)**: Contains nucleus and organelles.
- Dendrites**: Receive signals from other neurons.
- Axon**: Transmits signals to other neurons.
- Synapse**: Junction between neurons.

Types of Neurons: Bipolar, Unipolar, Multipolar.

STZ39 : Early Development of the Frog

Early Development of the Frog

- 2-Cell Stage**
- 4-Cell Stage**
- 8-Cell Stage**
- Late Blastula**
- Early Gastrula in Section**
- Gastrula in Section**
- Older Embryo with Neural Groove Closed**
- Older Embryo in Section**

STZ40 : Frog's Morphology & Internal Structure

Frog's Morphology & Internal Structure

Dorsal View

Ventral View

Internal Structure of Frog

STZ41 : Frog's Urogenital System

Frog's Urogenital System

Urogenital system of the frog consists of organs of excretion and reproduction. They are considered together because they share some common ducts and they work together quite often, especially in male frog.

Urogenital System of Male Frog

Labels: Fat body, Testis, Adrenal gland, Ureter, Large intestine, Seminal vesicle, Cloaca opening, Penis, Vas deferens, Uterus, Ovary, Uterine duct, Large intestine, Cloaca opening.

Urogenital System of Female Frog

Labels: Fat body, Ovary, Uterine duct, Large intestine, Cloaca opening, Part of excretory system, Adrenal gland, Uterus, Uterine duct, Large intestine, Cloaca opening.

STZ42 : Frog's Circulatory System

Frog's Circulatory System

The circulatory system of the frog consists of a heart, arteries, veins, capillaries and lymphatics.

Circulatory System of the Bullfrog in Ventral View

Labels: Heart, Aorta, Pulmonary artery, Ventricle, Artery, Vein, Capillary, Lymphatic vessel, etc.

Frog's Heart

Labels: Right ventricle, Left ventricle, Atrium, Septum, etc.

STZ43 : Frog's Nervous System

Frog's Nervous System

Frogs have a highly developed nervous system. It is divided into the brain, spinal cord and peripheral nerves.

Brain of Frog

Labels: Cerebrum, Cerebellum, Brain stem, etc.

Spinal Cord

Labels: Cervical, Thoracic, Lumbar, Sacral, etc.

STZ44 : Frog's Muscular System

Frog's Muscular System

Muscular structure of a frog is very different from that of a human. The difference is in the relative power of some of the muscle groups.

Ventral View

Labels: Pectoralis, Abductor, Adductor, etc.

Dorsal View

Labels: Latissimus, Trapezius, etc.

STZ45 : Life Cycle of a Cockroach

Life Cycle of a Cockroach

The life cycle of cockroach begins with the egg. After mating, cockroach female produces reddish egg cases known as oothecae.

- Ootheca Containing Eggs**
- Hatching**
- Nymph**
- Nymph**
- Nymph**
- Nymph**
- Nymph**
- Adult**

Adult cockroaches have an average lifespan of around a year but it depends on species.

Initially nymphs are whitish and soft. Once their exoskeleton hardens they will darken and appear in their normal colour.

Nymphs resemble adults in appearance and behaviour, although they are smaller in size and do not have wings.

STZ46 : Skeleton of a Bird

Skeleton of a Bird

The skeleton of a bird is adapted for flight. It is light and strong. The bones are hollow and have a porous structure.

Anatomy of Hyla

Labels: Mandible, Maxilla, etc.

Birds Have Pneumatic Bones

Labels: Air sac, Foramen, etc.

STZ47 : Skeleton of a Rabbit

Skeleton of a Rabbit

Skeleton of rabbit, like that of any other vertebrate, is divided into the skull, vertebral column, ribs and pelvic girdle.

Skull of Rabbit

Labels: Brain case, Orbit, etc.

Forelimb of Rabbit

Labels: Humerus, Radius, Ulna, etc.

Atoms and Atomic Structure

Atoms are the building blocks of matter.

Sir J. J. Thomson was the first to discover the presence of electrons in 1897. He performed the Discharge Tube Experiment.

An atom has a positively charged centre called nucleus. The nucleus has positively charged particles. Proton is positively charged and neutron has no charge. Electrons revolve around the nucleus. The number of electrons in an atom is equal to the number of protons in the atom.

Rutherford's Gold Foil Experiment led him to suggest the presence of positively charged nucleus deep inside the atom where probably the entire mass of atom is concentrated.

In 1932, James Chadwick discovered the presence of neutrons in an atom. Goldstein shows the existence of protons in an atom.

Bohr's Atomic Model suggested that electrons revolve around the nucleus in different energy levels or orbits. Energy levels or shells are represented either by numbers 1, 2, 3, 4, 5 and 6 or by letters K, L, M, N, O and P. The electrons do not lose their energy as long as they keep moving in their energy levels.

The electrons orbiting the nucleus of an atom can absorb energy and move from a normal orbit to higher one.

Mass number = protons + neutrons. It is represented by A.

Atomic mass: It is the average of mass number of naturally occurring isotopes of an atom.

In 1913, Mosley introduced atomic parameter called atomic number. It is equal to the number of protons present inside the nucleus of its atom. It is represented by Z.

The mass number and atomic number are shown as superscript and subscript respectively on the left side of the symbol of that element.

Rutherford suggested a fixed circular path of an electron around the nucleus.

According to classical electromagnetic theory, electrons will lose energy continuously while revolving around the nucleus. This, however, does not happen.

²³Na

Chemical Reactivity of An Element

The metals, which can lose electrons more readily to form positive ions are more reactive. The more reactive metals displace the less reactive metal from its salt solution. The less reactive metals do not lose electrons easily. Potassium is the most reactive metal. Gold is the least reactive metal.

Relative Reactivity of Metals

↓

Most reactive

Least reactive

1. Evolution of Gas

Sodium reacts with water vigorously to produce hydrogen gas.

$$2Na + 2H_2O \rightarrow 2NaOH + H_2 \uparrow$$

2. Formation of Precipitates

When zinc metal is added to an aqueous solution of copper sulfate, a brown precipitate is formed.

$$Zn + CuSO_4 \rightarrow ZnSO_4 + Cu \downarrow$$

3. Change of Colour

Colour change due to the formation of new products. When some iron filings are placed in a blue coloured solution of copper sulphate, a green colour and solution of ferrous sulphate is formed along with copper.

$$FeSO_4 \cdot 7H_2O + Fe \rightarrow FeO + FeSO_4$$

4. Change of State

Hydrolysis of water gives hydrogen and oxygen gases.

$$2H_2O \rightarrow 2H_2 \uparrow + O_2 \uparrow$$

5. Absorption of Heat

Other carbon and sulphur are heated, carbon dioxide is formed. Heat is absorbed in the reaction.

$$C + 2SO_2 \rightarrow CS_2 + 2SO \uparrow$$

Classification of Chemical Reactions

Combination Reaction

In a combination reaction two or more substances combine to form a single product.

Example: $2Mg + O_2 \rightarrow 2MgO$

Decomposition Reaction

A compound splits up into two or more substances in a chemical reaction.

Example: $2H_2O \rightarrow 2H_2 + O_2$

Displacement Reaction

In a displacement reaction, the more reactive element replaces a less reactive element.

Example: $Zn + CuSO_4 \rightarrow ZnSO_4 + Cu$

Double Displacement Reaction

In a double displacement reaction, two compounds exchange their ions to give new compounds.

Example: $Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2 \uparrow$

Redox Reaction

In redox reactions, both oxidation and reduction take place at the same time.

Oxidation Reaction: Oxidation involves loss of electrons or an increase in oxidation state. Carbon reacts with oxygen to form carbon dioxide. $C + O_2 \rightarrow CO_2$

Reduction Reaction: Reduction involves gain of electrons or a decrease in oxidation state. Copper oxide is reduced to form copper by adding hydrogen. $CuO + H_2 \rightarrow Cu + H_2O$

Exothermic Reaction

The reaction of an acid with a base is an exothermic reaction as it releases heat.

$HCl + NaOH \rightarrow NaCl + H_2O$

Endothermic Reaction

The reaction of an acid with a metal carbonate is an endothermic reaction as it absorbs heat.

$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2 \uparrow$

Photochemical Reaction

Photochemical reactions produce light as are initiated by a light source. Silver chloride is used in photography because it is sensitive to light.

$2AgCl \xrightarrow{h\nu} 2Ag + Cl_2$

Chemical Reaction and its Characteristics

A chemical reaction is a phenomenon of formation of new substances.

The arrangement of atoms of the reactants gives rise to the formation of new substances. Heating sodium carbonate and sodium hydroxide gives carbonates.

$$CaCO_3 + NaOH \rightarrow CaO + Na_2CO_3$$

1. Evolution of Gas

Sodium reacts with water vigorously to produce hydrogen gas.

$$2Na + 2H_2O \rightarrow 2NaOH + H_2 \uparrow$$

2. Change of Colour

Colour change due to the formation of new products. When some iron filings are placed in a blue coloured solution of copper sulphate, a green colour and solution of ferrous sulphate is formed along with copper.

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4. Change of State

Hydrolysis of water gives hydrogen and oxygen gases.

$$2H_2O \rightarrow 2H_2 \uparrow + O_2 \uparrow$$

5. Release of Heat

Reaction which involves release of heat are called exothermic reactions.

$$CaO + H_2O \rightarrow Ca(OH)_2 + Heat$$

6. Absorption of Heat

Reaction which involve absorption of heat are called endothermic reactions.

$$C + 2SO_2 \rightarrow CS_2 + 2SO \uparrow$$

Valencies of Elements

Valency - Capacity of a single atom or radical to combine with other atoms or radicals to form a stable molecule. Valency of an element depends on the number of valence electrons.

Hydrogen has 1 valence electron

Carbon has 4 valence electrons

Nitrogen has 5 valence electrons

Oxygen has 6 valence electrons

Aluminum has 3 valence electrons

| Z | Element | Sym. | Valency | Z | Element | Sym. | Valency |
|----|------------|------|--------------------------------|----|--------------|------|----------------------------|
| 1 | Hydrogen | H | +1, -1 | 27 | Silver | Ag | +1, -1, -3 |
| 2 | Helium | He | 0 | 48 | Calcium | Ca | +2, -2 |
| 3 | Lithium | Li | +1 | 49 | Indium | In | +3, -3, -5 |
| 4 | Beryllium | Be | +2 | 50 | Tin | Sn | +2, -2, -4 |
| 5 | Boron | B | +3, -3 | 51 | Antimony | Sb | +3, -3, -5, -7 |
| 6 | Carbon | C | +4, -4 | 52 | Tellurium | Te | +4, -4, -6, -8 |
| 7 | Nitrogen | N | +3, -2, -1, +1, +2, +3, +4, +5 | 53 | Iodine | I | +1, -1, +3, +5, +7 |
| 8 | Oxygen | O | +2, -1, -2, +1, +3 | 54 | Xenon | Xe | 0 |
| 9 | Fluorine | F | -1, +1 | 55 | Cesium | Cs | +1 |
| 10 | Neon | Ne | 0 | 56 | Barium | Ba | +2 |
| 11 | Sodium | Na | +1 | 57 | Lanthanum | La | +3 |
| 12 | Magnesium | Mg | +2 | 58 | Cerium | Ce | +3, +4 |
| 13 | Aluminum | Al | +3 | 59 | Praseodymium | Pr | +3 |
| 14 | Silicon | Si | +4, -4 | 60 | Neodymium | Nd | +3, +4 |
| 15 | Phosphorus | P | +3, +5, -3 | 61 | Promethium | Pm | +3 |
| 16 | Sulphur | S | +2, +4, +6 | 62 | Samarium | Sm | +2, +3 |
| 17 | Chlorine | Cl | +1, +3, +5, +7, +4, +6, +7 | 63 | Eurium | Eu | +2, +3 |
| 18 | Argon | Ar | 0 | 64 | Gadolinium | Gd | +3 |
| 19 | Potassium | K | +1 | 65 | Terbium | Tb | +3, +4 |
| 20 | Calcium | Ca | +2 | 66 | Dysprosium | Dy | +3 |
| 21 | Scandium | Sc | +3 | 67 | Holmium | Hm | +3 |
| 22 | Titanium | Ti | +3, +4 | 68 | Erbium | Er | +3 |
| 23 | Vanadium | V | +2, +3, +4, +5 | 69 | Thulium | Tm | +3, +4 |
| 24 | Chromium | Cr | +2, +3, +6 | 70 | Ytterbium | Yb | +2, +3 |
| 25 | Manganese | Mn | +2, +3, +4, +6, +7 | 71 | Lutetium | Lu | +3 |
| 26 | Iron | Fe | +2, +3, +6, +8 | 72 | Hafnium | Hf | +4 |
| 27 | Cobalt | Co | +2, +3, +4 | 73 | Tantalum | Ta | +3, +4, +5 |
| 28 | Nickel | Ni | +2, +3, +4 | 74 | Tungsten | W | +2, +3, +4, +5, +6 |
| 29 | Copper | Cu | +1, +2, +3 | 75 | Rhenium | Re | +1, +2, +3, +4, +5, +6, +7 |
| 30 | Zinc | Zn | +2 | 76 | Osmium | Os | +2, +3, +4, +6, +8 |
| 31 | Gallium | Ga | +3 | 77 | Iridium | Ir | +3, +4, +6, +8 |
| 32 | Germanium | Ge | +2, +4 | 78 | Platinum | Pt | +2, +3, +4, +6, +8 |
| 33 | Arsenic | As | +3, +5, -3, -5 | 79 | Gold | Au | +1, +2, +3 |
| 34 | Selenium | Se | +2, +4, +6 | 80 | Mercury | Hg | +1, +2 |
| 35 | Bromine | Br | +1, +3, +5, +7 | 81 | Thallium | Tl | +1, +2, +3 |
| 36 | Krypton | Kr | 0 | 82 | Lead | Pb | +2, +4 |
| 37 | Rubidium | Rb | +1 | 83 | Bismuth | Bi | +3, +5, +6, +7 |
| 38 | Strontium | Sr | +2 | 84 | Polonium | Po | +2, +4, +6 |
| 39 | Yttrium | Y | +3 | 85 | Astatine | At | +1, +2, +3, +5, +7 |
| 40 | Zirconium | Zr | +2, +3, +4 | 86 | Radium | Ra | +2 |
| 41 | Niobium | Nb | +2, +3, +4, +5 | 87 | Francium | Fr | +1 |
| 42 | Molybdenum | Mo | +2, +3, +4, +5, +6 | 88 | Radium | Ra | +2 |
| 43 | Rhenium | Re | +3, +4, +5, +6, +7, +8 | 89 | Actinium | Ac | +3 |
| 44 | Ruthenium | Ru | +2, +3, +4, +6, +7, +8 | 90 | Thorium | Th | +4 |
| 45 | Rhodium | Rh | +1, +3, +4, +5 | 91 | Protactinium | Pa | +3 |
| 46 | Palladium | Pd | +2, +4, +6 | 92 | Uranium | U | +3, +4, +5, +6, +8 |

Valency Mechanism

The way by which the elements combine with each other to attain a stable electronic configuration.

1. By forming ionic bond.
2. By forming covalent bond.
3. By forming co-ordinate bond.

STC06 : Chemical Bonding

Chemical Bonding

The attractive force which holds various atoms (atoms, ions etc.) together to different chemical species is a chemical bond.

COVALENT BONDING

In covalent bonding, atoms share their electrons with other atoms. When only one electron pair is shared, a single covalent bond is formed. Similarly a double bond or triple bond is formed when two pairs or three pairs of electrons are shared respectively.

NON POLAR COVALENT BOND
Electrons are equally shared between identical atoms.

POLAR COVALENT BOND
Electrons are shared between different atoms.

IONIC BONDING

When an atom loses or gains electrons it becomes electrically charged ion. An ionic bond is formed when ions with opposite charges are held together by electrical attraction and form an ionic lattice. In contrast with (HCl), sodium atoms lose an electron to form an positive ion, while the chlorine atoms gain an electron to form a negative ion.

METALLIC BONDING
Metal atoms have relatively free electrons in their outer shells. In metallic bonding, a lattice is formed when all the metal atoms share their outer electrons to form a sea of delocalised mobile electrons.

HYDROGEN BONDING

In polar covalent molecules involving hydrogen, the slightly positive hydrogen ends of these molecules tend to attract the slightly negative ends of their neighbours. This type of attraction is hydrogen bonding. It is a very weak sort of chemical bond.

STC07 : Combustion

Combustion

Combustion is the process of burning of a substance in the presence of oxygen to liberate energy in the form of heat and light. A substance which helps in burning of combustible substances is known as supporter of combustion. Oxygen is a supporter of combustion while nitrogen is a non-supporter.

Substances which burn in air to produce heat and light are called **Combustible Substances**.

Substances that do not burn easily are called **Non Combustible Substances**.

Types of Combustion

- 1. Rapid Combustion**
Combustion in which a large amount of heat and light are produced in a short time is called rapid combustion.
- 2. Slow Combustion**
Combustion at a very slow speed and at a low temperature is called slow combustion.
- 3. Explosion**
Combustion, in which a very large amount of energy is released in the form of heat, light and sound, in a very short period of time is called an explosion.
- 4. Complete Combustion**
Combustion in the presence of sufficient supply of oxygen is called complete combustion, e.g. burning of carbon to form carbon dioxide.
 $C + O_2 \rightarrow CO_2$
- 5. Incomplete Combustion**
Combustion in the presence of insufficient supply of oxygen is called incomplete combustion, e.g. incomplete combustion of carbon and there is carbon monoxide.
 $2C + O_2 \rightarrow 2CO$

Chemical Equations

$C + O_2 \rightarrow CO_2 + \text{heat} + \text{light}$

$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O + \text{heat} + \text{light}$

$2Mg + O_2 \rightarrow 2MgO + \text{heat} + \text{light}$

$2H_2 + O_2 \rightarrow 2H_2O + \text{heat} + \text{light}$

Ignition Temperature

A combustible substance starts burning only when it is heated to a certain minimum temperature called the ignition temperature. Three requirements for ignition take place:

1. A combustible substance.
2. A supporter of combustion such as oxygen.
3. Heat to raise the temperature of the combustible substance to the ignition temperature.

STC08 : Separation of Substances

Separation of Substances

Separation of substances is required to get a pure and clean substance for our use. Substances can be purified through various means. Some of them have been discussed below:-

Distillation

Distillation is used to separate mixtures of liquids having different boiling points.

Fractional Distillation

Fractional distillation is used to separate mixtures of liquids having different boiling points.

Leaching

The process of leaching is used to separate a substance from a mixture.

Filteration

Filteration is used to separate a solid from a liquid.

Evaporation and Crystallization

Evaporation and crystallization are used to separate a solid from a liquid.

Sublimation

Sublimation is used to separate a solid from a liquid.

Magnetic Separation

Magnetic separation is used to separate a magnetic substance from a mixture.

Sedimentation and Decantation

Sedimentation and decantation are used to separate a solid from a liquid.

Cleaning

Cleaning is used to remove dirt and impurities from a substance.

Sieving

Sieving is used to separate a mixture of solids of different sizes.

Winnowing

Winnowing is used to separate a mixture of solids of different sizes.

Separating Funnel

A separating funnel is used to separate two immiscible liquids.

Centrifugation

Centrifugation is used to separate a mixture of solids and liquids.

STC09 : Atmosphere and Composition of Air

Atmosphere and Composition of Air

The atmosphere is a thin layer of air that surrounds the Earth. It has been divided into four major layers:-

1. **TROPOSPHERE**
It extends up to 10 km from the surface of the Earth. It is the layer where most of the weathering takes place.
2. **STRATOSPHERE**
It extends up to 50 km from the surface of the Earth. It is the layer where the temperature decreases with height.
3. **MESOSPHERE**
It extends up to 85 km from the surface of the Earth. It is the layer where the temperature decreases with height.
4. **THERMOSPHERE**
It extends up to 1000 km from the surface of the Earth. It is the layer where the temperature increases with height.

Composition of Air

Air contains various gases and vapours. The composition of air is as follows:-

| Gas | Percentage |
|----------------|------------|
| Nitrogen | 78.0% |
| Oxygen | 21.0% |
| Carbon Dioxide | 0.04% |
| Water Vapour | Variable |

Uses of Air

Air is used for various purposes, such as breathing, photosynthesis, and combustion.

Properties of Air

Air is a mixture of gases and vapours. It is colourless, odourless, and tasteless.

STC10 : Occurrence and Forms of Carbon

Occurrence and Forms of Carbon

Occurrence of Carbon

Carbon occurs in various forms in nature, such as diamond, graphite, and coal.

Different Forms of Carbon

Carbon exists in various forms, including diamond, graphite, and amorphous carbon.

STC11 : Carbon Dioxide and Carbon Monoxide

Carbon Dioxide and Carbon Monoxide

CARBON DIOXIDE (CO₂)

Carbon dioxide is a colourless, odourless gas. It is formed when carbon is oxidized in a limited supply of air.

Properties of CO₂

1. It is a colourless and odourless gas.
2. It is heavier than air.
3. It does not support combustion.
4. It is acidic in nature.

Laboratory Preparation of CO₂

Carbon dioxide is prepared in the laboratory by reacting calcium carbonate with hydrochloric acid.

$$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$$

CARBON MONOXIDE (CO)

Carbon monoxide is a colourless, odourless gas. It is formed when carbon is oxidized in a limited supply of air.

Properties of CO

1. It is a colourless and odourless gas.
2. It is lighter than air.
3. It is highly poisonous.
4. It is acidic in nature.

STC12 : Carbonates and Bicarbonates

Carbonates & Bicarbonates

Carbonates and bicarbonates are the salts of carbonic acid.

CARBONATES

Carbonates are salts of carbonic acid. They are formed when carbon dioxide reacts with a base.

BICARBONATES

Bicarbonates are salts of carbonic acid. They are formed when carbon dioxide reacts with a base in the presence of water.

Uses of Carbonates and Bicarbonates

Carbonates and bicarbonates have various uses in industry and daily life.

STC13 : Sulphur

Sulphur

Extraction of Sulphur (Frasch Process)

Sulphur is extracted from underground deposits using the Frasch process.

Structure of Sulphur Molecule

Sulphur exists as S₈ rings in its natural state.

Effect of Heat on Sulphur

When sulphur is heated, it undergoes a phase change from rhombic to monoclinic form.

Vulcanisation of Rubber

Vulcanisation is the process of cross-linking rubber molecules to make them stronger.

STC14 : Mole Concept

Mole Concept

The word 'mole' is derived from the latin word moles, which means pile, heap or mass. Every mole of any element has the same number of atoms in it. One mole is the amount of a substance that contains as many particles or entities as there are atoms in exactly 12 gm (or 0.012kg) of the ¹²C isotope. Mole of a substance always contain same number of entities no matter what the substance may be.

AVOGADRO NUMBER: Knowing that 1 mole of carbon weighs 12g, the number of atoms in it is equal to

$$= 6.0221415 \times 10^{23}$$

This number is known as Avogadro Constant and is denoted by **N**.

| THE AVOGADRO NUMBER, N | | |
|---|--------------------------------|--------------------------------|
| $N = 6.0221415 \times 10^{23}$ | $N = 6.0221415 \times 10^{23}$ | $N = 6.0221415 \times 10^{23}$ |
| The number of units represented by the Avogadro Number, N, is 6.02×10^{23} . | | |

| ELEMENT | ATOMIC MASS (amu) | 1 MOLE (i.e. QUANTUM) (molecules 6.02×10^{23} atoms) |
|---------|-------------------|---|
| Al | 27.0 | 27.0 g |
| O | 16.0 | 16.0 g |
| C | 12.0 | 12.0 g |
| H | 1.008 | 1.008 g |

One mole of an element is a gram-atom of the element, it contains 6.02×10^{23} atoms.

| 1 MOLE (Gram-molecular mass) | MOLECULAR MASS (amu) |
|------------------------------|----------------------|
| H ₂ 2.016 g | 2.016 |
| O ₂ 32.0 g | 32.0 |
| CO ₂ 44.0 g | 44.0 |

The determination of the mass of a molecule also serve to determine the gram molecular mass of a substance.

AVOGADRO'S HYPOTHESIS

Equal volumes of all gases, under the same conditions of temperature and pressure, contain the same number of molecules.

CHARGE ON AN ELECTRON

$e = 1.6 \times 10^{-19}$ coulombs

Charge on one electron = 1.6×10^{-19} coulombs

A mole of electrons is 6.02×10^{23} electrons and is called the Faraday (F). In electrical units one Faraday is equal to 96,500 coulombs of charge.

STC15 : Composition of Water by Weight

Composition of Water by Weight

Method used by Berzelius, Dalton and Dumas to find Composition of Water by Weight

Results:
 Weight of water formed = 236.36 g
 Oxygen given off by the copper oxide = 214.20 g
 Weight of hydrogen present in water = 22.16 g

According to the experiment the ratio of hydrogen to oxygen by weight in water is 22.16 to 214.20 or 1 : 9.85

Wetley's Method of Direct Synthesis to find Composition of Water by Weight

Endometer for Demonstrating the Volume Composition of Steam

Wetley found that the combining ratio by weight of hydrogen to oxygen is 1:8 (or 1 : 8.00)

WELL WATER, SPRING WATER, SEA WATER, RAIN WATER vs **CLOUD, ICE, RIVER WATER**

In accordance with Proust's Law of Definite Proportion, the composition of water by weight is always the same, regardless of how the water is made or where the water is found.

2 Hydrogen atoms combine with 1 Oxygen atom to form 1 molecule of Water.

$$2H_2 + O_2 \rightarrow 2H_2O$$

Weight of Oxygen in 1 molecule of Water = 16
 Weight of Hydrogen in 1 molecule of Water = 4
 Total weight of 1 molecule of Water = 20

Thus, Oxygen makes up 80% of Weight of any sample of Pure Water, while Hydrogen makes up the remaining 10% of the Weight.

STC16 : Different Kinds of Cells

Different Kinds of Cells

Galvanic Cell: $Cu^{2+} + Zn \rightarrow Cu + Zn^{2+}$

Dry Cell: $Zn + 2MnO_2 + 2NH_4Cl \rightarrow ZnCl_2 + 2Mn_2O_3 + 2NH_3 + H_2$

Car Battery: $Pb + PbO_2 + 2H_2SO_4 \rightarrow 2PbSO_4 + 2H_2O$

Rechargeable Cell: $2Ni(OH)_2 + 2NiO(OH) + 2OH^- \rightleftharpoons 2Ni(OH)_2 + 2OH^-$

Solar Cell: $h\nu \rightarrow e^- + h\nu'$

Fuel Cell: $2H_2 + O_2 \rightarrow 2H_2O$

Mercury-Zinc Button Cell: $Zn + HgO \rightarrow ZnO + Hg$

STC17 : Electroplating and Corrosion

Electroplating and Corrosion

Electroplating is the coating of an electrically conductive object with a layer of metal using electrical current. The result is a thin, smooth, even coat of metal on the object. The layer of deposited metal is usually from 5×10^{-5} cm to 1×10^{-2} cm thick.

Basic rules for electroplating an object with metal M:

- The object must be made the cathode.
- The electrolyte must be a solution of a salt of metal M.
- The anode is made of a strip of metal M.

EXAMPLES OF CORROSION

The breaking down of essential properties in a material due to chemical reactions with its surroundings is called Corrosion.

Rusting of Iron: $4Fe + 3O_2 + 6H_2O \rightarrow 4Fe(OH)_3$

Silver tarnishes because dark when exposed to air: $4Ag + 2H_2S + O_2 \rightarrow 2Ag_2S + 2H_2O$

Green patina on copper vessels: $2Cu + CO_2 + H_2O \rightarrow Cu_2(OH)_2CO_3$

Mechanism of Rusting:

Anode (oxidation): $Fe \rightarrow Fe^{2+} + 2e^-$

Cathode (reduction): $O_2 + 2H_2O + 4e^- \rightarrow 4OH^-$

Overall reaction: $2Fe + O_2 + 2H_2O \rightarrow 2Fe(OH)_2$

STC18 : Cement and Concrete

Cement and Concrete

Preparing Portland Cement:

The limestone (provides calcium oxide) and Clay (provides silica, alumina and ferric oxide) are ground, mixed with water and calcined. Next the material is burned in a large rotary kiln at 2,500°F. The clinker so formed is then cooled and ground to a fine powder in a ball mill. Gypsum (CaSO₄·2H₂O) is added during this grinding process to delay setting time of cement. Finally the powdered cement is packed in water-proof bags.

| Composition of Cement | |
|--------------------------------|----------|
| CaO | 65 - 75% |
| SiO ₂ | 20 - 25% |
| Al ₂ O ₃ | 5 - 10% |
| Fe ₂ O ₃ | 2 - 3% |

Concrete: Concrete is a hardened building material created by combining sand, gravel, cement, chemical additives and water.

Connecting Concrete With Water:

Structure of Concrete:

When water is mixed into cement, hydration occurs. The hydrated cement surrounds the aggregate particles and hardens to provide maximum strength.

Types of Reinforced Concrete Foundations:

- Wall Foundations
- Pile Foundations
- House Foundations
- Column Foundations

Applications of Cement & Concrete:

- Precast Concrete Pipes
- Concrete Road
- Masonry Wall
- Bridge

STC19 : Manufacture of Glass

Manufacture of Glass

Manufacturing of Standard Soda-Lime-Silica Glass:

Glass Moulding:

The molten glass is shaped into the desired form by blowing or pressing. The glass is then cooled slowly to prevent cracking.

Raw Materials:

- Sand: 72.6%
- Soda Ash: 13.6%
- Limestone: 6.4%
- Dolomite: 4.0%
- Alumina: 2.0%

Coloured Glass: Cobalt Glass, Chrome Glass, Olive Green, Red Glass

Lead Crystal Glass:

Laminated Glass: Polyacrylate, Glass, Polyacrylate

Photochromatic Glass:

STC20 : Alkanes

Alkanes

ALKANES are the chemical compounds that consist only of the elements carbon (C) and hydrogen (H). They are also called saturated hydrocarbons because the carbon atoms in them are linked by single bonds.

General Formula: C_nH_{2n+2}

Methane Molecule: Methane is the simplest alkane. It has a tetrahedral structure with all H-C-H bond angles of 109.5°.

Names of alkane series of hydrocarbons end in 'ane'. The prefix tells the number of carbon atoms in the chain.

| Details of Early Members of Alkane Series | | | | |
|---|--------------------------------|---------------------|--------------------|------------------------------|
| Name | Molecular Formula | No. of Carbon Atoms | Boiling Point (°C) | Physical State at Room Temp. |
| Methane | CH ₄ | 1 | -164 | gas |
| Ethane | C ₂ H ₆ | 2 | -87 | gas |
| Propane | C ₃ H ₈ | 3 | -42 | gas |
| Butane | C ₄ H ₁₀ | 4 | 0 | gas |
| Pentane | C ₅ H ₁₂ | 5 | +36 | liquid |

Applications of Alkanes:

- Petroleum Refinery
- Petrol Pump
- Vehicle Run on Petrol
- LPG
- CNG Station
- Cooking Gas
- CNG Bus

STC21 : Alkenes

Alkenes

Alkenes are unsaturated hydrocarbons containing at least one double bond. They are also known as olefins (oil forming).

General Formula: C_nH_{2n} (n ≥ 2)

Functional group: C=C

Ethene is the simplest alkene commonly known as ethylene.

| Structure and IUPAC Name of Few Members | | |
|---|--|--------------------|
| Molecular Formula | Structure | IUPAC Name |
| C ₂ H ₄ | CH ₂ =CH ₂ | Ethene |
| C ₃ H ₆ | CH ₂ =CH-CH ₃ | Propene |
| C ₄ H ₈ | CH ₂ =CH-CH ₂ -CH ₃ | But-1-ene |
| C ₄ H ₈ | CH ₃ -CH=CH-CH ₃ | But-2-ene |
| C ₅ H ₁₀ | CH ₂ =CH-CH=CH ₂ | Buta-1,3-diene |
| C ₆ H ₁₂ | CH ₂ =C(CH ₃) ₂ | 2-Methylprop-1-ene |

Preparation:

- From partial reduction of alkynes: $2C\equiv C + H_2 \rightarrow C=C + C\equiv C$
- Acidic dehydration of alcohols: $C_2H_5OH \xrightarrow{H_2SO_4} C_2H_4 + H_2O$
- Dehalogenation of vicinal dihalides: $CH_2Cl-CHCl_2 + 2Zn \rightarrow CH_2=CH_2 + 2ZnCl_2$
- Dehalogenation of vicinal dihalides: $CH_2Cl-CH_2Cl + 2Zn \rightarrow CH_2=CH_2 + 2ZnCl_2$

Application of Alkenes:

- Plastics
- Squash bottles, Water bottles
- Egg cartons, disposable plastic glass
- PVC insulation tapes
- Dustbin
- Buckets

STC22 : Alkynes

Alkynes

Alkynes are unsaturated hydrocarbons containing at least one triple bond.

Functional Group $\text{—C}\equiv\text{C—}$ **General Formula** $\text{C}_n\text{H}_{2n-2}$ **3-D Structure of Simplest Alkyne (Ethyne/Acetylene)**

NOMENCLATURE: In common system, alkynes are named as derivatives of acetylene. In IUPAC system they are named as derivatives of corresponding alkanes replacing 'ane' by suffix 'yne'. The position of the triple bond is indicated by the first triply bonded carbon.

| Value of n | Mol. Formula | Structure | Common Name | IUPAC Name |
|------------|------------------------|--|-----------------|------------|
| 2 | C_2H_2 | $\text{H—C}\equiv\text{C—H}$ | Acetylene | Ethyne |
| 3 | C_3H_4 | $\text{CH}_3\text{—C}\equiv\text{C—H}$ | Methylacetylene | Propyne |
| 4 | C_4H_6 | $\text{CH}_3\text{—CH}_2\text{—C}\equiv\text{C—H}$ | Ethylacetylene | But-1-yne |

Preparation

- From Calcium Carbide:** Ethyne is prepared by heating calcium carbide with water.
 $\text{CaC}_2 + 2\text{H}_2\text{O} \rightarrow \text{Ca(OH)}_2 + \text{C}_2\text{H}_2$
- From Vicinal Dihalides:** Dehydrohalogenation of vicinal dihalides when treated with alcoholic potassium hydroxide forms alkyne. Treating with sodamide gives alkyne.
 $\text{H}_2\text{C—CH}_2 + \text{KOH} \xrightarrow{-\text{H}_2\text{O}} \text{H}_2\text{C}=\text{CH} + \text{H}_2\text{O}$
 $\xrightarrow{-\text{HBr}} \text{C}\equiv\text{C—H} + \text{HBr}$

Applications of Alkynes

- Use-1:** Alkynes are used as a starting material for drugs and dyes.
- Use-2:** Acetylene is used in welding of steel and metal.
- Use-3:** Used as starting material for manufacturing large number of organic compounds such as alcohols, vinyl chloride and acrylic polymers.

STC23 : Alcohols

Alcohols

Alcohols are organic compounds in which a hydroxyl group (—OH) is bound to a carbon atom of an alkyl or substituted alkyl group. In common terms alcohol refers to ethanol found in alcoholic beverages.

General Formula: $\text{C}_n\text{H}_{2n+1}\text{OH}$

Nomenclature: Alcohols are named by substituting 'ol' of alkanes with the suffix 'ol'. Position of substituents is indicated by numerals.

| Formula | Common Name | IUPAC Name |
|---|--------------------|---------------------|
| $\text{CH}_3\text{—OH}$ | Methyl alcohol | Methanol |
| $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—OH}$ | n-Propyl alcohol | Propan-1-ol |
| $\text{CH}_3\text{—CH(OH)—CH}_3$ | Isopropyl alcohol | Propan-2-ol |
| $\text{CH}_3\text{—CH}_2\text{—CH}_2\text{—CH}_2\text{—OH}$ | n-Butyl alcohol | Butan-1-ol |
| $\text{CH}_3\text{—CH(OH)—CH}_2\text{—CH}_3$ | tert-Butyl alcohol | 2-Methylpropan-2-ol |

Preparation

- From Alkenes:** Reaction of alkenes with water in presence of acid produce alcohols.
 $\text{CH}_2=\text{CH}_2 + \text{H}_2\text{O} \xrightarrow{\text{H}^+} \text{CH}_3\text{—CH}_2\text{—OH}$
- Reduction of Aldehydes and Ketones:**
 $\text{RCHO} + \text{H}_2 \xrightarrow{\text{Ni}} \text{RCH}_2\text{OH}$
 $\text{RCOR}' + \text{H}_2 \xrightarrow{\text{Ni}} \text{R—CH}_2\text{—OH}$
- Reduction of Carboxylic Acids:**
 $\text{RCOOH} \xrightarrow{\text{LiAlH}_4} \text{RCH}_2\text{OH}$

Applications of Ethanol

- In Alcoholic Beverages
- In Cough Syrups
- In Digestive Syrups
- In Antiseptic Lotions

STC24 : Esters

Esters

Esters are sweet smelling chemical compounds derived from an alcohol (or containing an ester group —COO—) and a hydroxyl compound such as an alcohol or phenol. Most common acids used to derive esters are carboxylic acids (R—C(=O)—OH).

GENERAL FORMULA
 $\text{R—C(=O)—OR}'$
 (R and R' are any alkyl or aryl group)

NOMENCLATURE

- Name the alkyl from the alcohol.
- Name the acid with the —COO— with suffix 'ate'.

| NAME | FORMULA | ODOR |
|------------------|---|-------------|
| Ethyl methanoate | HCOOC_2H_5 | Raspberries |
| Ethyl benzoate | $\text{C}_6\text{H}_5\text{COOC}_2\text{H}_5$ | Styrene |
| Ethyl acetate | $\text{CH}_3\text{COOC}_2\text{H}_5$ | Pineapple |
| Ethyl propanoate | $\text{C}_2\text{H}_5\text{COOC}_2\text{H}_5$ | Oranges |
| Ethyl butanoate | $\text{C}_3\text{H}_7\text{COOC}_2\text{H}_5$ | Oranges |

Preparation

Fischer Esterification: Carboxylic acids react with alcohols in presence of a few drops of concentrated sulphuric acid to produce esters. For example:
 $\text{CH}_3\text{COOH} + \text{C}_2\text{H}_5\text{OH} \rightarrow \text{CH}_3\text{COOC}_2\text{H}_5 + \text{H}_2\text{O}$

Applications of Esters

- Esters are used for making perfumes.
- Esters are used in soaps and cosmetics.
- Esters give flowers and fruits their pleasant fragrances and flavours.
- Esters react with sodium hydroxide to form soaps (saponification).
- Phenylacrylate is a long chain ester used for making plastics.
- Dacron, a long chain ester is used for making fabrics.

STC25 : Organic Acids

Organic Acids

Organic acids are organic compounds with acidic properties. Most common organic acids are carboxylic acids having COOH group.

NOMENCLATURE

- Common names end with the suffix —oic acid and have been derived from Latin or Greek names of their natural sources. Example—Formic acid, Acetic acid, Citric acid, Oxalic acid.
- In IUPAC system aliphatic carboxylic acids are named by replacing the ending —e in the name of the corresponding alkane with —oic acid .

| Structure | Molecular Formula | Common Name | IUPAC Name |
|---|-----------------------------------|----------------|----------------|
| H—C(=O)—OH | HCOOH | Formic Acid | Methanoic Acid |
| $\text{H—C(=O)—CH}_2\text{—OH}$ | CH_3COOH | Acetic Acid | Ethanoic Acid |
| $\text{H—C(=O)—CH}_2\text{—CH}_2\text{—OH}$ | $\text{C}_2\text{H}_5\text{COOH}$ | Propionic Acid | Propanoic Acid |
| $\text{H—C(=O)—CH}_2\text{—CH}_2\text{—CH}_2\text{—OH}$ | $\text{C}_3\text{H}_7\text{COOH}$ | Butanoic Acid | Butanoic Acid |

STRUCTURE OF CARBOXYL GROUP

Applications of Organic Acids

- Acetic acid is used in vinegar.
- Formic acid is used in leather industry.
- Benzoic acid is used in perfumes.
- Phenylacetic acid is used in perfumes.
- Phenylacrylate is used in plastics.
- Dacron is used in fabrics.

STC26 : Soaps and Detergents

Soaps and Detergents

SOAPS

Soaps are sodium or potassium salts of long chain fatty acids, e.g. stearic, oleic and palmitic acids. These cleansing action is due to their hydrophilic head and hydrophobic tail.

DETERGENTS

Detergents are synthetic cleansing agents which have hydrophilic head and hydrophobic tail.

CLEANSING ACTION

PROBLEM WITH HARD WATER

Hard water contains calcium or magnesium salts. These react with the sodium salt of the water-loving head of soap molecules forming insoluble soap.

SOFTENING HARD WATER

Hard water can be softened by adding washing soda (Na_2CO_3) or soda ash (Na_2O).

STC27 : Plastics

Plastics

Arrangement of molecular units is linear or slightly branched.

Thermoplastics

PVC (Polyvinyl chloride)
 Prepared by polymerization of vinyl chloride.

Polythene
 Prepared by polymerization of ethene.

Thermosetting plastics

Arrangement of molecular units is cross-linked or heavily branched.

Bakelite
 Prepared by heating a mixture of phenol and formaldehyde.

Melamine
 Prepared by heating a mixture of melamine and formaldehyde.

STC28 : Synthetic Fibres

Synthetic Fibres

Synthetic fibre is a chain of molecules known as monomers which form polymers.

Characteristics

- Dry up quickly
- Strong
- Less expensive
- Easy to maintain

Nylon

Strong, elastic, light, lustrous and easy to wash.

Rayon

Obtained by chemical treatment of wood pulp. Similar to that of silk (also called artificial silk).

Polyester

Example: Terylene

Prepared by heating a mixture of ethylene glycol and terephthalic acid at $420\text{--}480\text{K}$ in presence of zinc oxide as catalyst.

Acrylic

Example: Acrylonitrile

Prepared by addition polymerisation of acrylonitrile in presence of peroxide catalyst.

STC29 : Extraction of Iron (Blast Furnace)

EXTRACTION OF IRON (BLAST FURNACE)

The main ore of iron is hematite (Fe_2O_3). This is reduced to iron by reduction in blast furnace. The reaction is carried out in the blast furnace at $2000\text{--}2500\text{K}$. The change is shown by the following reaction:

MANUFACTURE OF STEEL

The iron produced by the blast furnace is known as pig iron. Most of the pig iron produced is used to make steel.

Basic Bessemer Process

Acid Bessemer Process

STC30 : Aluminium Metallurgy

Aluminium Metallurgy

Aluminium extraction is done in two phases: Bayer's process of refining bauxite ore to obtain alumina & Hall-Heroult process of smelting the alumina to get pure aluminium.

1. OREFINE

Bauxite ore is mechanically crushed.

2. REDUCER

The alumina is heated to 2000°C in the electrolytic cell. The carbon anodes are used as cathodes. The carbon dioxide gas is evolved from the electrolytic cell.

$$2Al_2O_3 + 3C \rightarrow 4Al + 3CO_2$$

3. PRECIPITATION

Large amount of copper are obtained from copper pyrite (CuFeS₂).

4. CONCENTRATION

The froth concentrate is concentrated by Froth-Flotation process.

5. ROASTING

Sulphur is oxidized to SO₂ and impurities of arsenic and antimony are removed as volatile oxides.

6. SMELTING

Copper sulphide and ferrous sulphide are further oxidized to Cu₂O and FeO respectively.

7. REFINING OF COPPER

Copper metal is extracted from molten matte through electrorefining. The matte is introduced into Bessemer converter. The air is blown through the matte/matte. Blast of air converts Cu₂O partly into Cu₂S which reacts with remaining Cu₂S to give molten copper.

Uses of Aluminium

STC31 : Copper Metallurgy

Copper Metallurgy

1. OREFINE

Bauxite ore is mechanically crushed.

2. REDUCER

The alumina is heated to 2000°C in the electrolytic cell. The carbon anodes are used as cathodes. The carbon dioxide gas is evolved from the electrolytic cell.

$$2Al_2O_3 + 3C \rightarrow 4Al + 3CO_2$$

3. PRECIPITATION

Large amount of copper are obtained from copper pyrite (CuFeS₂).

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Uses of Copper

STC32 : Extraction of Zinc

Extraction of Zinc

Worldwide, 90% of the zinc is mined from sulphide ore deposits mainly ZnS. After grinding the ore, froth flotation is used to get an ore concentrate. Lead is simultaneously extracted along with zinc.

Zinc is Extracted Using Two Processes

- Roasting**, which involves the preparation of zinc oxide from the concentrate.

$$ZnS + 3O_2 \rightarrow ZnO + 2SO_2$$
- Pyrometallurgical Process**, which further reduces zinc oxide with carbon or carbon monoxide at 950°C into the metal, which is distilled as zinc vapour. This zinc vapour is collected in a condenser.

$$ZnO + C \rightarrow Zn + CO$$

$$ZnO + CO \rightarrow Zn + CO_2$$

STC33 : Preparation of Sodium Hydroxide (NaOH)

Preparation of Sodium Hydroxide (NaOH)

Preparation of NaOH in Castner Kellner Cell

NaOH is commercially prepared by the electrolysis of sodium chloride in Castner Kellner Cell which has mercury as cathode and carbon as anode. A sodium amalgam is formed which is treated with water to give sodium hydroxide and hydrogen gas.

$$2Na-Amalgam + 2H_2O \rightarrow 2NaOH + 2H_2 + H_2$$

At cathode: $Na^+ + e^- \rightarrow Na\text{-amalgam}$

At anode: $Cl^- \rightarrow \frac{1}{2} Cl_2 + e^-$

Preparation of Sodium Carbonate (Ammonia Soda or Solvay Process)

Solvay process produces soda ash (Na₂CO₃) from brine and limestone. Calcium chloride is its major by product.

STC34 : Preparation of Nitrogen & Nitric Acid

Preparation of Nitrogen & Nitric Acid

LABORATORY PREPARATION OF NITROGEN

Nitrogen is prepared by heating a mixture of ammonium dichromate and sodium oxalate in the ratio 1:1 by mass with a small quantity of water. The presence of water prevents ammonium oxalate from subliming when heated.

$$2(NH_4)_2C_2O_4 + 2(NH_4)_2Cr_2O_7 \rightarrow 2N_2 + 2CO_2 + 2Cr_2O_3 + 8H_2O$$

MANUFACTURE OF NITROGEN

Nitrogen is prepared by heating a mixture of ammonium dichromate and sodium oxalate in the ratio 1:1 by mass with a small quantity of water. The presence of water prevents ammonium oxalate from subliming when heated.

LABORATORY PREPARATION OF NITRIC ACID

In laboratory nitric acid can be prepared by reacting copper, silver metal or platinum metal (Pt) with concentrated nitric acid (HNO₃) in a solution of H₂O and diluting this mixture. Nitric acid is obtained at 82°C.

$$Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2NO_2 + 2H_2O$$

MANUFACTURE OF NITRIC ACID (OSTWALD'S PROCESS)

- Primary Oxidation**
Catalytic oxidation of NH₃ takes place by platinum catalyst.
$$4NH_3 + 5O_2 \xrightarrow{Pt} 4NO + 6H_2O$$
- Secondary Oxidation** (The nitrous oxide (nitrogen dioxide) nitric oxide formed is further transferred to a oxidant chamber where it is oxidized with oxygen to give HNO₂.
$$2NO + O_2 \rightarrow 2NO_2$$
- Formation of HNO₃**
Nitrogen dioxide from secondary oxidation chamber is introduced into a special absorption tower to dissolve water and give HNO₃.
$$3NO_2 + H_2O \rightarrow 2HNO_3 + NO$$

STC35 : Prep. of Chlorine and Hydrochloric Acid

Prep. of Chlorine and Hydrochloric Acid

Laboratory Preparation of Chlorine

Chlorine is prepared in laboratory by heating manganese dioxide with a mixture of common salt and conc. sulphuric acid.

$$4NaCl + MnO_2 + 4H_2SO_4 \rightarrow 2Cl_2 + MnSO_4 + 2Na_2SO_4 + 4H_2O$$

Large Scale Manufacture of Chlorine

Chlorine is mostly obtained as a by-product during the manufacture of caustic soda, by the electrolysis of brine or molten sodium chloride.

$$2NaCl + 2H_2O \rightarrow 2NaOH + H_2 + Cl_2$$

Preparation of Hydrochloric Acid

Glauber prepared hydrogen chloride in 1648 by heating common salt with sulphuric acid. This also serves as a laboratory method to prepare it.

$$NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$$

$$NaHSO_4 + NaCl \rightarrow Na_2SO_4 + HCl$$

Industrially hydrogen chloride gas is made by burning hydrogen in chlorine.

$$H_2(g) + Cl_2(g) \rightarrow 2HCl(g)$$

Hydrogen chloride gas so formed is dissolved in water to form hydrochloric acid.

To dissolve the Hydrogen Chloride gas safely in water a filter funnel is placed in water instead of delivery tube.

STC36 : Prep. of Sulphur Dioxide & Sulphuric Acid

Prep. of Sulphur Dioxide & Sulphuric Acid

PREP. OF SULPHUR DIOXIDE

IN LABORATORY
SO₂ is readily prepared by treating a sulphite with dil. sulphuric acid.
$$SO_3^{2-}(aq) + 2H^+(aq) \rightarrow H_2O(l) + SO_2(g)$$

INDUSTRIAL PRODUCTION
Industrially it is produced as a by-product of the roasting of sulphide ores. The gas so produced is dried, liquefied under pressure and stored in steel cylinders.
$$4FeS_2 + 11O_2 \rightarrow 2Fe_2O_3 + 8SO_2$$

USES OF SULPHUR DIOXIDE

- Used to bleach wood, silk and wool pulp.
- Used as a food preservative and disinfectant.
- Used in the manufacture of sulphuric acid.
- Liquid SO₂ is used as a solvent to dissolve chemicals.

PRODUCTION OF SULPHURIC ACID

The steam from a cold gas scrubber, which is then sprayed into a furnace.

In the converter, water vapour is added to the sulphur dioxide to make sulphur trioxide. This is a contact process. The liquid called oleum.

Sulphur trioxide passes through a series of water traps which generate the sulphuric acid. This is a contact process. The liquid called oleum.

The oleum is diluted with water to make sulphuric acid of the right strength.

USES OF SULPHURIC ACID

STC37 : Preparation of Ammonia & Haber Process

Preparation of Ammonia & Haber Process

Natural Occurrence

Ammonia (NH₃) is produced by the natural decomposition of animal and plant matter in nature. It also occurs in the soil in the form of ammonium salts.

Laboratory Preparation of Ammonia

Ammonia gas is usually prepared in the laboratory by gently heating ammonium chloride (NH₄Cl) and slaked lime [Ca(OH)₂].

$$2NH_4Cl(s) + Ca(OH)_2(s) \xrightarrow{\Delta} CaCl_2(s) + 2NH_3(g) + 2H_2O(l)$$

Manufacture of Ammonia by Haber Process

STEPS IN THE HABER PROCESS

- Hydrogen is obtained from methane and steam.
- Nitrogen is obtained from air.
- The two gases (N₂ & H₂) are mixed in ratio 1:3.
- Mixture is compressed to about 200 bar and heated to high temperatures.
- Mixture is then goes to reactor containing beds of hot iron. The iron catalyzes the reaction.
$$N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$$
- Mixture of N₂, H₂ & NH₃ leaves the converter. It is cooled to condense ammonia. The N₂ and H₂ are pumped back to the converter.
- Ammonia is stored as liquid under pressure.

STC38 : Preparation of O₂ and Liquefaction of Air

Preparation of O₂ and Liquefaction of Air

Laboratory Preparation of Oxygen

BY HEATING COMPOUNDS CONTAINING OXYGEN

2KClO₃ → 2KCl + 3O₂

BY ELECTROLYSIS OF WATER

2H₂O → 2H₂ + O₂

Manufacture of Oxygen by Liquefaction of Air

Air is compressed at about 200 atmospheres. The air is added into fractions in this tower, which is cooled at the top.

MAJOR STEPS IN THE PROCESS

- Air is filtered to remove dust.
- Moisture & CO₂ are removed.
- Air is compressed at about 200 atmospheres.
- Compressed air is cooled & passed into coils contained in a chamber.
- Multiple fractions are allowed to expand in the chamber, cooling the coils.
- Expanded gas is returned to the compressor with multiple subsequent expansion and compression steps resulting finally in liquefaction of the compressed air at a temperature of -196°C.
- Liquid air is allowed to warm to distil first the lightest gases, then the nitrogen, leaving liquid oxygen.
- Multiple fractions will produce 99.5 percent pure oxygen.

STC39 : Preparation of H₂ and CO₂

Preparation of H₂ and CO₂

HYDROGEN

Laboratory Preparation

Metal + Acid → Salt + Hydrogen

Zn(s) + 2HCl(aq) → ZnCl₂(aq) + H₂(g)

Commercial Manufacture

Steam Re-forming of Natural Gas

CH₄(g) + H₂O(g) → 3H₂(g) + CO(g)

CO produced is used to reduce unreacted steam to produce more hydrogen.

CO(g) + H₂O(g) → H₂(g) + CO₂(g)

CARBON DIOXIDE

Commercial Manufacture

Complete combustion of carbon and carbon containing fuels in excess of air produces most of the carbon dioxide.

C(s) + O₂(g) → CO₂(g)

CH₄(s) + 2O₂(g) → CO₂(g) + 2H₂O(g)

Laboratory Preparation

In the laboratory it is conveniently prepared by the decomposition of calcium carbonate.

CaCO₃(s) → CaO(s) + CO₂(g)

STC40 : Manufacture of Bleaching Powder

Manufacture of Bleaching Powder

Bleaching powder is a dirty white amorphous solid with a pungent smell of chlorine.

CHEMICAL COMPOSITION

Bleaching powder is actually a mixture of Calcium Hypochlorite, Calcium Chloride, Water and some Slaked Lime.

Ca(OCl)₂·CaCl₂·Ca(OH)₂·2H₂O

INDUSTRIAL PRODUCTION

On industrial scale, it is manufactured in Hasenclever Plant or in Bachmann's Plant.

Raw Materials

- Slaked Lime
- Chlorine Gas

Reactions Involved

2Ca(OH)₂ + 2Cl₂(g) → Ca(OCl)₂ + CaCl₂ + 2H₂O

Manufacture of Bleaching Powder - HASENCLEVER PLANT

The plant consists of a number of horizontal cylinders provided with rotating shafts with blades. Slaked lime is dropped into the topmost cylinder. The rotating blades allow the downward movement of slaked lime into the other cylinders. Chlorine gas is introduced into the bottommost cylinder. The counter currents allow a thorough mixing of the raw materials and complete conversion into bleaching powder.

Manufacture of Bleaching Powder - BACHMANN'S PLANT

Bachmann's plant consists of vertical tower made of cast iron. The tower is provided with a hopper at the top, two ladders near the base (one for chlorine and other for hot air) and an exit for waste gases near the top.

The tower is fitted with eight shelves at different heights each equipped with rotating blades.

The slaked lime is introduced through the hopper.

Slaked lime comes in contact with chlorine.

Bleaching powder is collected in a barrel at the base.

STC41 : Manufacture of Phosphorus

Manufacture of Phosphorus

Production of White Phosphorus

Phosphate rock is heated to 1200-1500°C with sand and coke to produce vaporized P₄, which is subsequently condensed into a white powder under water.

The main reactions involved are:-

Ca₃(PO₄)₂ + SiO₂ → 3CaO + SiO₂ + P₄

SiO₂ + C → SiC + CO

Ca₃(PO₄)₂ + C → 3CaO + CO + P₄

Sand acts as a flux, converting CaO formed into slag.

CaO + SiO₂ → CaSiO₃

Converting White Phosphorus into Red Phosphorus

Red phosphorus is formed by heating white phosphorus to 250°C.

STC42 : Crystal Lattices

Crystal Lattices

A regular three dimensional arrangement of points in space at which the atoms, molecules or ions of a crystal occur, is a crystal lattice.

Unit cell is the smallest portion of a crystal lattice which, when repeated in different directions, generates the entire lattice.

Unit cell is characterized by:

- Its dimensions along the three edges, a, b and c. These edges may or may not be mutually perpendicular.
- Angles between the edges, α (between b and c), β (between a and c) and γ (between a and b). Thus, a unit cell is characterized by six parameters, a, b, c, α, β and γ.

Properties of a unit cell:

- Expanded gas is returned to the compressor with multiple subsequent expansion and compression steps resulting finally in liquefaction of the compressed air at a temperature of -196°C.
- Liquid air is allowed to warm to distil first the lightest gases, then the nitrogen, leaving liquid oxygen.
- Multiple fractions will produce 99.5 percent pure oxygen.

| Crystal System | Relative Unit Cells | Possible Variations | Examples |
|----------------|---|---|---|
| Cubic | Simple Cubic, Body-Centered Cubic, Face-Centered Cubic | Simple Cubic, Body-Centered Cubic, Face-Centered Cubic | NaCl, Zn, Metals |
| Tetragonal | Simple Tetragonal, Body-Centered Tetragonal | Simple Tetragonal, Body-Centered Tetragonal | White tin, Sn, TiO ₂ , CaSO ₄ |
| Orthorhombic | Simple Orthorhombic, Base-Centered Orthorhombic, Face-Centered Orthorhombic | Simple Orthorhombic, Base-Centered Orthorhombic, Face-Centered Orthorhombic | Rhodochrosite, FeSO ₄ , BaSO ₄ |
| Hexagonal | Simple Hexagonal | Simple Hexagonal | Graphite, Zn, Ca |
| Trigonal | Simple Trigonal | Simple Trigonal | Calcite, Diamond |
| Monoclinic | Simple Monoclinic, Base-Centered Monoclinic | Simple Monoclinic, Base-Centered Monoclinic | Monoclinic sulphur, Na ₂ SO ₄ , 10H ₂ O, Cu ₂ SO ₄ , 5H ₂ O, H ₂ O |
| Triclinic | Simple Triclinic | Simple Triclinic | H ₂ O |

STC43 : Close Packed Structures

Close Packed Structures

Close packing of particles leave minimum vacant space in solids.

Close Packing in Two Dimensions

Square Close Packing (AAA)
Coordination number is 4.

Hexagonal Close Packing (ABAB)
Coordination number is 6.

Close Packing in Three Dimensions

Three dimensional close packing from two dimensional square close packed layers

Three dimensional close packing from two dimensional hexagonal close packed layers

Tetrahedral & Octahedral voids are generated in a stack of two layers of close packed spheres.

Tetrahedral Voids

Top view, Expanded side view, Tetrahedral shape.

Octahedral Voids

Top view, Expanded side view, Octahedral shape.

Covering Tetrahedral Voids Hexagonal Close Packed Structures

Regulated view showing stacking of layers of spheres, 4 layers stacked in ABAB.

Covering Octahedral Voids Cubic Close Packed Structures

Regulated view showing stacking of layers of spheres, 4 layers stacked in ABCA.

STC44 : Sodium Chloride Crystal

Sodium Chloride Crystal

Formation of sodium chloride involves transfer of electron from chlorine atom to sodium atom. Chloride anions and Sodium cations thus formed are arranged in a regular lattice occupying all the octahedral sites. Each ion is surrounded by six ions of the other kind. This arrangement is known as cubic close packed (ccp).

Crystal Structure: NaCl is a face-centered cubic (FCC) lattice. The arrangement of the positive and negative ions in a sodium chloride crystal.

Crystal Features: Packing one layer against another in an ionic crystal brings ions of the same charge next to each other. The repulsive force thus forces the layers apart.

FCC Arrangement: Each face-centered lattice point gives exactly one half contribution, in addition to the corner lattice points, giving a total of 4 atoms per unit cell (8 × 1/8 + 6 × 1/2 = 4).

| NaCl Statistics | |
|-------------------|--|
| Formula | NaCl |
| Crystal System | Cubic |
| Lattice Type | Face-Centered |
| Space Group | Fm3m, No. 228 |
| Cell Parameters | a = b = c = 0.357 nm, α = β = γ = 90° |
| Atomic Positions | Cl: 4a, Na: 4b |
| Density | 2.167 g/cm ³ |
| Melting Point | 801°C |
| Alternative Names | Halite, rock salt, sea salt, table salt, rock salt |
| Systematic Name | Sodium Chloride |
| Common Name | Table Salt, Rock Salt, Halite |

STC45 : Acids, Bases and Salts

Acids, Bases and Salts

ACIDS

Acids are the substances that are sour in taste, change the colour of litmus and give H⁺ (hydrogen ion) when dissolved in water. Acids have a pH less than 7.

Properties of acids: Sour taste, change colour of litmus, react with metals to form hydrogen gas, react with carbonates to form CO₂.

BASES

Bases are substances that are bitter in taste, change red litmus blue and give OH⁻ (hydroxide ion) when dissolved in water. An aqueous solution of a base is referred to as an alkali. Bases have a pH greater than 7.

Properties of bases: Bitter taste, change colour of litmus, react with acids to form salts and water.

SALTS

Salt is produced because of neutralization.

Zinc + sulfuric acid → zinc sulfate + hydrogen gas

Sodium hydroxide + hydrochloric acid → sodium chloride + water

Neutralization in Every Day Life: Antacid, Soap, Stomach acid, Pickling.

STC46 : Electrolysis

Electrolysis

Electrolytic refines of the decomposition of a substance (electrolyte) by an electric current.

Electrolysis of molten NaCl

Electrolysis of molten sodium chloride (NaCl) is carried out in a cell. The electrolyte is molten NaCl. The electrodes are connected to a DC power source. At the cathode, sodium ions are reduced to sodium metal. At the anode, chloride ions are oxidized to chlorine gas.

At cathode: $\text{Na}^+ + e^- \rightarrow \text{Na}$

At anode: $2\text{Cl}^- \rightarrow \text{Cl}_2 + 2e^-$

Overall reaction: $2\text{NaCl} \rightarrow 2\text{Na} + \text{Cl}_2$

Quantitative Aspects of Electrolysis

Faraday's First Law of Electrolysis: The mass of a substance deposited or liberated at an electrode is directly proportional to the quantity of electricity (charge) passed through the electrolyte.

$M = Z \cdot Q$ or $M = Z \cdot It$

Faraday's Second Law of Electrolysis: The masses of different substances deposited or liberated at different electrodes are proportional to their chemical equivalents.

$\frac{M_1}{Z_1} = \frac{M_2}{Z_2}$

Refining Metals

Electrolytic refining of metals involves the use of an electrolyte solution containing the metal ions. The impure metal is used as the anode, and the pure metal is deposited at the cathode.

Electroplating

Electroplating is the process of depositing a thin layer of a metal on the surface of another metal by electrolysis.

STC47 : Atoms and Molecules

Atoms and Molecules

Atom: A particle which cannot be created or destroyed and which cannot be further divided into smaller particles.

Molecule: A group of atoms held together by chemical bonds.

Atomic number (Z): The number of protons (number of electrons) present in an atom, denoted by the symbol 'Z'.

Mass number (A): The sum of the number of protons and neutrons present in an atom, denoted by the symbol 'A'.

Isotopes: Atoms having the same atomic number but different mass numbers are called isotopes.

Molecules of Same Element: O_2 (Diatomic), O_3 (Triatomic), C_{60} (Fullerene).

Molecules of Different Elements: H_2O (Water), CO_2 (Carbon dioxide).

Chemical Formulas

Empirical formula: It shows the simplest whole number ratio of atoms of the elements in a compound. Example: C_6H_6 has empirical formula CH .

Molecular formula: It shows the actual number of atoms of each element in a molecule. Example: C_6H_6 has molecular formula C_6H_6 .

Explaining the Formulae

2NaCl : Sodium chloride. 2 molecules of sodium chloride.

H_2SO_4 : Sulphuric acid. 1 molecule of sulphuric acid.

STC48 : Solids, Liquids & Gases

Solids, Liquids & Gases

All Matter Occurs in Three Forms - Solid, Liquid and Gas.

The three states of matter differ from one another because of the differences in the attractive and repulsive forces between the molecules/particles.

Solids: Particles are closely packed in a regular pattern. They have strong intermolecular forces and are held together by these forces. They have a definite shape and volume.

Liquids: Particles are closely packed but not in a regular pattern. They have moderate intermolecular forces. They have a definite volume but no definite shape.

Gases: Particles are far apart and move randomly. They have very weak intermolecular forces. They have no definite shape or volume.

Change of State

Sublimation: Solid \rightarrow Gas (e.g., Naphthalene balls).

Condensation: Gas \rightarrow Liquid (e.g., Dew formation).

Freezing: Liquid \rightarrow Solid (e.g., Water to ice).

Melting: Solid \rightarrow Liquid (e.g., Ice to water).

Evaporation: Liquid \rightarrow Gas (e.g., Water to steam).

Boiling: Liquid \rightarrow Gas (e.g., Water to steam at 100°C).

STC49 : Shapes of Atomic Orbitals

Shapes of Atomic Orbitals

An atomic orbital is a quantum mechanical concept and refers to the one electron wave function in an atom. It is characterized by three quantum numbers - Principal quantum number (n), Azimuthal quantum number (l) and Magnetic quantum number (m). The square of the wave function (ψ^2) at a point gives the probability density of the electron at that point.

Table of Quantum Numbers and Orbitals

| n | l | m | Number of Orbitals |
|---|------------|------------------------------|--------------------|
| 1 | 0 | 0 | 1 |
| 2 | 0, 1 | 0, 1, -1 | 4 |
| 3 | 0, 1, 2 | 0, 1, -1, 2, 1, -2 | 9 |
| 4 | 0, 1, 2, 3 | 0, 1, -1, 2, 1, -2, 3, 2, -3 | 16 |

Shapes of Orbitals

s-orbital: Spherically symmetrical.

p-orbital: Dumbbell-shaped, oriented along the x, y, or z axis.

d-orbital: Complex shapes, including dumbbell and cloverleaf shapes.

STC50 : Chemical Equilibrium

Chemical Equilibrium

A reversible reaction reaches a state of dynamic equilibrium when the rate of the forward reaction is equal to the rate of the reverse reaction.

LAW OF CHEMICAL EQUILIBRIUM

At equilibrium, the concentrations of reactants and products are constant and do not change with time.

CHEMICAL EQUILIBRIUM CONSTANT

$K_c = \frac{[\text{Products}]}{[\text{Reactants}]}$

Effect of Change of Temperature on the Position of Equilibrium

Le Chatelier's Principle: If a system at equilibrium is subjected to a change in temperature, pressure, or concentration, the system will adjust itself to counteract the change and restore a new equilibrium.

STC51 : Kinetic Theory

Kinetic Theory

According to Kinetic Theory, the particles of matter are in continuous motion and the properties of matter are explained in terms of the motion of the particles.

Pressure: The force exerted by the particles of a gas on the walls of the container.

Temperature: A measure of the average kinetic energy of the particles.

Diffusion: The process by which particles of a gas spread out to fill the available space.

Osmosis: The movement of solvent molecules through a semi-permeable membrane from a region of lower concentration to a region of higher concentration.

STC52 : Electronic Configuration

ELECTRONIC CONFIGURATION

The arrangement of electrons in an atom is called its electronic configuration.

Shell Model: Electrons are arranged in shells (K, L, M, N, O, P, Q) around the nucleus.

Subshells: Each shell is further divided into subshells (s, p, d, f).

Maximum number of electrons in a shell: $2n^2$

Maximum number of electrons in a subshell: s: 2, p: 6, d: 10, f: 14

Order of Filling: 1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s, 4f, 5d, 6p, 7s, 5f, 6d, 7p.

Stable Configuration: Atoms with a completely filled outer shell are chemically inert (noble gases).

STP01 : Motion

MOTION

An object is said to be in motion with respect to certain other objects if its position continuously changes with respect to these objects.

LINEAR MOTION

All parts of a body move with the same speed in a straight or curved line.

Rectilinear Motion

Body changes its position in a straight line with respect to time.



Motion of Child Along Slide



Motion of Athlete Running on Track



Motion of Ball Hit by Player



Motion of Writing Fountain Pen

Curvilinear Motion

Body Changes its position with respect to time on a curved path.

ROTATIONAL MOTION

Distance of the moving object remain constant from a fixed point which lies on its axis.



Motion of Potter's Wheel



Motion of Spinning Top



Motion of Merry Go Round



Motion of Wheels of Bicycle

OSCILLATORY MOTION

To and fro movement along the same path is known as oscillatory motion or simply oscillation.



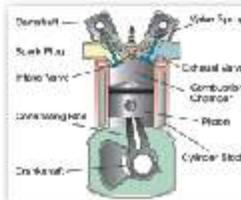
Motion of Pendulum



Motion of Strings of Guitar



Motion of Taut Membrane of Tabla



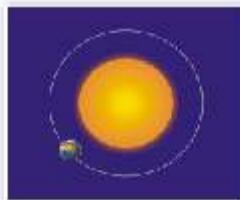
Motion of Piston in Engine

PERIODIC MOTION

Motion which repeats itself after regular interval of time is known as periodic motion.



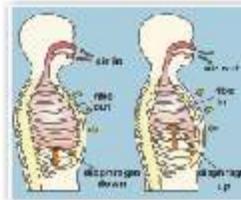
Motion of Moon Around Earth



Motion of Earth Around Sun



Motion of Hands in Watch



Motion of Lungs During Breathing

STP02 : Changes Around Us

CHANGES AROUND US

SLOW CHANGE
Changes which take place over a long period.
1) Growth of plants and animals.
2) Change in the color of leaves.
3) Ripening of fruits.
4) Change in the shape of mountains.

FAST CHANGE
Changes which take place over a short period.
1) Bursting of a balloon.
2) Melting of ice.
3) Burning of paper.

REVERSIBLE CHANGE
Processes in which a substance changes its state but can be brought back to its original state by reversing the conditions.
1) Melting of ice.
2) Dissolving of sugar in water.
3) Dissolving of salt in water.
4) Inflating a balloon.

IRREVERSIBLE CHANGE
Processes in which a substance changes its state and cannot be brought back to its original state by reversing the conditions.
1) Burning of paper.
2) Cooking of food.
3) Rusting of iron.

PERIODIC CHANGE
Changes which occur after fixed intervals of time.
1) Day and night.
2) Seasons.
3) Tides.
4) Revolution of Earth.

NON-PERIODIC CHANGE
Changes which do not occur after fixed intervals.
1) Birth and death.
2) Growth of a plant.
3) Change in the shape of mountains.

DESIRED CHANGE
Changes which are desirable and useful to us.
1) Growth of plants.
2) Change in the color of leaves.
3) Ripening of fruits.
4) Change in the shape of mountains.

NON-DESIRED CHANGE
Changes which are not desirable and harmful to us.
1) Rusting of iron.
2) Growth of weeds.
3) Change in the shape of mountains.

PHYSICAL CHANGE
Changes in which the substance changes its state but its chemical composition remains the same.
1) Melting of ice.
2) Dissolving of sugar in water.
3) Dissolving of salt in water.
4) Inflating a balloon.

CHEMICAL CHANGE
Changes in which a new substance is formed from an old substance.
1) Burning of paper.
2) Rusting of iron.
3) Change in the color of leaves.
4) Change in the shape of mountains.

STP04 : Measurements

Measurements

Comparing unknown quantities with some known fixed quantities of same kind are measurements. Measurement is expressed in two parts.

Weight of a Sack of Wheat is 98 kg

Parts of Body Used For Measurements
Cubic ways of measurements always give exact results.

Standard System of Units of Measurements
Standard ways of measurements always give exact results.

| System | Length | Mass (Weight) | Time |
|--------|------------|---------------|--------|
| FPS | feet | pound | second |
| CGS | centimetre | gram | second |
| MKS | metre | kilogram | second |
| SI | metre | kilogram | second |

Measuring Length
Properly place the scale along the length to be measured.

Measuring Mass
Standard weights and balances are used to measure mass of an object.

Measuring Small Thickness
Stacking, Measuring height, Averaging height to know thickness.

Measuring Time & Temperature
We use a Thermometer to measure temperature. Clocks are used to measure time.

Measuring Irregular Surface Area
Superimpose aerial photo or maps over a suitable sized graph paper. Count number of squares to find area of the surface required.

Measuring Volume of Irregular Objects
Water Displacement Method.

STP03 : Metric Weights & Measures

Metric Weights & Measures

Metric system is a decimalized system of measurement. It is the official system of measurement now and is known as The International System of Units (abbreviated as SI).

Standard Prefixes For the Units of Measure

| Prefix | Synonym | Prefix | Synonym | Sub-multiples |
|--------|---------|------------------|---------|-------------------|
| deca | da | 10 ¹ | deci | 10 ⁻¹ |
| hecto | h | 10 ² | centi | 10 ⁻² |
| kilo | k | 10 ³ | milli | 10 ⁻³ |
| mega | M | 10 ⁶ | micro | 10 ⁻⁶ |
| giga | G | 10 ⁹ | nano | 10 ⁻⁹ |
| tera | T | 10 ¹² | pico | 10 ⁻¹² |
| petta | P | 10 ¹⁵ | femto | 10 ⁻¹⁵ |
| exa | E | 10 ¹⁸ | atto | 10 ⁻¹⁸ |
| zetta | Z | 10 ²¹ | zepto | 10 ⁻²¹ |
| yotta | Y | 10 ²⁴ | yocto | 10 ⁻²⁴ |

SI Base Units

| Unit | Symbol | Quantity |
|----------|--------|---------------------|
| metre | m | length |
| kilogram | kg | mass |
| second | s | time |
| ampere | A | electric current |
| Kelvin | K | temperature |
| candela | cd | luminous intensity |
| mole | mol | amount of substance |

Multiples and Submultiples of Units

Length
1 kilometre = 1000 metres
1 centimetre = 1/100 metre
1 millimetre = 1/1000 metre
1 metre = 1000 millimetres
1 kilometre = 1000 metres

Weight (Mass)
1 tonne = 1000 kilograms
1 kilogram = 1000 grams
1 gram = 1000 milligrams
1 milligram = 1/1000 gram
1 tonne = 1000 kilograms
1 kilogram = 1000 grams
1 gram = 1000 milligrams
1 milligram = 1/1000 gram

Time
1 second = 1000 milliseconds
1 minute = 60 seconds
1 hour = 60 minutes
1 day = 24 hours
1 year = 365 days
1 decade = 10 years
1 century = 100 years
1 millennium = 1000 years

Area
1 square centimetre = 100 square millimetres
1 square metre = 100 square decimetres
1 square kilometre = 100 square hectometres

Volume and Capacity (Liquid and Dry)
1 cubic centimetre = 1000 cubic millimetres
1 cubic decimetre = 1000 cubic centimetres
1 cubic metre = 1000 cubic decimetres
1 litre = 1000 cubic centimetres
1 kilolitre = 1000 litres
1 hectolitre = 100 litres
1 decalitre = 10 litres
1 decalitre = 100 litres

STP05 : Sound

Sound

Sound is a vibration transmitted through solid, liquid or gas medium. It is a mechanical energy which produces a sensation of hearing. Ears are the receiver of sound. Sound is measured in decibels.

Generation of sound waves
Propagation of sound waves
Ears perceive sound

Characteristics of Sound

- Amplitude: Loudness of sound
- Frequency: Pitch of sound
- Wavelength: Distance between two consecutive compressions or rarefactions

Measurement of different sounds on a decibel scale (dB)

- 0 dB: Threshold of hearing
- 10-20 dB: Whisper
- 30-40 dB: Normal conversation
- 50-60 dB: Loud conversation
- 70-80 dB: Vacuum cleaner, lawnmower
- 90-100 dB: Siren, jackhammer
- 110-120 dB: Rock concert, jet airplane
- 130-140 dB: Pain threshold

Sonic Boom
Ultrasound & Echo

STP06 : Wave Motion

Wave Motion

Transference of energy in a medium or through a vacuum due to the oscillation caused by a disturbance is called wave motion.

Transverse Wave

Particles of a medium oscillate at right angle to the direction of propagation of a wave.

Electromagnetic waves are non-mechanical transverse waves.

Transverse waves produced in a string.

Transverse waves produced in a rope are mechanical waves.

Longitudinal Wave

All longitudinal waves are mechanical waves.

Particles of a medium oscillate in the direction of propagation of the wave.

Longitudinal wave in spring.

Examples of Wave Motion

Ripples on the surface of water.

Sunlight propagating in sky.

Sound.

Propagating seismic waves.

Seismic waves are transverse.

STP07 : Simple Machine

Simple Machine

Simple machine is a device that changes the amount, distance, or direction of the force needed to do work in order to gain a Mechanical Advantage.

Lever

A lever is a simple machine that is used to push, pull, or lift things called loads from a fixed point called the fulcrum.

Pulley

Pulley is used to change the direction of an applied force or to gain a mechanical advantage. Fixed pulley system does not create a mechanical advantage.

Wedge

A wedge is a triangular shaped tool. It can be used to separate two objects or portions of an object, lift an object, or hold an object in place.

Inclined Plane

The inclined plane is a flat surface whose endpoints are at different heights. The inclined plane allows the same work to be done with a smaller force exerted over a greater distance.

Screw

A screw is a shaft with threads formed on its surface. A screw can convert a rotational force (torque) to a linear force and vice versa.

Wheel & Axle

A wheel and axle is a modified lever of the first class in which larger wheel (or tubular) rotates around the smaller wheel (axle).

STP08 : Lever

LEVER

A lever is a simple machine. Three main components of a lever are:

- Fulcrum:** A point on which the lever rests or around which the lever can rotate.
- Load of Resistance:** Is the object to be moved or the object on which force is applied.
- Effort:** It is the force which is applied on lever or on load to move it.

Lever Of The First Class

In lever of the first kind the fulcrum lies between the effort and the load.

Lever Of The Second Class

In lever of the second class the load comes between the effort and the fulcrum.

Lever Of The Third Class

In lever of the third class the effort comes between the load and the fulcrum.

STP09 : Principle of Archimedes

Principle of Archimedes

Body immersed in a fluid is buoyed up by a force equal to the weight of the displaced fluid. This force enables the object to float or at least seem lighter.

Examples of Archimedes Principle

- Floating Log:** Log floats because its density is less than water, it weighs less and hence floats.
- Sinking Rock:** The rock sinks because its density is greater than water.
- Floating Ship:** The ship floats because the average density of ship is less than that of water.
- Balloons Rise High:** Hot air balloons rise because the balloon's density is less than density of surrounding air.

STP10 : Pascal's Law

Pascal's Law

Pascal's law, established by French mathematician Blaise Pascal, states that pressure exerted anywhere in a confined incompressible fluid is transmitted equally in all directions throughout the fluid such that the pressure ratio remains the same.

$$\Delta P = \rho g(\Delta h)$$

Where:

- ΔP is the hydrostatic pressure (in pascal).
- ρ is the fluid density (in kg/m³).
- g is acceleration due to gravity (in m/s²).
- Δh is the height of fluid above the point of measurement.

APPLICATIONS

- Used in Artesian Wells, Water Towers, and Dams.
- Hydraulic Press.
- Used for Amplifying the Force of the Driver's Foot in the Braking System.

STP11 : Reflection of light

Reflection of light

Laws of Reflection

- The incident ray, the reflected ray and the normal ray, all lie in the same plane.
- The angle of incidence is equal to the angle of reflection.
- The reflected ray and the incident ray are on the opposite sides of the normal ray.

Image Formation by Plane Mirrors

- Image produced is upright.
- Image is virtual.
- Size of image & object is same.
- Distance of the image and the object from the mirror is same.
- Image is laterally inverted.

Image Formation by Spherical Mirrors

Concave Mirror and Convex Mirror diagrams showing focal points and image formation.

STP12 : Refraction Through a Glass Slab

Refraction Through a Glass Slab

Lateral Displacement of a Light Ray.

Refractive Index of a Glass Slab.

Refractive index (μ) = Speed of light in air / Speed of light in glass.

Refraction of Light Through Different Media

Diagrams showing light bending at interfaces between air, glass, and water.

Total Internal Reflection

When light passes from an optically denser medium to a rarer medium, beyond critical angle, it undergoes total internal reflection instead of refraction.

STP13 : Refraction Through Prisms

Refraction Through Prisms

Dispersion of White Light Through a Prism

Dispersion: The phenomenon due to which white light splits into seven colours (i.e. violet, indigo, blue, green, yellow, orange and red (VIBGYOR)), when passed through an equilateral prism, is called dispersion.

Refraction of Light Through an Equilateral Prism

Diagram showing incident ray, refracted ray, and emergent ray through a prism.

Re-Combination of Spectrum Colours

The seven coloured rays of the spectrum can be recombined to give back white light. A triangular glass prism is placed on its base, alongside it, in the reverse direction on its vertex, another glass prism of the same material and same refractive index is placed, so that its refracting surface is in the opposite direction.

Rainbow

A rainbow is produced by the dispersion of sunlight by tiny raindrops which act as many small prisms in the sky.

SCIENCE AND TECHNOLOGY
 Charts on Physics
 Laminated Art, Size 58 x 90 cm (In English only)

STP14 : Refraction of Light Through Lenses

Refraction of Light Through Lenses

Lens: A transparent material bounded by two spherical surfaces.

Refraction: Bending of light ray when it passes from one transparent medium to another transparent medium.

Some Definitions:

- Optical Axis:** The line joining the centres of the two spheres of which the lens is made is called the optical axis.
- Optical Centre:** Optical Centre is that point on the principal axis which allows a ray of light to pass through it without any deviation.
- Principal Focus:** For convex lens, it is a point on the principal axis from which a parallel ray to the principal axis converges after refraction through the lens. For concave lens, it is a point on the principal axis from which a parallel ray to the principal axis appears to diverge after refraction through the lens.
- Focal length:** The distance between the optical centre and the focus is called the focal length.

Image Formed by a Lens:

Objects are imaged by a lens, we know the nature of the image formed, that is, whether the object after refraction, in case of converging lens, it appears to come from the focus after refraction.

Key points to remember:

- Key point to remember: The size of the image formed through the lens is a function of the distance of the object from the lens.
- Key point to remember: The nature of the image formed through the lens is a function of the distance of the object from the lens.
- Key point to remember: The nature of the image formed through the lens is a function of the distance of the object from the lens.

Image Formation by Convex Lens:

Object Beyond 2F: The image is formed between F and 2F. It is inverted and smaller than the object.

Object at 2F: The image is real, inverted and of the same size as the object. It is formed at 2F on the other side of the lens.

Object Between F and 2F: The image is real, inverted and larger than the object. It is formed beyond 2F on the other side of the lens.

Object at F: The image is formed at infinity.

Object Between F and O: The image is virtual, erect and highly magnified. It is formed on the same side of the lens.

Image Formation by Concave Lens:

Object at any distance: The image is virtual, erect and smaller than the object. It is formed on the same side of the lens.

STP15 : Optical Instruments

OPTICAL INSTRUMENTS

Slide Projector: A device that projects an enlarged image of a slide onto a screen.

Telescope: An optical instrument that uses lenses or mirrors to collect and focus light from distant objects.

Compound Microscope: An instrument that uses two lenses to magnify small objects.

Magnifying Glass: A simple lens used to enlarge the appearance of objects.

Camera: A device that captures and records images by focusing light onto a light-sensitive surface.

Periscope: An instrument that uses mirrors to observe objects from a distance, often used in submarines.

STP16 : Microscope

MICROSCOPE

In a Compound Microscope, two lenses are used for larger magnification, one compensating the effect of the other. The objective lens forms a real, inverted and magnified image of the object. This serves as the object for the second lens, the eyepiece, which produces the final image, which is enlarged and virtual.

Compound Microscope: Shows the objective lens, eyepiece, stage, and other components.

Electron Microscope: Uses a beam of electrons instead of light to magnify objects.

RAY DIAGRAM FOR COMPOUND MICROSCOPE: Illustrates the path of light rays through the objective and eyepiece lenses.

STP17 : Telescope

TELESCOPE

The Telescope is used to provide angular magnification of distant objects. It has an objective lens and an eyepiece lens. The objective has a large focal length and a much larger aperture than the eyepiece. Light from a distant object enters the objective and a real image is formed at its second focal point. The eyepiece magnifies this image producing a final inverted image.

A Refracting Telescope: Uses two lenses to magnify distant objects.

A Reflecting Telescope (Cassegrain): Uses a primary mirror and a secondary mirror to magnify distant objects.

STP18 : Eye and its Defects

Eye and its Defects

Transverse Section of Eyeball: Shows the internal structure of the eye, including the cornea, iris, lens, and retina.

Presbyopia: A condition where the eye's ability to focus on nearby objects is reduced.

Cataract: A clouding of the lens in the eye that causes blurred vision.

Myopia: A condition where the eye focuses light in front of the retina, making distant objects blurry.

Hypermetropia: A condition where the eye focuses light behind the retina, making nearby objects blurry.

Astigmatism: A condition where the eye's vision is blurred due to an irregularly shaped cornea or lens.

STP19 : Electric Current - Sources - Effects

Electric Current - Sources - Effects

Electric current is defined as the rate at which charge flows.

SOURCES:

- Galvanic Cell:** A cell that converts chemical energy into electrical energy.
- Daniel Cell:** A type of galvanic cell used in laboratories.
- DTV Cell:** A cell that uses a diaphragm to separate the two half-cells.

EFFECTS:

- HEATING AND LIGHTING:** Electric current can produce heat and light.
- MAGNETIC EFFECT:** Electric current can produce a magnetic field.

STP20 : Static Electricity

Static Electricity

Electrical charge at rest on a body is termed as Static Electricity. Two kinds of electric charges are there - Positive (+) and Negative (-).

Like Charges Repel: Two objects with the same type of charge repel each other.

Unlike Charges Attract: Two objects with opposite types of charge attract each other.

Electrostatic Induction: The process of charging a body without direct contact.

Photocopier: Uses static electricity to copy text and images.

Lightning Spark: A sudden discharge of static electricity between clouds and the ground.

STP21 : Current Electricity

Current Electricity

Flow of electric charges through a conductor constitutes current electricity.

Mobile Electrons Are Responsible For Electric Current: Shows how the movement of electrons creates an electric current.

Voltage Cell: A source of electrical energy that maintains a constant potential difference.

Wiring of a Plug: Shows the internal wiring of a standard electrical plug.

Conventional Current: The direction of flow of positive charges, opposite to the direction of electron flow.

Electric Circuit inside a Torch: Shows the circuit that powers a flashlight.

Transmission of Electricity: Shows how electricity is transmitted over long distances.

Electric Circuit in a House: Shows the typical wiring setup in a residential building.

STP22 : Ohm' Law & Electrical Resistance

Ohm's Law & Electrical Resistance

Ohm's Law
Georg Simon Ohm found out the relationship between the current flowing in a metallic wire and the potential difference across its terminals. This relationship is called Ohm's Law. He stated that the current flowing through a metallic conductor is directly proportional to the voltage across its ends if the temperature and other conditions are constant.
i.e. $V \propto I$ where V = Potential Difference
 I = Current
or $VI = \text{Constant}$
or $VI = R$
Where R is a constant called Resistance. In SI unit it is Ω (ohm).

Factors Affecting Resistance

Length: Resistance of the conductor is directly proportional to its length.

Area of Cross-Section: Resistance of the conductor is inversely proportional to its area of cross-section.

Material: Resistance of the conductor depends upon the nature of its material.

Temperature: Resistance also depends upon the temperature of the conductor.

Resistance of a System of Resistors

Series Combination: In a combination of resistors in series, the total resistance is the sum of individual resistances.
 $R_{\text{total}} = R_1 + R_2 + R_3 + \dots$

Parallel Combination: In a combination of resistors in parallel, the total current is the sum of individual currents.
 $\frac{1}{R_{\text{total}}} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} + \dots$

STP23 : Electric Circuit's Component Symbols

Electric Circuit's Component Symbols

| | | | |
|----------------------|---------------------------------------|---------------------------------------|------------------|
| Electric Cell | Battery | Bulb | Resistor |
| Switch (Open) | Switch (Close) | Variable Resistance (Rheostat) | Ammeter |
| A Wire Joint | Wires Crossing Without Joining | Fuse | Voltmeter |

STP24 : Magnetism

Magnetism

Earth's Magnetic Field: The Earth acts like a magnet. Its magnetic field is due to the rotation of the Earth on its axis.

Magnetic Compass: A magnet with a needle is used to find the direction of the Earth's magnetic field.

Artificial Magnets: Magnets made by artificial means are called artificial magnets.

Natural Magnets: Magnets found in nature are called natural magnets.

Types of Artificial Magnets: Bar magnet, Horseshoe magnet, Cylindrical magnet, Ring magnet.

Temporary and Permanent Magnets: Temporary magnets lose their magnetism when the external magnetic field is removed. Permanent magnets retain their magnetism.

Theory of Magnetism: Magnets are made of tiny particles called magnetic domains. In a magnet, these domains are aligned in the same direction.

Flu-Like Poles: Like poles repel each other, and unlike poles attract each other.

Van Allen Radiation Belt: A region of space around the Earth containing charged particles trapped by the Earth's magnetic field.

Magnetic Field: A magnetic field is the region around a magnet where its magnetic force can be felt.

STP25 : Properties of a Magnet, Making a Magnet

Properties of a Magnet, Making a Magnet

Making an Electromagnet: An electromagnet is made by passing an electric current through a coil of wire.

Properties of Magnet:

- Like poles repel each other, and unlike poles attract each other.
- Magnets attract iron and other magnetic materials.
- Magnets have two poles: North and South.
- Magnets can attract small pieces of iron and other magnetic materials.

Proper Storage and Handling of Magnet: Magnets should be stored in pairs with soft iron fillers at their ends to prevent them from losing their magnetism.

Magnet's Induction: A magnet can induce magnetism in other magnetic materials.

Repulsive and Attractive Forces: Like poles repel, and unlike poles attract.

STP26 : Electromagnetism

Electromagnetism

Electric current through a wire generates a magnetic field which is called electromagnetism. It describes the relationship between electricity and magnetism.

Oersted's Experiment: In 1820, Hans Christian Oersted discovered the link between magnetism and electric current when he found that a magnetic needle gets deflected when placed near a current-carrying conductor.

Magnetic Field of a Current Carrying Conductor:

- Straight Conductor:** The magnetic field lines are concentric circles around the conductor.
- Solenoid:** The magnetic field lines are parallel to the axis of the solenoid.
- Circular Loop:** The magnetic field lines are parallel to the axis of the loop.

Maxwell's Right Hand Grip Rule: If you grip a current-carrying conductor with your right hand such that the thumb points in the direction of the current, the fingers will curl in the direction of the magnetic field.

Fleming's Left Hand Rule (motor effect): If the forefinger, middle finger, and thumb of the left hand are extended at right angles to each other, the forefinger indicates the direction of the magnetic field, the middle finger indicates the direction of the current, and the thumb indicates the direction of the motion of the conductor.

Fleming's Right Hand Rule (induced current direction): If the forefinger, middle finger, and thumb of the right hand are extended at right angles to each other, the forefinger indicates the direction of the magnetic field, the thumb indicates the direction of the motion of the conductor, and the middle finger indicates the direction of the induced current.

Applications: Electric Bell, Electric Motor, Simple Electromagnet.

STP27 : Electromagnetic Induction

Electromagnetic Induction

Faraday and Henry discovered that a magnetic field can be used to produce a current.

Primary Circuit: A circuit containing a battery, a coil, and a switch.

Secondary Circuit: A circuit containing a coil and a galvanometer.

Applications: Transformer, Generator, Induction Cooker.

STP28 : Electric Motor

Electric Motor

An electric motor converts electrical energy to mechanical energy.

Working of a Simple DC Motor:

- Current flows through the coil, and the coil starts to rotate.
- The coil continues to rotate, and the current in the coil reverses.
- On reversing the current, the coil continues to rotate in the same direction.
- The coil continues to rotate, and the current in the coil reverses again.

Commercial Electric Motor: A commercial electric motor has many coils and a soft iron core. It is used in various household appliances.

Simple AC Motor: A simple AC motor has a rotating coil and a permanent magnet. It is used in various household appliances.

Applications of Electric Motor: Fan, Washing Machine, Blender, etc.

STP29 : Electric Bell

Electric Bell

There are various types of electric bells, including the single-stroke bell, the trembler bell, the buzzer, and a continuously ringing bell, but all depend on the attraction exerted by the electromagnet on a soft iron armature. A typical single stroke bell circuit is shown here.

When the switch is pressed, the current begins to flow. The solenoid gets magnetised and attracts the armature due to which the hammer strikes the gong and the bell rings.

The movement of the armature breaks the contact and the current stops flowing. The electromagnet loses its magnetism and the armature returns back to its original position. This completes the circuit once again and the action is repeated. As a result, the bell continues to ring as long as the push-button is pressed.

STP30 : Electric Generator

Electric Generator

In an electric generator, mechanical energy is used to rotate a conductor coil in a magnetic field to produce electricity. It is based on the principle of electromagnetic induction explained by the Faraday's Law.

A.C. Generator

The simplest A.C. generator consists of a rectangular coil rotating between the poles of a permanent magnet. The ends of the coil are joined to two slip rings on the axis and against which carbon brushes press. The rotating coil cuts the magnetic field lines and a voltage is induced in it. The induced current that produced reverses every half-turn due to the slip rings.

The induced current flows out only as the coil passes the permanent magnet's two poles.

The current reverses at each side of the coil as the coil passes the two opposite poles of the permanent magnet.

D.C. Generator

An A.C. generator becomes a D.C. generator if the slip rings are replaced by a split-ring commutator. As the coil rotates, the commutator changes the connections every half turn, so the current that is generated flows in one direction only.

The induced current in this coil will change direction.

STP31 : Dynamo

Dynamo

Dynamo Principle

Dynamo works on electromagnetic principles. It converts mechanical motion into pulsed DC through the use of a commutator. It consists of a stationary magnet to provide a constant magnetic field, and a set of rotating windings which turn within that field to produce the electric current.

Bicycle Bottle Dynamo

Bottle dynamo operates using a roller placed on the sidewall of a bicycle tyre. The movement of the bicycle tyre turns the roller which spins a magnet inside a fixed coil. Electricity is generated in the coil by electromagnetic induction.

The First Dynamos

FARADAY'S DISC DYNAMO

The first dynamo invented by Michael Faraday in 1831 with a copper disk that rotated between the poles of a magnet.

PIKIP'S COMMUTATED DC DYNAMO

In 1832, Hippolyte Pixii built a dynamo based on Faraday's principles. He used a spinning permanent magnet whose north and south poles passed by a piece of iron wrapped with insulated wire. To convert the AC to DC, Pixii invented a commutator.

STP32 : Force

Force

A force is a push or pull that changes the motion, size or shape of an object.

Effects of Force

- Change the direction of motion
- Stop motion
- Set a stationary object in motion
- Change speed
- Change direction
- Change of shape or size

Combining Force

Two separate forces acting on the same object can be combined by adding them together according to the parallelogram law.

STP33 : Friction

Friction

Friction is the component of the contact force parallel to the surfaces in contact, which opposes impending or actual relative motion between the two surfaces.

STATIC FRICTION

Opposes impending relative motion
 $f_s \leq \mu_s N$

KINETIC FRICTION

Opposes relative motion
 $f_k = \mu_k N$

ROLLING FRICTION

Opposes relative motion during rolling
 $f_r = \mu_r N$

Where μ_s , μ_k and μ_r are respectively the coefficients of static friction, kinetic friction & rolling friction. N is the normal force. Also,
 $\mu_r < \mu_k < \mu_s$

ADVANTAGES

- Helps to Write
- Helps to Apply Brakes
- Helps to Walk

DISADVANTAGES

- Causes Wear and Tear
- Causes Skin Abrasions

INCREASING FRICTION

- Spiking the Shoes
- Grooving the Tyres

REDUCING FRICTION

- Using Ball Bearing
- Using Powder
- Lubricating With Oil

STP34 : Gravitation

Gravitation

Universal Law of Gravitation

Everybody in the universe attracts every other body with a force which is directly proportional to the product of their masses & inversely proportional to the square of the distance between them.

$$F_g = \frac{GM_1M_2}{r^2}$$

Where, G is the universal gravitational constant, M_1 and M_2 are masses of two objects, r is the distance between two masses.

Gravitational Constant G

Henry Cavendish's Torsion Balance provided the first measurement of the gravitational constant G .
 Currently accepted value of G is $6.67 \times 10^{-11} \text{ Nm}^2/\text{Kg}^2$.

Acceleration Due To Gravity

Gravitational acceleration at a point is equal to g as given as

$$g = \frac{GM}{r^2}$$
 Acceleration due to gravity of the earth, $g = 9.8 \text{ m/s}^2$

Weight

Weight is a force caused by the gravitational attraction.

$$W = mg$$
 Weight equals mass times gravitational acceleration.
 Also, Weight of the object on the moon $\frac{1}{6}$ Weight of the object on the earth.

Weightlessness

When an object is in free fall, it is weightless.

STP35 : Moment and Couple

Moment and Couple

Moment (Torque)

The turning effect of a force is called a moment. The moment of a force is also called a Torque. It depends on:
 (i) the magnitude of the force (bigger force means greater moment).
 (ii) the perpendicular distance of the force from the Pivot (further the force acts from the pivot, the greater is its moment).

Moment of Force (Torque) = Force \times Moment Arm (F) (d)

SI Unit of Moment is Newton meter (Nm) Dimension $[ML^2T^{-2}]$

The Principles of Moment

Example 1: $T = F \times d$
 Example 2: $T = 0$
 Example 3: $T = F \times d \cos \theta$
 Example 4: Equilibrium (Balanced) $T_1 = T_2$, $F_1 \times d_1 = F_2 \times d_2$

Couple

A special case of moments where two anti-parallel forces (F_1 & F_2) separated by a distance 'd' cause an object to rotate.

Applications of a Couple

- Turning of a steering wheel
- Turning of a screw
- Turning of a nut
- Turning of a door handle
- Turning of a nut
- Turning of a nut

STP36 : Work and Power

Work and Power

WORK

If a body is displaced with a given force, a certain amount of work is done.

$$W = (F \cos \theta) d = f \cdot d$$
 Unit: joule (J) Dimension: $[ML^2T^{-2}]$

Amount of work is greater when displacement is greater for the same force applied.
 Amount of work is greater when force applied is greater for the same displacement.

SPECIAL CASES FOR WORK DONE

- When $\theta = 0^\circ$, Maximum work is done.
- When $\theta = 90^\circ$, No work is done.
- When $d = 0$, No work is done.
- When $f = 0$, No work is done.

POWER

Time rate at which work is done.

$$P = \frac{W}{t} = \frac{f \cdot d}{t} = f \cdot v$$
 Unit: watt (W) 1 horsepower = 746 watt

STP37 : Nuclear Fusion

Nuclear Fusion

ASTROPHYSICAL NUCLEAR FUSION

Proton-Proton (pp) Chain in Sun

Four hydrogen nuclei combine to form a nucleus with a release of 26.7 MeV of energy.
 $4^1_1\text{H} + 2e^- \rightarrow ^4_2\text{He} + 2\nu + 6\gamma + 26.7\text{MeV}$

CNO Cycle in Massive Stars

C-13 acts as a nuclear catalyst.

CONTROLLED FUSION

TOKAMAK: The most researched device for producing controlled thermonuclear fusion.

HYDROGEN BOMB

Detonation of small atomic bomb creates the temperature to trigger the hydrogen bomb explosion. The inward travelling shock waves thus produced compress deuterium & tritium. These nuclei undergo fusion at temperatures over $5 \times 10^7 \text{ }^\circ\text{C}$.

STP38 : Nuclear Fission

Nuclear Fission

When a massive nucleus ($A \approx 235$) breaks apart into smaller nuclei, there is a slight loss of mass, which comes in the form of enormous energy according to Einstein's equation $E = mc^2$. Such process is called Nuclear Fission. Uncontrolled nuclear fission chain reaction releases enormous energy as in atom bombs.

NEUTRON INDUCED NUCLEAR FISSION
When a neutron is bombarded on a nucleus, the nucleus breaks into two nearly equal fragments, releasing great amount of energy.

CONTROLLED NUCLEAR FISSION
The release of energy in nuclear reactor is controlled nuclear fission.

BREEDING PLUTONIUM-239
U-238 is first bombarded with neutron to produce U-239, which further decays to Pu-239.

SPONTANEOUS FISSION
URANIUM-238
RADIOACTIVE DECAY
THORIUM-234
ALPHA PARTICLE

ENRICHMENT OF THE NUCLEAR FUEL
1. Trailing uranium released to form yellow cake (80% Uranium)
2. Uranium hexafluoride
3. Uranium hexafluoride
4. Uranium hexafluoride
5. Uranium hexafluoride
6. Uranium hexafluoride
7. Uranium hexafluoride
8. Uranium hexafluoride
9. Uranium hexafluoride
10. Uranium hexafluoride
11. Uranium hexafluoride
12. Uranium hexafluoride
13. Uranium hexafluoride
14. Uranium hexafluoride
15. Uranium hexafluoride
16. Uranium hexafluoride
17. Uranium hexafluoride
18. Uranium hexafluoride
19. Uranium hexafluoride
20. Uranium hexafluoride

STP39 : Nuclear Reactor

Nuclear Reactor

Pressurized water reactor uses ordinary water under high pressure (superheated water) as coolant to remove heat generated, and to be the moderator to slow down the reaction. The primary coolant loop is kept under high pressure to prevent the water from boiling, hence the name. PWRs are the most common type of power producing nuclear reactors.

Fast Nuclear Reactor
The fast reactor has no moderator and therefore water cannot be used as a coolant. Also the heat is more concentrated in a coolant such as liquid sodium or sodium-potassium alloy which do not require a pressure vessel. Coolants are also used for electricity.

STP40 : Radioactivity

Radioactivity

The atoms of unstable chemical elements try to rearrange themselves to make more stable atoms. In the process, they give off tiny bundles of radiations. This process is called radioactivity. Radioactivity is both harmful (damages or destroys the tissues) and useful (used to make nuclear energy, preserve food and in the treatment of cancer) to us in everyday life.

Types of Radioactive Radiation
Alpha Decay
 ${}^4_2\text{He} \rightarrow {}^2_2\text{He} + {}^2_0\text{He}$
Beta Minus Decay
 ${}^0_{-1}\text{e}$
Beta Plus Decay
 ${}^0_{+1}\text{e}$
Gamma Decay
 ${}^0_0\gamma$

Penetrating Power of Radioactive Radiations
All types of radioactive radiations are dangerous to living organisms. They cause ionisation and damage them. The amount of damage depends on the type of radiation and the dose received. Alpha radiation can be stopped by a sheet of paper. Beta radiation can be stopped by a thin metal foil. Gamma radiation can be stopped by a thick lead or concrete wall.

Radiocarbon Dating
Archaeologists find the age of fossils by measuring amount of radioactive isotope of carbon-14 in it. When an organism dies, its stores of carbon-14 gradually decrease. Because of radioactive decay, about half of its mass in 5568 years, a period known as half life of carbon-14 is known. By comparing the amount of carbon-14 in a modern sample with their fossil counterparts and knowing the rate of carbon-14 decay, scientists can calculate with fair accuracy the age of the fossil.

Decay of Uranium-238

STP41 : Radio Telescope

Radio Telescope

Radio Telescope is an astronomical instrument consisting of a radio receiver and an antenna system that is used to detect radio frequency radiations emitted by extraterrestrial sources. Because radio wavelengths are much longer than those of visible light, radio telescopes must be very large in order to attain the resolution of

Astronomical Interferometers
Interferometers combine images from several radio telescopes to make one image that looks like it was taken from one large dish.

STP42 : X-Rays

X-Rays

Stream of high energy photons having wavelength in the range from 0.01 to 10 nanometers are X-rays. X-rays are also called as Roentgen Radiations.

CHARACTERISTICS

- They are electromagnetic waves.
- They are not deflected by magnetic and electric fields.
- They affect photographic plates.
- They ionize the gases through which they pass.
- Depending on their wavelength, X-rays penetrate through different depths.

PRODUCTION OF X-RAYS

Two different atomic processes produce X-ray photons.

X-ray Tube
In an X-ray tube, the electrical potential up to 100 KV between the cathode and the anode heats the filament to several thousand °C to release a stream of free electrons. Electrons from the cathode are accelerated towards the target anode. X-rays are produced when free electrons give up some of their energy when they interact with the electrons of the target atom.

Work done W in transferring charge Q through a p.d. V is $W = Q \times V$
This will equal the K.E. of the electrons reaching the anode. Less than 1% of this K.E. of the electrons becomes X-ray energy.

USES

- Medical Imaging
- Security Scanners
- X-ray Crystallography

STP43 : Television

Television

Picture Tube
Deflector Coils, Evacuated Tube, Electron Gun, Shadow Mask, Phosphor Coating on Screen.

Guided by a magnetic field and fired out of three electron guns, electron beams that correspond to colours in a TV image strike millions of dots of fluorescent compound on inside of the screen.

The electronic signals from the studio are sent to a home television station. Here they are amplified, and sent out from the transmission mast.

Color Triplets
Arranged in lines, each red, green, or blue on the electron beams strike them out. A grid behind the screen keeps the beams from overlapping.

The aerial picks up the signal. The signal is then split into three parts. The three signals are sent as beams of electrons to the screen, where they are focused on coloured phosphors. The phosphors glow brightly when a signal hits them.

STP44 : Multistage Rocket

Multistage Rocket

Multistage rockets can be used to increase efficiency and acceleration.

The Stage Principle
To place a significant payload into the earth's orbit, staging is generally employed. In using the principle, each rocket will separate in turn with the same engine and fuel tanks. The stage is discarded once the fuel has been used up, when spent the next stage is ignited. This less the effect of reducing the weight of the rocket, resulting that a gas faster acceleration than that.

Chemical Rocket Types
Liquid, Solid, Hybrid

Components of Rocket System
Payload, Rocket Engine, Rocket Motor, Rocket Nozzle, Rocket Chamber, Rocket Structure, Rocket Support, Rocket Fuel, Rocket Oxidizer, Rocket Motor, Rocket Nozzle, Rocket Chamber, Rocket Structure, Rocket Support, Rocket Fuel, Rocket Oxidizer

Engine Operation
Before the fuel is ignited, the reaction gases are held in the chamber. The rocket ignites only if the oxygen of the propellant is introduced. The rocket then ignites and the reaction gases are expelled. The main engine remains operational in its own way and the rocket continues to rise.

STP45 : Windmill

Windmill

A TYPICAL WINDMILL
Windmill converts wind energy into rotational motion by means of adjustable blades which sweep across the blades of a windmill. It exerts a force on them. This rotates the shaft of the windmill to do a variety of works.

The Principle of Windmill
When the wind strikes across the blades of a windmill, it exerts a force on them. This rotates the shaft of the windmill to do a variety of works.

USES OF WINDMILL
Wind Power (Grinding), Wind Power (Pumping), Wind Power (Sawing), Wind Power (Sailing), Wind Power (Electricity Generation)

MODERN ERA WINDMILL - A WIND TURBINE
Horizontal Axis Wind Turbine, Vertical Axis Wind Turbine

STP46 : Petrol Engine

Petrol Engine

FOUR STROKE PETROL ENGINE

Four stroke petrol engine (internal combustion engine) is used in cars, motorcycles, trucks, aircrafts, construction machinery and many others. The four stroke engine refers to intake, compression, combustion (power), and exhaust strokes.

The cycle begins at Top Dead Center, when the piston is farthest away from the axis of the crankshaft. A stroke refers to the full travel of the piston from Top Dead Center to Bottom Dead Center.

1 INTAKE STROKE

The piston descends from the top of the cylinder to the bottom of the cylinder, reducing the pressure inside the cylinder. A fuel and air mixture is sucked by atmospheric pressure into the cylinder through the intake valve. The intake valve then closes.

2 COMPRESSION STROKE

With both intake and exhaust valves closed, the piston returns to the top of the cylinder compressing the fuel-air mixture.

3 POWER STROKE

With the piston close to top dead center, the compressed air-fuel mixture is ignited by a spark plug. The resulting massive pressure from the combustion of the compressed fuel-air mixture forces the piston back down toward bottom dead center with tremendous force.

4 EXHAUST STROKE

During the exhaust stroke, the piston once again returns to top dead center while the exhaust valve is open. This action forces out the combustion products from the cylinder by pushing the spent fuel-air mixture through the exhaust valve.

STP47 : Steam Engine

Steam Engine

A practical device which transforms heat energy of steam

Simple Steam Engine Working

Principle — Steam occupies a larger space than occupied by the same amount of water. Therefore, it exerts greater pressure on the walls of the cylinder. Steam when expands, pushes the piston fitted with the cylinder. The motion of the piston can now be made to move any object by suitably connecting it to the piston.

The expanding steam loses its heat energy and condenses to water. The piston then falls back. Letting the cooled steam out of the cylinder and reintroducing fresh hot steam into it, entire cycle could be made to repeat as long as desired.

One of The First Steam Locomotives (1825)

STP48 : Diode

Diode

Diode is a two-terminal electronic component that conducts electric current in only one direction. Diode is usually made from semiconductor materials. Silicon and Germanium are the most common semiconductor used to make diodes.

TYPES OF DIODES & SYMBOLS

- Diode Symbol**: Shows the direction of current flow.
- Zener Diode**: Allows current to flow in either direction, but only when the voltage is above a certain value.
- Tunnel Diode**: Operates at very low voltages and with the characteristic frequency up to 100 GHz.
- Schottky Diode**: A diode with low voltage drop.
- Varactor / Varicap Diode**: Variable capacitance diode.
- Photodiode**: Measures current flow when exposed to light.
- Silicon Diode**: Commonly used in power electronics.
- Germanium Diode**: Used in high-speed electronics.
- Light Emitting Diode (LED)**: Emits light when current flows through it.
- Laser Diode (in type of photodiode)**: Emits a narrow beam of light.

STP49 : Universe - I (Life Cycle of a Star)

Universe-I (Life Cycle of a Star)

1. PROTOSTAR: A protostar is a dense, glowing cloud of gas and dust that is contracting under its own gravity.

2. PROTOSTAR: As the protostar contracts, it becomes hotter and denser. The core temperature rises to about 10 million degrees Celsius.

3. PROTOSTAR: The protostar continues to contract and heat up. The core temperature rises to about 100 million degrees Celsius.

4. PROTOSTAR: The protostar continues to contract and heat up. The core temperature rises to about 1 billion degrees Celsius.

5. PROTOSTAR: The protostar continues to contract and heat up. The core temperature rises to about 10 billion degrees Celsius.

6. PROTOSTAR: The protostar continues to contract and heat up. The core temperature rises to about 100 billion degrees Celsius.

7. PROTOSTAR: The protostar continues to contract and heat up. The core temperature rises to about 1 trillion degrees Celsius.

8. PROTOSTAR: The protostar continues to contract and heat up. The core temperature rises to about 10 trillion degrees Celsius.

9. PROTOSTAR: The protostar continues to contract and heat up. The core temperature rises to about 100 trillion degrees Celsius.

10. PROTOSTAR: The protostar continues to contract and heat up. The core temperature rises to about 1 quadrillion degrees Celsius.

STP50 : Universe II (Comets & Meteors)

Universe II (Comets & Meteors)

Comets

A comet is an icy celestial body in solar system made of dust and ice mixed together.

Formation of Comet's Tail and Head

Comets originate in the Kuiper Belt or Oort Cloud.

Meteors

Meteoroid: A small celestial piece of dust, rock, ice or metal moving through space.

Meteor: The incandescent streak caused by a meteoroid encountering Earth's atmosphere. It is commonly called a shooting star.

Meteorite: It is a meteor that has reached the Earth's surface.

Types of Meteorites

- Achondrite
- Chondrite
- Iron
- Meteorite
- Meteorite

Most meteoroids have their origin in Asteroid Belt.

STP51 : Star Map

Star Map

MAP OF NORTHERN HEAVEN

MAP OF SOUTHERN HEAVEN

STP52 : Newton's Laws of Motion

Newton's Laws of Motion

Newton's First Law of Motion

Every object continues to be in its state of rest or of uniform motion unless acted upon by an external unbalanced force.

Everyday Observations Based on Newton's First Law of Motion

- A ball rolling on a smooth surface continues to move with uniform velocity unless acted upon by an external force.
- A ball rolling on a rough surface slows down and eventually stops.
- A ball rolling on a smooth surface continues to move with uniform velocity unless acted upon by an external force.

Newton's Second Law of Motion

The rate of change of momentum of a body is directly proportional to the applied force and takes place in the direction in which the force acts.

Newton's Third Law of Motion

Whenever one body exerts a force (action) on another body, the second body exerts an equal and opposite force (reaction) on the first body.

STP53 : Simple Electric Circuit

Simple Electric Circuit

A circuit is a path along which an electric current can flow. A simple circuit consists of an electric source like battery, a wire, a switch and an output device like bulb. Each part of the circuit must be connected to the next, and each must be able to conduct electricity.

Types of Circuits

There are many ways of connecting together various components and wires to make circuits.

Parallel Circuit

In parallel circuit, each component is in its own 'circuit loop'.

Series Circuit

In series circuit, the components are joined one after the other. The whole circuit has only one path through which electric current flows.

STP54 : Measuring Instruments

Measuring Instruments

MEASURING INSTRUMENTS

The SI unit of length is metre and is denoted by symbol 'm'. The SI unit of mass is kilogram and is denoted by symbol 'kg'.

MEASURING LENGTH

SI unit for length is metre and is denoted by symbol 'm'. The SI unit of mass is kilogram and is denoted by symbol 'kg'.

CALIBRATION OF OSCILLOSCOPE (C.S.O.)

The Cathode Ray Oscilloscope is a device which is used to study the variation of voltage and current with time. It is used to study the variation of voltage and current with time.

SPECTROMETER

Spectrometer is used to study the spectrum of light. It is used to study the spectrum of light.

CALORIMETER

Calorimeter is used to measure the heat capacity of a substance. It is used to measure the heat capacity of a substance.

VOLTMETER

Voltmeter is used to measure the potential difference between two points in a circuit. It is used to measure the potential difference between two points in a circuit.

AMMETER

Ammeter is used to measure the current flowing through a circuit. It is used to measure the current flowing through a circuit.

GALVANOMETER

Galvanometer is used to detect and measure small currents. It is used to detect and measure small currents.

STP55 : Energy

Energy

Capacity to do work is called energy. SI unit of energy is Joule (J).

Types of energy are:

- Mechanical Energy
- Heat Energy
- Sound Energy
- Light Energy
- Magnetic Energy
- Electrical Energy
- Nuclear Energy
- Bio Energy
- Solar Energy
- Chemical Energy

Law of Conservation of Energy

Total energy in the universe is constant.

Energy cannot be created nor can be destroyed, but can change from one form to another.

Mechanical Energy

Mechanical Energy is the sum of kinetic and potential energy.

Conservation of Potential Energy

Potential energy is the energy possessed by a body due to its position or configuration.

STP56 : Heat and temperature

Heat and Temperature

HEAT

Heat is the form of energy that transfers from one object to another because of the temperature difference between them. It flows from a higher temperature object to a lower temperature object.

TEMPERATURE

Temperature is the degree of hotness or coldness of a body. SI unit of temperature is Kelvin (K).

WATER THERMISTANCE

Water thermistance is a device which is used to measure the temperature of a liquid. It is used to measure the temperature of a liquid.

QUANTITY OF HEAT

Quantity of heat is the amount of energy transferred from one object to another. SI unit of quantity of heat is Joule (J).

TEMPERATURE SCALE

Temperature scale is a scale used to measure the temperature of a body. SI unit of temperature is Kelvin (K).

STP57 : Different Types of Satellite

Different Types of Satellites

Satellites are objects that move around a planet. Satellites can be natural like the Moon or they can be man-made like the space station.

Artificial Satellites

Artificial satellites are categorised according to the type of work they are doing. The type of work they have to perform.

Weather Satellite

Weather satellite or meteorological satellite is mainly used to check the climatic and other conditions of the earth's surface and atmosphere.

Navigation Satellite

Navigation satellite is used to determine the location of ships, aircrafts, or any other object.

Remote Sensing Satellite

Remote sensing satellite is used to study the physical characteristics of an area by detecting the reflected radiation of a distance from the satellite.

Earth Observation Satellite

Earth observation satellite is used to detect the changes in the earth's surface, atmosphere, and other objects on the earth's surface.

Astronomical Satellite

Astronomical satellite is used to observe the other planets, stars, galaxies, and other objects in the universe.

Communication Satellite

Communication satellite is used to provide relay services for television, radio, internet, mobile, and other services.

STG01 : The Cell Theory

The Cell Theory

Unicellular and Multicellular Organisms

As proposed by Schleiden (1838) and Schwann (1839) the cell theory is based on the following postulates:

- All living organisms are made of cells.
- The cell is the basic unit of structure and function.
- All cells arise from pre-existing cells.

Types of Cells

There are two types of cells: prokaryotic and eukaryotic.

1. Prokaryotic

These are simple cells. They do not have a nucleus. The DNA is a single circular molecule. They are found in bacteria and blue-green algae.

2. Eukaryotic

These have a nucleus and other organelles. The DNA is in the nucleus. They are found in plants and animals.

Multicellular Organisms

A multicellular organism is an organism in which a single cell is specialized to perform a specific function. Examples include plants and animals.

Amoeba

A unicellular organism that can move by pseudopodia.

Paramecium

A unicellular organism that can move by cilia.

Bacteria

Small unicellular organisms that can be seen with a microscope.

Fungi

Organisms that can be seen with a microscope. They are found in soil and water.

Multicellular Organisms

These organisms are made of many cells. Some cells are specialized to perform a specific function. Examples include plants and animals.

Cell

Islets

Capillaries

Organ System

Organism

STG02 : DNA

DNA

Deoxyribonucleic acid (DNA) is the most important constituent of chromosomes. DNA carries all genetic information.

DNA is a long chain of nucleotides. DNA structure was first suggested by James Watson and Francis Crick in 1953.

1. DNA Structure (Semi-conservative)

2. DNA Structure (Conservative)

3. Double Helix DNA Structure (Semi-conservative)

Nucleotide DNA

Nucleotide is the structural unit of DNA. A nucleotide has a nitrogenous base, a phosphate group, and a deoxyribose sugar.

Adenine

A purine base.

Thymine

A pyrimidine base.

Cytosine

A purine base.

Guanine

A purine base.

STG03 : RNA

RNA

Ribonucleic Acid (RNA) is a copy of the DNA strand. In RNA, the pentose sugar is ribose and not deoxyribose as in DNA. It carries all genetic information. RNA is responsible for protein synthesis in the cell. There are three classes of cellular RNAs: Ribosomal RNA (rRNA), Messenger RNA (mRNA), and Transfer RNA (tRNA).

messenger RNA (mRNA) They are found in the ribosome where protein synthesis occurs.

Transfer RNA (tRNA) It is produced in the nucleus and carries amino acids to the ribosome for protein synthesis. For each amino acid, there is a specific tRNA.

Transfer RNA (tRNA) It is a small molecule smaller than the mRNA. It carries amino acids from cytoplasm to the ribosome for protein synthesis.

rRNA consists of a long chain of nucleotides. It usually has a cloverleaf structure.

mRNA consists of a long chain of nucleotides. It usually has a linear structure.

tRNA consists of a long chain of nucleotides. It usually has a cloverleaf structure.

DNA gives genetic information from DNA and uses this information to direct the synthesis of proteins.

A strand of RNA is synthesized from a DNA template, which determines the synthesis of proteins.

RNA is the genetic material in all plant viruses and some animal viruses.

STG04 : Levels of Organisation

Levels of Organisation

In the living world there are different levels of organisation. The highest level of organisation of the individual level is an organism. The lowest level of organisation is a cell. The levels of organisation are: Cell, Tissue, Organ, Organ System, Organism, Population, Community, Ecosystem, and Biosphere.

1. CELL LEVEL

2. TISSUE LEVEL

3. ORGAN LEVEL

4. ORGAN SYSTEM

5. ORGANISM

6. POPULATION LEVEL

7. COMMUNITY

8. ECOSYSTEM

9. BIOSPHERE

Different levels of organisation in the living world (atomic level to biosphere level)

STG05 : Origin of Life

Origin of Life

Organic molecules from space and inorganic molecules from Earth.

Organic polymers and organic monomers.

Coacervates.

Steps in Origin of Life:

1. Abiogenesis: The origin of life from non-living matter.
2. Evolution: The change in the characteristics of an organism over time.
3. Speciation: The formation of new species from an existing one.
4. Extinction: The disappearance of a species.

Various types of prokaryotes and then eukaryotes evolved eventually. Some prokaryotes became oxygen producing photosynthesizers.

STG06 : Cellular Respiration

Cellular Respiration

1. GLYCOLYSIS

1. Glycolysis: The breakdown of glucose into pyruvate.

2. Krebs TCA Cycle: The cycle of reactions that release energy from pyruvate.

3. ELECTRON TRANSPORT CHAIN

3. Electron Transport Chain: The final stage of cellular respiration where electrons are transferred to oxygen, forming water.

STG07 : Animal Husbandry

Animal Husbandry

Systematic rearing, caring and improvement of domestic animals is called Animal Husbandry.

Important Steps Involved in Animal Husbandry:

1. Breeding: The process of producing offspring from two parents.
2. Feeding: The process of providing food to animals.
3. Housing: The process of providing shelter to animals.
4. Health: The process of maintaining the health of animals.

Various types of animals: Poultry, Apiculture, Fisheries, Sericulture, Milk Cattle, and Meat Cattle.

STG08 : Economic Plants

Economic Plants

Many plants are cultivated for their various economical values and are classified under the following categories:

Cereals

Pulses

Vegetables

Fruits & Nuts

Fibre Crops

Oil Seeds

Spices

Timber

Beverages

Decorative Plants & Flowers

Sugar Crops

Medicinal Plants

STG09 : Basic Agricultural Practices

Basic Agricultural Practices

Cultivation of plants is known as agriculture.

Preparation of Soil

Planting **Sowing** **Weeding**

Sowing and Transplantation

Irrigation **Application of Fertilisers and Manures**

Weeding

Protection of Crop

Harvesting **Threshing** **Winnowing** **Storage**

STG10 : Medicinal Plants - 1

Medicinal Plants-1

| | | |
|---|--|---|
| 1. ALOE VERA Aloe barbadensis Aloe vera | 2. ALOE ARABICA Aloe arabica Aloe vera | 3. ALOE FURCRAEA Aloe furcraea Aloe vera |
| 4. ALOE PULCHERRIMA Aloe pulcherrima Aloe vera | 5. ALOE SPINOSA Aloe spinosa Aloe vera | 6. ALOE SPINOSA Aloe spinosa Aloe vera |
| 7. ALOE SPINOSA Aloe spinosa Aloe vera | 8. ALOE SPINOSA Aloe spinosa Aloe vera | 9. ALOE SPINOSA Aloe spinosa Aloe vera |
| 10. ALOE SPINOSA Aloe spinosa Aloe vera | 11. ALOE SPINOSA Aloe spinosa Aloe vera | 12. ALOE SPINOSA Aloe spinosa Aloe vera |
| 13. ALOE SPINOSA Aloe spinosa Aloe vera | 14. ALOE SPINOSA Aloe spinosa Aloe vera | 15. ALOE SPINOSA Aloe spinosa Aloe vera |
| 16. ALOE SPINOSA Aloe spinosa Aloe vera | 17. ALOE SPINOSA Aloe spinosa Aloe vera | 18. ALOE SPINOSA Aloe spinosa Aloe vera |
| 19. ALOE SPINOSA Aloe spinosa Aloe vera | 20. ALOE SPINOSA Aloe spinosa Aloe vera | 21. ALOE SPINOSA Aloe spinosa Aloe vera |
| 22. ALOE SPINOSA Aloe spinosa Aloe vera | 23. ALOE SPINOSA Aloe spinosa Aloe vera | 24. ALOE SPINOSA Aloe spinosa Aloe vera |
| 25. ALOE SPINOSA Aloe spinosa Aloe vera | 26. ALOE SPINOSA Aloe spinosa Aloe vera | 27. ALOE SPINOSA Aloe spinosa Aloe vera |
| 28. ALOE SPINOSA Aloe spinosa Aloe vera | 29. ALOE SPINOSA Aloe spinosa Aloe vera | 30. ALOE SPINOSA Aloe spinosa Aloe vera |

STG11 : Medicinal Plants - 2

Medicinal Plants-2

| | | |
|--|--|--|
| 1. ALOE SPINOSA Aloe spinosa Aloe vera | 2. ALOE SPINOSA Aloe spinosa Aloe vera | 3. ALOE SPINOSA Aloe spinosa Aloe vera |
| 4. ALOE SPINOSA Aloe spinosa Aloe vera | 5. ALOE SPINOSA Aloe spinosa Aloe vera | 6. ALOE SPINOSA Aloe spinosa Aloe vera |
| 7. ALOE SPINOSA Aloe spinosa Aloe vera | 8. ALOE SPINOSA Aloe spinosa Aloe vera | 9. ALOE SPINOSA Aloe spinosa Aloe vera |
| 10. ALOE SPINOSA Aloe spinosa Aloe vera | 11. ALOE SPINOSA Aloe spinosa Aloe vera | 12. ALOE SPINOSA Aloe spinosa Aloe vera |
| 13. ALOE SPINOSA Aloe spinosa Aloe vera | 14. ALOE SPINOSA Aloe spinosa Aloe vera | 15. ALOE SPINOSA Aloe spinosa Aloe vera |
| 16. ALOE SPINOSA Aloe spinosa Aloe vera | 17. ALOE SPINOSA Aloe spinosa Aloe vera | 18. ALOE SPINOSA Aloe spinosa Aloe vera |
| 19. ALOE SPINOSA Aloe spinosa Aloe vera | 20. ALOE SPINOSA Aloe spinosa Aloe vera | 21. ALOE SPINOSA Aloe spinosa Aloe vera |
| 22. ALOE SPINOSA Aloe spinosa Aloe vera | 23. ALOE SPINOSA Aloe spinosa Aloe vera | 24. ALOE SPINOSA Aloe spinosa Aloe vera |
| 25. ALOE SPINOSA Aloe spinosa Aloe vera | 26. ALOE SPINOSA Aloe spinosa Aloe vera | 27. ALOE SPINOSA Aloe spinosa Aloe vera |
| 28. ALOE SPINOSA Aloe spinosa Aloe vera | 29. ALOE SPINOSA Aloe spinosa Aloe vera | 30. ALOE SPINOSA Aloe spinosa Aloe vera |

STG12 : Energy Needs

Energy Needs

Energy is required to perform different tasks

Hydro Energy **Solar Energy** **Wind Energy**

Nuclear Energy **Geothermal Energy** **Bioenergy**

Light Energy

STG13 : Fossil Fuels

Fossil Fuels

The term 'fossil' refers to parts of dead plants and animals that have been preserved in nature for thousands of years. These fossils which are used to obtain energy in any form are called fossil fuels. For eg. coal, petroleum, etc.

TYPES OF FUELS

Solid Fuels **Liquid Fuels** **Gaseous Fuels**

Characteristics of a Good Fuel

Coal **Petroleum**

Uses of Coal Products **Uses of Petroleum Products**

STG14 : Petroleum & Natural Gas

Petroleum & Natural Gas

Petroleum may be formed from organic matter in the sea. As microorganisms, they continue to die at the bottom of the sea and get covered with layers of sand and silt. Over a period of million years high pressure and temperature brought on by distance of air transformed these dead organisms into petroleum and natural gas. Due to its great commercial importance, petroleum is also called 'black gold'.

FRACTIONATING COLUMN

Uses of Petroleum Products

STG15 : Renewable Sources of Energy

Renewable Sources of Energy

Renewable energy is energy that can be used again and again.

SOLAR ENERGY **WIND ENERGY** **HYDROELECTRIC ENERGY**

GEOTHERMAL ENERGY **BIOENERGY FROM BIOMASS** **TIDAL ENERGY**

WIND ENERGY

STG16 : Nuclear Energy

Nuclear Energy

Nuclear Energy Power Plant

Sources of Nuclear Energy

Atomic Bomb **Hydrogen Bomb**

Uses of Nuclear Energy **Effects of Nuclear Radiation**

STG17 : Bio - Gas

BIO - GAS

Animal and plant wastes are easily degraded by anaerobic micro-organisms in the presence of water. In this process gases such as methane, carbon dioxide, hydrogen and hydrogen sulphide are produced. This mixture of gases is called biogas. Biogas can be burned to give energy to give heat. It can also be used for electricity and for running engines. Two successful designs of biogas plants have been generally used: The Fixed-Dome Type and The Floating-Gas-Holder Type.

FIXED-DOME TYPE BIO-GAS PLANT

FLOATING GAS-HOLDER TYPE BIO-GAS PLANT

USES OF BIO-GAS

- Streetlight
- Cooking
- Manure

STG18 : Nitrogen Cycle

Nitrogen Cycle

Nitrogen cycle is a process of nitrogen passing through the ecosystem. Nitrogen is taken up by plants in the form of nitrates, which is converted into proteins by plants/animals. This nitrogen is utilized by the animals including the human beings. The dead plants and animals and their excreta pass nitrogen back to the soil.

| Conversion of Nitrogen into Nitrates | Utilization of Nitrogen by Plants and Animals | Return of Nitrogen to Soil |
|---|--|--|
| Nitrogen in atmosphere combines with water vapour and oxygen to form nitric acid. This acid is washed down to the soil by rain. | Nitrogen is taken up by plants in the form of nitrates. It is used to synthesize proteins. | Dead plants and animals, their excreta and urine are broken down into nitrates by soil bacteria. |
| Nitrogen is also fixed in soil by some soil bacteria. | Nitrogen is used by animals to synthesize proteins. | Nitrogen is returned to soil by soil bacteria. |
| Nitrogen is also fixed in soil by some soil bacteria. | Nitrogen is used by animals to synthesize proteins. | Nitrogen is returned to soil by soil bacteria. |

STG19 : Oxygen Cycle

Oxygen Cycle

Uses of Oxygen

- Combustion
- Respiration
- Photosynthesis
- Acid rain
- Water for plants
- Water for animals
- Water for humans
- Water for fish
- Water for birds
- Water for insects
- Water for microorganisms
- Water for plants
- Water for animals
- Water for humans
- Water for fish
- Water for birds
- Water for insects
- Water for microorganisms

STG20 : Carbon Cycle

Carbon Cycle

The percentage of carbon dioxide in air is around 0.03% by volume. A series of processes taking place in the atmosphere keep this value almost constant. Carbon Cycle is the sequence, which maintains the balance between the formation and removal of carbon.

Release of Carbon Dioxide

- Respiration in animals
- Respiration in plants
- Decomposition of dead organic matter
- Combustion of fossil fuels
- Volcanic eruption
- Forest fires

Utilization of Carbon Dioxide

- Photosynthesis in plants
- Photosynthesis in algae
- Photosynthesis in cyanobacteria
- Photosynthesis in some bacteria
- Photosynthesis in some fungi
- Photosynthesis in some protists

STG21 : Fire and Fire Extinguishers

Fire and Fire Extinguishers

Three things required to sustain fire are oxygen, fuel and ignition temperature. To kill a fire one or more of these three things must be taken away.

Classification of Fire

- Class A: Involves ordinary combustibles like paper, wood, cloth, etc.
- Class B: Involves flammable liquids like petrol, kerosene, etc.
- Class C: Involves electrical equipment.
- Class D: Involves combustible metals like magnesium, potassium, etc.
- Class E: Involves ordinary combustibles like paper, wood, cloth, etc. in the presence of live electrical equipment.

Use of Fire Extinguishers - PASS

- Pull the locking pin
- Aim the nozzle at the base of the fire
- Squeeze the trigger
- Sweep the extinguisher discharge from side to side over the area of the fire.

Types of Fire Extinguishers

- Water (H₂O) Type Fire Extinguisher:** This is the most commonly used fire extinguisher. It is used for Class A fires. It works by cooling the burning material and cutting off the oxygen supply.
- Dry Chemical Powder (DCP) Type Fire Extinguisher:** This is a very effective fire extinguisher. It is used for Class A, B, and C fires. It works by smothering the fire and cutting off the oxygen supply.
- Carbon Dioxide (CO₂) Type Fire Extinguisher:** This is a very effective fire extinguisher. It is used for Class B and C fires. It works by smothering the fire and cutting off the oxygen supply.

STG22 : Soil - A Natural Resource

Soil - A Natural Resource

A natural resource is anything that comes from the earth to us and is used by us. Soil is our most important natural resource. We use it in the following ways -

- Food and Shelter
- Minerals
- Building material
- Underground water

Soil Erosion

The process of carrying away soil particles, silt and other agents from one place to another is called soil erosion.

Types of Soil Erosion

- Sheet Erosion
- Bank Erosion
- Wind Erosion
- Water Erosion

Soil Conservation

The process of protecting soil from any damaging activity and erosion is called soil conservation. Soil conservation can be done by following -

- Planting trees and shrubs
- Contour farming
- Strip cropping
- Terracing
- Soil bunding
- Soil cover
- Soil mulch
- Soil conservation banks
- Soil conservation structures

Soil Pollution

Lowering of soil fertility or degradation of its characteristics is called soil pollution. Soil pollution is caused due to -

- Use of pesticides
- Use of fertilizers
- Use of insecticides
- Use of herbicides
- Use of fungicides
- Use of nematicides
- Use of molluscicides
- Use of acaricides
- Use of repellents
- Use of attractants
- Use of pheromones
- Use of kairomones
- Use of allelochemicals
- Use of secondary metabolites
- Use of primary metabolites
- Use of natural products
- Use of synthetic products
- Use of natural and synthetic products
- Use of natural, synthetic and semi-synthetic products

STG23 : How Soil is Formed and Soil Profile

How Soil is Formed and Soil Profile

Soil formation starts with the physical and chemical weathering of rocks. The process of soil formation is called pedogenesis. The soil profile is the vertical section of soil showing its various layers.

Physical Weathering

- Freeze-thaw action
- Root action
- Exfoliation
- Desiccation
- Thermal expansion and contraction
- Salt crystallization
- Biological weathering

Chemical Weathering

- Hydrolysis
- Oxidation
- Redox reactions
- Carbonation
- Sulfidation
- Chelation
- Complexation
- Ion exchange
- Adsorption
- Absorption
- Desorption
- Desiccation
- Thermal expansion and contraction
- Salt crystallization
- Biological weathering

Soil Profile

GENERAL SOIL PROFILE:

- Litter (L):** Organic material on the surface of the soil.
- O Horizon (O):** Organic material that has decomposed into humus.
- A Horizon (A):** Topsoil, the uppermost layer of mineral soil.
- B Horizon (B):** Subsoil, the layer below the topsoil.
- C Horizon (C):** Parent material, the layer below the subsoil.
- R Horizon (R):** Bedrock, the layer below the parent material.

STG24 : Types of Soils in India

Types of Soils in India

Soil is the most important natural resource. We depend on it for our needs, especially food. India is rich in natural resources such as soil and the rich variety of soil increases the vegetation and food products. India has six main types of soils.

1. ALLUVIAL SOILS

- INDIA:** Found in the Indo-Gangetic plains, the coastal plains, and the Deccan trap region.
- INDIA:** Found in the Indo-Gangetic plains, the coastal plains, and the Deccan trap region.

2. RED SOILS

- INDIA:** Found in the Deccan trap region, the Eastern Ghats, and the Western Ghats.
- INDIA:** Found in the Deccan trap region, the Eastern Ghats, and the Western Ghats.

3. BLACK SOILS

- INDIA:** Found in the Deccan trap region, the Eastern Ghats, and the Western Ghats.
- INDIA:** Found in the Deccan trap region, the Eastern Ghats, and the Western Ghats.

4. LATERITE SOILS

- INDIA:** Found in the Western Ghats, the Eastern Ghats, and the Deccan trap region.
- INDIA:** Found in the Western Ghats, the Eastern Ghats, and the Deccan trap region.

5. DESERT SOILS

- INDIA:** Found in the Thar Desert, the Rajasthan Desert, and the Deccan trap region.
- INDIA:** Found in the Thar Desert, the Rajasthan Desert, and the Deccan trap region.

STG25 : Food Chain in Forest Ecosystem

Food Chain in Forest Ecosystem

A Simple Food Chain in Forest

A Food Web in Forest

STG26 : Solar Cooker

Solar Cooker

The solar cookers are safest and cheapest mode of cooking. They utilize solar energy to cook the food. Depending upon the method in which the solar energy is utilized in the solar cookers, they are divided into various types.

Box Type Solar Cooker

Parabolic Type Solar Cooker

Panel Type Solar Cooker

STG27 : Water Harvesting

Water Harvesting

Water Harvesting is a way to capture the rain water when it rains, store that water above ground or in a tank or in a well and use it later. This happens naturally in open rural areas. But in congested, over-populated metropolitan cities, we need to create methods to capture the rain water.

The total amount of water that is received in the form of rainfall over an area is called rainwater endowment of the area. Out of this the amount that can be effectively harvested is called the Water Harvesting Potential.

Water Harvesting in a Town

Water Harvesting in a Village

Flow Chart Showing Ways of Water Harvesting

Water Harvesting Potential = Rainfall (mm) × Collection Efficiency

Water harvesting can serve the following purposes:

- Provide drinking water.
- Provide irrigation water.
- Increase groundwater recharge.
- Reduce storm water discharges, when floods and overloading of sewage treatment plants.
- Reduce sewerage ingress in coastal areas.

STG28 : Purification of Water

Purification of Water

BOILING
It is a simple method of water purification. Boiling kills many bacteria and micro-organisms.

DISTILLATION
99.9% pure water can be obtained by distillation. It involves boiling of water to produce water vapours. The vapours on cooling condense as a pure liquid.

FILTRATION
Slow sand filters are used for treating raw water to produce a potable product. Apart from impurities, it also removes 90-95% bacteria.

CHLORINATION
Chlorination is one of the most common and relatively cheap method of water purification. Chlorine tablets deactivate most of the micro-organisms.

REVERSE OSMOSIS
R.O. is used to purify water on a large scale to remove salts and impurities in order to improve the colour, taste or properties of fluid. Mechanical pressure is applied to impure water to force pure water through a semi-permeable membrane.

DOMESTIC R.O. SYSTEM

STG29 : Poultry

Poultry

Independent Breed and **Cross Breeds**

Equipment Required

Feed Formulas

| Ingredients | Percentage (%) | Amount (kg) |
|-----------------|----------------|-------------|
| Maize | 65 | 102.5 |
| Soyabean | 20 | 31.25 |
| Groundnut cake | 10 | 15.625 |
| Wheat | 5 | 7.8125 |
| Cracked corn | 5 | 7.8125 |
| Mineral-vitamin | 5 | 7.8125 |
| Common salt | 0.5 | 0.78125 |
| Antibiotic | 0.5 | 0.78125 |
| Sum | 100 | 156.25 |

Disease Table

| Disease | Major Symptoms |
|-----------------|--|
| Avian Influenza | High fever, depression, loss of appetite, watery eyes, cough, diarrhoea, greenish droppings, swollen air sacs, cyanosis of the comb and wattle, and death within 2-3 days. |
| 新城疫 (ND) | Depression, loss of appetite, watery eyes, cough, diarrhoea, greenish droppings, swollen air sacs, cyanosis of the comb and wattle, and death within 2-3 days. |
| 传染性法氏囊炎 (IBD) | Depression, loss of appetite, watery eyes, cough, diarrhoea, greenish droppings, swollen air sacs, cyanosis of the comb and wattle, and death within 2-3 days. |

STG30 : Sericulture

Sericulture

Life Cycle of Silkworm (Bombyx Mori)

There are four different species of silk worms: 1. Mulberry, 2. Tear, 3. Muga, 4. Eri.

Stages of Production

STG31 : Apiculture

Apiculture

Queen Honey Bee and **Artificial Bee Hive**

Life Cycle of Honey Bee

Honey Extractor and Packaging Process

Bee Waggle Dance

STG32 : Food Pyramid

Food Pyramid

Food pyramid is a pyramid-shaped nutrition guide divided into sections to show the recommended intake for each food group.

Components of Food

- Carbohydrates
- Proteins
- Fats
- Minerals
- Vitamins
- Fiber
- Regulators

Balanced Diet

Diet which contains all the nutrients in proper amounts to help normal growth and development.

STG33 : Microorganisms

Microorganisms

Microorganisms are the living organisms around us which require magnification to see and resolve their structures. Microorganisms have a high degree of adaptability and can survive in almost all kinds of environments like hot springs, ice-cold waters, saline waters, desert or even marshes. Microorganisms are grouped as bacteria, fungi, protozoa, algae and viruses.

Bacteria: E. coli, Bacillus, Staphylococcus aureus

Fungi: Aspergillus, Bread mould, Penicillium, Yeast

Algae: Spirogyra, Chara, Ulothrix, Volvox

Viruses: Bacteriophage, Influenza virus, Corona virus, HIV, Ebola virus

Protozoa: Amoeba, Paramecium, Plasmodium, Trypanosoma

STG34 : Mutation

Mutation

A mutation occurs when a DNA gene is damaged or changed in such a way as to alter the genetic message carried by that gene.

TYPES OF MUTATION

INSERTION: A section of DNA is added.

DUPPLICATION: A section gets duplicated.

DELETION: A section of DNA is lost or removed.

INVERSION: Reversing the order of a chromosomal segment.

TRANSLOCATION: A section of DNA is transferred to another chromosome.

FRAME SHIFT: Insertion or deletion of a nucleotide shifts the reading frame.

POINT MUTATION: A single nucleotide change in the DNA sequence.

SILENT: No effect on the protein sequence.

MISSING: A nucleotide is replaced by another nucleotide.

PROTEIN: A nucleotide change can lead to a different amino acid.

STG35 : Enzymes

Enzymes

Enzymes are globular proteins with enormous catalytic power with which they greatly enhance the rate of which specific reactions approach equilibrium by lowering the activation energy. Activation energy is the minimum energy required to initiate a chemical reaction.

Mechanism of Enzyme

$E+S \rightleftharpoons ES \rightleftharpoons EP \rightleftharpoons E+P$

The catalytic action of the enzyme at substrate is caused by the substrate being in the pocket of the reaction.

Enzyme Lower the Activation Energy of a Reaction

Classification of Enzyme

- Oxidoreductases / Dehydrogenases
- Transferases
- Isomerases
- Lipases
- Lyases

Factors Affecting Enzyme Activity

Temperature: Enzyme activity increases with temperature up to an optimum point, then decreases.

pH: Enzyme activity is highest at an optimum pH.

Change in Substrate Concentration: Enzyme activity increases with substrate concentration up to a saturation point.

Inhibitors: Substances that decrease or stop enzyme activity.

STG36 : DNA Replication

DNA Replication

DNA Replication is a biological process in which each of the two strands of DNA molecule serves as template for the formation of complementary strands. The process is SEMI-CONSERVATIVE REPLICATION.

INITIATION

Helicase unwinds the DNA into single strands. Single strand binding proteins bind to the separated DNA strands and prevent them from re-annealing. Topoisomerase relieves the strain on the overwinding DNA.

ELONGATION

RNA primase synthesizes a short RNA primer in 5' to 3' prime direction. The leading strand elongates continuously in 5' to 3' prime direction whereas the lagging strand is synthesized discontinuously as a series of segments called as Okazaki fragments.

DNA polymerase I removes RNA primers, DNA ligase joins the Okazaki fragments with lagging strand. During DNA replication, DNA polymerases proofread each nucleotide against its template as soon as it is added to the growing strand. If a nucleotide is incorrectly paired the polymerase removes the nucleotide and then replaces the opposite.

TERMINATION

At termination site, the replication fork ends and two stable DNA strands are formed.

STG37 : Osmosis

Osmosis

Osmosis is the net movement of freely moving water molecules from a region of their higher concentration to a region of their lower concentration through a partially permeable membrane. The pressure exerted by freely moving water molecules in a system is called the water potential. A solution with a high water potential has a high number of freely moving water molecules.

Isotonic Solution: No net movement of water molecules.

Hypotonic Solution: Net movement of water molecules into the cell.

Hypertonic Solution: Net movement of water molecules out of the cell.

Osmosis in Animal Cells & Plant Cells

Animal Cell in Isotonic Solution: No net movement of water.

Animal Cell in Hypotonic Solution: Swells and may burst.

Animal Cell in Hypertonic Solution: Shrinks.

Plant Cell in Hypotonic Solution: Becomes turgid.

Plant Cell in Hypertonic Solution: Becomes plasmolysed.

STG38 : Evidence of the Evolution of Life

Evidence of The Evolution of Life

1. THE FOSSIL RECORD

Evidence of orderly change can be seen when fossils are arranged according to their age.

ANCIENT HUMAN: 3.5 Million Years Ago (Australopithecus Afarensis)

MODERN HUMAN: 0.1 Million Years Ago (Homo Sapiens)

2. COMPARATIVE ANATOMY

Homologous structures (same structure but different functions indicate a shared ancestry)

Human Forelimb: Humerus, Radius, Ulna, Carpals, Metacarpals, Phalanges

Bat's Forelimb: Humerus, Radius, Ulna, Carpals, Metacarpals, Phalanges

Bird's Forelimb: Humerus, Radius, Ulna, Carpals, Metacarpals, Phalanges

3. COMPARATIVE EMBRYOLOGY

Many vertebrate embryos in their earlier stages are indistinguishable and all four are evolved from a common ancestor.

Fish Embryo: Gill slits, Tail

Pig Embryo: Gill slits, Tail

Monkey Embryo: Gill slits, Tail

Human Embryo: Gill slits, Tail

STG39 : Food Chain in Pond Ecosystem

Food Chain in Pond Ecosystem

Abiotic Factors: Light, Temperature, Water, Minerals, Producers

Biotic Factors: Consumers (Primary, Secondary, Tertiary), Decomposers & Detritivores

Food Web in Pond Ecosystem

STG40 : Food Chain in Desert Ecosystem

Food Chain in Desert Ecosystem

Abiotic Factors: Light, Temperature, Water, Minerals, Producers

Biotic Factors: Consumers (Primary, Secondary, Tertiary), Decomposers & Detritivores

Food Web in Desert Ecosystem

PT03S : Modern Periodic Table of the Elements

MODERN PERIODIC TABLE OF THE ELEMENTS LONG FORM

This table shows the modern periodic table with groups labeled IA through VIIIA and periods 1 through 7. It includes a legend for element types: Metals (shaded blue), Nonmetals (shaded green), and Metalloids (shaded yellow). A 'BEST COMMON EFFECTS' legend is also present. The table includes elements from Hydrogen (H) to Oganesson (Og).

PT07S : Mendeleev's Periodic Table

MENDELEEV'S PERIODIC TABLE

THE PROPERTIES OF ELEMENTS ARE A PERIODIC FUNCTION OF THEIR ATOMIC MASSES.

HINTS OF MENDELEEV'S CLASSIFICATION OF ELEMENTS

- Mendeleev's periodic law predicted the existence of some elements that had not been discovered at that time.
- Mendeleev's periodic table could predict the properties of several elements on the basis of the periodicity of the periodic table.
- Mendeleev's periodic table could accommodate some gases when they were discovered.

ANOMALIES OF MENDELEEV'S CLASSIFICATION OF ELEMENTS

- The position of cobalt could not be explained.
- Wrong order of atomic masses of some elements could not be explained.
- A correct position could not be assigned to hydrogen in the periodic table.

Key → Silver
Symbol → Ag
Atomic Mass → 107.87

| PERIOD | GROUP I R ⁺ O | GROUP II R ⁺⁺ O | GROUP III R ⁺⁺⁺ O | GROUP IV R ⁺⁺⁺⁺ O | GROUP V R ⁺⁺⁺⁺ O | GROUP VI R ⁺⁺⁺⁺ O | GROUP VII R ⁺⁺⁺⁺ O | GROUP VIII R ⁺⁺⁺⁺ O |
|--------|-----------------------------|-------------------------------|---------------------------------|---------------------------------|--------------------------------|---------------------------------|----------------------------------|---|
| 1 | Hydrogen (H) = 1.008 | | | | | | | |
| 2 | Lithium (Li) = 6.938 | Beryllium (Be) = 9.012 | Boron (B) = 10.81 | Carbon (C) = 12.011 | Nitrogen (N) = 14.007 | Oxygen (O) = 15.999 | Fluorine (F) = 18.998 | |
| 3 | Sodium (Na) = 22.99 | Magnesium (Mg) = 24.31 | Aluminium (Al) = 26.98 | Silicon (Si) = 28.09 | Phosphorus (P) = 30.974 | Sulphur (S) = 32.06 | Chlorine (Cl) = 35.453 | |
| 4 | Potassium (K) = 39.102 | Calcium (Ca) = 40.08 | Scandium (Sc) = 44.96 | Titanium (Ti) = 47.88 | Vanadium (V) = 50.94 | Chromium (Cr) = 52.00 | Manganese (Mn) = 54.94 | Iron (Fe) = 55.85, Cobalt (Co) = 58.93, Nickel (Ni) = 58.71 |
| 5 | Copper (Cu) = 63.54 | Zinc (Zn) = 65.37 | Gallium (Ga) = 69.72 | Germanium (Ge) = 72.64 | Arsenic (As) = 74.92 | Selenium (Se) = 78.96 | Bromine (Br) = 79.909 | |
| 6 | Rubidium (Rb) = 85.47 | Strontium (Sr) = 87.62 | Yttrium (Y) = 88.91 | Zirconium (Zr) = 91.22 | Niobium (Nb) = 92.91 | Molybdenum (Mo) = 95.94 | Technetium (Tc) = 99 | Rhodium (Rh) = 101.07, Rodium (Rb) = 102.91, Palladium (Pd) = 106.4 |
| 7 | Silver (Ag) = 107.87 | Cadmium (Cd) = 112.40 | Indium (In) = 114.82 | Tin (Sn) = 118.69 | Antimony (Sb) = 121.75 | Tellurium (Te) = 127.60 | Iodine (I) = 126.90 | |
| 8 | Caesium (Cs) = 132.90 | Barium (Ba) = 137.34 | Lanthanum (La) = 138.91 | Cerium (Ce) = 140.12 | | | | |
| 9 | | | | | | | | |
| 10 | | | Ytterbium (Yb) = 173.04 | Hafnium (Hf) = 178.49 | Tantalum (Ta) = 180.95 | Tungsten (W) = 183.85 | | Osmium (Os) = 190.2, Iridium (Ir) = 192.2, Platinum (Pt) = 195.09 |
| 11 | Gold (Au) = 196.87 | Mercury (Hg) = 200.59 | Thallium (Tl) = 204.37 | Lead (Pb) = 207.19 | Bismuth (Bi) = 208.98 | | | |
| 12 | | | | Thorium (Th) = 232.04 | | Uranium (U) = 238.03 | | |

In the formulae for oxides and hydroxides, the letter 'R' is used to represent any of the elements in the groups.

MODERN PERIODIC TABLE OF THE ELEMENTS

Also available as:-

- | | |
|-------------|---|
| Code | Size & other details |
| PT01 | Size 140 × 100 cm Laminated |
| PT02 | Size 100 × 70 cm Laminated |
| PT04 | Size 50 × 35 cm Paper |
| PT05 | Size 50 × 35 cm Laminated w/o rollers |
| PT06 | Size 100 × 75 cm Paper folded in Book form |
| PT07S | Size 100 x 70 cm Mendeleev's Periodic Chart Synthetic |
| PT08 | Size 90 × 55 cm Laminated |

PERIODIC TABLE ELEMENTARY

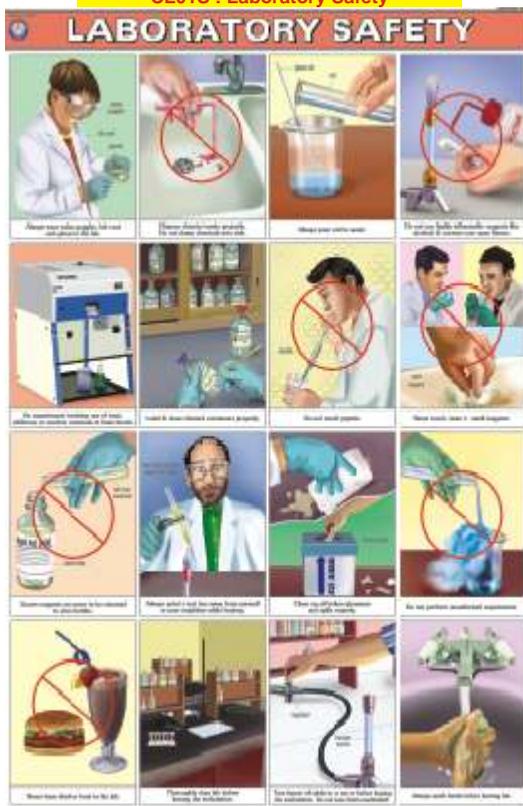
» Size 96 x 70 cm » Laminated

PT09 : Periodic Table Elementary

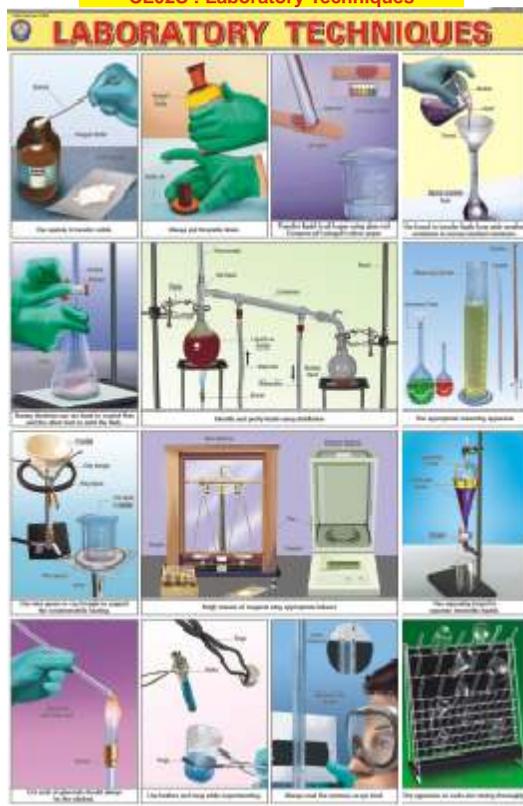
PERIODIC TABLE

This table is a simplified version of the periodic table. It includes a legend for element types: Metals (shaded blue), Nonmetals (shaded green), and Metalloids (shaded yellow). A 'REFERENCE' legend indicates that solid elements are shown in green, gases in blue, liquids in red, and synthetic elements in orange. The table includes elements from Hydrogen (H) to Oganesson (Og).

CL01S : Laboratory Safety



CL02S : Laboratory Techniques



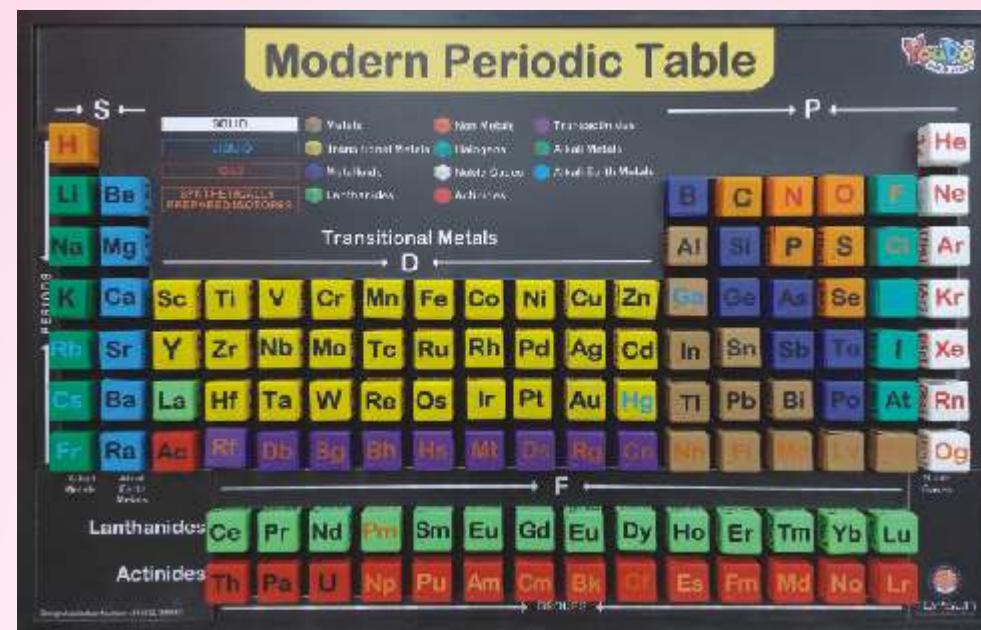
CL03S : pH Colour Chart



CL04S : Laboratory First Aid



3 DIMENSIONAL INTERACTIVE PERIODIC TABLE



Product Code: CH 122 C

- » Wall mountable
- » Detachable element cubes
- » 118 Cue cards for teachers
- » Colour codes depict the state of elements.
- » Below characteristics are depicted on each side of cube:-

- Element symbol
- Element name
- Atomic weight
- Atomic number
- Electron structure
- Electronegativity



Real Life Co-relation of Elements

Teacher's Hand Book

Size: 103x65 cm

PEDIGREE ANALYSIS - 1

STANDARD SYMBOLS AND SAMPLE PEDIGREE

After the rediscovery of Mendel's work, the process of analysing inheritance pattern of traits in human beings began. Since control crosses are not possible in case of human beings, study of the family history about inheritance of a particular trait provides an alternative. Such an analysis of traits in several generations of a family is called the Pedigree Analysis. In human genetics, pedigree study provides a strong tool, which is utilized to trace the inheritance of a specific trait, abnormality or disease.

Standard symbols used in Pedigree Analysis

| | | | | |
|--|--|--|--|--|
| | | I, II, III generation number | | |
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SAMPLE PEDIGREE

Pedigree 1 : Inheritance of an autosomal dominant trait.

Pedigree 2 : Inheritance of an autosomal recessive trait.

Pedigree 3 : Inheritance of an X-linked recessive trait.

PEDIGREE ANALYSIS - 2

AUTOSOMAL RECESSIVE TRAIT

Myotonic Dystrophy Pedigree

Tongue Curler Pedigree

Legend:
 ■ or ● = affected
 □ or ○ = normal
 D = allele for Myotonic Dystrophy
 d = normal allele
 T = Allele for tongue curler
 t = Allele for non-tongue curler

PEDIGREE ANALYSIS - 3

AUTOSOMAL RECESSIVE TRAIT

Inheritance of Attached Ear Lobe

Inheritance of Sickle Cell Anemia

Legend:
 ■ or ● = affected individual
 □ or ○ = normal individual
 F = allele for free ear lobe
 f = allele for attached ear lobe
 L = allele for normal blood cell
 l = allele for sickle cell

PEDIGREE ANALYSIS - 4

X-LINKED RECESSIVE TRAIT

Haemophilia Pedigree

Colour Blindness Pedigree

Legend:
 ■ or ● = affected individual
 □ or ○ = normal individual
 H = Normal allele
 h = Haemophilic allele
 C = Normal allele
 c = Colour blind allele

PEDIGREE ANALYSIS - 5

X-LINKED DOMINANT TRAIT

Pedigree of Hypophosphatemia

Pedigree of Downey Lynch

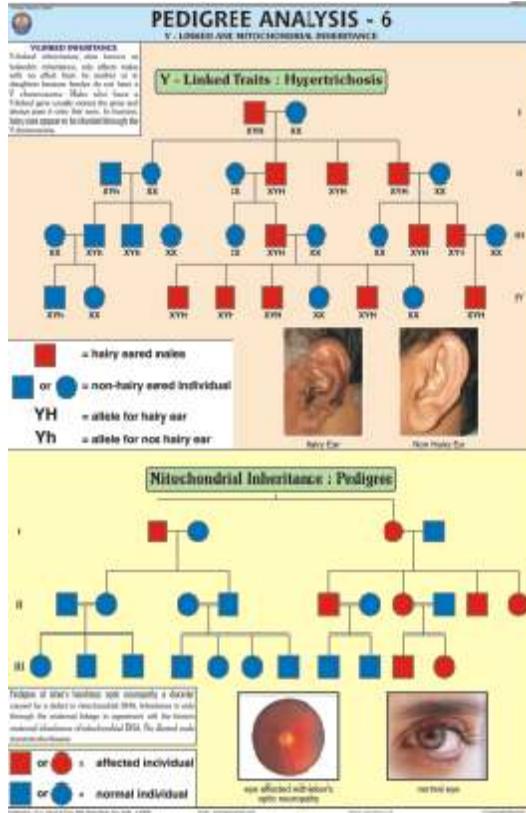
Legend:
 ■ or ● = affected individual
 □ or ○ = normal individual
 X^H = allele for hypophosphatemia
 X^h = normal allele

GENETICS AND EVOLUTION CHARTS

A set of 13 charts

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GE06S : Pedigree Analysis - 6



GE07S : Homologous Organs - Animals



GE08S : Analogous Organs - Animals



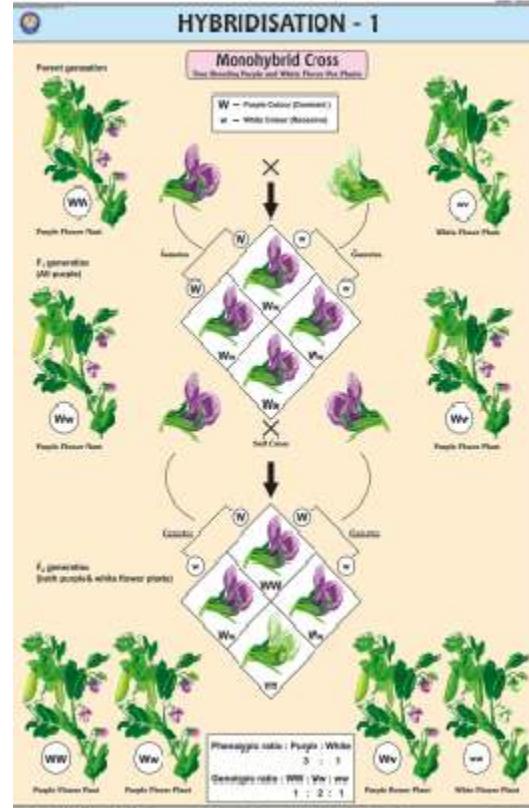
GE09S : Homologous Organs - Plant



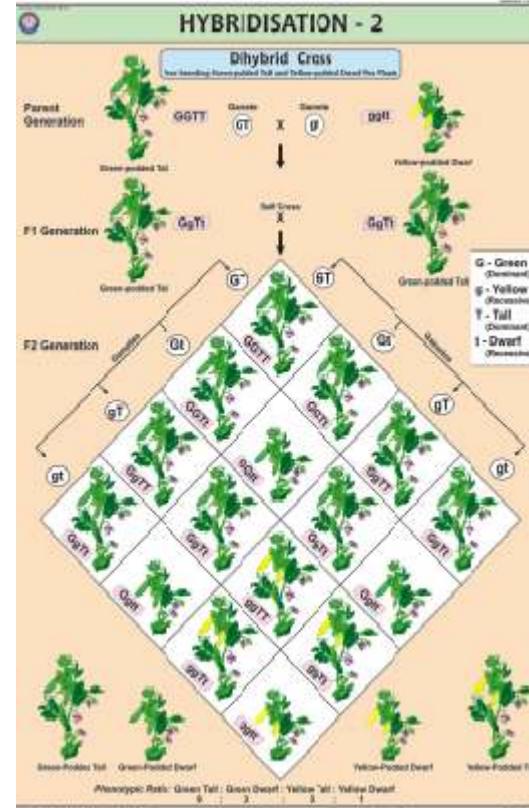
GE10S : Analogous Organs - Plants



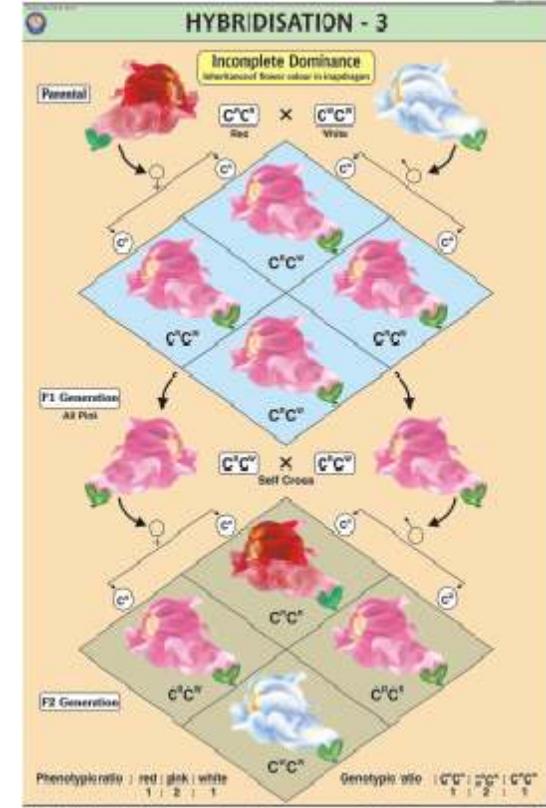
GE11S : Hybridisation - 1



GE12S : Hybridisation - 2



GE13S : Hybridisation - 3



HP01S : Human Skeleton

HUMAN SKELETON

ANTERIOR VIEW

POSTERIOR VIEW

SKULL (Lateral View)

THE RIB CAGE (Front View)

COMPACT BONE IS COMPOSED OF OSTEONS CEMENTED TOGETHER

VERTEBRA

ATLAS

AXIS

CERVICAL VERTEBRA

THORACIC VERTEBRA

LUMBAR VERTEBRA

SKELETAL SYSTEM

Skeleton is a flexible structure of rigid bones which provide shape, movement and support to the body and offer protection to the internal organs. The rigid bones are buried within the muscles and other soft tissues. Movement is only possible because of the way bones are joined to one another in joints and the way muscles are attached to those bones. On an average there are 206 bones of various shapes and sizes in an adult human skeleton.

LEFT FOOT VIEW

LEFT HAND VIEW

TYPES OF SYNOVIAL JOINT

VERTEBRAL COLUMN

HP02S : Human Muscles

HUMAN MUSCLES

FUNCTIONS OF MUSCLES

- Maintain posture
- Generate heat
- Produce movement
- Store glycogen
- Produce blood cells

PHASES OF SKELETAL MUSCLE

MUSCLES THAT ARE SUPPLIED BY PHRENIC NERVE

MUSCLES THAT ARE SUPPLIED BY VAGUS NERVE

MUSCLES THAT ARE SUPPLIED BY VAGUS NERVE

HP03S : Blood Circulation

BLOOD CIRCULATION

THE HEART AND CIRCULATION

THE HEART

ARTERIES

VEINS

HP04S : Nervous System

NERVOUS SYSTEM

THE NERVOUS SYSTEM

FUNCTIONAL AREAS OF THE CEREBRAL CORTEX

STRUCTURE OF A NEURON

STRUCTURE OF AN AXON

HP05S : Digestive System

DIGESTIVE SYSTEM

ORAL CAVITY

PHARYNX

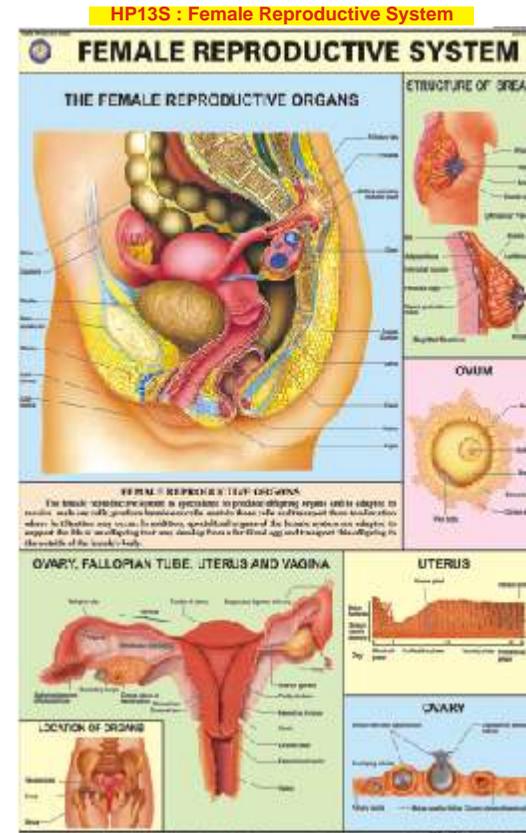
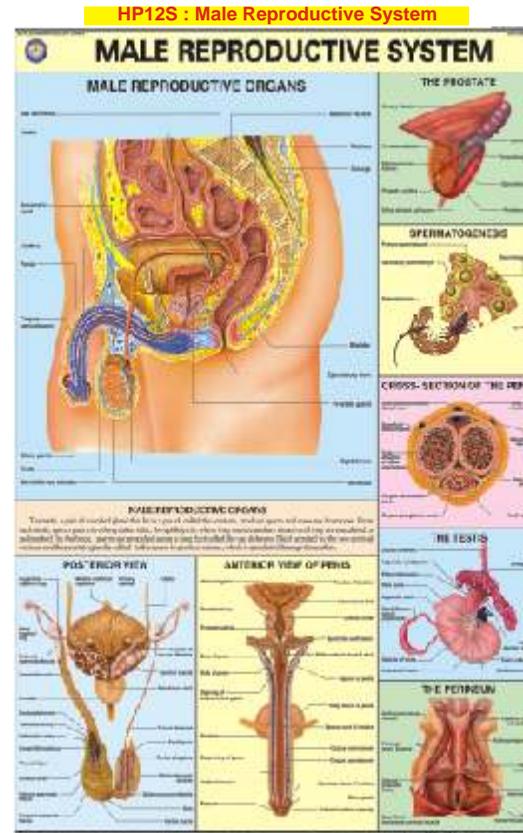
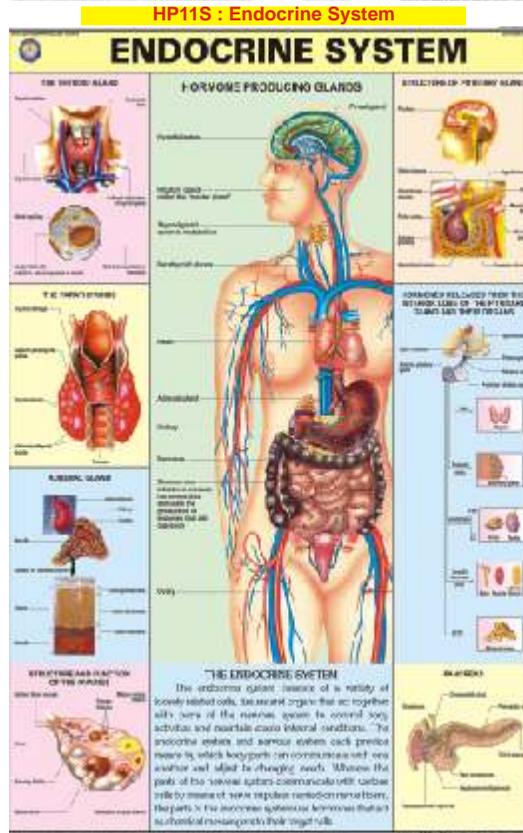
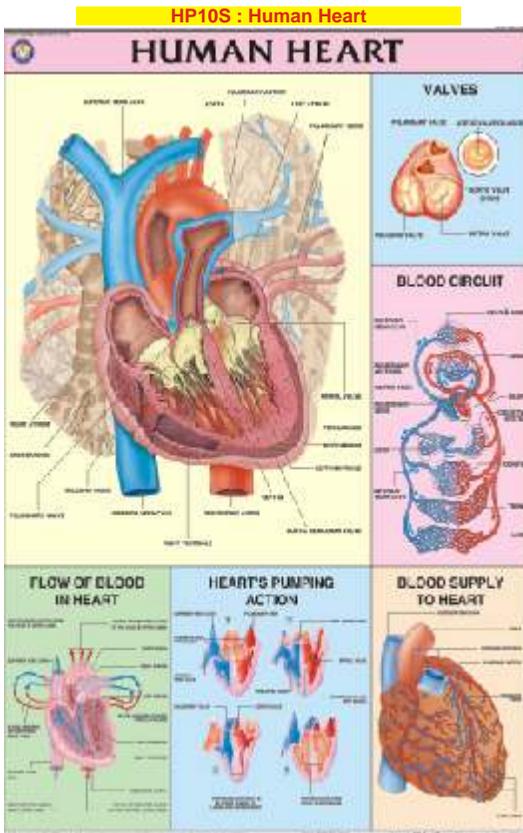
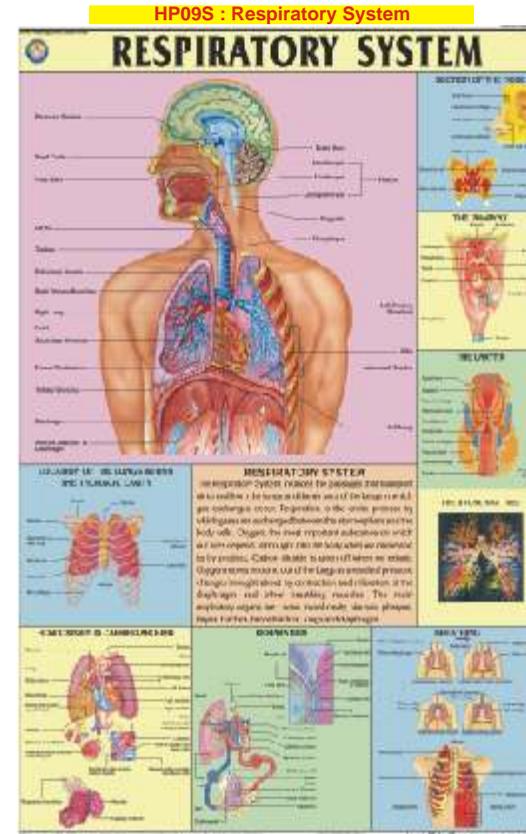
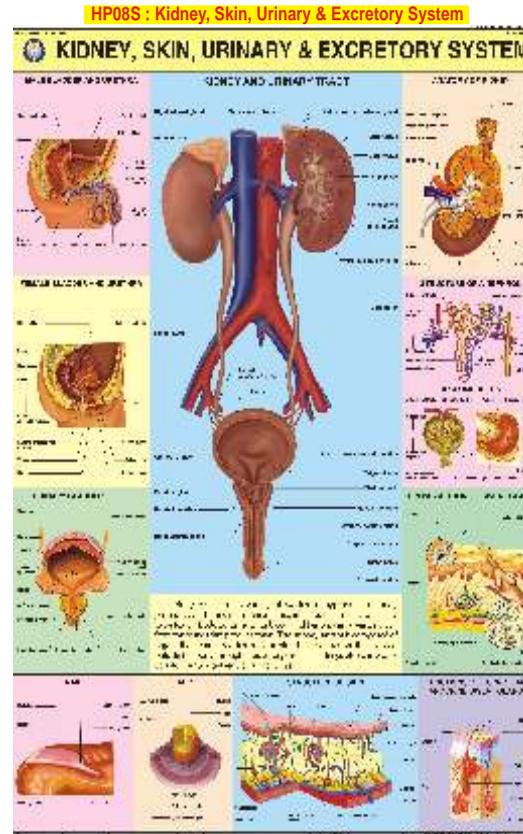
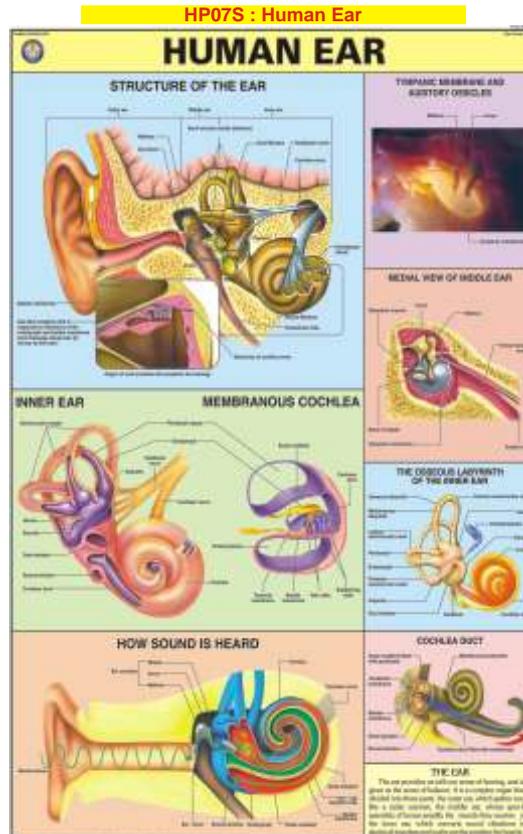
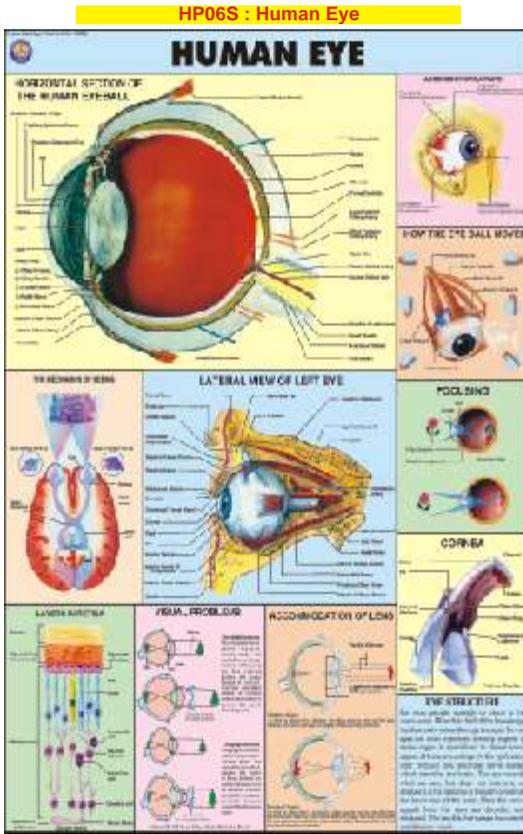
ESOPHAGUS

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HP17S : Human Teeth

HUMAN TEETH

Teeth are critical for eating and are also used for other functions. They are developed from the ectoderm and mesoderm. The first set of teeth is called the deciduous or baby teeth. The second set of permanent teeth, containing 32 teeth, begins to erupt in the late teens and the age of 20 years. There are 16 teeth in each jaw.

STRUCTURE OF THE MOUTH

TEETH STRUCTURE

TEETHING

TYPES OF TEETH

MANDIBULAR DENTAL ARCADE

ROOT CANAL THERAPY

MARILLARY AND MANDIBULAR TEETH (DIPYCNIA) - Lateral aspect

HP14S : Human Embryology

HUMAN EMBRYOLOGY

OVARY, FALLOPIAN TUBE, UTERUS AND VAGINA

STEPS IN THE FERTILIZATION

THE EMBRYO

DEVELOPMENT OF EMBRYO

HP15S : Human Lymphatic System

HUMAN LYMPHATIC SYSTEM

LYMPHATIC SYSTEM

LYMPHATIC SYSTEM

LYMPHATIC SYSTEM

HP16S : Human Brain

HUMAN BRAIN

Located in the skull, the brain is the largest and most complex part of the nervous system. It occupies the cranial cavity and is composed of billions of nerve cells and supporting cells (glia). Its average weight is around 3 pounds (1.4 kg). The human brain is divided into cerebrum, diencephalon, brain stem and cerebellum.

SAGITTAL SECTION OF BRAIN IN SITU

BRUNDED AND VENOUS SINUSES

CEREBELLUM INFERIOR

VENTRICLES OF BRAIN

LOBES OF BRAIN

LYMPH SYSTEM

FUNCTIONAL AREAS

CIRCULATION OF CEREBROSPINAL FLUID

HP18S : Pregnancy And Birth

PREGNANCY AND BIRTH

Pregnancy is the state of having a developing fetus in the uterus which extends from conception to labour (parturition). Pregnancy takes approximately 283 days from the first day of last menstrual period (approximately 267 days from conception).

STAGES OF LABOUR (PARTURITION)

Development of Ovary and Antrum

Placenta

Antenatal tests

HP19S : Human Kidney

HUMAN KIDNEY

Right Kidney Dissection

Nephron

Blood Vessels in Parenchyma of Kidney

Renal Capsule

Intrarenal Arteries

Renal Artery and Vein in Situ

HP20S : Urinary Tract

URINARY TRACT

The urinary system regulates the volume and composition of fluids in the body and removes waste products and excess fluid. Waste products are filtered from the blood by the kidneys for excretion in the urine, which descends through the ureters to the hollow urinary bladder. Urine is stored here until a convenient time, when the muscles at the bladder outlet relax, allowing it to be expelled from the body through the urethra.

Female Urinary Tract (superior section)

Male Bladder

Male Urinary Tract (inferior section)

HP21S : Human Skull

HUMAN SKULL

The skull is the bony structure that forms part of the vertebrate skeleton. It consists of the cranium and the face. The cranium is divided into the brain case, the eye sockets, the ear canals, and the mouth.

Skull (Anterior View)

Cranial Base (Inferior View)

Skull (Lateral View)

Skull (Superior View)

Skull (Medial Section)

Skull (Distal View)

Skull of Newborn

HUMAN PHYSIOLOGY CHARTS

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HP22S : Ear, Nose & Throat

EAR, NOSE & THROAT

This chart provides a detailed anatomical overview of the human ear, nose, and throat. It includes a frontal section of the ear, a sagittal section of the nose, and a cross-section of the larynx. Key structures labeled include the eardrum, ossicles, nasal cavity, and vocal cords. The chart also features diagrams of the pharynx, uvula, and various receptors in the nose and throat.

HP23S : Liver, Gallbladder & Pancreas

LIVER, GALLBLADDER & PANCREAS

This chart illustrates the anatomy and function of the liver, gallbladder, and pancreas. It shows the liver's lobules, the gallbladder's connection to the biliary system, and the pancreas's role in both endocrine and exocrine functions. Diagrams include the passage of bile, the structure of the pancreas, and the flow of blood through these organs.

HP24S : Human Lungs

HUMAN LUNGS

This chart details the human respiratory system, focusing on the lungs. It shows the bronchial tree branching into smaller airways, the structure of the alveoli, and the intricate network of blood vessels. Diagrams illustrate the intrapulmonary blood circulation and the exchange of gases in the lungs.

HP25S : Joints of Human Body

JOINTS OF HUMAN BODY

This chart provides a comprehensive overview of the human skeletal system, highlighting the various types of joints. It includes a full-body skeleton with joints labeled, as well as detailed views of specific joints like the shoulder, hip, and knee. The chart explains the functional classification of joints based on their structure and movement.

HP26S : Human Immune System

HUMAN IMMUNE SYSTEM

This chart explores the human immune system, showing the organs involved and the process of the immune response. It includes diagrams of the thymus, spleen, and lymph nodes, as well as a detailed flowchart of how the immune system identifies and fights off pathogens.

HP27S : Human Skin

HUMAN SKIN

This chart provides a detailed look at human skin, showing its multi-layered structure and various components. It includes diagrams of the epidermis, dermis, and hypodermis, as well as the structure of hair follicles, nails, and skin glands. The chart also discusses the skin's role as a thermoregulatory organ.

HP28S : Synovial (Movable) Joints

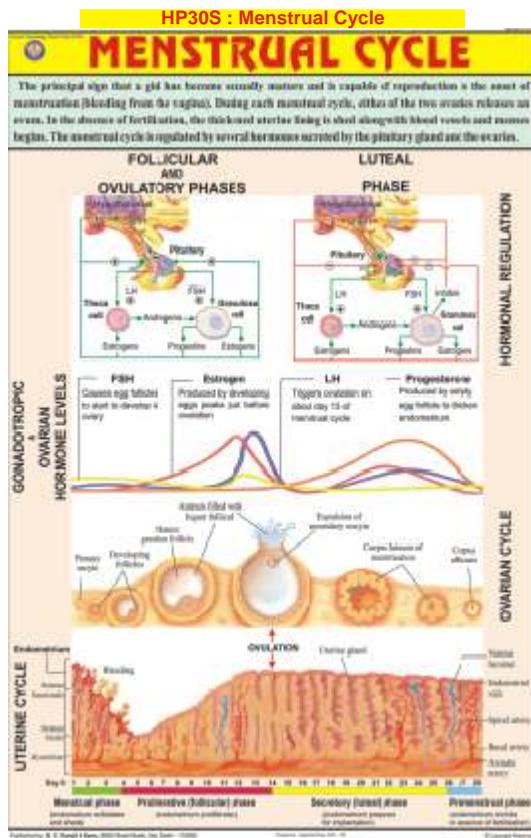
SYNOVIAL (Movable) JOINTS

This chart focuses on synovial joints, which are the most common and most movable joints in the body. It shows various types of synovial joints, including the elbow, knee, hip, and shoulder, and explains their structure and function. Diagrams illustrate the articular cavity and the role of synovial fluid.

HP29S : Human Spinal Cord

HUMAN SPINAL CORD

This chart details the human spinal cord, showing its structure and the path of nerve fibers. It includes diagrams of the spinal cord's segments, the meninges, and the nerve roots. The chart also discusses the spinal cord's role in transmitting signals between the brain and the rest of the body.



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LIFE SKETCH OF SCIENTISTS

A set of 20 charts
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LSS09 : Jagdish Chandra Bose



BIOLOGIST & PHYSICIST **Jagdish Chandra Bose** 1858-1937

Dr. Jagdish Chandra Bose was an eminent biologist and physicist. He was the first in India to develop the device that generates microwaves, the invention that proved and established the highly sensitive mechanism to record the waves of a plant. This is considered the world's first and only such kind of apparatus that sets a precise standard for modern scientific methods.

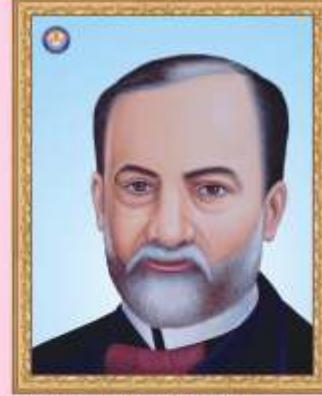
Bose was born in Medinipur, now in Bangladesh on 30th November, 1858 to Bhagwan Chandra and Manu Sankar Bose. Bose was brought up at home along with his siblings and others. He did his schooling first at a school set up by his father and then at St. Xavier's School in Kolkata. He received his B.A. in Science from Presidency University in 1877. Later he went to England for higher studies and returned to India in 1882 with a B.Sc. degree and a Bachelor Science Paper. He accepted the position of a lecturer in Presidency College in Kolkata and continued to draw his salary as a private teacher till 1891 when he left that of his 'father' colleagues. After three years, his work was recognized and he was given full salary with retrospective effect for three years, in 1891. He was married to Aditi Bose.

Bose rightly is called the inventor of wireless telegraphy. His inspired genius and keen intellect led him to use electrical circuits in plants, which he called 'plant telegraphs'. He discovered that plants have electrical circuits and that they can be used as a kind of 'plant telegraph'. He also discovered that plants have electrical circuits and that they can be used as a kind of 'plant telegraph'. He also discovered that plants have electrical circuits and that they can be used as a kind of 'plant telegraph'.

Bose also invented several scientific instruments. The Cresograph which he invented to measure the rate of growth of a plant that is 10,000 times more than the actual. His experiments showed that plants respond to various stimuli as if they have nervous system. He also showed that plants have a sense of touch, smell, and hearing. He also discovered that plants have a sense of touch, smell, and hearing. He also discovered that plants have a sense of touch, smell, and hearing.

Bose founded the Bose Research Institute in Kolkata in 1917. Apart from the study of plants, research on several other subjects was carried out here. Research on the structure of the nucleus of an atom was also carried out here.

LSS10 : Louis Pasteur



MICROBIOLOGIST & CHEMIST **Louis Pasteur** 1822-1895

Louis Pasteur was born on 27th December 1822 in Dole, in eastern France. He grew up in the town of Arbois, where he did his primary and secondary schooling. He continued his education at the Royal College in Besancon and obtained his B.A. in 1840 and B.Sc. in 1842. In 1842 he entered the Ecole Normale Supérieure in Paris, the great school that prepares teachers for the training of young professors. He obtained his doctorate in 1847.

He served briefly in 1848 as a professor of physics and as an assistant professor in chemistry at the Faculty of Science in Besancon. He then went to Paris to study for his doctorate. He was appointed to the Chair of Chemistry in 1849. He was the first to show that microorganisms are not spontaneously generated but are produced from pre-existing microorganisms. He also discovered that microorganisms are not spontaneously generated but are produced from pre-existing microorganisms.

In 1854, Pasteur became Dean of the College of Science at Lille University. He began his biological investigations there. He demonstrated that fermentation is caused by the growth of microorganisms, and that the growth of these organisms is sensitive to heat. He also discovered that microorganisms are not spontaneously generated but are produced from pre-existing microorganisms.

Louis Pasteur generalized his studies on various diseases with roasting. He discovered that roasting kills the bacteria that cause anthrax, cholera, and other diseases. He also discovered that roasting kills the bacteria that cause anthrax, cholera, and other diseases.

Louis Pasteur passed his studies on various diseases with roasting. He discovered that roasting kills the bacteria that cause anthrax, cholera, and other diseases. He also discovered that roasting kills the bacteria that cause anthrax, cholera, and other diseases.

LSS11 : Marie Curie



CHEMIST & PHYSICIST **Marie Curie** 1867-1934

Marie Sklodowska-Curie, generally known as Marie Curie, was born in Poland on 7th November, 1867. She was the second of five children in a family of nine. Her father was a teacher and her mother was a homemaker. She was the first woman to receive a Nobel Prize.

She was educated at the Sorbonne in Paris. She was the first woman to receive a degree from the Sorbonne. She was the first woman to receive a degree from the Sorbonne.

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LSS12 : Meghnad Saha



ASTROPHYSICIST **Meghnad Saha** 1893-1956

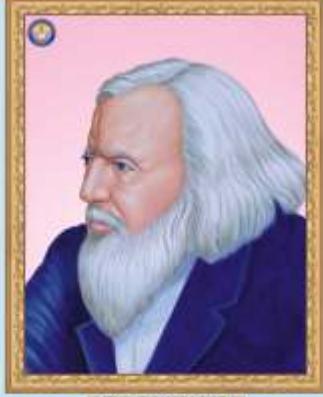
Meghnad Saha was an outstanding Indian astrophysicist born on 16th October, 1893 in Dhanshal, a small village in the district of Balasore, near to Bhubaneswar, Jharkhand. He was a very bright and hardworking student. He was the first Indian to receive a Nobel Prize.

He was educated at the University of Calcutta. He was the first Indian to receive a degree from the University of Calcutta. He was the first Indian to receive a degree from the University of Calcutta.

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LSS13 : Dmitri Mendeleev



CHEMIST **Dmitri Mendeleev** 1834-1907

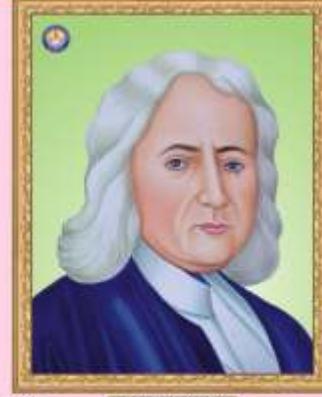
The Russian chemist Dmitri Mendeleev was born in Tobolsk, Siberia on 8th February, 1834. He was the only one who predicted the existence of the Periodic Table of Elements. He was the first to propose the periodic table of elements.

He was educated at the University of Kazan. He was the first Russian to receive a degree from the University of Kazan. He was the first Russian to receive a degree from the University of Kazan.

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LSS14 : Isaac Newton



Physicist & Mathematician **Isaac Newton** 1643-1727

Isaac Newton was an English natural philosopher, mathematician, and scientist. He was the first to propose the laws of motion and universal gravitation. He was the first to propose the laws of motion and universal gravitation.

He was educated at Trinity College, Cambridge. He was the first to receive a degree from Trinity College, Cambridge. He was the first to receive a degree from Trinity College, Cambridge.

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LSS15 : Raja Ramanna



PHYSICIST **Raja Ramanna** 1925-2004

Raja Ramanna was an eminent Indian physicist and one of the most prominent developers of atomic and nuclear technology in India. He was the first Indian to receive a Nobel Prize.

He was educated at the University of Madras. He was the first Indian to receive a degree from the University of Madras. He was the first Indian to receive a degree from the University of Madras.

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LSS16 : Srinivasa Ramanujan



MATHEMATICIAN **Srinivasa Ramanujan** 1887-1920

Srinivasa Ramanujan was an Indian mathematician who made extraordinary contributions to mathematical analysis, number theory, and the theory of partitions. He was the first Indian to receive a Nobel Prize.

He was educated at the University of Cambridge. He was the first Indian to receive a degree from the University of Cambridge. He was the first Indian to receive a degree from the University of Cambridge.

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LIFE SKETCH OF SCIENTISTS

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LSS17 : Ernest Rutherford



PHYSICIST **Ernest Rutherford** 1871-1937

Rutherford was born at Spring Grove (now Highfields) near Nelson in New Zealand on 18th August, 1871. His father James Rutherford was a schoolmaster and a farmer. Following a scholarship from Nelson College in 1889, he went to Canterbury College in Christchurch. He received B.Sc. in 1891 and B.A. in 1894. For his honors degree he investigated the magnetic properties of iron by high frequency electric discharges and published his first scientific paper on the topic. He conducted a very careful investigation of magnetic based atomic structure.

Rutherford went to England for higher studies at the Cavendish Laboratory University of Cambridge in 1895. There he worked under J.J. Thomson as a research student. In 1900, Rutherford accepted the Massey Research Professorship of Physics at McGill University in Montreal, Canada. While working on radioactivity he discovered alpha rays and beta rays in 1899 and in the next year he found the most penetrating power: the gamma rays. In 1905, Rutherford, in collaboration with Frederick Soddy and Kathleen the disintegration theory of radioactivity and showed that radioactivity involves actual transmutation of substances into different kinds of matter.

In 1907, he took the professorship of physics at the University of Manchester. The most important contribution of Rutherford to physics came in when he with his students Hans Geiger and Ernest Marsden did experiments on scattering of alpha particles by thin gold foil which became the foundation of his concept of the nucleus. He, based on his experiments, demonstrated conclusively the relative mass of the atom and all positive charge of the atom is concentrated in the very minute centre. Rutherford demonstrated the nuclear structure of the atom in 1911.

During World War I, Rutherford was given charge of investigations into the development of atomic bombs. In 1917, Rutherford successfully brought their structure with alpha particles changing them to nitrogen atoms that became the first process to change one element into another. He was appointed Director of the Cavendish Laboratory in 1919 and remained in the post until 1937.

Rutherford was awarded with many honors and awards besides 1908 Nobel Prize for chemistry. He received Royal Society's Copley Medal in 1920, the Presidency of Royal Society from 1920 to 1925, the Order of Merit in 1925, the Albert Medal of Royal Society of Arts in 1930 and the Faraday Medal of the Institution of Electrical Engineers in 1930. He also got many honorary doctorates from the Universities of over the World. He died in Cambridge on October 19, 1937 and he is buried in Westminster Abbey, London.

LSS18 : Satyendra Nath Bose



PHYSICIST-MATHEMATICIAN **Satyendra Nath Bose** 1894 - 1974

Satyendra Nath Bose was a scientist of exceptionally brilliant caliber. With his very high intelligence he solved many problems and kept winning the admiration of his contemporaries. He made important contributions to quantum physics. Perhaps no other scientist in our country drew as much international attention as he did.

Satyendra Bose was born on 1st January 1894 in Shriniketan, West Bengal. From his earliest days, he was recognized as an intelligent student. When he joined Presidency College of Kolkata, he found himself among the company of brilliant students like Meghnad Saha, J.C. Ghosh and other scientists like C.C. Bose and P.C. Ray. This group of great genius happened to be an extremely great influence. He was a research scholar under the supervision of Lord Kelvin, in the year 1914. He joined the University College of Science in Kolkata on a research job with the famous physicist Sir Jagadish Chandra Bose. He worked on 'Equation of State' based on quantum mechanical theory, and 'Relativistic Statistics' were published in 'Philosophical Journal' of London in 1924. His work which earned 'Bose-Einstein Equilibrium' was published in 1924. In 1925, he with Saha, investigated Einstein's papers on relatively Bose-Einstein in English.

In 1927, Bose moved to Calcutta University as a lecturer in physics. He continued to work on theoretical and mathematical physics. He used his research paper 'Planck's Law and Light Quantum Hypothesis' as an independent and independently received a Ph.D. of Science in 1931. In 1934, he won the Nobel Prize for his work on Bose-Einstein statistics which not only explained it but also translated it into terms of Bose-Einstein statistics. He was also awarded the Padma Vibhushan in 1954.

He was a very hard working personality. Besides science, he was much interested in literature and music also. He had made a deep study of several works in English, French, German and English literature. He also translated some French stories. He could also play 'Vocal' and a Bengali musical instrument.

Bose was interested with atmospheric phenomena also. He had published a number of papers on the subject. He has been in his height in the middle range. He founded 'Bengal Weather Service' in 1938 with the aim to help the people in the state.

He got many honors and awards for his contributions. In 1954, he was awarded 'Padma Vibhushan' and in 1955 he was made Fellow of Royal Society in UK. He died in Calcutta on 23rd February, 1974.

LSS19 : Dr. Vikram Sarabhai



PHYSICIST **Dr. Vikram Sarabhai** 1919-1971

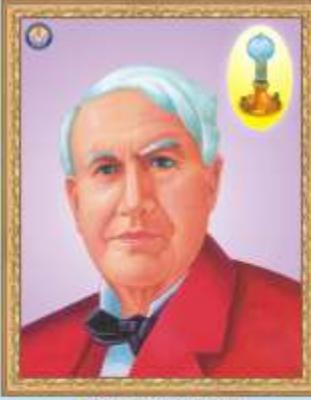
Dr. Vikram Sarabhai, one of the greatest scientists and visionaries of India, is remembered for his role in the development of India's nuclear program because of his significant contributions in the field of atomic energy and development of space technology in India. He was not only an imaginative and creative scientist but also a pioneering industrialist and an action planner. Besides his technical work, he was also a keen observer and writer. He also created a number of institutions like IIT Bombay, Atomic Energy Centre, Atomic Energy Research Establishment, Centre for Environmental Planning and Technology and Vikram Sarabhai Space Centre.

Sarabhai was born on 12th August 1919 at Ahmednagar in an affluent intellectual family. His father Mahadevi Sarabhai owned many wells in Gujarat. He got his early education in a private school established by his mother Sharda Devi. After that he went to Cambridge and then to London where he studied at King's College in 1938. Due to financial difficulties, he returned to India and joined Indian Institute of Physics in Bangalore. He started his research in cosmic rays there under the expert guidance of P.C. Ray. After the war, he returned to Cambridge and obtained his Ph.D. in 1947 for his thesis titled 'Cosmic Ray Ionization in Tropical Latitudes'.

Sarabhai, with the support of his wife Mrs. Mahadevi, managed to start the Physical Research Laboratory on 13th November, 1947 using a few rooms of I.I.T. Bombay Institute of Advanced Education (now IIT Bombay). He believed that the study of cosmic rays would provide complete information on ionospheric ionization, atmospheric structure of the earth and the outer space. Therefore, he established other branches of the laboratory at Calcutta, Trombay and Bhubaneswar. He was the one who set the ball rolling on the world stage of space science. He organized the Indian Space Research Organisation and was mainly responsible for setting up of Physical Research Laboratory in Trombay from where the tropical night was launched on November 11, 1962 with a Indian Space Probe. India's first satellite, Aryabhata was put to orbit in 1975 due to a project started by Dr. Sarabhai.

Dr. Sarabhai died suddenly on 30th December, 1971 at Ahmednagar, Maharashtra, India. He received many honors and awards for his services to science and society. In his memory the International Astronomical Union named after him a crater on the moon.

LSS20 : Thomas Alva Edison



PHYSICIST **Thomas Alva Edison** 1847 - 1931

Edison was the most prolific and practical inventor whose work has greatly influenced the world, particularly in the fields of communication and electrical power. He had patented more than a thousand inventions. The first known of which were the phonograph, the precursor of the gramophone and the incandescent filament lamp.

Edison was the seventh child of Samuel Edison who managed to escape against a plan to overthrow Canadian Governor and ended in Milan, Ohio with the help of a large captain, Mrs. Bradley. He was born on 11th February, 1847 in Milan, Ohio. He was born and raised in Milan, Ohio with the help of a large captain, Mrs. Bradley. He was born on 11th February, 1847 in Milan, Ohio. He was born and raised in Milan, Ohio with the help of a large captain, Mrs. Bradley.

He was born to be an inventor. In 1864, he patented his first invention - an electric vote-recorder. One day when he was working with Western Union Telegraph in Boston which he joined in 1862 as a telegraph operator. Based with Boston, he moved to New York. He got his first success there with a tape machine called 'Tape' which communicated stock exchange prices across the country. The amount of \$ 30,000. He got his selling his invention to Gold and Stock Telegraph Company, who used to set up an industrial research laboratory in 1869 in Newark, New Jersey.

In 1871, he married Mary Stilwell. He turned his attention then to telegraphy. In 1876 he patented his first telegraphic system but it proved to be commercially unsuccessful. Mrs. Stilwell's suggestion, she then invented carbon pencil telegraph and made a large amount of money. He moved to Menlo Park, a small village in New Jersey and set up his laboratory which remained the center for his research. In 1877, he invented the phonograph - a musical instrument. In October, 1879 he obtained a patent of light-bulb in Menlo Park. He was the first to use an incandescent lamp. In 1882 he and Joseph Wilson Swan formed 'Edison and Swan United States Patent Company Ltd.' to get commercial benefits of his discovery.

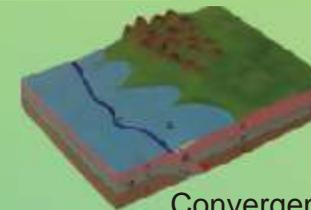
In 1889 Mary died of typhoid. In 1890, he got with an idea of serving pictures and developed a high speed camera and cinematograph. In 1895, he invented the Kinetograph and moved to West Orange, New Jersey. He spent most of his time in developing his own system of motion pictures. He died on 18th October, 1931 in West Orange.

For Social Studies,
please ask for our separate catalogue

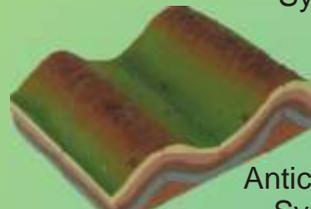
Geography Models



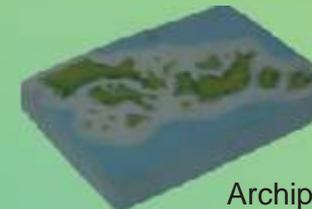
Transporting River System



Convergent Plate Boundaries



Anticlines and Synclines



Archipelago



Delta



Valley



Glacier



Composite Volcano Cutaway Model



Underground Mine Model



Hirakud Dam

FN01 : Our Food / हमारा भोजन

OUR FOOD / हमारा भोजन

(BALANCED DIET) / संतुलित आहार
Diet which contains all the vitamins in proper amounts to help in normal growth and development.
आहार जिसमें सभी विलक्षण तत्वों के सही मात्रा में होने के कारण सामान्य वृद्धि और विकास में सहायता मिलेगी।

COMPONENTS OF FOOD / आहार के तत्व

| | | | | | | |
|----------------------------------|------------|--------------------|-----------------|--------------------|------------|------------------|
| Carbohydrates / कार्बोहाइड्रेट्स | Fats / वसा | Proteins / प्रोटीन | Minerals / खनिज | Vitamins / विलक्षण | Water / जल | Roughage / रूग्ज |
|----------------------------------|------------|--------------------|-----------------|--------------------|------------|------------------|

FUNCTIONS OF FOOD / आहार के कार्य

- 1. Energy / ऊर्जा
- 2. Growth and Development / वृद्धि और विकास
- 3. Repair and Maintenance / मरम्मत और रखरखाव
- 4. Protection / सुरक्षा

FOOD PYRAMID / भोजन पिरामिड
Fats, Oils and Ghee (2-3 Servings) (1-2 Tablespoon)
Milk and Milk Products (2-3 Servings) (2-3 Glasses)
Meat, Poultry, Fish, Dry Beans, Eggs and Other Protein Foods (2-3 Servings)
Vegetables (3-4 Servings)
Fruits (3-5 Servings)
Breads, Grains and Other Starchy Foods (6-8 Servings)
Water (8-10 Servings)

| Age Group | Energy (Kcal) | Protein (g) | Carbohydrate (g) | Fat (g) | Calcium (mg) | Iron (mg) | Vitamin A (µg) | Vitamin B1 (mg) | Vitamin B2 (mg) | Vitamin C (mg) |
|--------------------------------|---------------|-------------|------------------|---------|--------------|-----------|----------------|-----------------|-----------------|----------------|
| Infants (0-12 months) | 900 | 30 | 120 | 30 | 400 | 0.5 | 400 | 0.2 | 0.3 | 50 |
| Children (1-3 years) | 1300 | 40 | 160 | 40 | 600 | 1 | 600 | 0.3 | 0.5 | 70 |
| Children (4-6 years) | 1800 | 50 | 210 | 50 | 800 | 2 | 800 | 0.5 | 0.8 | 90 |
| Children (7-9 years) | 2200 | 60 | 260 | 60 | 1000 | 3 | 1000 | 0.8 | 1.2 | 110 |
| Children (10-12 years) | 2600 | 70 | 310 | 70 | 1200 | 4 | 1200 | 1.0 | 1.5 | 130 |
| Adolescent boys (13-17 years) | 3000 | 80 | 360 | 80 | 1400 | 5 | 1400 | 1.2 | 1.8 | 150 |
| Adolescent girls (13-17 years) | 2600 | 70 | 310 | 70 | 1200 | 4 | 1200 | 1.0 | 1.5 | 130 |
| Adult men (18-30 years) | 3000 | 80 | 360 | 80 | 1400 | 5 | 1400 | 1.2 | 1.8 | 150 |
| Adult women (18-30 years) | 2600 | 70 | 310 | 70 | 1200 | 4 | 1200 | 1.0 | 1.5 | 130 |
| Elderly (60+ years) | 2000 | 50 | 210 | 50 | 800 | 2 | 800 | 0.5 | 0.8 | 90 |

FN02 : Proteins / प्रोटीन

PROTEINS / प्रोटीन

Plant Sources / (Vegetarian Proteins) / जन्तुमत्त स्रोत
Green peas, Chickpeas, Lentils, Soybeans, Beans, Peas, Corn, Quinoa, Buckwheat, Millet, Rice, Wheat, Oats, Rye, Barley, Mung, Moong, Chana, Rajma, Kidney beans, Pigeon peas, Soyabean curries.

Animal Sources / (Non-vegetarian Proteins) / पशु स्रोत
Eggs, Meat, Fish, Milk, Cheese, Curries.

FUNCTIONS OF PROTEIN / प्रोटीन के कार्य

1. Building blocks of body / शरीर के निर्माण के लिए ब्लॉक
2. Enzymes and hormones / एंजाइम और हार्मोन
3. Carrying oxygen in blood / रक्त में ऑक्सीजन ले जाना
4. Fighting infection / संक्रमण से लड़ना
5. Maintaining fluid balance / तरल संतुलन बनाए रखना
6. Source of amino acids / अमीनो एसिड का स्रोत

SPECIAL HIGH PROTEIN NEEDS / प्रोटीन की विशेष आवश्यकताएँ

1. Growing children / बढ़ते हुए बच्चे
2. Pregnant women / गर्भवती महिलाएँ
3. Lactating women / दूध देने वाली महिलाएँ
4. Sportsmen / खिलाड़ी
5. Elderly / बूढ़े लोग
6. Patients recovering from illness / बीमारी से ठीक हो रहे रोगी

FN03 : Fats / वसा

FATS / वसा

Fats are the components of calcium, hydrogen, and oxygen. Fat contains more energy as compared to carbohydrates. One gram of fat provides 9 kcal of energy as against 4 kcal from one gram of carbohydrates.

CLASSIFICATION OF FATS / वसा के वर्गीकरण

- Saturated fats / जंतुमत्त वसा
 - Animal sources / जन्तुमत्त स्रोत
 - Unsaturated fats / अजंतुमत्त वसा
 - Monounsaturated (Oleic acid) / मोनोअनसंतुलित (ओलिक एसिड)
 - Polysaturated / पॉलीसंतुलित
 - Essential fatty acids / आवश्यक विलक्षण अम्ल

SOURCES / स्रोत
Eggs, Milk, Meat, Fish, Oils, Ghee, Butter, Margarine, Nuts, Seeds, Avocado, Olive oil, Sunflower oil, Corn oil, Soybean oil, Sesame oil, Mustard oil, Coconut oil, Ghee, Butter.

FUNCTIONS OF FATS / वसा के कार्य

1. Concentrated energy source / सांद्र ऊर्जा स्रोत
2. Solubilizing vitamins A, D, E, K / विलक्षण विलक्षण A, D, E, K को घोलना
3. Insulation / इंसुलेशन
4. Cell membrane structure / कोशिका झिल्ली की संरचना
5. Hormone production / हार्मोन उत्पादन
6. Energy storage / ऊर्जा संग्रहीत करना

FN04 : Carbohydrates / कार्बोहाइड्रेट्स

CARBOHYDRATES / कार्बोहाइड्रेट्स

Carbohydrates are the major component of our diet. They are the main source of energy supplying 75% of total energy requirement. Daily intake of carbohydrate is 130g for an average adult.

CLASSIFICATION OF CARBOHYDRATES / कार्बोहाइड्रेट्स के वर्गीकरण

- Simple carbohydrates / सरल कार्बोहाइड्रेट्स
 - Monosaccharides (Glucose, Fructose) / मोनोसैकराइड्स (ग्लूकोस, फ्रुक्टोस)
 - Disaccharides (Maltose, Sucrose) / डिसैकराइड्स (माल्टोस, सुक्रोस)
- Complex carbohydrates / जटिल कार्बोहाइड्रेट्स
 - Polysaccharides (Starch, Glycogen) / पॉलीसैकराइड्स (स्टार्च, ग्लाइकोजन)
 - Cellulose / सेल्यूलोज
 - Hemicellulose / हेमिसेल्यूलोज
 - Pectin / पेक्टिन
 - Lignin / लिग्निन

SOURCES / स्रोत
Rice, Wheat, Corn, Beans, Lentils, Peas, Chickpeas, Potatoes, Apples, Bananas, Grapes, Oranges, Milk, Sugar, Honey, Jaggery, Dates, Figs, Raisins, Prunes, Apples, Pineapple, Mangoes, Peaches, Nuts, Seeds, Oats, Whole grains, Legumes, Lentils, Corn, Potatoes.

FUNCTIONS / कार्य

- 1. Store energy in form of glycogen / ग्लाइकोजन के रूप में ऊर्जा संग्रहीत करना
- 2. Provide energy through glycolysis and oxidative phosphorylation / ग्लाइकोलिसिस और ऑक्सीडेटिव फॉस्फोरिलेशन के माध्यम से ऊर्जा प्रदान करना
- 3. Supply carbon for synthesis of other compounds / अन्य यौगिकों के संश्लेषण के लिए कार्बन आपूर्ति करना
- 4. Form structural components of cells and tissues / कोशिकाओं और ऊतकों की संरचनात्मक घटक बनना

FN05 : Vitamins / विटामिन

VITAMINS / विटामिन

FAT SOLUBLE / वसा में घुलनशील

- VITAMIN A / विटामिन A**: Night blindness, dry skin, poor vision.
- VITAMIN D / विटामिन D**: Rickets, osteoporosis, muscle weakness.
- VITAMIN E / विटामिन E**: Neurological disorders, skin problems.
- VITAMIN K / विटामिन K**: Bleeding disorders, poor blood clotting.

WATER SOLUBLE / जल में घुलनशील

- THIAMINE (Vitamin B1) / थायामिन (विटामिन B1)**: Beriberi, weakness, weight loss.
- RIBOFLAVIN (Vitamin B2) / रिबोफ्लेविन (विटामिन B2)**: Cheilosis, sore throat, skin problems.
- NIACIN (Vitamin B3) / नियासिन (विटामिन B3)**: Pellagra, skin rashes, dementia.
- PANTOTHIC ACID (Vitamin B5) / पैंटोथिक एसिड (विटामिन B5)**: Fatigue, numbness, skin rashes.
- CYANOCOBALAMIN (Vitamin B12) / सायनोकोबालामिन (विटामिन B12)**: Anemia, nerve damage, memory loss.
- ASCORBIC ACID (Vitamin C) / अस्कॉर्बिक एसिड (विटामिन C)**: Scurvy, gum disease, iron deficiency.

FN06 : Minerals / खनिज

MINERALS / खनिज

- IODINE / आयोडीन**: Goiter, hypothyroidism, cretinism.
- POTASSIUM / पोटैशियम**: Muscle weakness, irregular heart rhythm.
- CALCIUM / कैल्शियम**: Osteoporosis, muscle cramps.
- PHOSPHORUS / फॉस्फोरस**: Bone weakness, muscle pain.
- IRON / लौह**: Anemia, fatigue, weakness.
- SODIUM / सोडियम**: High blood pressure, dehydration.
- FLOURIDE / फ्लोराइड**: Dental caries, bone strength.
- ZINC / जिंक**: Growth retardation, poor wound healing.
- COPPER / कॉपर**: Anemia, neurological disorders.
- CHLORIDE / क्लोरिड**: Dehydration, metabolic acidosis.

FN07 : Water and Roughage / जल और रूग्ज

WATER AND ROUGHAGE / जल और रूग्ज

SOURCES OF WATER / स्रोत
Tap water, Bottled water, Milk, Juice, Tea, Coffee, Soups, Stews, Broth, Ice cream, Soft drinks, Alcoholic drinks, Fruits, Vegetables.

FUNCTIONS OF WATER / कार्य
1. Solvent for metabolic reactions / मेटाबोलिक प्रतिक्रियाओं के घोलक।
2. Temperature regulation / तापमान नियंत्रण।
3. Lubrication of joints and organs / जोड़ों और अंगों के स्निग्धत्व।
4. Protection of body / शरीर की सुरक्षा।

SOURCES OF ROUGHAGE / स्रोत
Whole grains, Legumes, Vegetables, Fruits, Nuts, Seeds, Bran, Fiber supplements.

FUNCTIONS OF ROUGHAGE / कार्य
1. Regulate bowel movements / आंतों की गति नियंत्रित करना।
2. Prevent constipation / कब्ज से रोकना।
3. Maintain normal body weight / सामान्य शरीर वजन बनाए रखना।
4. Reduce risk of chronic diseases / مزمن बीमारियों के जोखिम को कम करना।

FN08 : Deficiency Diseases / हिनताजनित रोग

DEFICIENCY DISEASES / हीनताजनित रोग

- Marasmus / मारसम**: Severe wasting, muscle loss, skin changes.
- Kwashiorkor / क्वाशीकोर**: Swelling, fatty liver, skin rash.
- Rickets / रिकेट्स**: Bone deformities, muscle weakness.
- Goitre / गोइटर**: Swelling of thyroid gland.
- Anemia / एनीमिया**: Pale skin, weakness, fatigue.
- Night blindness / रात में अंधापन**: Difficulty seeing in low light.
- Scurvy / स्कर्वी**: Bleeding gums, skin bruising.
- Pellagra / पैलैग्रा**: Dermatitis, diarrhea, dementia.
- Dental Caries / दाहज**: Tooth decay, pain.

CHARTS ON FOOD AND NUTRITION

A set of 10 charts

Laminated, Size 70 x 100 cm (In English and Hindi Combined)

FN09 : Overnutrition Disorders
OVERNUTRITION DISORDERS अतिशय भोजन विकार

The charts include:

- Arteriosclerosis** (शरणाकारित्व): Shows the thickening and hardening of arteries.
- Obesity** (मोटापा): Illustrates excess body fat and its health risks.
- Hypervitaminosis A** (अतिविटामिन A): Shows symptoms like skin peeling and bone pain.
- Hypervitaminosis D** (अतिविटामिन D): Shows symptoms like kidney stones and bone calcification.
- Hypertension** (अतिरक्तचाप): Illustrates high blood pressure and its measurement.
- Fluorosis** (फ्लोरोसिस): Shows dental and skeletal fluorosis.

FN10 : Food's Nutritive Value
Food's Nutritive Value भोजन का पोषणिक मान

| Food | Energy | Protein | Carbohydrate | Fat | Fiber | Calcium | Iron | Vitamin A | Vitamin B1 | Vitamin B2 | Vitamin B6 | Vitamin C |
|---------|--------|---------|--------------|-------|-------|---------|------|-----------|------------|------------|------------|-----------|
| Apple | 52 | 0.5 | 13.8 | 0.2 | 2.4 | 6 | 0.2 | 10 | 0.03 | 0.04 | 0.05 | 8 |
| Banana | 89 | 1.1 | 22.8 | 0.3 | 3.1 | 5 | 0.3 | 10 | 0.03 | 0.04 | 0.05 | 8 |
| Carrot | 41 | 0.9 | 9.7 | 0.1 | 2.8 | 33 | 0.6 | 830 | 0.01 | 0.02 | 0.03 | 6 |
| Chicken | 165 | 31.0 | 0.0 | 3.6 | 0.0 | 12 | 0.7 | 10 | 0.03 | 0.04 | 0.05 | 8 |
| Cheese | 391 | 25.0 | 0.0 | 33.0 | 0.0 | 12 | 0.7 | 10 | 0.03 | 0.04 | 0.05 | 8 |
| Egg | 143 | 12.6 | 2.7 | 11.6 | 0.0 | 12 | 0.7 | 10 | 0.03 | 0.04 | 0.05 | 8 |
| Flour | 364 | 11.1 | 74.8 | 1.0 | 2.7 | 12 | 0.7 | 10 | 0.03 | 0.04 | 0.05 | 8 |
| Grain | 148 | 7.0 | 14.5 | 0.9 | 3.2 | 12 | 0.7 | 10 | 0.03 | 0.04 | 0.05 | 8 |
| Meat | 106 | 20.8 | 0.0 | 10.3 | 0.0 | 12 | 0.7 | 10 | 0.03 | 0.04 | 0.05 | 8 |
| Milk | 42 | 3.3 | 4.7 | 1.1 | 0.1 | 12 | 0.7 | 10 | 0.03 | 0.04 | 0.05 | 8 |
| Oil | 884 | 0.0 | 0.0 | 100.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Rice | 148 | 2.6 | 28.2 | 0.3 | 1.4 | 12 | 0.7 | 10 | 0.03 | 0.04 | 0.05 | 8 |
| Soybean | 160 | 36.0 | 20.0 | 19.0 | 6.0 | 12 | 0.7 | 10 | 0.03 | 0.04 | 0.05 | 8 |
| Sugar | 387 | 0.0 | 100.0 | 0.0 | 0.0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wheat | 148 | 11.1 | 74.8 | 1.0 | 2.7 | 12 | 0.7 | 10 | 0.03 | 0.04 | 0.05 | 8 |

For your requirements of items for Medical lab,
 please ask for our separate catalogue
Skeleton & Bones Models



HC01 : Health Rules

Health Rules स्वास्थ्य के नियम

1. Take regular morning and evening bathing.

2. Wash your hands before and after eating.

3. Use clean drinking water.

4. Eat healthy food.

5. Take your bath daily.

6. Wear your shoes before going out.

7. Eat fresh fruits and vegetables.

8. Wash your hands after touching animals.

9. Practice good oral hygiene.

10. Avoid contact with people who are sick.

11. Avoid contact with people who are coughing or sneezing.

12. Avoid contact with people who have a fever.

13. Avoid contact with people who have a rash.

14. Avoid contact with people who have a sore throat.

15. Avoid contact with people who have a runny nose.

16. Avoid contact with people who have a cough.

17. Avoid contact with people who have a sneeze.

18. Avoid contact with people who have a headache.

19. Avoid contact with people who have a dizziness.

20. Avoid contact with people who have a fainting.

HC02 : Causes of Diseases

Causes of Diseases रोग के कारण

1. Insects like mosquitoes and flies spread diseases.

2. Poor hygiene and unclean surroundings cause diseases.

3. Lack of exercise and physical activity causes diseases.

4. Poor diet and lack of nutrients causes diseases.

5. Lack of sleep and rest causes diseases.

6. Stress and anxiety causes diseases.

7. Poor air quality causes diseases.

8. Poor water quality causes diseases.

9. Poor sanitation causes diseases.

10. Poor personal hygiene causes diseases.

11. Poor oral hygiene causes diseases.

12. Poor eye hygiene causes diseases.

HC03 : Prevention of Diseases

Prevention of Diseases रोग से बचाव

1. Get vaccinated against diseases.

2. Drink clean and safe drinking water.

3. Eat healthy and balanced diet.

4. Practice good personal hygiene.

5. Avoid contact with sick people.

6. Avoid contact with animals.

7. Avoid contact with insects.

8. Avoid contact with people who are coughing or sneezing.

9. Avoid contact with people who have a fever.

10. Avoid contact with people who have a rash.

11. Avoid contact with people who have a sore throat.

12. Avoid contact with people who have a runny nose.

HC04 : Effects of Alcohol

Effects of Alcohol मद्य (शराब) के परिणाम

1. Drinking alcohol causes liver damage.

2. Drinking alcohol causes heart disease.

3. Drinking alcohol causes high blood pressure.

4. Drinking alcohol causes diabetes.

5. Drinking alcohol causes cancer.

6. Drinking alcohol causes mental health problems.

7. Drinking alcohol causes social problems.

8. Drinking alcohol causes family problems.

9. Drinking alcohol causes accidents.

10. Drinking alcohol causes violence.

11. Drinking alcohol causes poverty.

12. Drinking alcohol causes death.

HC05 : Tobacco & Other Habit Forming Drugs

Tobacco & Other Habit Forming Drugs तम्बाकू तथा अन्य मादक पदार्थ

1. Smoking causes addiction.

2. Addiction leads to increased consumption.

3. Increased consumption leads to health problems.

4. Health problems lead to social and family issues.

5. Social and family issues lead to economic problems.

6. Economic problems lead to poverty and crime.

7. Poverty and crime lead to death.

HC06 : Clean Body

Clean Body स्वच्छ शरीर

1. Wash your face regularly.

2. Wash your hands frequently.

3. Take a shower daily.

4. Use clean and safe drinking water.

5. Eat healthy and balanced diet.

6. Exercise regularly.

HC07 : Clean Water

Clean Water स्वच्छ पानी

1. Drink clean and safe drinking water.

2. Protect water sources from pollution.

3. Use clean and safe drinking water.

4. Use clean and safe drinking water.

5. Use clean and safe drinking water.

6. Use clean and safe drinking water.

HC08 : Constituents of Food

Constituents of Food अन्न के पौष्टिक अंगु

| PROTEIN प्रोटीन | GLUCOSE ग्लूकोज | MINERAL MINERALS खनिज | FA'S फैट्स |
|--|-----------------------------------|---------------------------------|-------------------------------|
| Meat, Fish, Eggs, Milk, Soybean, pulses, lentils, etc. | Starch, sugar, etc. | Iron, calcium, phosphorus, etc. | Butter, oil, etc. |
| CARBOHYDRATE कार्बोहाइड्रेट | VITAMINS जीवन लवण | VITAMINS AND THEIR SOURCES | |
| Starch, sugar, etc. | VITAMIN A: Carrots, spinach, etc. | | VITAMIN B: Milk, pulses, etc. |
| | VITAMIN C: Citrus fruits, etc. | | VITAMIN D: Sunlight, etc. |
| | VITAMIN E: Sunflower oil, etc. | | |

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HEALTH CARE SERIES

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HC09 : Malnutrition

Malnutrition कुपोषण

Kwashiorkor and Marasmus कुपोषण के प्रकार

SYMPTOMS लक्षण

TREATMENT उपचार

SUPPORTIVE CARE सह-उपचार

HC10 : Immunization of The Child

Immunization of The Child बच्चों का प्रतिरक्षीकरण

0-12 Months 0-12 महीने तक

1-3 Years 1-3 साल तक

4-10 Years 4-10 साल तक

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Number with Plate

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Construction of Parabola

PD01 : Cholera हैजा

Microscopic view of bowel अंतर्गुहा का सूक्ष्मदर्शी दृश्य

CAUSES कारण

SYMPTOMS लक्षण

TREATMENT उपचार

SUPPORTIVE CARE सह-उपचार

PD02 : Malaria मलेरिया

CAUSES कारण

SYMPTOMS लक्षण

TREATMENT उपचार

SUPPORTIVE CARE सह-उपचार

PD03 : AIDS एड्स

CAUSES कारण

SYMPTOMS लक्षण

PRECAUTIONS सावधानियाँ

PD04 : Plague प्लेग

CAUSES कारण

SYMPTOMS लक्षण

PREVENTION बचाव

TREATMENT उपचार

SUPPORTIVE CARE सह-उपचार

PD05 : Tuberculosis (T.B.) क्षय रोग (टी.बी.)

X-Ray of Human Lung मानव फेफड़े का एक्स-रे

CAUSES कारण

SYMPTOMS लक्षण

TREATMENT उपचार

SUPPORTIVE CARE सह-उपचार

PD06 : Leprosy कुष्ठ रोग (कोह)

CAUSES कारण

SYMPTOMS लक्षण

TREATMENT उपचार

SUPPORTIVE CARE सह-उपचार

PD07 : Influenza श्लेष्माज्वर (फ्लू)

CAUSES कारण

SYMPTOMS लक्षण

TREATMENT उपचार

SUPPORTIVE CARE सह-उपचार

PD08 : Jaundice पीलिया

CAUSES कारण

SYMPTOMS लक्षण

TREATMENT उपचार

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PD09 : Cancer

CANCER कैंसर

Neocarcinoma Tumor न्यूकारिनोमा ट्यूमर

Carcinoma Tumor कार्सिनोमा ट्यूमर

Common Causes सामान्य कारण

CAUSES कारण

SYMPTOMS लक्षण

TREATMENT उपचार

SUPPORTIVE CARE सह-उपचार

PD10 : Typhoid

Typhoid मियादी बुखार (टाइफाइड)

CAUSES कारण

SYMPTOMS लक्षण

PREVENTION बचाव

TREATMENT उपचार

SUPPORTIVE CARE सह-उपचार

PD11 : Viral Diseases

Viral Diseases विषाणु संक्रमण

Microscopic view of Viruses विषाणु का सूक्ष्मदर्शी अवलोकन

CAUSES कारण

SYMPTOMS लक्षण

TREATMENT उपचार

SUPPORTIVE CARE सह-उपचार

PD12 : Chicken Pox

Chicken Pox चेचक

CAUSES कारण

SYMPTOMS लक्षण

TREATMENT उपचार

SUPPORTIVE CARE सह-उपचार

PD13 : Dysentery

Dysentery अतिसार

CAUSES कारण

SYMPTOMS लक्षण

TREATMENT उपचार

SUPPORTIVE CARE सह-उपचार

PD14 : Hepatitis

Hepatitis हैपेटाइटिस

CAUSES कारण

SYMPTOMS लक्षण

PREVENTION बचाव

TREATMENT उपचार

SUPPORTIVE CARE सह-उपचार

PD15 : Heart Attack

Heart Attack हृदय घात

Blockage of Coronary Artery शिराओं में रुकावट

CAUSES कारण

SYMPTOMS लक्षण

TREATMENT उपचार

SUPPORTIVE CARE सह-उपचार

PD16 : Diabetes

Diabetes मधुमेह (शर्करा)

CAUSES कारण

SYMPTOMS लक्षण

TREATMENT उपचार

SUPPORTIVE CARE सह-उपचार

PD17 : Asthma दमा

Microscopic view of Lungs केशरी का सूक्ष्मदर्शी दृश्य

CAUSES कारण
 Cold, Allergies, Stress, Air Pollution, Infections, etc.

SYMPTOMS लक्षण
 Wheezing, Shortness of breath, Chest tightness, etc.

TREATMENT उपचार
 Inhalers, Medications, etc.

SUPPORTIVE CARE सह-उपचार
 Avoid triggers, Regular exercise, etc.

PD18 : Arthritis जोड़ों का दर्द

CAUSES कारण
 Age, Inflammation, Injury, etc.

SYMPTOMS लक्षण
 Joint pain, Swelling, Stiffness, etc.

TREATMENT उपचार
 Medications, Physical therapy, etc.

SUPPORTIVE CARE सह-उपचार
 Weight management, Exercise, etc.

PD19 : Thyroid थाईरॉयड

Thyroidal Disorders and Thyroid Gland

CAUSES कारण
 Autoimmune, Iodine deficiency, etc.

SYMPTOMS लक्षण
 Weight changes, Fatigue, etc.

TREATMENT उपचार
 Medications, Surgery, etc.

SUPPORTIVE CARE सह-उपचार
 Diet, Stress management, etc.

PD20 : Blood - Pressure रक्तचाप

Hypertension उच्च रक्तचाप

CAUSES कारण
 High salt intake, Stress, etc.

SYMPTOMS लक्षण
 Headache, Dizziness, etc.

TREATMENT उपचार
 Medications, Diet changes, etc.

SUPPORTIVE CARE सह-उपचार
 Regular checkups, Stress reduction, etc.

PD21 : Dengue डेंगू

CAUSES कारण
 Mosquito bite

TRANSMISSION प्रेषण
 Mosquito

SYMPTOMS लक्षण
 High fever, Headache, Joint pain, etc.

TREATMENT & SUPPORTIVE CARE उपचार व सह-उपचार
 Rest, Hydration, etc.

PREVENTION बचाव
 Mosquito control, etc.

PD22 : Measles खसरा

CAUSES कारण
 Measles virus

SYMPTOMS लक्षण
 High fever, Rash, Cough, etc.

COMPLICATIONS जटिलताएं
 Pneumonia, Encephalitis, etc.

TREATMENT & PREVENTION उपचार व बचाव
 Vaccination, Isolation, etc.

PD23 : Food Poisoning खाद्य विषाक्तता

CAUSES कारण
 Contaminated food, Improper handling

SYMPTOMS लक्षण
 Nausea, Vomiting, Diarrhea, etc.

TREATMENT & SUPPORTIVE CARE उपचार व सह-उपचार
 Hydration, Rest, etc.

PREVENTION बचाव
 Food safety, Hygiene, etc.

PD24 : Poliomyelitis (Polio) पोलियो मेरूजन्तुशोथ

CAUSES कारण
 Poliovirus

SYMPTOMS लक्षण
 Weakness, Paralysis, etc.

TREATMENT & SUPPORTIVE CARE उपचार व सह-उपचार
 Supportive care, etc.

PREVENTION बचाव
 Vaccination, Hygiene, etc.

CHARTS ON AIDS

A set of 8 charts
Synthetic, Size 70 x 100 cm (Available in English Only)

AS01S : HIV

HIV

Structure of HIV

Mechanism of infection by human immunodeficiency virus

AS02S : Transmission of HIV

Transmission of HIV

HIV is transmitted in only a few specific ways. The virus is not highly contagious. Transmission occurs only when blood or certain other body fluids from infected person enter another person's body. Various means of transmission are:

- Unprotected vaginal sex
- Unprotected anal sex
- Unprotected oral sex
- Sharing needles during drug abuse.
- Transfusion of HIV infected blood.
- Breast feeding by HIV infected mother.
- Infants born to HIV infected mothers.
- Using improper sterilized hospital tools.
- Transplantation of infected organs.

AS03S : Prevention

PREVENTION

HIV, although lethal, does not spread as readily as the flu viruses or cold viruses. Individual can protect themselves from AIDS by adopting various preventive measures.

- Practice safer sex. Use condoms.
- Never share needles. Always use sterile needles.
- Avoid multiple sexual partners.
- HIV infected mothers should feed their baby formula milk instead of breast feeding.
- Drug treatment for HIV infected mothers during pregnancy.
- Delivering infant by cesarean section if mother is HIV infected.

AS04S : How AIDS is not Transmitted

HOW AIDS IS NOT TRANSMITTED

AIDS patients often face various types of discriminations because of several misconceptions widespread in the society. Also, these misconceptions unnecessarily create confusions in the minds of people. Therefore, everyone should have an accurate information about AIDS.

- AIDS is not caused by mosquito/best bite.
- AIDS is not caused by touching or hugging.
- AIDS is not caused by hand shaking.
- AIDS is not caused by studying with HIV positive.
- AIDS is not caused by sharing public toilets.
- AIDS is not caused by working with HIV positive.
- AIDS is not caused by sneezing or coughing.
- AIDS is not caused by sharing food.

AS05S : Progress of Infection

PROGRESS OF INFECTION

AIDS PROGRESSES THROUGH THREE DISTINCT PHASES:- ACUTE PHASE, CHRONIC PHASE AND FULL BLOWN AIDS.

- 1. ACUTE PHASE**
 - HIV enters the body and begins reproducing itself.
 - T4-cell count is high.
 - The number of viruses rises rapidly.
 - Antibodies to HIV begin to increase.
 - Most patients show no symptoms during the first few months after infection. A few may exhibit symptoms similar to those of infectious mononucleosis- fever, chills, aches and swollen lymph nodes. However these symptoms vanish shortly thereafter.
- 2. CHRONIC PHASE**
 - T4 cell count begins to fall.
 - Antibody levels rise initially and then fall.
 - Patients begin to show outward signs- severe fatigue, unexplained persistent fever, persistent cough, loss of memory, depression, diarrhea, difficulty in thinking and unexplained weight loss.
- 3. FULL-BLOWN PHASE**
 - AIDS has been defined as occurring in a person who:
 - has a laboratory documented HIV infection.
 - has a CD4 count less than 200 cells per ml of blood.
 - has had one or more infections that wouldn't normally occur in a person with a healthy immune system.
 - Persistent infections, extreme loss of weight and weakness.
 - Infections that normally are not capable of producing serious infections, take hold and become life-threatening.

AS06S : Opportunistic Diseases

OPPORTUNISTIC DISEASES

Multiple infections and cancer may develop because of the disturbed immune response. Many of these infections are highly unusual in people with healthy immune systems. They are called opportunistic infections because they take advantage of a weakened immune system due to AIDS.

- KAPOSI'S SARCOMA
- CANDIDIASIS
- PNEUMOCYSTIS CARINII
- LYMPHOMAS
- CMV-INFECTION
- HERPES SIMPLEX INFECTION

AS07S : Sexually Transmitted Diseases

Sexually Transmitted Diseases

Individuals who are infected with STDs are more prone to acquire HIV than uninfected individuals when they are exposed to the virus through sexual contact. Also, an HIV infected individual if also infected with another STD, is more likely to transmit HIV through sexual contact than other HIV infected persons. Thus, presence of other STDs increases the likelihood of both transmitting and acquiring HIV.

- Syphilis
- Gonorrhoea
- Trichomoniasis
- Chlamydia
- Chancroid
- Genital Herpes

HP26S : Human Immune System

HUMAN IMMUNE SYSTEM

ORGANS OF THE IMMUNE SYSTEM

THE IMMUNE RESPONSE

DIFFERENTIATION OF LEUCOCYTES FROM A SINGLE STEM CELL

FA01 : Skeleton & Circulatory System

SKELETON & CIRCULATORY SYSTEM

SKELETON

CIRCULATION OF BLOOD

SKULL

SPINE

HIP & KNEE BONES

BLOOD CIRCULATION

Heart pumps oxygenated blood through arteries and very small arteries (shown red in the diagram) to 500 (6,25,00,00,000 or 62,50,00,00,000) small capillaries about 17.25 cm. Each cell has a tiny capillary, power and/or, comes circulates up and sends oxygenated blood to each cell. Oxygen turns to glucose energy. Carbon dioxide is produced in breathe use. The deoxygenated blood along with the waste material returns back to the heart through veins (shown in blue) and then to the lung to oxygenate oxygen.

Skeleton is a flexible structure of rigid bones which provides shape and support to the body and offers protection to the internal organs. On an average there are 256 bones of various shapes and sizes in a adult human skeleton.

FA02 : Triangular Bandages

TRIANGULAR BANDAGES

THE TRIANGULAR BANDAGE FOLDS

KNIFE TEST

ARM SLINGS

COLLAR & CUFF SLINGS **BANDAGE FROM THE CHEST** **BANDAGE FOR THE SHOULDER**

BANDAGE FOR THE SCALP **BANDAGE FOR THE HEAD** **BRACE FOR THE ELBOW** **BANDAGE FOR THE ELBOW**

BANDAGE FOR THE WRIST **BANDAGE FOR A STUMP** **BANDAGE FOR THE FOOT**

PURPOSE OF BANDAGES:
Bandages are for the use in a case when the blood vessel is cracked, blood comes out, to prevent swelling, to provide support for limbs and preventing movement. These should be applied firmly enough to keep dressing in place but not so tight as to cause injury or hinder blood circulation.

FA03 : Roller Bandages

ROLLER BANDAGES

APPLICATION OF DRESSING:
The surrounding skin should be dry. Wash your hands thoroughly before applying the dressing. Do not touch or press your fingers over the wound. Dressings should be removed with care using a suitable technique.

PROTECTIVE COVERING FOR WOUND OR FRACTURE:
FINGER BANDAGE SPICA BANDAGE FOR THE LIMB WREST BANDAGING

BANDAGES FOR THE ELBOW **FOOT & ANKLE BANDAGING** **BANDAGE FOR THE HEEL**

SPICA BANDAGE FOR SHOULDER **KNEE BANDAGE** **HIP SPICA BANDAGE** **DOUBLE SPICA FOR GROIN**

CUFF LINE BANDAGES

HEAD BANDAGING **BANDAGE FOR THE EYE**

FA04 : Fractures

Fractures

Pain, Swelling and Loss of energy are the general signs of a fracture. A first aider should immobilise the fractured body part. Sling or splint should be used where necessary.

Types of Fractures:

- Open Fracture of Leg:** Fracture of the bone is visible through the skin. Immobilize the leg with a splint and bandage it to the body.
- Fracture of elbow:** Immobilize the elbow with a splint and bandage it to the body.
- Fracture of Rib:** Immobilize the rib with a splint and bandage it to the body.
- Fracture of Finger:** Immobilize the finger with a splint and bandage it to the hand.
- Fracture of Lower Jaw:** Immobilize the lower jaw with a splint and bandage it to the face.
- Fracture of Spine:** Immobilize the spine with a splint and bandage it to the body.

FA05 : Artificial Respiration

Artificial Respiration

HOLGER - NIELSEN METHOD (For Adults)

SCHAFFER'S METHOD

SILVESTER'S METHOD

For Children Under Five Years

FA06 : Transport of the Injured

TRANSPORT OF THE INJURED

ONE MAN CARRY

TWO HANDED SEAT **STRETCHER LIFT**

HOLLANDER'S METHOD **THREE PERSON CARRY**

FA07 : Unconsciousness

Unconsciousness

Immediate Condition of a Casualty:
Check for breathing, pulse, and consciousness. If the casualty is unconscious, place them in the recovery position. If there is a head injury, do not move the casualty. If there is a spinal injury, immobilize the neck and head.

FAINTING: Lay the casualty on their back, loosen their clothing, and fan them.

SEIZURE FIT: Lay the casualty on their side, do not restrain them, and do not put anything in their mouth.

HYSTERIA: Lay the casualty on their back, reassure them, and do not restrain them.

EPILEPTIC CONVULSIONS: Lay the casualty on their side, do not restrain them, and do not put anything in their mouth.

STROKES: Lay the casualty on their side, do not move their head, and do not give them anything to eat or drink.

POISONING: Lay the casualty on their back, do not induce vomiting, and call for medical help.

FA08 : Haemorrhage

HAEMORRHAGE

HAEMORRHAGE: A flow of blood from a blood vessel. It is usually the result of an injury. Arteries, known as the 'red' vessels, carry fresh blood to other parts of the body. Veins, known as the 'blue' vessels, carry blood from other parts of the body to the heart.

PRESSURE POINT FOR THE BRACHIAL ARTERY: Apply pressure to the inner side of the upper arm.

PRESSURE POINT FOR THE FEMORAL ARTERY: Apply pressure to the inner side of the thigh.

PRESSURE POINT FOR THE CAROTID ARTERY: Apply pressure to the side of the neck.

PRESSURE POINT FOR THE SUBCLAVICULAR ARTERY: Apply pressure to the upper chest.

TOURNIQUET TO THE ARM FOR BLEEDING FROM FOREARM: Apply a tourniquet to the upper arm.

TOURNIQUET APPLIED FOR BLEEDING FROM THIGH: Apply a tourniquet to the upper thigh.

FIRST AID CHARTS
A set of 15 charts, Size 50 x 70 cm
Laminated, (Available in English-Hindi Combined)

FA09 : Electric Shock And Treatment

ELECTRIC SHOCK AND TREATMENT

INSIDE THE HOUSE

OUTSIDE THE HOUSE

Effects of Shock

First Aid

ARTIFICIAL RESPIRATION

CONTACT IN EMERGENCY :

Doctor, Ambulance, Fire Brigade, Police

FA10 : Emergency Resuscitation

EMERGENCY RESUSCITATION

Mouth-to-Mouth Rescue Breathing

Step 1 Put one hand on casualty's forehead and tilt the head back. With two fingers under the chin and thumb on top, lift the jaw. This opens the airway.

Step 2 Restoring the head to and pinching the nose, open your mouth wide and take a deep breath.

Step 3 Put your mouth against the casualty's mouth and make a tight seal with your lips. Breathe out into the casualty's mouth. Give two short rescue breaths.

Step 4 Check for the circulation by looking for breathing, coughing or movement. If there is no sign of circulation, perform CPR.

Cardiac Compressions

Place the heel of the other hand on the chest. Press the heel of the hand firmly down on the chest. Repeat the hand position of the first hand already placed on lower end of breastbone.

For Children (11 years) Press down vertically with the heel of one hand to one-third of the depth of the chest. After every 30 compressions, give two rescue breaths.

For Infant Use two fingers to compress the breastbone. Use the thumb and middle finger (just underneath the sternum) to compress the chest.

FA11 : Removal of Foreign Bodies

REMOVAL OF FOREIGN BODIES

Foreign bodies of all kinds can become lodged in body parts or orifices and may cause injury, bleeding, infection, discomfort and other problems. Foreign bodies must be removed safely and clearly.

FOREIGN BODY IN THE EYE

While the patient's head down, place a cloth folded applicator on the upper lid.

FOREIGN BODY IN THE EAR

Gently flood the ear with tepid water or mustard oil. Insert a soft cotton applicator on the upper lid.

FOREIGN BODY IN NOSE

Put the lid forward and up, folding it back over the applicator.

GLASS PRICES IN THE SKIN

Gently remove the foreign object with antiseptic.

FOREIGN BODY BLOCKING AIRWAY (CHOKING)

FOR ADULTS
Lean victim forward, supporting his chest. Give five sharp blows between shoulder blades.

FOR INFANTS
If back stop fails, give stroke five abdomen thrusts.

FOR CHILDREN
Lay the body face down on forearm, with their head down. Give five sharp blows.

FA12 : Burns & Scalds

Burns & Scalds

A major priority in all burn cases is to cool the skin and cover the burn to prevent infection. Remove anything that is stuck to the burn. Do not burst any blisters. In case of chemical burn do not try to neutralize the chemical.

Thermal Burn

Chemical Burn to Eye

Chemical Burn to Body

Scalds

Clothes on Fire

FA13 : Snakes & Their Bites

Snakes & Their Bites

Morphology of poisonous Snake

Coral Snake, Saw-toothed Viper, Eastern Green Mamba, Cobra

Gently wash the bitten area with soap and water.

If available, apply suction with the extractor. Do not attempt cut and mouth suction.

Elevating the head and shoulder, bandage the bitten part firmly but not too tightly to stop circulation. Do not apply tourniquet.

Splint the bandaged bitten part to rest it. Seek medical attention to give antivenom.

FA14 : Poisons & Their Antidotes

POISONS & THEIR ANTIDOTES

A poison is a substance capable of injuring & killing a person. An antidote is an agent which counter acts a poison. An antidote for an acid is an alkali & for an alkali is an acid.

POISON MAY ENTER BODY THROUGH MOUTH, NOSE OR SKIN. FOR PROPER TREATMENT TRY TO FIND OUT THE POISON TAKEN

| Poison | Symptoms | Treatment |
|---|---|---|
| ACIDS Hydrochloric, Sulphuric or Sulfuric acid | Reddening, swelling, burning sensation in the affected, head and upper abdominal pain, ingestion of yellow or grey solids on the skin, if vomiting takes place, there will be a characteristic odor coming in contact with air. | No vomiting should be induced. Give plenty of water to dilute the acid. If possible, add two spoonfuls of weak alkali such as soda or milk of magnesia or plaster of paris wash to a pint of water. |
| ALKALIS Lye, Quick Lime, Ammonia, Caustic Soda, Potash | Stings on skin. Biting sometimes takes place there will not be any effect on skin on coming in contact with air. | Nothing should be induced. Give plenty of water to dilute the acid. If possible, add two spoonfuls of weak alkali such as soda or milk of magnesia or plaster of paris wash to a pint of water. |
| DISINFECTANTS Carbolic acid, Phenyl, Lysol, Dettol, Bleach, Cresololol | Odorous, Irritation, redness, blisters, itching, swelling, may lead to necrosis. | Do not make the casualty vomit. Give two spoonfuls of weak alkali such as soda or milk of magnesia or plaster of paris wash to a pint of water. |
| ALCOHOL Ethyl, Methylated spirit, other strong liquors | Same as above | Give tea or coffee on any vomiting & drink. Give heat to the feet and wash to the head. Induce vomiting by giving few spoonfuls of vomit and to be warm or by holding the back of the hand. |
| CARBON MONOXIDE Carbon monoxide, benzene, naphthalene, kerosene, paraffin, kerosene, phosphorus, acetone, gas, kerosene, etc. | Headache, dizziness, vomiting, nausea, weakness, loss of consciousness, etc. | Immediately remove the casualty from the place. Ensure free passage of air. Apply artificial respiration and oxygen. |
| ARSENIC Pot. arsenite, arsenic trioxide | Lips and face are blackish, contraction of pupils and stupor afterwards. | Give some arsenic to induce vomiting and give water scrubbing, drink, weak blackberry, coffee or tea, white of egg or lemon juice to drink, to prevent copious vomit and stridor. |
| COBALT Lithium, sodium, potassium, ammonium, cyanide, etc. | Coma and heart weakness. | Give some arsenic to induce vomiting. Keep the casualty awake. Give one spoon of arsenic or sodium salt with water. Give tea or coffee. |
| HEROINE Cocaine, opium | Pinpointing of pupil | Give some arsenic to induce vomiting. Give white of egg in water followed by milk, barley water or mineral. Give few spoonfuls of potassium permanganate dissolved in water. |
| HYDROFLUORIC ACID Copper used in photography & etching | Headache, blurred vision, swelling of throat and chest, slow pulse, cyanosis, etc. | It is an emergency, induce vomiting. Give artificial respiration. Repeat if necessary. Give water with few spoonfuls of potassium permanganate. |
| STRYCHNINE & IPECACUAN Strychnine, etc. | No action. | Induce vomiting, unless spasms have begun. Keep very quiet. Do not keep in movement. Give plenty of water. Apply artificial respiration. |
| URTICARIA Canned goods, etc. | Swelling of throat, itching, swelling of the face, etc. | Induce vomiting. Keep the casualty awake. Give an emetic. Prevent regression by washing with water. Relaxation by hot coffee or a hot medicinal whiskey. Apply warm and artificial respiration. |

FA15 : First Aid & Appliances

FIRST AID & APPLIANCES

FIRST AID LEARNING IS A CIVIC RESPONSIBILITY OF EVERY CITIZEN.

FIRST AID is to preserve life and assist the casualty in recovery until doctor is available.

FIRST AIDER is a person qualified to give first aid.

PRIORITY OF TREATMENT

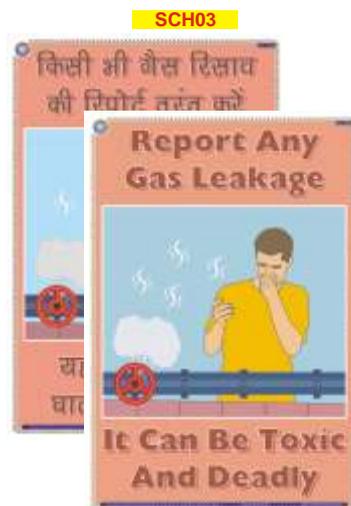
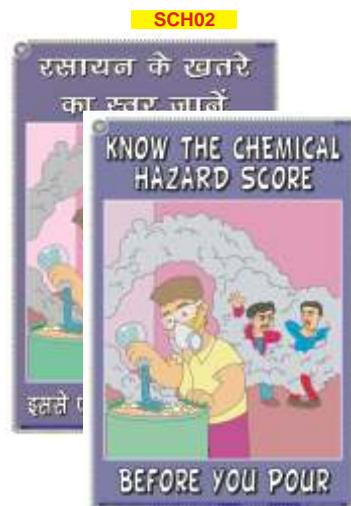
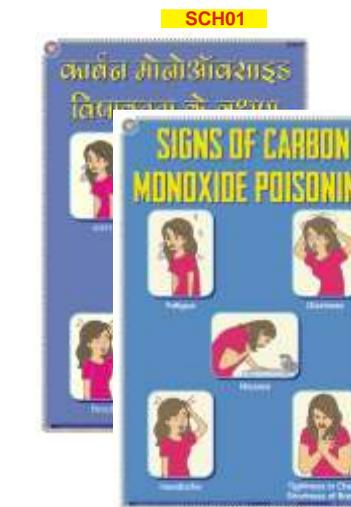
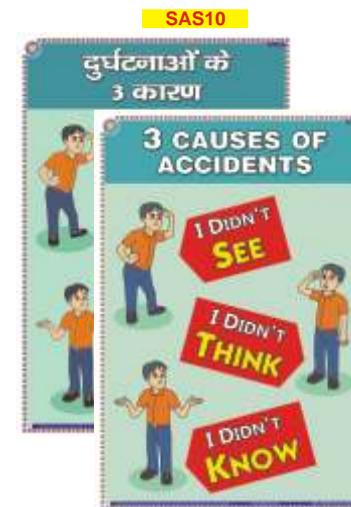
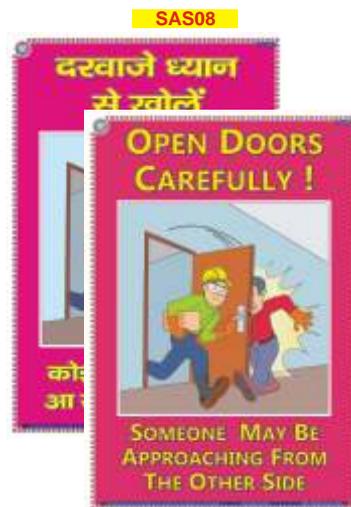
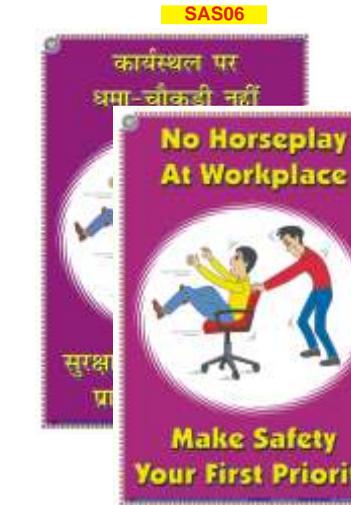
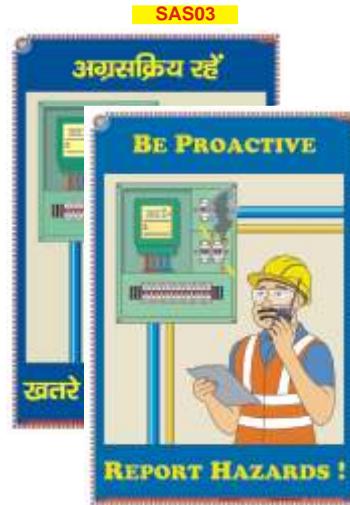
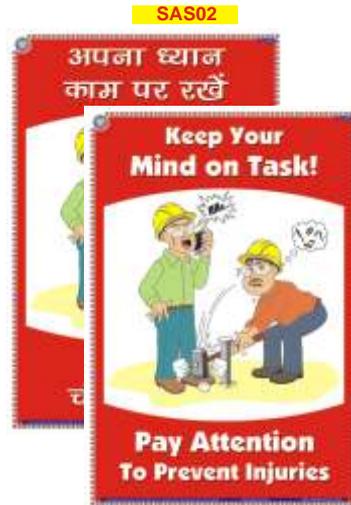
- Immediate response to call for assistance.
- Proper examination & diagnosis.
- Control of bleeding, if necessary give cardio-respiratory resuscitation.
- Treat shock with care of unconsciousness.
- Fracture immobilization.
- Eye, Ear, Nose injuries, burns, etc.
- Arrange transport for the injured to hospital or to his home.
- Assure the casualty of good treatment.

ESSENTIAL ITEMS FOR FIRST AID



Size: 33x48cm Quality: 250 gsm Paper, Laminated, Wall Stickable Available in English & Hindi Separately

SAFETY POSTERS



Available Topics: • Accidental Safety • Chemical Safety • Electrical Safety • Fire Safety • General Safety • Health Care / First Aid Safety • Industrial Safety • Material Handling Safety • Operational Safety

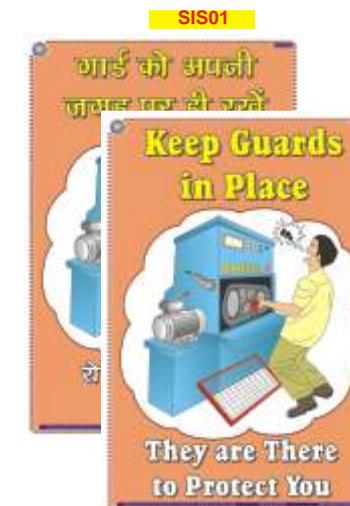
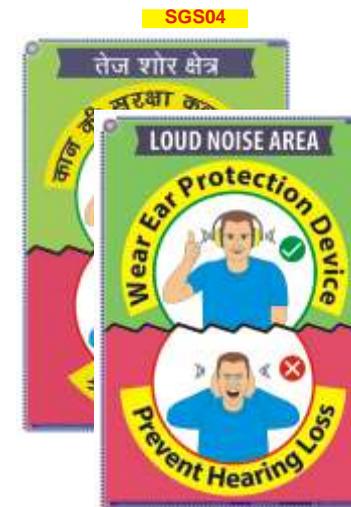
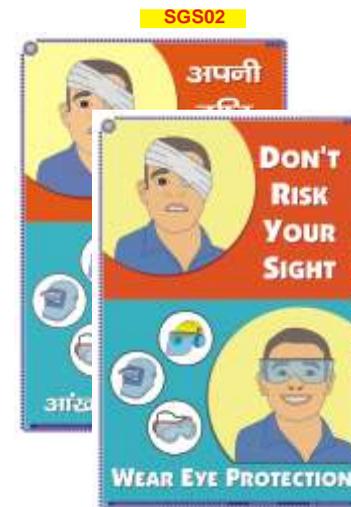
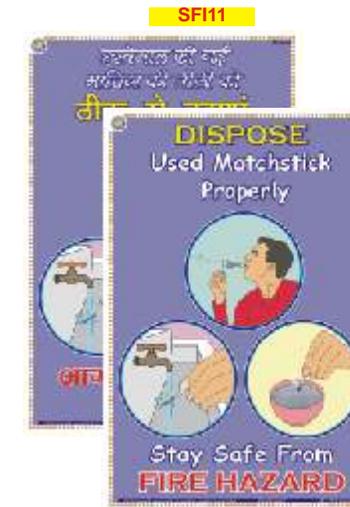


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SAFETY POSTERS

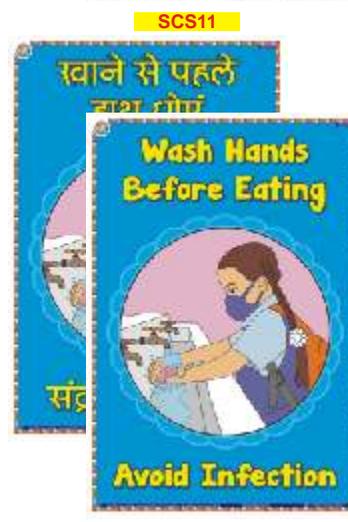
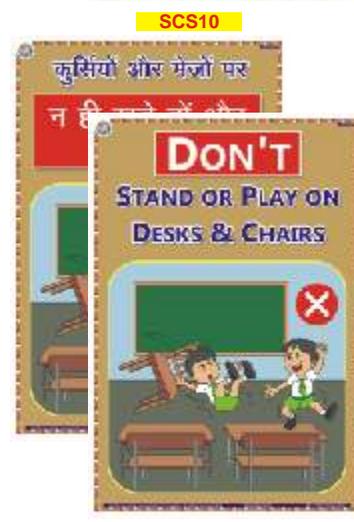
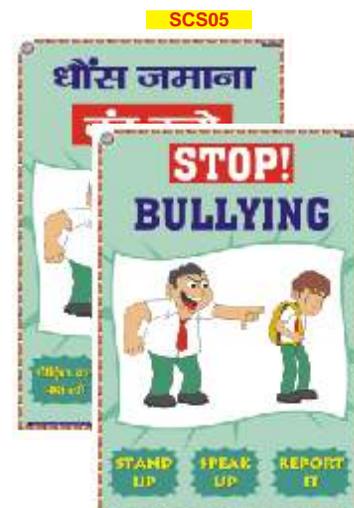
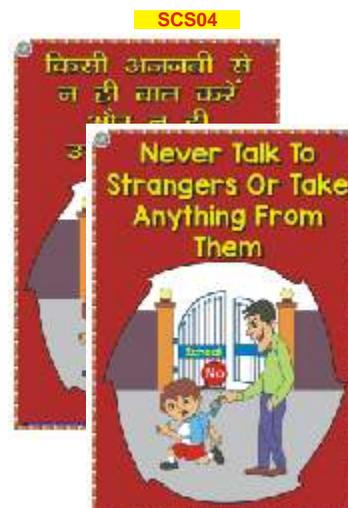
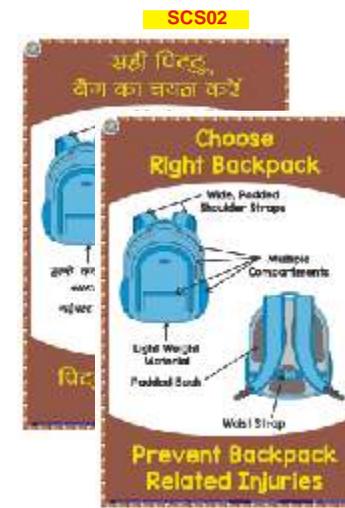
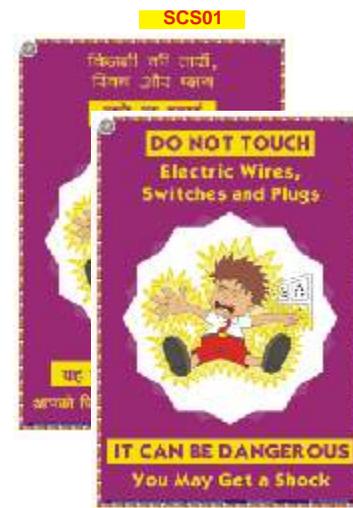
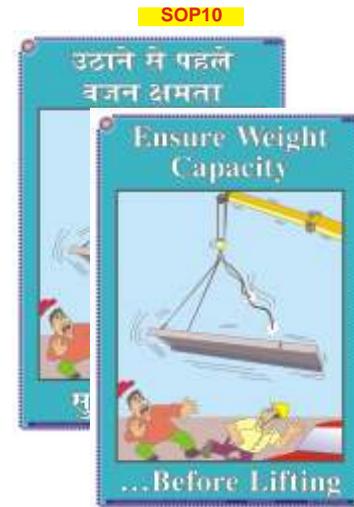
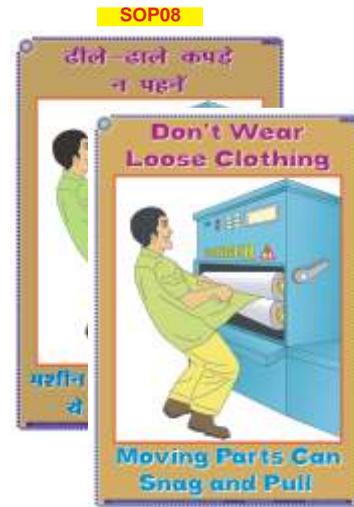
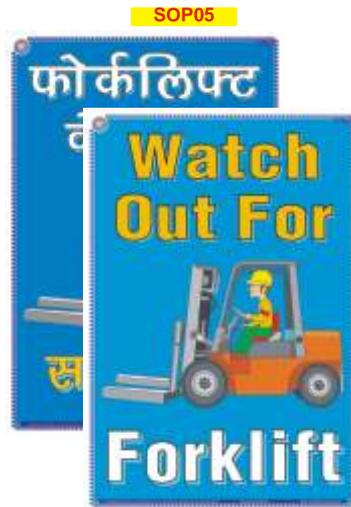


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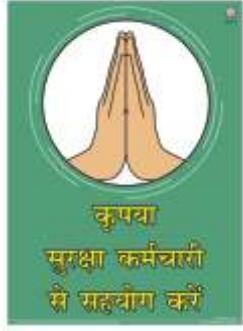
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Available Topics: • Accidental Safety • Chemical Safety • Electrical Safety • Fire Safety • General Safety • Health Care / First Aid Safety • Industrial Safety • Material Handling Safety • Operational Safety

CSS01H / CSM01H



CSS02H / CSM02H



CSS03H / CSM03H



CSS04H / CSM04H



CSS05H / CSM05H



CSS06H / CSM06H



CSS07H / CSM07H



CSS08H / CSM08H



CSS09H / CSM09H



CSS10H / CSM10H



CSS11H / CSM11H



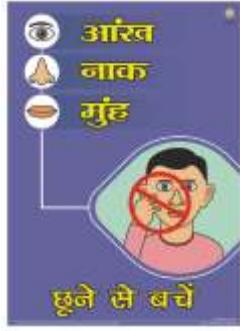
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CSS13H / CSM13H



CSS14H / CSM14H



CSS15H / CSM15H



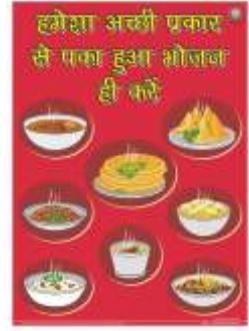
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CSS17H / CSM17H



CSS18H / CSM18H



CSS19H / CSM19H



CSS20H / CSM20H



CSS21H / CSM21H



CSS22H / CSM22H



CSS23H / CSM23H



CSS24H / CSM24H



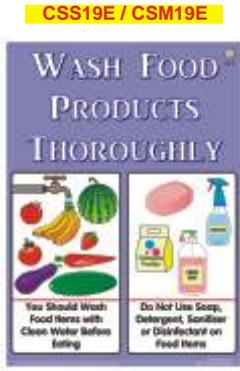
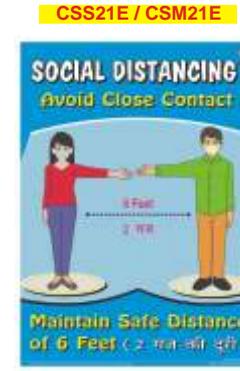
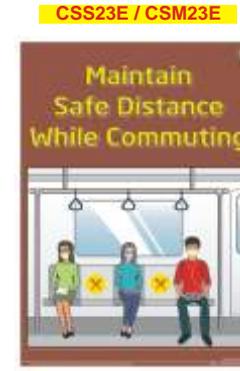
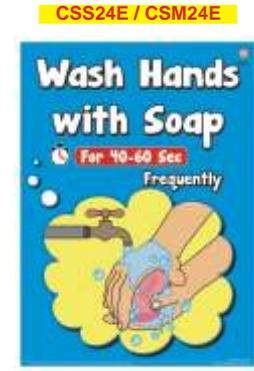
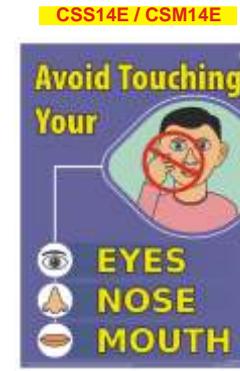
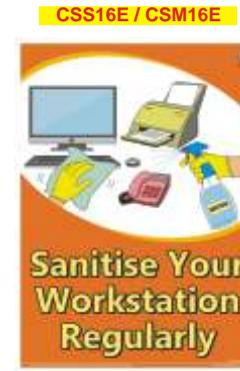
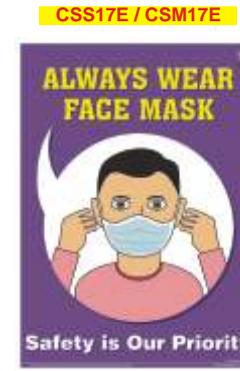
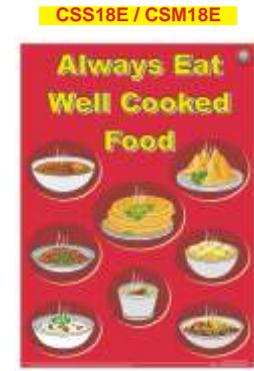
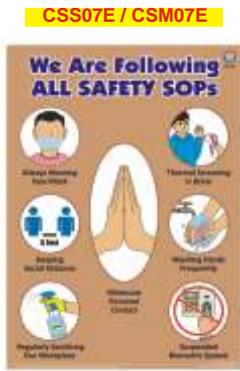
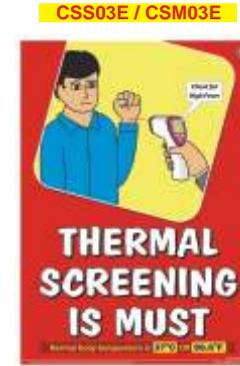


COVID SAFETY POSTERS

Small Size: 23x32cm,
Plastic Sticker Sheets

Medium Size: 32x47cm,
250 gsm Paper, Laminated

Available in
English & Hindi Separately,
Wall Stickable



YO01 : Shuddhi Kriyas

SHUDDHI KRIYAS (SHAT KARMAS)

| | | |
|---|---|---|
|  <p>Kunjal (Vaman Dhauti) Sit in Utkatasana and drink 4-6 glasses of lukewarm salty water. Bend forward. Touch the uvula by two fingers and do Uddiyan Bandha. Throw out all the water through the mouth.</p> |  <p>Kapal Bhati Exhale forcefully through the nose, turning the neck left and right, up and down. Repeat it 10 times. Do it after Jalneti also. Brain is cleaned, intelligence develops.</p> | |
|  <p>Jal Neti Take salty lukewarm water in a spout lota (vessel). Tilt it to let water enter into one nostril and come out through the other.</p> |  <p>Sutra Neti After wetting the sutra (string), insert its thin end in one nostril. When it touches the inner throat, draw it out from mouth with two fingers. Repeat this exercise through other nostril also.</p> |  <p>Ghrit Neti Drop 3-4 drops of ghee (Clarified butter) in both nostrils before going to sleep.</p> |
|  <p>Vastra Dhauti Keep wet dhauti's end on the last portion of the tongue and take it inside slowly. Keep a bit outside. Take out the vastra (muslin cloth) after Nauli/Uddiyan Bandha. Drink water if needed.</p> |  <p>Dand Dhauti Fill the stomach with normal water. Insert Dand Dhauti (rubber tube about one foot) in the mouth. Vomiting may happen. Take it out after doing Nauli or Uddiyan Bandha.</p> | |
|  <p>Nauli Karma First practice Uddiyan Bandha. Do middle Nauli, after that left & right and rotate right-left and left-right also many times.</p> |  <p>Basti (enema) Fill the enema pot with water. Put nozzle in anus to get the water in. Retain water for some time and go for latrine.</p> |  <p>Tratak Gaze at a bright point for 1 to 5 minutes. When water comes in eyes close them and do palming. Wash eyes with water.</p> |
| <p>Benefits</p> <ol style="list-style-type: none"> 1. Kunjal, Dand Dhauti & Vastra Dhauti: These remove the ailments of ulcer, blood, vatt (air), pitt (fire), kaff (water), skin diseases, constipation, asthma, dyspepsia, gas, blindness, anaemia. Remove heartburn and develop the appetite. 2. Neties: Ghrit Neti lubricates the nose, helps in sleep and to remove the mental dryness. Other netis are helpful in ear, nose, throat weaknesses, headache, sinus problems. 3. Nauli, Basti: Diseases related to stomach, kidney, urinary bladder and anus are removed. 4. Tratak — Develops concentration, will power and eyesight. | | |

YO02 : Shankh Prakshalan

SHANKH PRAKSHALAN

| | |
|--|---|
| <p>Asanas Do in Paschimottasana. Drink one glass lukewarm salty water.</p> | <p>Tiryak Tadasana Stand erect. Inhale. The tips of both hands, shake stretch the arms & feet upwards. See your feet towards right and left. Exhale. Inhale. Shake the arms.</p> |
| <p>Tiryak Bhujangasana Lie on your side or on your back. Look at the feet. Breathe in the nose. Right side up. Left side down. Do it 10 times. Do it after Uddiyan Bandha.</p> | <p>Hal Chakrasan Stand upright. Inhale. The tips of both hands, shake stretch the arms & feet upwards. See your feet towards right and left. Exhale. Inhale. Shake the arms.</p> |
| <p>Urdhva Dhanurasana Do in Paschimottasana. Inhale. The tips of both hands, shake stretch the arms & feet upwards. See your feet towards right and left. Exhale. Inhale. Shake the arms.</p> | <p>Shivasana Lie on your back and close your eyes. Look at the feet. Breathe in the nose. Right side up. Left side down. Do it 10 times. Do it after Uddiyan Bandha.</p> |
| <p>Benefits This is a wonderful exercise. It makes the body strong, healthy and active. It helps in the absorption of nutrients and the removal of toxins. It is a good exercise for the digestive system and the respiratory system. It is a good exercise for the heart and the lungs. It is a good exercise for the brain and the nerves. It is a good exercise for the eyes and the ears. It is a good exercise for the skin and the hair. It is a good exercise for the overall health and well-being of the body.</p> | |

YO04 : Yog Mudras, Padmasan & Matsyasan

YOG MUDRAS, PADMASAN & MATSYASAN

| | |
|---|--|
| <p>FAST MUDRAS FOR THE CALMNESS OF MIND</p>  <p>Four Fingered Mudra (Four Elements)</p> <p>Fig 1. Anjali Mudra (Prayer Mudra) Fig 2. Chin Mudra (Dhyan Mudra) Fig 3. Varuna Mudra (Water Element Mudra) Fig 4. Agni Mudra (Fire Element Mudra)</p> | <p>YOGA MUDRA</p>  <p>1. Sit in Padmasana. Hold your right wrist with left hand. 2. Bend forward. Breathe in. Inhale. Touch the forehead to the ground. 3. Make the hands spread. Breathe in. Inhale. Touch the forehead to the ground.</p> |
| <p>PADMASAN</p>  <p>1. Sit on the ground. Bend the knees. Bring the feet together. Sit on the heels. 2. Bend the right knee. Push the right foot towards the left. Bend the left knee. Push the left foot towards the right. Sit on the heels. 3. Place the right leg on left. Right heel towards left. Right foot towards left. Bend the right knee. 4. Place the left leg on right. Left heel towards right. Left foot towards right. Bend the left knee.</p> | <p>ARDHMATSYAN</p>  <p>1. Sit in Padmasana. Bend the right knee. Push the right foot towards the left. Bend the left knee. Push the left foot towards the right. Sit on the heels. 2. Bend the right knee. Push the right foot towards the left. Bend the left knee. Push the left foot towards the right. Sit on the heels.</p> |
| <p>Benefits This is a wonderful exercise. It makes the body strong, healthy and active. It helps in the absorption of nutrients and the removal of toxins. It is a good exercise for the digestive system and the respiratory system. It is a good exercise for the heart and the lungs. It is a good exercise for the brain and the nerves. It is a good exercise for the eyes and the ears. It is a good exercise for the skin and the hair. It is a good exercise for the overall health and well-being of the body.</p> | |

YO03 : Surya Namaskar

SURYA NAMASKAR

| | |
|--|---|
| <p>Asana 1 Stand upright. Inhale. The tips of both hands, shake stretch the arms & feet upwards. See your feet towards right and left. Exhale. Inhale. Shake the arms.</p> | <p>Asana 2 Stand upright. Inhale. The tips of both hands, shake stretch the arms & feet upwards. See your feet towards right and left. Exhale. Inhale. Shake the arms.</p> |
| <p>Asana 3 Stand upright. Inhale. The tips of both hands, shake stretch the arms & feet upwards. See your feet towards right and left. Exhale. Inhale. Shake the arms.</p> | <p>Asana 4 Stand upright. Inhale. The tips of both hands, shake stretch the arms & feet upwards. See your feet towards right and left. Exhale. Inhale. Shake the arms.</p> |
| <p>Asana 5 Stand upright. Inhale. The tips of both hands, shake stretch the arms & feet upwards. See your feet towards right and left. Exhale. Inhale. Shake the arms.</p> | <p>Asana 6 Stand upright. Inhale. The tips of both hands, shake stretch the arms & feet upwards. See your feet towards right and left. Exhale. Inhale. Shake the arms.</p> |
| <p>Benefits of Surya Namaskar This is a wonderful exercise. It makes the body strong, healthy and active. It helps in the absorption of nutrients and the removal of toxins. It is a good exercise for the digestive system and the respiratory system. It is a good exercise for the heart and the lungs. It is a good exercise for the brain and the nerves. It is a good exercise for the eyes and the ears. It is a good exercise for the skin and the hair. It is a good exercise for the overall health and well-being of the body.</p> | |

YO05 : Paschimottasana-Ardhmatsyendrasan

PASCHIMOTTANASAN-ARDHMATSYENDRASAN

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|--|--|
| <p>PASCHIMOTTANASAN</p>  <p>1. Sit on the ground. Bend the knees. Bring the feet together. Sit on the heels. 2. Bend the right knee. Push the right foot towards the left. Bend the left knee. Push the left foot towards the right. Sit on the heels.</p> | <p>ARDHMATSYENDRASAN</p>  <p>1. Sit in Padmasana. Bend the right knee. Push the right foot towards the left. Bend the left knee. Push the left foot towards the right. Sit on the heels. 2. Bend the right knee. Push the right foot towards the left. Bend the left knee. Push the left foot towards the right. Sit on the heels.</p> |
| <p>Benefits This is a wonderful exercise. It makes the body strong, healthy and active. It helps in the absorption of nutrients and the removal of toxins. It is a good exercise for the digestive system and the respiratory system. It is a good exercise for the heart and the lungs. It is a good exercise for the brain and the nerves. It is a good exercise for the eyes and the ears. It is a good exercise for the skin and the hair. It is a good exercise for the overall health and well-being of the body.</p> | |

YO06 : Vajrasan, Ushtrasan & Suptavajrasan

VAJRASAN, USHTRASAN & SUPTAVAJRASAN. Includes diagrams and instructions for Vajrasana, Ushtrasana, and Suptavajrasana.

YO07 : Bhujangasan, Shalabhasan, Dhanurasan & Mayurasan

BHUJANGASAN, SHALBHASAN, DHANURASAN & MAYURASAN. Includes diagrams and instructions for Bhujangasana, Shalabhasana, Dhanurasana, and Mayurasana.

YO08 : Pawan Muktasan & Chakrasan

PAWAN MUKTASAN & CHAKRASAN. Includes diagrams and instructions for Pawanuktasana and Chakrasana.

YO09 : Sarvangasan & Halasan

SARVANGASAN & HALASAN. Includes diagrams and instructions for Sarvangasana and Halasana.

YO10 : Bandh and Pranayam

BANDH AND PRANAYAM. Includes diagrams and instructions for various Bandhas (Uddiyana, Jalandhara, Mula) and Pranayamas (Nadi, Kapalabhati, Bhramari, etc.).

YO11 : Spine and Related Organs

SPINE AND RELATED ORGANS. Includes diagrams of the spine and instructions for various Yogasanas for a healthy spine.

YO12 : Healthy Eyes

HEALTHY EYES. Includes diagrams and instructions for various YOGIC EXERCISES FOR EYESIGHT.

YO13 : Pawanuktasan & Chakrasan

PAWAN MUKTASAN & CHAKRASAN. Includes diagrams and instructions for Pawanuktasana and Chakrasana.

CHARTS ON YOGA. A set of 12 charts, Size 50 x 70 cm. Laminated, (Available in English-Hindi Combined)

INC01 : Breast Changes in Pregnancy

BREAST CHANGES IN PREGNANCY

Breast Anatomy (Sagittal View)

During pregnancy, lobules (milk-producing glands) increase in size and number in preparation for breast-feeding the baby. By the end of the first trimester, they can produce colostrum, the yellow fluid that provides antibodies to protect against allergy and respiratory and gastrointestinal infections in the newborn.

Milk glands in Non-lactating Breast **Milk glands in Engorged Breast**

BREAST CHANGES DURING PREGNANCY

Histological changes during Pregnancy
 During pregnancy, terminal tubules are converted to acinar structures. The lumens are enlarged and connective tissue is compressed. The secretory epithelial cells are now mature.

BREAST CHANGES DURING PREGNANCY

1. Hormonal changes in pregnancy can cause improved blood flow and some changes in breast tissues. This causes swelling in breasts, soaring, tingling and abnormally sensitive to touch.
2. Breasts start increasing its size at about eight weeks of pregnancy.
3. Skin start stretching, feel itchiness and develop stretch marks.
4. Nipple and areola become darker and bigger.
5. During third months of pregnancy, the colostrum start producing. In last months of pregnancy, breasts will leak a little amount of thick yellowish liquid.
6. The small glands on the surface of the areola called as Montgomery's tubercles become raised bumps.

12th week of Pregnancy
Breast will feel heavier and tender.

20th week of Pregnancy
Nipple and areola became darker and more prominent. Note raised bumps of Montgomery Gland.

Lactating breast
Note bigger areola and somewhat flat nipple due to engorgement.

INC02 : Uterine Changes During Pregnancy

UTERINE CHANGES DURING PREGNANCY

CHANGES IN THE BODY OF UTERUS

1. For the first few weeks the uterus is relatively unaltered.
2. By 12 weeks the uterus is about twice its normal size.
3. By 16 weeks the uterus is no longer retroverted and anteflexed and the cervix of the uterus becomes upright. The fundus may be palpated abnormally above the symphysis pubis.
4. By 18 weeks uterus becomes more spherical stage due to softening of the ligaments.
5. At 20 weeks the fundus can be palpated at the level of the umbilicus. From here it remains stationary or ascends and has rounded, dome-shaped fundus.
6. At 28 weeks of pregnancy the fundus may be palpably midway between umbilicus & xiphisternum.
7. Uterus reaches the level of the xiphisternum at the 36th week of pregnancy. Lightening begins as uterine fundus height and anteroposterior pressure on the upper part of abdomen.
8. Cervix remains 2 to 3 cm long throughout pregnancy but becomes softer & looser because of increased progesterone.
9. Subcutaneous fat on the abdomen increases by 24 weeks & by 32 weeks the normal 0.5 cm is lost by the 32nd week. Effacement occurs during the latter half of pregnancy in primipara. The cervix becomes more or less effaced.

Height of fundus by weeks of normal gestation with a single foetus

Enlarging Uterus During Gestation Period
 Note Displacement of internal abdominal structures and diaphragm

Changes in Uterine Size & Shape in Puerperium Period

INC03 : First Stage of Labour

FIRST STAGE OF LABOUR

CERVICAL EFFACEMENT AND DILATION

A. Foetal Position before labour begins **B. Foetus moves into the birth canal and cervix begins to dilate.**

FIRST STAGE OF LABOUR IS DIVIDED INTO TWO PHASES

A. Latent Phase

1. Definition
 - a. Cervical dilation <3 cm and
 - b. Regular contractions
2. Normal Progress
 - a. Multiparous women
 - i. Mean duration: 0.6 hours
 - ii. Maximum normal duration: 28 hours
 - b. Multiparous women
 - i. Cervical dilation: >1.2 cm/hour
 - ii. Foetal Descent: >1 cm/hour

B. Active Phase

1. Definition
 - a. Cervical dilation >3 cm and
 - b. Regular contractions
2. Normal Progress
 - a. Multiparous women
 - i. Cervical dilation: >1.2 cm/hour
 - ii. Foetal Descent: >1 cm/hour
 - b. Multiparous women
 - i. Cervical dilation: >1.5 cm/hour
 - ii. Foetal Descent: >2 cm/hour

INC04 : Second Stage of Labour

SECOND STAGE OF LABOUR

A. Expulsion of the head of the foetus from uterus.

B. Expulsion of the foetus from uterus.

The second stage of labour begins when the cervix is completely opened and ends with the delivery of the baby. The second stage is often referred to as the "pushing" stage. During the second stage, the woman becomes actively involved by pushing the baby through the birth canal to the outside world. When the baby's head is visible at the opening of the vagina, it is called "crowning". The second stage is shorter than the first stage, and generally takes between 30 to 60 minutes in a woman's first pregnancy.

INC05 : Third Stage of Labour

THIRD STAGE OF LABOUR

After the baby is delivered, the new mother enters the third and final stage of labour — delivery of the placenta. This stage usually lasts just a few minutes and involves the passage of the placenta out of the uterus and through the vagina.

A. EXPULSION OF THE PLACENTA

B. CONTRACTION OF UTERUS

C. EXPELLED PLACENTA

INC06 : Complete Breech Presentation

COMPLETE BREECH PRESENTATION

Complete Breech (Flexed)
Legs are normally flexed as in the vertex position.

Vaginal Examination of Complete Breech
Sacrum, anus, genitalia and feet can be identified. The sacrum can be mistaken for the occiput unless all foraminae are palpated.

INC07 : Incomplete Breech Presentation

INCOMPLETE BREECH PRESENTATION

The incomplete breech presents with the hips flexed and legs extended on the abdomen. Severity depends on breech presentation and of this type and it is particularly common in primigravidae whose gastrocnemius muscle tone initially flexes the legs and free turning of the fetuses.

Frank Breech
(Breech with extended legs)
Lx: Longitudinal or vertical
Presenting Part: Sacrum
Attitude: Flexion, except for legs at knees

Vaginal Examination of frank breech in RSL position
No feet felt - the legs are extended

INC08 : Foot Presentation

FOOT PRESENTATION

Footling Breech
This is rare. One or both feet present because neither hips nor knees are fully flexed. The feet are lower than the buttocks, which distinguishes it from the complete breech.

Single Footling Presentation

Knee Presentation
Knee presentation is very rare. One or both hips are extended with the knees flexed.

INC09 : Shoulder Presentation

SHOULDER PRESENTATION

- Shoulder Presentation**
 - Occurs when foetus is transverse with back down
 - Shoulder sits over pelvic inlet
- Epidemiology**
 - Incidence: 0.3% of singleton births
- Causes**
 - Prematurity
 - Placenta Praevia
 - Abnormal uterus
 - Contracted pelvis or relaxed abdominal wall
 - Polyhydramnios
- Diagnosis**
 - Leopold's Manoeuvres
 - Transverse lie should be easy to identify
 - Digital cervical exam
 - No presenting part
- Management**
 - Caesarean section required in most cases
 - Indications to consider External Cephalic Version
 - Intact membranes and no labour
 - Back-up transverse lie with cervix fully dilated
- Complications**
 - Uterine Rupture

Dorsoanterior Shoulder Presentation

Dorsoanterior Shoulder Presentation

INC10 : Face Presentation

FACE PRESENTATION

When the attitude of the head is one of complete extension, the occiput of the foetus will be in contact with its spine and the face will present. The incidence is about 1 : 500 or less. In face presentation position, the denominator is the mentum.

Vaginal examination in LMA position.
Subnubregmatic diameter measures 9.5 cm.

Six positions of face presentation

INC11 : Brow Presentation

BROW PRESENTATION

Vaginal examination with brow presentation.

Moulding in a brow presentation (dotted line)

| | 17P or 1st 47B |
|-------------------------------------|----------------|
| Incidence | 99 |
| Multiplex | 99 |
| Primip | 99 |
| Fetal mortality | 2 |
| Acromioclavicular joint dislocation | 0 |
| Hydrocephalus | 0 |
| Misdiagnosis - vaginal | 4 |
| Delivery | 99 |
| Spontaneous | 99 |
| Forceps | 99 |
| Caesarean section | 99 |

* Includes one set of twins where both babies presented by the brow

INC12 : Twin Pregnancy

TWIN PREGNANCY

DIZYGOTIC TWINS

MONOZYGOTIC TWINS

INC13 : Placenta Praevia

PLACENTA PRAEVIA

Placenta Praevia: Abnormal implantation of Placenta in lower Uterine Segment. About 80% cases occur in Multiparous. Probability increases after the age of 35.

Low Lying Placenta Praevia (Part of the placenta lies in the lower segment, but does not reach the cervical os)

Partial Placenta Praevia (Placenta covers the cervical os when closed, but not completely when it is dilated)

Total Placenta Praevia (Placenta totally covers the cervical os)

Risk Factors

- Previous Myomectomy
- Scarred uterus or VBAC
- Previous Abortion
- Endometriosis
- Multiparity
- Erythroblastosis

IMPORTANT NURSING CHARTS
A set of 20 charts, Laminated Rigid or Laminated Flexible
Size 51 x 66 cm (Available in English only)

INC14 : Caput Succedaneum

CAPUT SUCCEDANEUM

Caput succedaneum is a transient swelling, most commonly found on the occiput. With antenatal presentation, the subpressure of the skull against the cervix results in compression of fetal vessels, thereby slowing circulation. The slower return causes an increase in fluid volume within the tissue of the scalp, and an edematous swelling develops. This swelling presents at birth, subsides within 24 hours of the head and disappears spontaneously within 3 to 4 days.

Edema
Sagittal suture
Scalp
Periosteum
Skull bone

Newborn with edematous head or gross caput with resulting

CEPHALHAEMATOMA

Cephalohematoma is a collection of blood between a skull bone and its periosteum. Cephalohematoma does not cross a suture; that is, the blood is confined to the skull bone that bears the periosteum. Cephalohematoma may occur with spontaneous birth from pressure against the maternal bony pelvis. A cephalohematoma is usually a benign condition that resolves on its own. The swelling of a cephalohematoma is spontaneously resolved in 2 to 6 weeks.

Tears blood vessels
Blood
Scalp
Periosteum
Sagittal suture
Skull bone

Newborn with a Cervical Lymphatic Malformation
It starts in 1/36 as a congenital defect and 85% in the cervical area. 20% of the cases are associated with the malformation. These are not produced in children but during embryonic development. Therefore, it is not a disease.

INC15 : Congenital Malformations of New Born

CONGENITAL MALFORMATIONS OF NEW BORN

Total Anomalous Pulmonary Venous Return

Encephalocele is a congenital malformation that occurs in the fetus. It is a protrusion of the spine and the meninges of the spinal cord through an opening in the vertebral arch. The child is born with a protruding mass on the back of the spine. The child is born with a protruding mass on the back of the spine. The child is born with a protruding mass on the back of the spine.

Heart
Aorta
Pulmonary artery
Pulmonary vein
Superior vena cava
Inferior vena cava

Frontal Encephalocele

Occipital Encephalocele

Lymphatic Malformation (LM)

A newborn with a Cervical Lymphatic Malformation

INC16 : Cleft Lip-Palate

CLEFT LIP-PALATE

Unilateral cleft lip (partial)

Unilateral cleft of primary palate (complete, involving lip and alveolar ridge)

Bilateral cleft lip

Partial cleft of palate

Complete cleft of secondary palate and unilateral cleft of primary palate

Cleft lip and palate are congenital anomalies resulting in structural facial malformation. The lip and palate, fail to close in approximately 1 in every 1,000 newborns. Cleft lip (with or without cleft palate) occurs more frequently in males, and isolated cleft palate is more frequent in females. Combination of cleft lip and cleft palate occurs in approximately 50% of cases; cleft lip alone occurs in about 25% of cases; and cleft palate alone occurs in about 25% of cases.

INC17 : Spina Bifida

SPINA BIFIDA

Spina bifida is a type of birth defect called a neural tube defect. In spina bifida, a baby's spine does not close completely during early pregnancy. Spina bifida can begin to develop in the fetus even before the mother knows she is pregnant.

Spina bifida with neural crest

Myelomeningocele
• This is the most severe form of spina bifida.
• A cyst made up of membranes, nerve roots, and sometimes the spinal cord itself comes through the open spine.
• Substantial problems including paralysis and incontinence of bowel and bladder may occur. These symptoms are frequently relieved by surgery.
• Myelomeningocele is frequently accompanied by changes in the spinal cord that prevent cerebrospinal fluid from circulating normally around the brain. These changes may require additional surgery to prevent increased pressure in the spinal fluid, which goes into the cranial cavity, thus leading to a serious condition called "hydrocephalus." This causes pressure on the brain itself.

Rhinoglossocele
• A cleft made up of membranes, which surround the spinal cord, protrudes through the open part of the spine.
• Spinal fluid can leak out.
• The cyst can be surgically removed.
• Development after surgery is usually normal.

INC18 : Hydrocephalus

HYDROCEPHALUS

Hydrocephalus is a condition of altered production, flow, or absorption of cerebrospinal fluid (CSF). It is characterized by an abnormal increase in CSF volume within the intracranial cavity and by enlargement of the head's contour. Occurs in approximately three to four cases per 1,000 births.

Clinical appearance in advanced hydrocephalus

Section through brain showing dilatation of lateral and 3rd ventricles

Pathophysiology and Aetiology

1. Monogenic hydrocephalus
 - May be familial, sporadic, or complex
 - Occurs in the majority of cases
 - Usually congenital aetiology
 - Also caused by acquired conditions, such as infectious, trauma, spontaneous intracranial bleeding, and neoplasms.
2. Communicating hydrocephalus
 - Failure in the absorptive system
 - Excessive production of CSF
 - The ventricular system becomes grossly dilated.

Clinical Manifestations in Infants

1. Excessive head growth
2. Dilated fontanelles of the anterior fontanelle
3. Fontanelles tense and elevated above the surface of the skull.
4. Signs of increased intracranial pressure
5. Late physical signs
 - Fontanelle becomes prominent
 - Scalp appears shiny with prominent scalp veins
 - Eyeballs and nostrils may be drawn upward, opening the bridge above the iris
 - Infant cannot gaze upward, causing "sunset eyes"
 - Diarrhoea, vomiting, and/or atrophy may occur
 - Difficult feeding
 - Physical or mental developmental lag

Diagnostic Evaluation

1. Ophthalmology may reveal papilloedema
2. Intracranial shunts for selected cases of noncommunicating hydrocephalus
3. Behavioural alerts (used commonly)

Prognosis

1. Many children experience normal motor and intellectual development.
2. The severity of neurologic deficits is directly proportional to the interval between onset of hydrocephalus and the time of diagnosis.
3. Approximately two-thirds of patients survive at any early age if they do not receive surgical treatment.

INC19 : Anencephalus

ANENCEPHALUS

Anencephalus is a neural tube defect occurring prior to 28 days which prevents the closure of the anterior neuropore resulting in a large defect of the calvarium, meninges and skull.

Clinical Appearance in Anencephaly

Development of Neural Tube

Risk Factors

1. Down's syndrome is a 4% and an increase in 10% if a couple has had 2 previous anencephalic infants
2. Maternal and paternal advanced age
3. Poly- and single drug use

Associated Anomalies

1. 80% polyhydramnios (excess in amniotic fluid)
2. 10-20% bowel atresia, cleft palate, congenital heart disease

Pathogenesis

1. Both cerebral hemispheres and the spinal cord potential tracts are absent
2. Absence of the calvarium
3. Residue of the brain is usually present
4. Hypoplastic pituitary gland
5. The remaining brain remaining consists of portions of connective tissue, vessels, and meninges

Clinical Features

1. Defective appearance: a large defect in the skull of the skull (calvarium) meninges, and any exposed soft membrane mass of neural tissue covered with a thin membrane continuous with the skin.
2. The skull defect may extend cranially to the orbital region exposing a flat and flattened spinal cord (prosencephalic).
3. The optic chiasm may protrude due to hydrocephalus (raised intracranial pressure).

Medical Care

1. Prenatal Diagnosis
 - Elevated maternal serum alpha-fetoprotein (AFP)
 - Level 1 ultrasound
 - Amniocentesis - elevated AFP and acetylcholinesterase

Management

1. No Treatment. Most infants will survive in or die within several days of birth.

INC20 : Breast Self Examination

BREAST SELF EXAMINATION

Look in the mirror for visual signs and consult a doctor as soon as possible if you notice any of these changes. The woman then palpates her breasts with the pads of her fingers to feel for lumps (either superficial or deeper in tissue) or soreness.

Visual Signs to Watch For

1. Asymmetry in breast size or shape
2. Changes in breast contour or shape
3. A lump or mass
4. Dimpling or distortion of the breast skin
5. Inverted or retracted nipple

Palpation of the Breast

1. Palpation of the breast with the pads of the fingers
2. Palpation of the breast with the tips of the fingers
3. Palpation of the breast with the base of the fingers

Three Ways to Palpate Breast

1. Vertical pattern
2. Circular pattern
3. Wedge pattern

DMN001 : Human Skeleton

HUMAN SKELETON

Anterior View | **Posterior View**

Skeletal System
Skeleton is a flexible structure of rigid bones which provide shape, movement and support to the body and offer protection to the internal organs. The rigid bones are held within the muscles and other soft tissues. Movement is only possible because of the way bones are joined to one another at joints and the way muscles are attached to these bones. On an average there are 206 bones of various shapes and sizes in an adult human skeleton.

DMN002 : Different Types of Joints

DIFFERENT TYPES OF JOINTS

A joint also called articulation or suture, is a point of contact between two bones, between bone and cartilage between bone and both. Joints are classified into two main types: fibrous joints and synovial joints. This classification is based on the nature of the joint.

1. Fibrous joints are characterized by the presence of a fibrous band or ligament between the bones. They are found in the skull and between the ribs and the vertebral column.

The fibrous joints are classified into three types: sutures, syndesmosis and gomphosis. Sutures are found in the skull, syndesmosis is found between the tibia and fibula, and gomphosis is found between the teeth and their sockets.

SYNOVIAL JOINTS

Shoulder Joint
The shoulder joint is a ball-and-socket joint. It is formed by the head of the humerus and the glenoid cavity of the scapula. It is surrounded by a joint capsule and is supported by ligaments and muscles.

Elbow Joint
The elbow joint is a hinge joint. It is formed by the distal humerus and the proximal radius and ulna. It is surrounded by a joint capsule and is supported by ligaments and muscles.

Knee Joint
The knee joint is a complex joint. It is formed by the distal femur and the proximal tibia. It is surrounded by a joint capsule and is supported by ligaments and muscles.

Wrist Joint
The wrist joint is a complex joint. It is formed by the distal radius and ulna and the proximal carpal bones. It is surrounded by a joint capsule and is supported by ligaments and muscles.

Interphalangeal Joint
The interphalangeal joints are hinge joints. They are found between the phalanges of the fingers and toes. They are surrounded by a joint capsule and are supported by ligaments and muscles.

Intervertebral Joint
The intervertebral joints are complex joints. They are found between the vertebrae of the spine. They are surrounded by a joint capsule and are supported by ligaments and intervertebral discs.

Other types of joints shown: I. Gomphosis, II. Syndesmosis, III. Suture, IV. Synsiphysis, V. Sphero-siphysis.

DMN003 : Different Types of Vertebra, Atlas

DIFFERENT TYPES OF VERTEBRA, ATLAS

General Structure of a Vertebra

Position of Atlas in the Cervical Spine

Atlas (C1), Anterior View

Atlas (C1), Inferior View

Atlas (C1), Left Lateral View

Atlas (C1), Superior View

DMN004 : Different Types of Vertebra, Axis

DIFFERENT TYPES OF VERTEBRA, AXIS

General Structure of a Vertebra

Position of Axis in the Cervical Spine

Axis (C2), Anterior View

Axis (C2), Proximal Superior View

Axis (C2), Left Lateral View

Axis (C2), Superior View

DMN005 : Different Types of Vertebra, Cervical

DIFFERENT TYPES OF VERTEBRA, CERVICAL

First Cervical Vertebra (Axis)

Second Cervical Vertebra (Axis)

The Cervical Spine

Fourth Cervical Vertebra (Vertebra Prominens)

DMN006 : Different Types of Vertebra, Thoracic

DIFFERENT TYPES OF VERTEBRA, THORACIC

Second Thoracic Vertebra

General Structure of a Vertebra

Sixth Thoracic Vertebra

The Thoracic Spine

Tenth Thoracic Vertebra

DMN007 : Different Types of Vertebra, Lumbar

DIFFERENT TYPES OF VERTEBRA, LUMBAR

Second Lumbar Vertebra

General Structure of a Vertebra

Fourth Lumbar Vertebra

The Lumbar Spine

Fifth Lumbar Vertebra

DMN008 : Different Types of Arm Bones

DIFFERENT TYPES OF ARM BONES

Right Humerus

Proximal Right Humerus

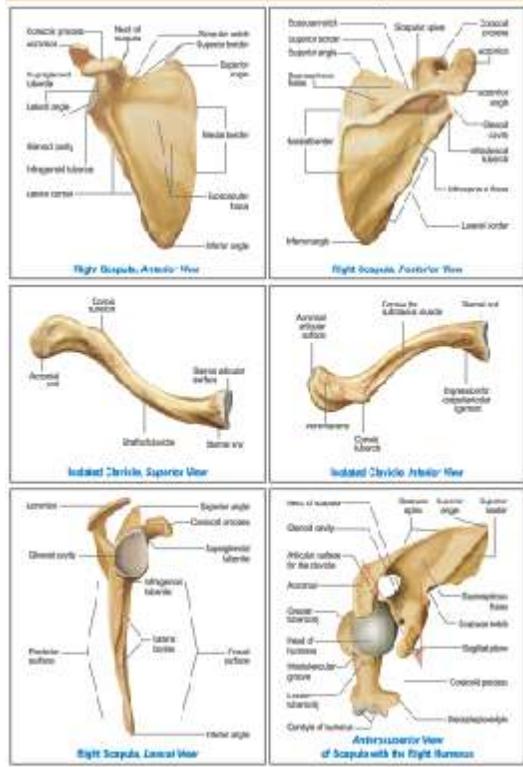
Distal Right Humerus

Right Radius

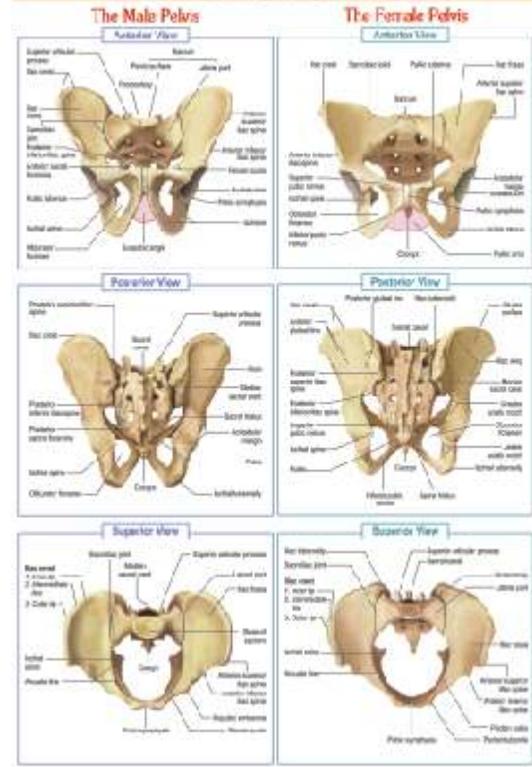
Right Ulna

Articular Surfaces of Radius and Ulna

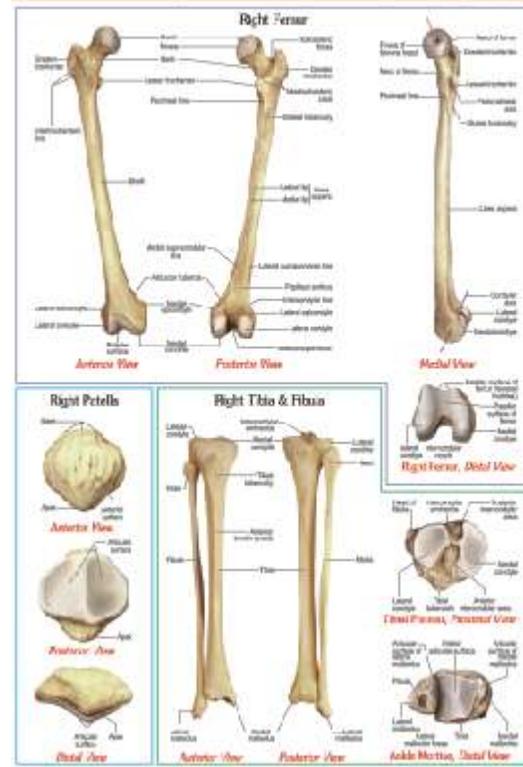
DMN009 : Different Types of Bones, Scapula
DIFFERENT TYPES OF BONES, SCAPULA



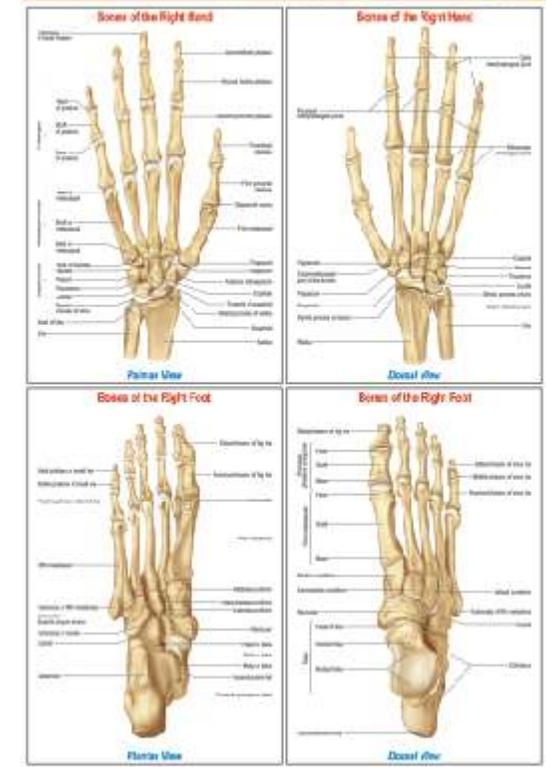
DMN010 : The Pelvic Girdle
THE PELVIC GIRDLE



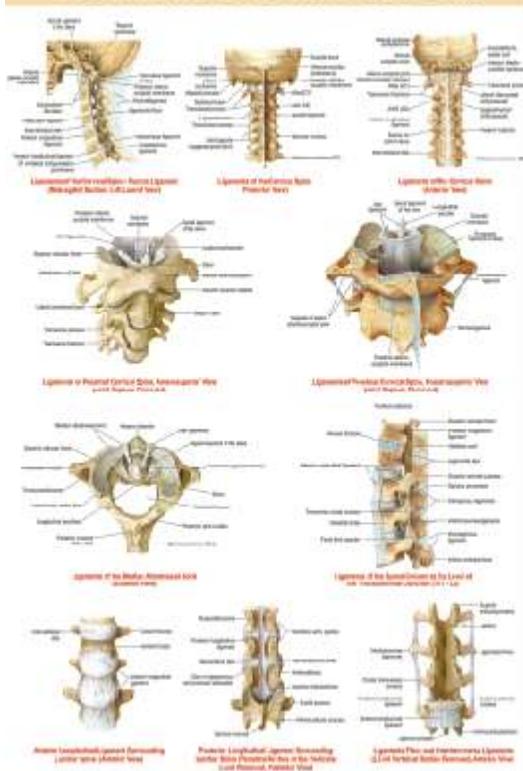
DMN011 : Different Types of Leg Bones
DIFFERENT TYPES OF LEG BONES



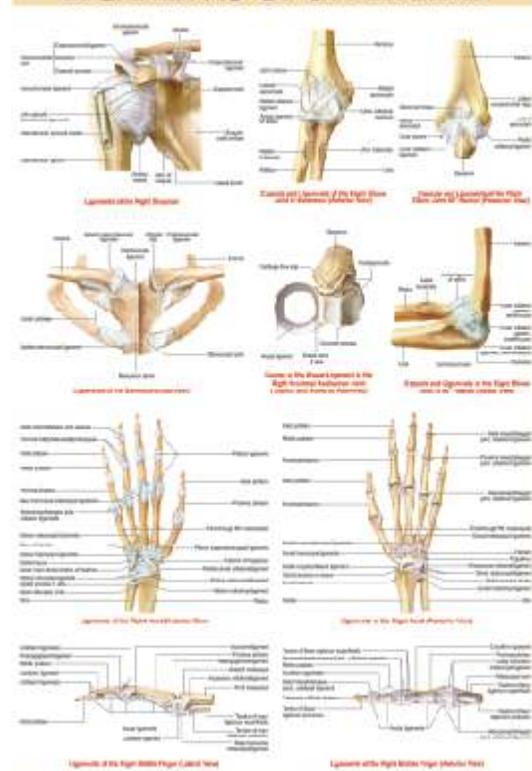
DMN012 : Human Hand And Foot Bones
HUMAN HAND AND FOOT BONES



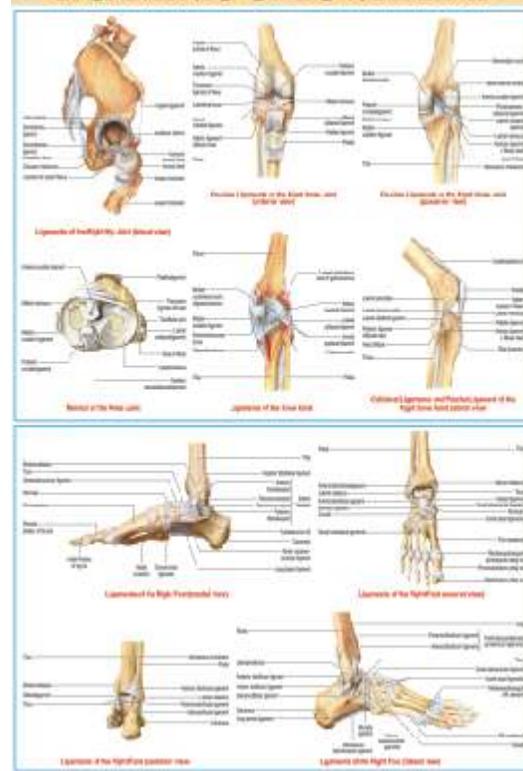
DMN013 : Ligaments of Spinal Column
LIGAMENTS OF SPINAL COLUMN



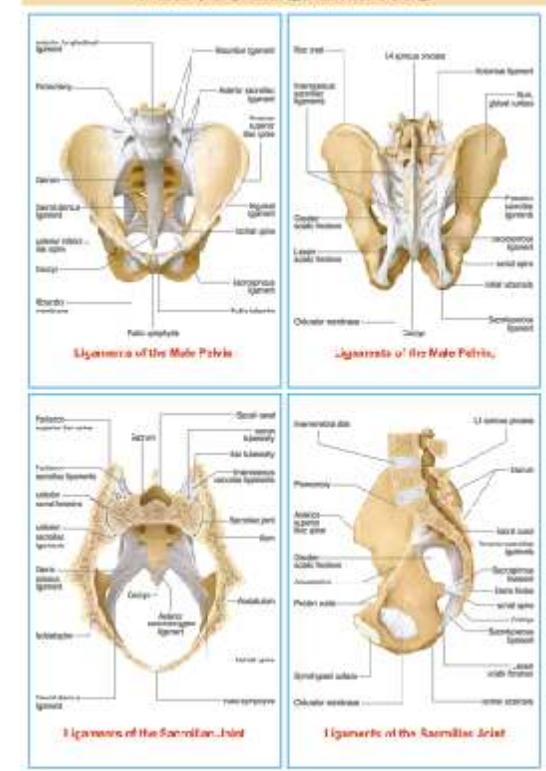
DMN014 : Ligaments of Upper Limb
LIGAMENTS OF UPPER LIMB



DMN015 : Ligaments of Lower Limb
LIGAMENTS OF LOWER LIMB



DMN016 : Pelvic Ligaments
PELVIC LIGAMENTS



DMN017 : Hip and Knee

HIP AND KNEE

Pelvis (Hip)

Anterior View, Posterior View, Right Hip Joint (Lateral View)

Knee & Its Ligaments

Anterior View, Posterior View, Lateral View

Patella

Anterior View, Posterior View, Dorsal View

DMN018 : Vertebral Column

VERTEBRAL COLUMN

Anterior View, Posterior View, Left Lateral View

DMN019 : Bone: Structure & Formation

BONE : STRUCTURE & FORMATION

DETAILED BONE STRUCTURE

BONE FORMATION

BONE FORMATION IN CHILDHOOD

DMN100 : Dentition-Teeth Types

DENTITION - TEETH TYPES

Teeth are classified according to their shape and function into four types: Incisors, Canines, Premolars, and Molars.

Tooth Structures

Toothing

Upper Jaw, Lower Jaw

Types of Teeth

| Incisors | Canines | Premolars | Molars |
|---------------------------|-------------------|---------------------------|---------------------------|
| Upper Jaw: I1, I2, I3, I4 | Upper Jaw: C1, C2 | Upper Jaw: P1, P2, P3, P4 | Upper Jaw: M1, M2, M3, M4 |
| Lower Jaw: I1, I2, I3, I4 | Lower Jaw: C1, C2 | Lower Jaw: P1, P2, P3, P4 | Lower Jaw: M1, M2, M3, M4 |

Arrangement of Teeth in the Mouth

Mandibular and Maxillary Teeth (Exposed) - Lateral Aspect

DMN101 : Mammalian Skin - V.S.

MAMMALIAN SKIN - V.S.

Mammalian skin has a thick epidermis and a thick dermis. It is composed of two main layers. The epidermis is stratified squamous epithelial tissue consisting of many cells. The dermis consists of loose connective tissue, nerves, blood vessels, and sweat glands.

Skin Structure

Longitudinal Section of the Hair Follicle

Sense of Touch - Tactile Corpuscles

Layers of the Epidermis

DMN102 : Trachea

TRACHEA

Ventral Aspect, Dorsal Aspect

Cross-section of Trachea

Microscopic views of the trachea

(A) Higher magnification of the tracheal wall, (B) Higher magnification of the internal surface.

DMN103 : Larynx

LARYNX

Anterior view, Posterior view, Sagittal Section, Coronal Section

Laryngeal Muscles (Posterior View)

Laryngeal Muscles (Anterior View)

Arteria & Nervi of Larynx (Sagittal Section)

Function of Laryngeal Muscles (Superior Aspect)

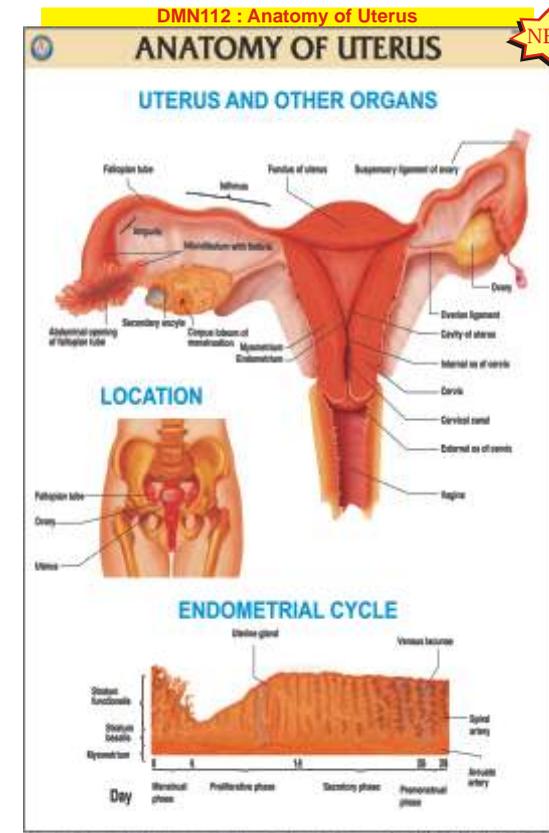
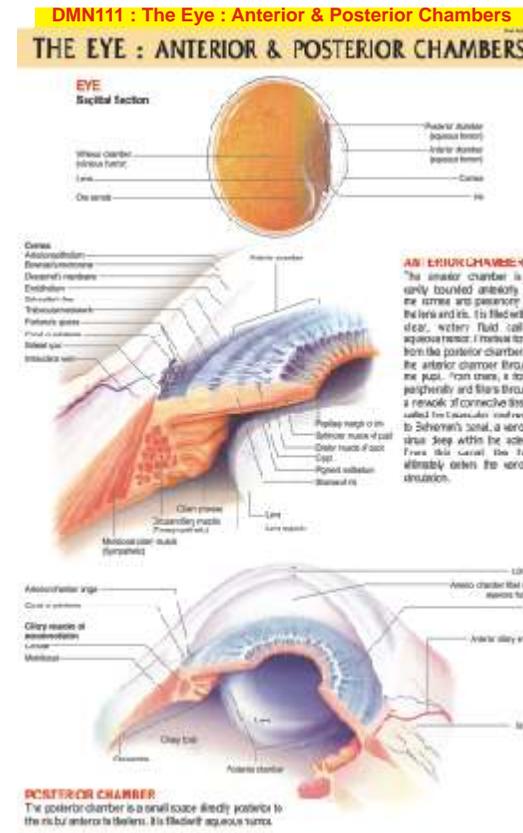
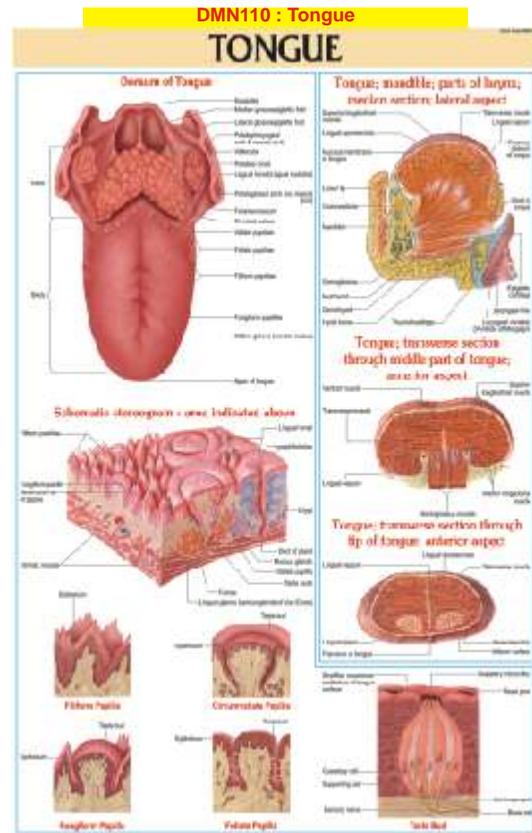
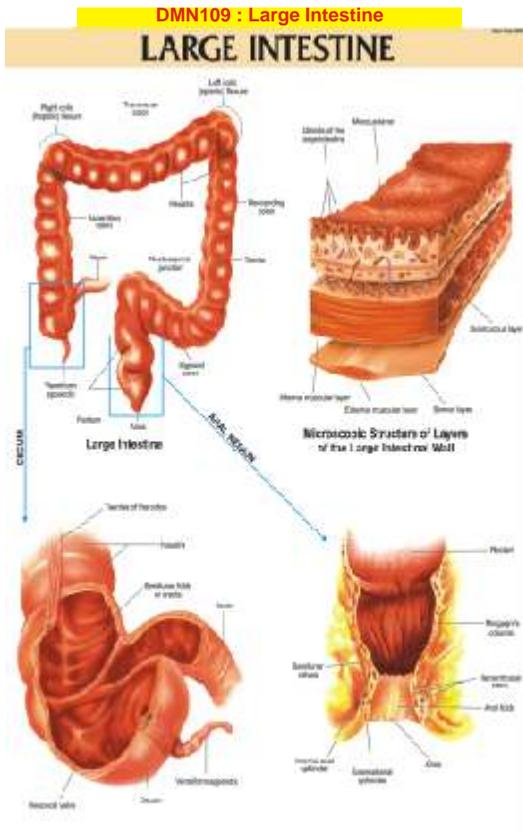
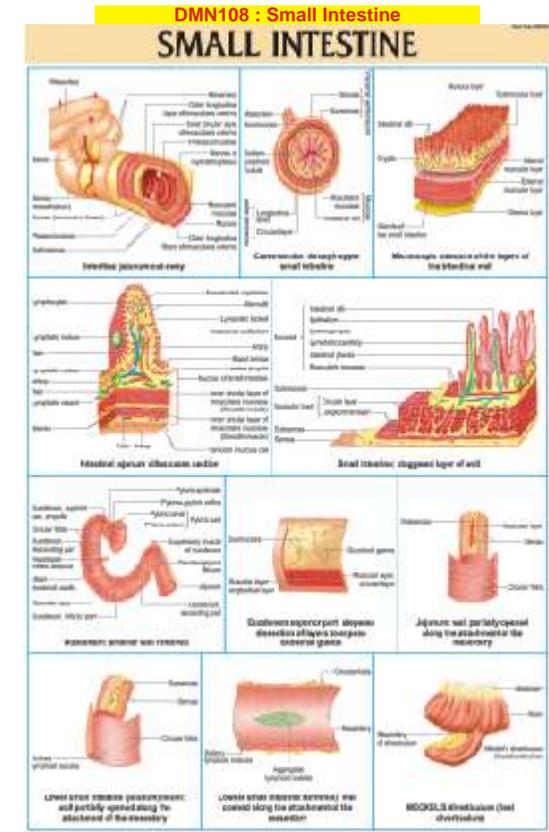
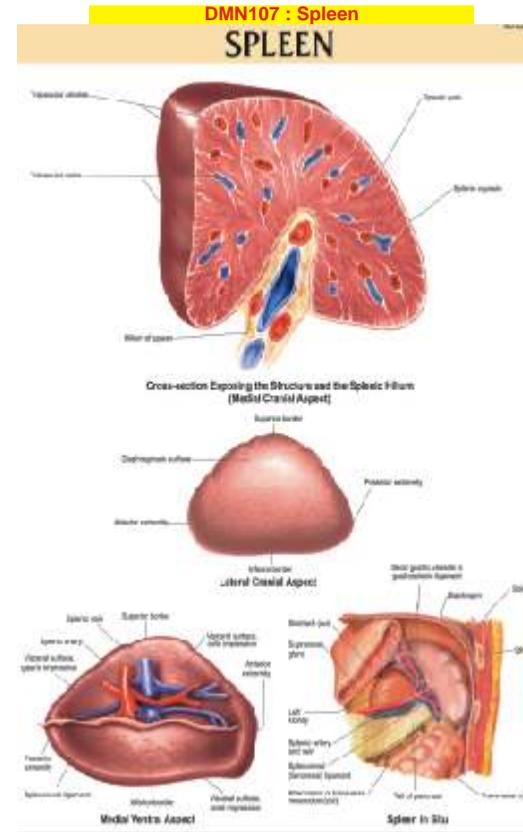
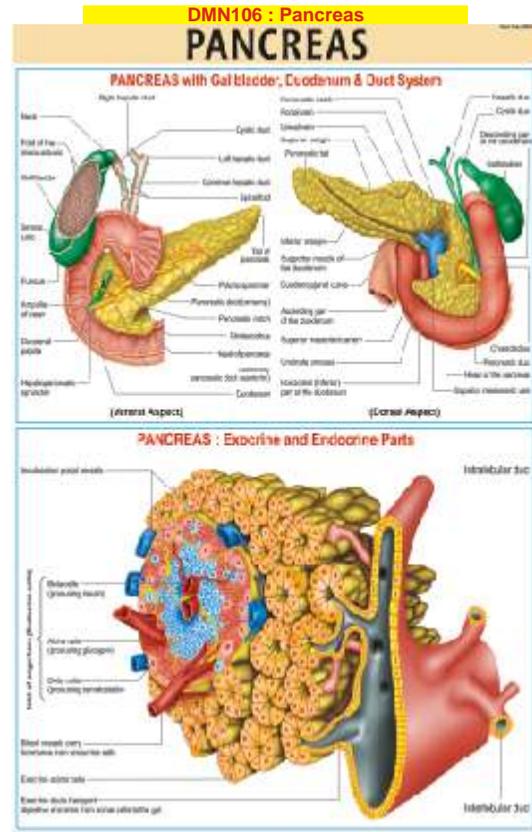
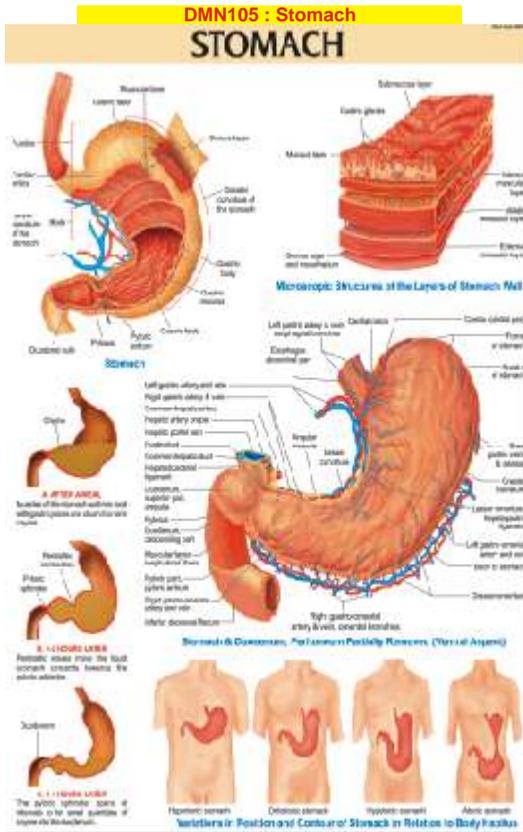
DMN104 : Oral Cavity

ORAL CAVITY

ORAL CAVITY; TONGUE DRAWN FORWARD

ORAL CAVITY SHOWING SALIVARY GLANDS

ORAL CAVITY; PARASAGITTAL SECTION



DMN113 : Structure of an Ovary NEW

STRUCTURE OF AN OVARY

Ovary Cross-section

- Primary follicle
- Primary oocyte
- Primordial follicle
- Antrum
- Thecal cells
- Zona pellucida
- Mature graafian follicle
- Follicular fluid
- Discharging follicle (Ovulation)
- Secondary oocyte (haploid)
- Vein
- Artery
- Ovarian stroma
- Corpus albicans
- Degeneration corpus luteum
- Space filled with blood
- Corpus luteum

Unfertilized Ovum

- Nucleus
- Nucleolus
- Cytoplasm
- Zona pellucida
- Corona radiata
- Polar body

DMN114 : Ear, Nose & Throat NEW

EAR, NOSE & THROAT

FRONTAL SECTION OF EAR

MIDDLE EAR

INNER EAR

NOSE AND THROAT

PHARYNX

TONGUE

PHARYNX (Detailed view)

OLFACTORY RECEPTORS

PHARYNGEAL ARCHES

LARYNX

DMN115 : Anatomy of the Heart NEW

ANATOMY OF THE HEART

FLOW OF BLOOD IN HEART

BLOOD SUPPLY TO HEART

DMN116 : Anatomy of the Inner Ear NEW

ANATOMY OF THE INNER EAR

STRUCTURE OF THE EAR

INNER EAR

COCHLEA

COCHLEA DETAIL

VESTIBULAR COCHLEA

ORGAN OF CORTI

CRISTA AMPULLARIS

HAIR CELL

DMN200 : Blood Circulatory System

BLOOD CIRCULATORY SYSTEM

THE HEART AND CIRCULATION

THE LYMPHATIC SYSTEM

The lymphatic system includes the liver, bone marrow and spleen, as well as the thymus, tonsils, and lymph nodes. It is a network of vessels that carry lymph, a clear fluid that contains white blood cells. The lymphatic system is a part of the immune system and helps to fight off infections and diseases.

DMN201 : Reproductive System

REPRODUCTIVE SYSTEM

The Male Reproductive Organs

THE MALE REPRODUCTIVE ORGANS

The male reproductive system consists of the testes, vas deferens, epididymis, ureters, corpus spongiosum, penile urethra, glans penis, and penile sheath.

The Female Reproductive Organs

THE FEMALE REPRODUCTIVE ORGANS

The female reproductive system consists of the uterus, ovaries, fallopian tubes, vagina, and vulva.

DMN202 : Portal system

PORTAL SYSTEM

Week 4

Week 8

Week 12

3 Months

DMN203 : Lymphatic System NEW

HUMAN LYMPHATIC SYSTEM

DEFENCES AGAINST INFECTION

LYMPH NODE STRUCTURE

STRUCTURE OF LYMPHATIC CAPILLARY

TWO TYPES OF LYMPHOCYTES

THE LYMPHATIC SYSTEM

The lymphatic system is a network of vessels that carry lymph, a clear fluid that contains white blood cells. It is a part of the immune system and helps to fight off infections and diseases.

DMN700 : Stages of Human Development

STAGES OF HUMAN DEVELOPMENT

Human life begins with the formation of eggs, a most fertilization of eggs with the sperm. The zygote divides into a cluster of cells known by several divisions of the fertilized eggs. Some of these cells form membranes to protect both the embryo and its placenta, which nourishes the embryo and removes its waste products. Day during the first 8 weeks of development, the mother is called an embryo. For the rest of the pregnancy, it is known as a fetus.

DEVELOPMENT OF EMBRYO

1. Fertilization
 2. Cleavage
 3. Blastocyst
 4. Gastrulation
 5. Embryonic period
 6. Fetal period

DMN701 : Cross Sectional Anatomy, Thoracic Vicera

CROSS-SECTIONAL ANATOMY, THORACIC VICERA

Transverse Section: Level of T4 Intervertebral Disk
 Transverse Section: Level of T6 Intervertebral Disk
 Coronal Section: Superior Vena Cava
 Coronal Section: Inferior Vena Cava

DMN702 : Cross Sectional Anatomy, Abdominal Vicera

CROSS-SECTIONAL ANATOMY, ABDOMINAL VICERA

Transverse Section: Level of T9 Esophageal Junction
 Transverse Section: Level of T12 Lumbar Spine
 Transverse Section: Level of T14 Intervertebral Disk
 Transverse Section: Level of T16 Intervertebral Disk
 Transverse Section: Level of L1 Superior Iliac Spine
 Transverse Section: Level of L4 Inferior Iliac Spine

DMN703 : Cross Sectional Anatomy, Pelvic Vicera

CROSS-SECTIONAL ANATOMY, PELVIC VICERA

Mid Pelvic Section: Right Lateral View
 Mid Pelvic Section: Left Lateral View
 Mid Pelvic Section: Frontal View
 Mid Pelvic Section: Sagittal Section
 Mid Pelvic Section: Coronal Section

DMN704 : Development of Blood Cells

DEVELOPMENT OF BLOOD CELLS

Hematopoietic Stem Cells (HSCs) reside in the bone marrow and have the unique ability to give rise to all of the different mature blood cell types. The development of different blood cells from HSCs to mature cells is called hematopoiesis.

DMN300 : Baby Development

BABY DEVELOPMENT

AGENCY

1. Gross Motor Skills
 2. Fine Motor Skills
 3. Communication
 4. Social Interaction

DMN301 : Feeding Schedule of Preterm Infants

FEEDING SCHEDULE OF PRETERM INFANTS

Providing adequate nutrition to preterm infants is challenging because of several problems. These problems include immaturity of bowel function, inability to suck and swallow, high risk of sepsis, necrotizing enterocolitis (NEC), illnesses that may interfere with adequate oral feeding (eg, RDS, patent ductus arteriosus) and medical interventions that preclude feeding (eg, umbilical vessel catheters, exchange transfusions, laryngeal mask airway).

FEEDING PROTOCOL

- METABOLIC OF PRETERM: Bowel tract immaturity, immature sucking and swallowing, then modulated by gauge
- Oxygenation is crucial: Do not use infant who is on oxygen that is in its stomach
- Do not use doxycycline or erythromycin to manage feeding as antibiotics are not safe and can cause the gut to become susceptible to fungal flora
- Night feedings can be considered beneficial
- LOW BIRTHWEIGHT (LBW) infants: They are not better
- Breast milk: It is best to breastfeed

RECOMMENDATIONS FOR FEEDING OF PRETERM INFANTS

| Coronal Age (weeks) | Volume of First Feed (mL/kg) | Frequency | Rate of Feeding |
|---------------------|------------------------------|-----------------|--|
| 28-32 | 2 or 2.5 | every 4-6 hours | More to 5-7 days then 30-100 mL/kg/day |
| 32-34 | 2 | every 4-6 hours | More to 3-3 days then 60-200 mL/kg/day |
| 34-37 | 2 | every 4 hours | As tolerated but aim for full feeds every 7 days |

THUMB RULES FOR GROWTH OF PREemie

- At 30 weeks of age, a preemie will develop different or later for different needs, all needs will be met actively, will make eye contact and to smile
- At 13 weeks of age, the preemie will be able to use their hands and feet to hold and hold a rattle or toy
- At 25 weeks of age, preemie will learn to sit from front to back, sit by themselves, transfer objects from one hand to another, and respond when being talked to
- At 35 weeks of age, a preemie can sit up, hold a bottle, hold a spoon, hold a bottle, hold a spoon, hold a bottle, hold a spoon
- By one year of age, preemies may be able to stand without support, may take their first steps, and can combine actions with words

DMN302 : Placenta Membranes

PLACENTA MEMBRANES

STRUCTURE

The placenta is the site of an antepartum of approximately 300 g and is roughly spherical in shape and is attached to the uterine wall. The umbilical cord is attached to the chorionic plate and is connected to the surface of the placenta making up the maternal or fetal surface. The maternal surface shows the maternal blood supply and the fetal surface shows the fetal blood supply.

THREE DISTINCT LAYERS OF MEMBRANES

Ambion

1. The outermost layer
2. It is a thin, transparent layer of epithelial cells and connective tissue
3. It is derived from the fetal ectoderm by cellular migration
4. It is covered by the amnion with its surface cells

Chorion

1. It is the middle layer
2. Amnion is primarily attached to it by the internal pressure of amniotic fluid
3. The chorion has a core of connective tissue which contains the fetal (placental) blood vessels
4. The villi of the chorion are derived from the chorion

Decidua Capsularis

1. It is the innermost layer
2. It is a thin, transparent layer of epithelial cells and connective tissue
3. It is derived from the maternal endometrium
4. It is normally covered by a layer of maternal blood vessels, some of which are in the decidua capsularis
5. At the placental margin, the decidua capsularis is continuous with the decidua basalis

DEVELOPMENT

10 Weeks p.m.
 12 Weeks p.m.
 17 Weeks p.m.

DMN303 : Anatomy of Breast NEW

ANATOMY OF BREAST

(Anterior View)

- Ampulla
- Nipple
- Areola
- Alveolar duct

(Sagittal Section)

- Rib
- Adipose tissue
- Intercostal muscles
- Pectoralis major
- Muscle pectoralis minor
- Alveolar glands
- Lactiferous duct
- Alveolar duct

DMN304 : Dilation & Evacuation Abortion (D&E) NEW

(23 WEEK OLD FETUS)

- The body parts are grasped at random with strong toothed clamp.
- The body parts are pulled from the fetal body with the vaginal canal.
- The remaining body parts are grasped and pulled out.
- The head is grasped and crushed in order to remove it from the vaginal canal.

The placenta and remaining contents are suctioned from the uterus.

DMN305 : Postpartum Haemorrhage NEW

POSTPARTUM HAEMORRHAGE

Excess bleeding following childbirth upto the end of puerperium is called postpartum haemorrhage. Loss of blood is greater than 500 ml after a vaginal birth and 1000 ml after a cesarean section.

POSTPARTUM HAEMORRHAGE

- Early PPH (within 24 hrs)
- Late PPH (24 hrs-6 weeks)

POSTPARTUM HAEMORRHAGE (PPH)

- PPH is responsible for 35% of maternal mortality worldwide, reaching as high as 60% in developing countries.
- Approximately 12% of women who survive PPH will have severe anaemia.

DMN306 : Antepartum Haemorrhage NEW

ANTEPARTUM HAEMORRHAGE

ANTEPARTUM HAEMORRHAGE (APH)

Antepartum haemorrhage is any vaginal bleeding which occurs at or after 24 weeks and before the birth of the infant. It is associated with significant maternal and fetal morbidity and mortality. Patients with antepartum haemorrhage must be regarded as serious emergencies and management will depend on the causes of the haemorrhage.

CAUSES OF ANTEPARTUM HAEMORRHAGE

- Placental bleeding (70%)
 - Placenta praevia (35%)
 - Placental abruption (35%)
- Unexplained or indeterminate (25%)
- Extra placental causes (5%)
 - Local cervico-vaginal lesions:
 - Cervical polyp
 - Carcinoma cervix
 - Varicose vein
 - Local trauma

DMN307 : Critical Periods in Human Development NEW

CRITICAL PERIODS IN HUMAN DEVELOPMENT

Mean Embryonic Period (in weeks)

- 1-2: Germinal period
- 3-8: Neurulation
- 9-16: Organogenesis
- 17-38: Fetal period

Organ Systems and Development:

- Brain:** Upper limb, Lower limb, Upper eye, Lower eye, Ear, Eye, External hypophysis and olfactory, Middle hypophysis, Pituitary, Gonads, Gonadotropin releasing hormone, Hypothalamus, Pineal gland, Adrenal medulla, Adrenal cortex, Thyroid gland, Parathyroid gland, Pituitary gland, Pancreas, Adipose tissue, Liver, Spleen, Kidney, Lung, Heart, Intestine, Stomach, Duodenum, Jejunum, Ileum, Cecum, Sigmoid colon, Rectum, Anus, Uterus, Vagina, Cervix, Vaginal canal, Vaginal opening, Penis, Testis, Epididymis, Vas deferens, Urethra, Ureter, Bladder, Uterus, Vagina, Cervix, Vaginal canal, Vaginal opening, Penis, Testis, Epididymis, Vas deferens, Urethra, Ureter, Bladder.

DMN308 : Vacuum Extraction Delivery NEW

VACUUM EXTRACTION DELIVERY

A Ventouse or vacuum extractor uses a soft cup placed on the baby's head. When the uterus contracts and mother pushes, doctor gently pulls on the cup to assist the baby to come through the birth canal and out of the vagina. More than one pull may be required.

A: Shows the vacuum cup being applied to the fetal head.

B: Shows the vacuum pump being used to assist in the delivery of the baby.

DMN309 : Family Planning & Birth Control Methods NEW

FAMILY PLANNING & BIRTH CONTROL METHODS

Various contraceptive methods not only prevent unwanted pregnancies but also are the most important measures to check population growth rate.

WHAT IS AN IDEAL CONTRACEPTIVE ?

- Use-friendly
- Easily available
- Effective
- No or Least Side Effects
- Reversible
- No interference with Sexual Drive, Groom & Social Act

COMMON CONTRACEPTIVE METHODS

- Natural/Traditional Methods:**
 - Abstain from sex & sperm washing
 - Periodic abstinence
 - Withdrawal-Coitus interruptus
 - Lactational amenorrhea
- Barrier Methods:**
 - Female Condom
 - Male Condom
 - Diaphragm
 - Spermicide
- Injectables:**
 - Subdermal progesterone implants
- Oral Contraceptives:**
 - Progesterone or progestin-estrogen combination pills
- Surgical Methods:**
 - Vasectomy (male)
 - Tubectomy (female)
- IUDs:**
 - Copper IUD
 - Progesterone-releasing IUD

DMN310 : Fetal Skull Development NEW

FETAL SKULL DEVELOPMENT

12 WEEKS: Shows the developing skull with labels for Frontal, Parietal, Occipital, and Sphenoid bones.

16 WEEKS: Shows further development of the skull bones.

FULL TERM - SIDE VIEW: Shows the mature skull with labels for Frontal, Parietal, Occipital, Sphenoid, and Temporal bones.

FULL TERM - VIEW FROM TOP: Shows the skull from above with labels for Frontal, Parietal, Occipital, Sphenoid, and Temporal bones.

DMN311 : Fetal Brain Development **NEW**

FETAL BRAIN DEVELOPMENT

8 WEEKS
 Superior cerebellar peduncle, Corpus callosum, Falx cerebri, Basilar ganglia, Medulla, Myelencephalon, Metencephalon, Diencephalon, Forebrain, Telencephalon, Cerebellum, Choroid plexus, Cauda equina, Spinal cord

11 WEEKS
 Superior cerebellar peduncle, Corpus callosum, Falx cerebri, Basilar ganglia, Medulla, Myelencephalon, Metencephalon, Diencephalon, Forebrain, Telencephalon, Cerebellum, Choroid plexus, Cauda equina, Spinal cord

21 WEEKS
 Superior cerebellar peduncle, Corpus callosum, Falx cerebri, Basilar ganglia, Medulla, Myelencephalon, Metencephalon, Diencephalon, Forebrain, Telencephalon, Cerebellum, Choroid plexus, Cauda equina, Spinal cord

26 WEEKS
 Superior cerebellar peduncle, Corpus callosum, Falx cerebri, Basilar ganglia, Medulla, Myelencephalon, Metencephalon, Diencephalon, Forebrain, Telencephalon, Cerebellum, Choroid plexus, Cauda equina, Spinal cord

30 WEEKS
 Superior cerebellar peduncle, Corpus callosum, Falx cerebri, Basilar ganglia, Medulla, Myelencephalon, Metencephalon, Diencephalon, Forebrain, Telencephalon, Cerebellum, Choroid plexus, Cauda equina, Spinal cord

40 WEEKS
 Superior cerebellar peduncle, Corpus callosum, Falx cerebri, Basilar ganglia, Medulla, Myelencephalon, Metencephalon, Diencephalon, Forebrain, Telencephalon, Cerebellum, Choroid plexus, Cauda equina, Spinal cord

DMN312 : Fetal Sex Differentiation **NEW**

FETAL SEX DIFFERENTIATION

UNDIFFERENTIATED (UP TO 12 WEEK)
 Genital tubercle, Urethral fold, Urogenital sinus, Testis, Vagina, Labial swelling, Labial fold, Urethral slit, Clitoris, Penis, External genital tubercle, Scrotum, Hymen, Vagina

12 WEEK
 Genital tubercle, Urethral fold, Urogenital sinus, Testis, Vagina, Labial swelling, Labial fold, Urethral slit, Clitoris, Penis, External genital tubercle, Scrotum, Hymen, Vagina

MALE
 Genital tubercle, Urethral fold, Urogenital sinus, Testis, Vagina, Labial swelling, Labial fold, Urethral slit, Clitoris, Penis, External genital tubercle, Scrotum, Hymen, Vagina

FEMALE
 Genital tubercle, Urethral fold, Urogenital sinus, Testis, Vagina, Labial swelling, Labial fold, Urethral slit, Clitoris, Penis, External genital tubercle, Scrotum, Hymen, Vagina

FULLY DEVELOPED
 Genital tubercle, Urethral fold, Urogenital sinus, Testis, Vagina, Labial swelling, Labial fold, Urethral slit, Clitoris, Penis, External genital tubercle, Scrotum, Hymen, Vagina

DMN400 : CPR Infant **NEW**

CPR INFANT (UNDER 1 YEAR)

MAKE SURE THE ENVIRONMENT IS SAFE FOR RESCUERS & VICTIM

- Attempt to Wake the Infant and Call for Help.**
 If breathing is not occurring or is just gasping, shout loudly and repeatedly until help arrives. Call for help immediately and activate 2. If breathing is absent or you can't help while the other rescuer is on step 2.
- Begin Chest Compressions.**
 If the infant is not breathing, kneel on the floor or the other rescuer's knees. Place the infant on the chest and compressions. Complete the cycle of 30:2. If you are alone, perform 30:2. If there are two rescuers, perform 15:2.
- Open the Airway.**
 After 30 compressions, use the infant's head-tilt/chin-lift technique. Check for breathing. If breathing is not present, start rescue breaths.
- Begin Rescue Breaths.**
 Open the infant's mouth and use the thumb and index finger to lift the chin. Pinch the nostrils. Give two rescue breaths. If the chest does not rise, reposition the head and try again. If still no rise, stop CPR.
- Repeat Chest Compressions.**
 Repeat chest compressions. Do 30 compressions (at the speed indicated). Do not stop for the first few compressions.
- Repeat Rescue Breaths.**
 Repeat rescue breaths. Give two breaths (at the speed indicated). Do not stop for the first few breaths.

DMN401 : CPR Child **NEW**

CPR CHILD (1-8 YEARS)

MAKE SURE THE ENVIRONMENT IS SAFE FOR RESCUERS & VICTIM

- Attempt to Wake the Child and Call for Help.**
 If breathing is not occurring or is just gasping, shout loudly and repeatedly until help arrives. Call for help immediately and activate 2. If breathing is absent or you can't help while the other rescuer is on step 2.
- Begin Chest Compressions.**
 If the child is not breathing, kneel on the floor or the other rescuer's knees. Place the child on the chest and compressions. Complete the cycle of 30:2. If you are alone, perform 30:2. If there are two rescuers, perform 15:2.
- Open the Airway.**
 After 30 compressions, use the child's head-tilt/chin-lift technique. Check for breathing. If breathing is not present, start rescue breaths.
- Begin Rescue Breaths.**
 Open the child's mouth and use the thumb and index finger to lift the chin. Pinch the nostrils. Give two rescue breaths. If the chest does not rise, reposition the head and try again. If still no rise, stop CPR.
- Repeat Chest Compressions.**
 Repeat chest compressions. Do 30 compressions (at the speed indicated). Do not stop for the first few compressions.
- Repeat Rescue Breaths.**
 Repeat rescue breaths. Give two breaths (at the speed indicated). Do not stop for the first few breaths.

DMN402 : CPR Adult **NEW**

CPR ADULT (9 YEARS AND OVER)

MAKE SURE THE ENVIRONMENT IS SAFE FOR RESCUERS & VICTIM

- Recognition of Cardiac Arrest and Call for Help.**
 If breathing is not occurring or is just gasping, shout loudly and repeatedly until help arrives. Call for help immediately and activate 2. If breathing is absent or you can't help while the other rescuer is on step 2.
- Begin Chest Compressions.**
 If the adult is not breathing, place them on the back on a firm surface. Kneel beside the adult's head. Place your hands in the center of the chest. Push hard and fast. Compress at a rate of 100-120 per minute. Push at least 5 cm (2 inches) deep.
- Open the Airway.**
 After 30 compressions, use the adult's head-tilt/chin-lift technique. Check for breathing. If breathing is not present, start rescue breaths.
- Begin Rescue Breaths.**
 Open the adult's mouth and use the thumb and index finger to lift the chin. Pinch the nostrils. Give two rescue breaths. If the chest does not rise, reposition the head and try again. If still no rise, stop CPR.
- Repeat Chest Compressions.**
 Repeat chest compressions. Do 30 compressions (at the speed indicated). Do not stop for the first few compressions.
- Repeat Rescue Breaths.**
 Repeat rescue breaths. Give two breaths (at the speed indicated). Do not stop for the first few breaths.

DMN403 : Hand Washing Technique **NEW**

HAND WASHING TECHNIQUE

- Wet hands with water.
- Apply enough soap to cover all hand surfaces.
- Rub hands palm to palm.
- Rub back of each hand with palm of other hand with fingers interlaced.
- Rub palm to palm with fingers interlaced.
- Rub with back of fingers to opposing palm with fingers interlaced.
- Rub each thumb clasped in opposite hand using a rotational movement.
- Roll tips of fingers and rub in a circular motion.
- Rub each wrist with opposite hand.
- Use cotton or paper towel to turn off tap.
- Dry thoroughly with a single use towel.

DMN404 : How to Put on Sterile Gloves **NEW**

HOW TO PUT ON STERILE GLOVES

- Perform hand hygiene.
- Open the package. Using the thumb and index finger of one hand, carefully grasp the folded cuff edge of the gloves.
- Slip the other hand into the glove.
- Pick up the second glove by sliding the fingers of the gloved hand underneath the cuff of the glove.
- Slip the second glove on to the exposed hand while avoiding any contact between the gloved hand on.
- Unfold the cuff of the first gloved hand by gently slipping the fingers of the other hand inside the fold. The hands are now gloved.

DMN405 : Prevent Infections **NEW**

PREVENT INFECTIONS

PREVENT INFECTIONS, SAVE LIVES IN HEALTH CARE

Infection prevention and control contributes to achieving sustainable development goals and could save millions of lives.

GOOD HEALTH AND WELL BEING | **CLEAN WATER AND SANITATION**

WHAT'S THE PROBLEM?

- 1 IN 11 PATIENTS get an infection while receiving care.
- UP TO 32% OF SURGICAL PATIENTS get a post-op infection, up to 51% antibiotic resistant.
- UP TO 90% OF HEALTH CARE WORKERS do not clean their hands in some facilities.
- INFECTIONS CAUSE UP TO 90% OF DEATHS among hospital-born babies.
- 15-20% WOMEN get a wound infection after a caesarean section.
- 50-70% OF INJECTIONS given in some developing countries are unsafe.
- INFECTIONS can lead to disability, ANTIBIOTIC RESISTANCE, increased hospital time and death.

WHAT'S THE SOLUTION?

- HAVE ACTIVE INFECTION PREVENTION AND CONTROL PROGRAMMES and target antibiotic resistance.
- USE CLEAN PRACTICES and asepsis for interventions.
- PRACTICE HAND HYGIENE to prevent infection and reduce the spread of antibiotic resistance.
- HAVE ENOUGH STAFF, a clean and hygienic environment and don't overcrowd health care facilities.
- MONITOR INFECTIONS and make action plans to reduce their frequency.
- NEVER RE-USE needles and syringes.
- Only dispense antibiotics when TRULY NEEDED TO REDUCE THE RISK OF RESISTANCE.

DMN406 : Exercises During Pregnancy

EXERCISES DURING PREGNANCY

Quadriped arm/leg raises **Modified push-up**

Lunges **Wall slide** **Heel raises**

Rowing **Arm slides on wall**

DMN407 : Intramuscular (IM) injection Sites

INTRAMUSCULAR (IM) INJECTION SITES

Deltoid Site **Ventrogluteal Site**

Vastus Lateralis Site **Dorsogluteal Site**

DMN408 : Homemade ORS

HOMEMADE ORS

Homemade ORS to OVERCOME DEHYDRATION

1. Take 4 cups of clean drinking water.

2. Mix 1/2 small spoon of salt.

3. Mix 6 small spoon of sugar.

4. Mix it thoroughly.

5. Drink This Homemade ORS Several Times A Day

DMN409 : Back Care

BACK CARE

Basic Effleurage **Rolling Petrissage**

Circular Friction **Beating Percussion**

DMN410 : What to do in Diarrhoea

WHAT TO DO IN DIARRHOEA ?

First to do in Diarrhoea

Give baby ORS solution after every loose motion. Do not stop the solution for more than 24-36 hrs.

Put 1 small packet of ORS in a glass of water.

Put 1 large packet of ORS in 1 litre of water.

Check the expiry date of the ORS solution. It is valid for 2 years only.

Use 1 glass of ORS solution to mix with the 2 year old.

DMN411 : Autoclave

AUTOCLAVE

STERILIZER COMPONENTS

- Control valve
- Exhaustion relief valve
- Air vented tube
- Back handle
- Back
- Support stand
- Modified water level mark
- Cast aluminum control bar
- Cast iron support base
- Mechanical bell lever
- Flint light
- Thermometer
- Quartz watch

DMN412 : Body Mass Index (BMI)

BODY MASS INDEX (BMI)

Body Mass Index (BMI) is a measurement of a person's weight with respect to his/her height. It is more of an indicator than a direct measurement of a person's total body fat.

BMI Calculation:

The body mass index formula is a simple calculation that takes one's weight and height into account.

The imperial BMI formula is: $\text{Weight (lbs)} \div \text{Height (inches)}^2$

The metric BMI formula is: $\text{Weight (kg)} \div \text{Height (meters)}^2$

BMI Status:

- Underweight: BMI < 18.5
- Normal: BMI 18.5 - 24.9
- Overweight: BMI 25.0 - 29.9
- Obese (Class I): BMI 30.0 - 34.9
- Obese (Class II): BMI 35.0 - 39.9
- Obese (Class III): BMI > 40.0

DMN413 : Immunization Schedule & Dose

IMMUNIZATION SCHEDULE & DOSE

| Age | Vaccine | Dose | Qty. |
|--------------|------------------------------|--------|---------|
| BIRTH | BCG | Only 1 | 0.5 ml |
| | OPV (oral polio vaccine) | 1st | 2 Drops |
| | Hepatitis B vaccine | 1st | 0.5 ml |
| 6 WEEKS | OPV (oral polio vaccine) | 2nd | 2 Drops |
| | Vaccines B vaccine | 2nd | 0.5 ml |
| | Hepatitis B vaccine | 2nd | 0.5 ml |
| 10 WEEKS | OPV (oral polio vaccine) | 3rd | 2 Drops |
| | Rotavirus | 3rd | 0.5 ml |
| | Hepatitis B vaccine | 3rd | 0.5 ml |
| 14 WEEKS | OPV (oral polio vaccine) | 4th | 2 Drops |
| | Rotavirus | 3rd | 0.5 ml |
| | Hepatitis B vaccine | 3rd | 0.5 ml |
| 6-9 MONTHS | OPV (oral polio vaccine) | 5th | 2 Drops |
| | Health & Vaccine** | 1st | 0.5 ml |
| | Health & Vaccine** | 2nd | 0.5 ml |
| 9 MONTHS | Measles Vaccine | 1st | 0.5 ml |
| | Vaccine First Vaccine | Only 1 | 0.5 ml |
| | Health & Vaccine** | 1st | 0.5 ml |
| 15-18 MONTHS | MM2† (Measles Mumps Rubella) | Only 1 | 0.5 ml |
| | OPV (oral polio vaccine) | 5th | 2 Drops |
| | Health & Vaccine** | 1st | 0.5 ml |
| 5 YEARS | OPV (oral polio vaccine) | 5th | 2 Drops |
| | Health & Vaccine** | 1st | 0.5 ml |
| | Health & Vaccine** | 2nd | 0.5 ml |
| 10 YEARS | Td | 3rd | 0.5 ml |
| | Health & Vaccine** | 1st | 0.5 ml |
| | OPV (oral polio vaccine) | 1st | 0.5 ml |
| 15-16 YEARS | TT (Tetanus) | 4th | 0.5 ml |
| | Health & Vaccine** | 1st | 0.5 ml |
| | OPV (oral polio vaccine) | 1st | 0.5 ml |

Disclaimer: Consult physician before administering any medicine.

DMN414 : Creatinine Clearance Calculator

CREATININE CLEARANCE CALCULATOR

The Creatinine Clearance is a widely used test to estimate the Glomerular Filtration Rate (GFR). GFR is the best available method to measure kidney function.

The Creatinine Clearance is calculated as the removal rate per min (CCr x 60) divided by the Serum Creatinine Concentration (SCr).

Creatinine Clearance levels to assess the true GFR by 15 to 20 percent or more depending upon the proportion of Urinary Creatinine that is absorbed from the secretion.

Cockcroft-Gault (CG) Equation

$$CCr (\text{ml/min}) = \frac{140 - \text{age} (\text{yr}) \times \text{weight} (\text{kg})}{72 \times SCr (\text{mg/dL})} \times 0.85 \text{ if female}$$

Fabrizzi's Formula

CCr (ml/min) = $\frac{180}{2.3 \times SCr} \times 0.85 \text{ if female}$ (if age is between 20 and 40 years)

CCr (ml/min) = $\frac{180}{2.3 \times SCr} \times 0.85 \text{ if female}$ (if age is between 40 and 60 years)

CCr (ml/min) = $\frac{250}{2.8 \times SCr} \times 0.85 \text{ if female}$ (if age > 60 years)

Mays Clinic Quadratic (MCQ) Formula

$$CCr (\text{ml/min}) = \exp[1.913 + (0.29 \times SCr) - (0.134 \times SCr^2) - (0.00088 \times \text{age}) - (0.102 \times \text{female})]$$

Modification of Diet in Renal Disease (MDRD) Equation

$$eGFR (\text{ml/min/1.73 m}^2) = 175 \times SCr^{-1.154} \times \text{Age}^{-0.203} \times [0.742 \text{ if female}] \times [1.212 \text{ if African-American}]$$

Normal Value of GFR (ml/min/1.73 m²)

| Age (Year) | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | 60 | 65 | 70 | 75 | 80 | 85 | 90 |
|------------|-----|-----|-----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Male | 120 | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | 5 | 2 | 1 | 0 |
| Female | 110 | 100 | 90 | 80 | 70 | 60 | 50 | 40 | 30 | 20 | 10 | 5 | 2 | 1 | 0 | 0 |

DMN500 : Ocular Infections

OCULAR INFECTIONS

CONJUNCTIVITIS

Causes: Bacterial, Viral, Allergic, Chemical, Trauma, Contact lens wear.

ELEPHANTIASIS AND STY

Causes: Infection of the eyelids.

Corneal Ulcer

Causes: Bacterial, Fungal, Parasitic, Trauma, Contact lens wear.

OCULAR HERPES

Causes: Herpes simplex virus.

| Characteristic | Bacterial | Viral | Allergic |
|----------------|-----------|--------|-------------|
| Discharge | Purulent | Watery | Itchy |
| Redness | Yes | Yes | Yes |
| Swelling | Yes | Yes | Yes |
| Prevalence | Rare | Common | Very Common |

DMN501 : Anxiety Disorders

ANXIETY DISORDERS

Brain in Anxiety

Causes: Genetic, Environmental, Neurochemical.

Generalized Anxiety Disorder (GAD)

Causes: Chronic worry, excessive anxiety.

Panic Attack

Causes: Sudden onset of intense fear.

Cognitive Model of Social Anxiety

Causes: Negative thoughts, self-focus, safety behaviors.

DMN502 : Obsessions and Compulsions

OBSSESSIONS AND COMPULSIONS

Signs and Symptoms of OCD

Causes: Genetic, Environmental, Neurochemical.

Cognitive Model of OCD

Causes: Obsessive thoughts, compulsive behaviors.

DMN503 : Schizophrenia

SCHIZOPHRENIA

Many brain regions and systems operate abnormally in schizophrenia, including those highlighted below.

Frontal Cortex

Involved in executive functions, decision making, and planning.

Subcortical Structures

Involved in emotion, motivation, and reward.

Signs and Symptoms

- Positive symptoms: Hallucinations, delusions, disorganized speech, gross motor behavior, negative symptoms.
- Negative symptoms: Apathy, social withdrawal, anhedonia, avolition, alogia.
- Cognitive symptoms: Impaired executive functions, attention, working memory, verbal fluency, processing speed.

Risk Factors

- Genetic: Family history, twin studies.
- Environmental: Prenatal complications, urban upbringing, migration, cannabis use.
- Psychosocial: Stress, trauma, social isolation.

DMN504 : Bicornuate Uterus

BICORNUATE UTERUS

Bicornuate Uterus with No Pregnancy

Causes: Congenital anomaly.

Bicornuate Uterus with 34 Week Old Fetus

Causes: Congenital anomaly.

DMN505 : Fibroid Uterus

FIBROID UTERUS

Fibroids are very common benign non-cancerous tumors of the uterine smooth muscle and are seen in 20-40% of women in reproductive age groups and upto 10-15% of infertile ladies and 60% of infertile postmenopausal age groups.

Types of Fibroids

Severe Case of Fibroid Uterus

DMN506 : Fibroadenoma Breast

FIBROADENOMA BREAST

A fibroadenoma is the most common benign solid tumor of the breast. It is a lump of fibrous and glandular tissue which is solid to touch. It is a lump of fibrous and glandular tissue which is solid to touch.

Fibroadenoma Types

- Low grade: Well-circumscribed, slow growing.
- Bridge: Intermediate growth.
- High grade: Poorly circumscribed, fast growing.

Management

Observation, medical treatment, surgery.

NEW MEDICAL NURSING CHARTS

Laminated Rigid or Laminated Flexible
Size 51 x 66 cm (Available in English only)

DMN507 : IUGR Baby IUGR BABY

CLASSIFICATION

Symetrical

- Thinner head and body proportionately
- Major abnormal feature: proportionately small head



Normal Baby

Asymetrical

- Baby's head is abnormally size when compared to the rest of the body
- The rest of the body is proportionate to the rest of the body



IUGR Baby

CHARACTERISTICS OF IUGR

| | |
|---|---|
| SYMMETRICAL <ul style="list-style-type: none"> • Asymetrical IUGR • From early pregnancy (first trimester) • Growth restriction of head • Growth restriction of body • Head circumference is below normal • Head circumference is proportional to body weight • Growth restriction is symmetrical | ASYMMETRICAL <ul style="list-style-type: none"> • Asymetrical IUGR • Late pregnancy onset • Growth restriction of body • Head circumference is normal • Head circumference is not proportional to body weight • Growth restriction is asymmetrical |
|---|---|

MATERNAL RISK FACTORS

- Continuously small or IUT
- Placenta previa
- High altitude
- Smoking
- Alcohol consumption
- Chronic hypertension
- Anemia

FETAL RISK FACTORS

- Placental insufficiency
- Placental abruption
- Placental previa
- Placental infarction
- Placental malformation
- Placental dysfunction
- Placental insufficiency
- Placental abruption
- Placental previa
- Placental infarction
- Placental malformation
- Placental dysfunction

PLACENTAL FACTORS

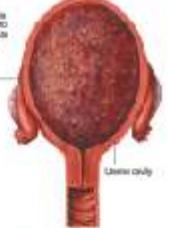
- Placental insufficiency
- Placental abruption
- Placental previa
- Placental infarction
- Placental malformation
- Placental dysfunction
- Placental insufficiency
- Placental abruption
- Placental previa
- Placental infarction
- Placental malformation
- Placental dysfunction




DMN508 : Hydatidiform Mole HYDATIDIFORM MOLE

Hydatidiform mole is a rare mass of growth that forms inside the womb (uterus) at the beginning of a pregnancy. It is a type of gestational trophoblastic disease (GTD).

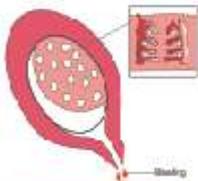
Causes: Hydatidiform mole results from too much production of the tissue that is supposed to develop into the placenta. With a molar pregnancy, the tissues develop into an abnormal growth, called a mole.



There are 2 Types of These Moles:

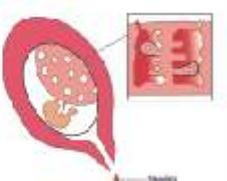
Complete Hydatidiform Mole

There is an abnormal placenta and no fetus.



Partial Hydatidiform Mole

There is an abnormal placenta and some fetal development.



Symptoms

1. Abnormal growth of the uterus
2. Nauseous vomiting
3. Vaginal bleeding during the first 3 months of pregnancy
4. Symptoms of hyperthyroidism
5. Symptomatic pre-eclampsia that occurs in the first trimester or early second trimester

Treatment

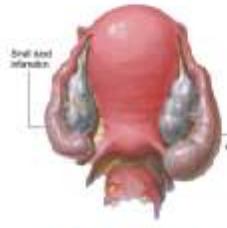
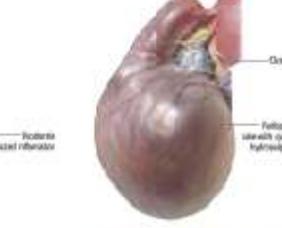
1. Dilation and curettage (D & C) will most likely be recommended.
2. Sometimes postmolar pregnancy can continue. However, these are very high-risk pregnancies.
3. A hysterectomy (surgery to remove the uterus) may be an option for older women who do not wish to become pregnant in the future.
4. After treatment, your hCG level will be followed. It is important to avoid another pregnancy and to use reliable contraception for 12 months after treatment for a molar pregnancy.

DMN509 : Hydrosalpinx HYDROSALPINX

Hydrosalpinx is a condition where the fallopian tube gets filled with fluid because of chronic inflammation by bacteria like Chlamydia or Neisseria and others or due to Tuberculosis. It may damage the fallopian tube and may be associated with blood clots. In acute infection tubes may be filled with pus and is called pyosalpinx.




The presence of hydrosalpinx is known to reduce the pregnancy rate by half even in IVF pregnancies and disconnecting the tube with hydrosalpinx from uterus is found to double the pregnancy rate. The presence of tubal damage or blocked tubes may require IVF to get conceived.

DMN510 : Syphilis SYPHILIS

Syphilis is a highly contagious disease caused by bacterium *Treponema pallidum*. Syphilis is a curable disease with prompt diagnosis and treatment. However, if treated too late, there may be permanent damage to the heart and brain even after the infection is destroyed.





STAGES & SYMPTOMS

1. **Early or Primary Syphilis**
 - Incubation period is 9-90 days.
 - Infected person will develop one or more painless sores called chancres. Chancres may occur on external genitalia, anus, perianal area, in the mouth or anal canal.
 - Chancres disappear after 3-4 weeks even without treatment.
 - 4-10 weeks after initial infection.
2. **Latent & Late Stages of Syphilis**
 - 3-15 years after initial infection
 - Affects 33% of untreated cases
 - Gummata
 - Bone deformities
 - Blindness
 - Loss of coordination
 - Paralysis
 - Hoarsely
 - Disease damages internal organs and can result in death.

CONGENITAL SYPHILIS

1. Pregnant women with the disease can spread it to their baby.
2. The congenital syphilis can cause abnormalities like
 - Abnormally shaped teeth (Hutchinsonian teeth)
 - Nasal septum collapse
 - Skeletal abnormalities
3. Depending on how long a pregnant woman has been infected with syphilis, she has a good chance of having a stillbirth or giving birth to a baby who dies shortly after birth.



DMN511 : Parkinson's Disease PARKINSON'S DISEASE

Parkinson's disease also known as paralysis agitans is a nervous system disease in which muscular stiffness and tremors develop.

Typical Clinical Features of Parkinson's Disease

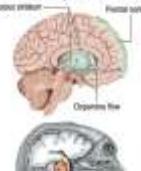
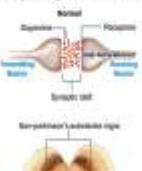
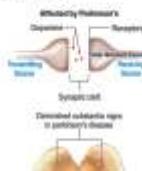
- Slowest hand
- Stiffness of the neck
- Drooping of the eyelids
- Forward flexion of the trunk
- Weight loss
- Restlessness
- Tremor in hand
- Altered
- Shuffling and shuffling gait

Non-motor Disorders Caused by Parkinson's Disease

- Sleep apnoea
- Rigidity
- Blurred vision & white
- Loss of pupal reflex
- Difficulty in reading
- Difficulty in handwriting
- Difficulty in walking
- Blurred vision, head aches
- Difficulty in walking
- Blurred vision, head aches

Causes of Parkinson's Disease

- Disease is caused by degeneration of the ganglia (substantia nigra) at the base of the brain. This results in reduction of dopamine (chemical substance which acts as a messenger to control and coordinate body movements). Then the part of brain controlling movement can't work normally causing movements to become slow and abnormal.

Complications

The disease which generally occurs in later middle age, often results from idiopathic. May prove fatal if the muscles of respiration are seriously affected.

DMN512 : Alzheimer's Disease ALZHEIMER'S DISEASE

Alzheimer's disease is a chronic progressive disease that affects primarily middle-aged and older persons. The disease is characterized by progressive failure of recent memory and difficulties in thinking, reasoning, and judgement. It is often associated with emotional disturbances such as depression, anxiety and irritability.

Symptoms

- Memory loss
- Disorientation
- Difficulty in completing familiar tasks
- Trouble in planning and problem solving
- Loss of judgment
- Mood swings
- Misplacing things
- Difficulty in communicating
- Loss of motor skills and sense of touch
- Delusions and paranoia
- Trouble in sleeping
- Verbal and physical aggression

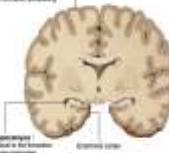
Risk Factors

- Aging
- Family history
- Female gender
- Thyroid disease
- Head injury
- Genetics
- Down syndrome
- Cardiovascular disease

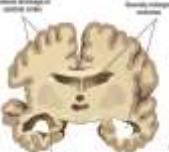
Changes in Brain

Brain gets smaller and has fewer healthy cells.

HEALTHY BRAIN



ALZHEIMER'S DISEASE BRAIN



DMN513 : Epilepsy EPILEPSY

Epilepsy is a disorder marked by disturbed electrical rhythms in the Central Nervous System. It is characterized by epileptic seizures. Epilepsy can be confirmed with an electroencephalogram (EEG).

Symptoms

- Temporary Confusion
- A staring spell
- Uncontrollable jerking movements
- Loss of consciousness or awareness
- Clonus
- Stiffening of the body
- Drooping of the tongue
- Salivary frothing

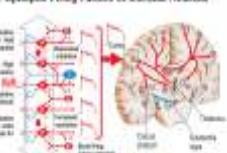


Mechanism (Epileptogenesis)

A. Normal Firing Pattern of Cortical Neurons

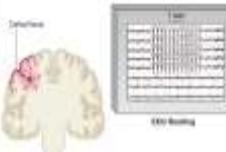


B. Epileptic Firing Pattern of Cortical Neurons

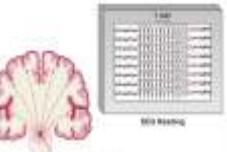


Epileptic Seizures

A. Partial Seizures



B. Generalized Seizures

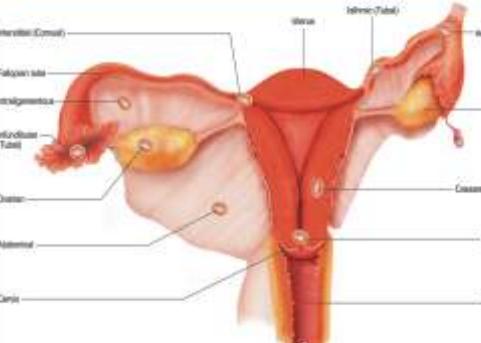


DMN514 : Ectopic pregnancy ECTOPIC PREGNANCY

Ectopic pregnancy is a pregnancy complication in which the fertilized egg attaches itself in a place other than inside the uterus.

- 95-96% are in the Fallopian tube:
 - 70% are Ampullary (in the middle part of the Fallopian tube).
 - 12% are Isthmic (in the upper part of the Fallopian tube close to the uterus).
 - 11% are Fimbrial (at the end of the tube)
 - 2-3% are Interstitial (between the part of the Fallopian tube that connects into the uterus) or Cervical (where an abnormally shaped uterus).

- 3% are Ovarian (in or on the ovary)
- <1% are within a Caesarean section scar on the uterus
- <1% are Cervical (on the Cervix)
- <1% are Abdominal (in the abdomen)



SYMPTOMS

- Sharp waves of pain in the abdomen, pelvis, shoulder, or neck
- Severe pain that occurs on one side of the abdomen
- Light to heavy vaginal spotting or bleeding
- Dizziness or fainting
- Rectal pressure

RISK FACTORS

- Previous ectopic pregnancy
- Tubal surgery
- Pelvic inflammatory disease
- Tobacco use
- Advanced maternal age
- Prior spontaneous abortion
- Medically induced abortion
- History of infertility
- Intrauterine device

DMN515 : Heart Attack

HEART ATTACK

CAUSES

- Excessive smoking and drinking is a reason for Heart Attack
- Excess quantity of fats and oil in diet
- Lack of exercise

SYMPTOMS

- Feeling pain in the left side of chest and abnormal ECG report
- Loss of consciousness
- Feeling vomiting
- Difficult breathing
- Excessive sweating

TREATMENT

- To dilate the blood clot in the artery medical treatment is needed
- Powerful injections should be given for quick relief from chest pain
- By Pass Surgery or to open the blocked artery Coronary Angioplasty

SUPPORTIVE CARE

- Reduce obesity and blood cholesterol
- Eat green leafy vegetables
- Do exercise regularly

DMN516 : Hypertension

HYPERTENSION

CAUSES

- Hereditary
- Old age
- Obesity
- Tension
- Alcohol & Tobacco

SYMPTOMS

- Headache
- Irritation
- Feeling weak and tired
- Dizziness & Palpitation
- Loss of consciousness, Breathlessness, Giddiness

TREATMENT

- Take Medicines as recommended by doctor regularly.
- Reduce fats & salt in the diet.
- Do regular exercises
- Regular check-up is necessary

SUPPORTIVE CARE

- Do not intake or drink.
- Take less amount of salt in diet.
- Keep your weight normal.

DMN517 : Cardiovascular Disease

CARDIOVASCULAR DISEASE

Blockage of Coronary Artery

Fatty substance gradually accumulates in the lining of the coronary artery wall and the muscle layer thickens as new muscle cells form in the fatty deposit. As a result, the artery becomes progressively narrow and causes short supply of blood and oxygen to heart.

Total Anomalous Pulmonary Venous Return

All Four Pulmonary Veins Connect to Superior Vena Cava

Normal anatomy: Superior Vena Cava, Inferior Vena Cava, Right Atrium, Right Ventricle, Left Atrium, Left Ventricle, Pulmonary Vein, Pulmonary Artery, Aorta, Septum.

CAUSES
The cause of total anomalous pulmonary venous return (TAPVR) is unknown.

SYMPTOMS
The infant may appear to be critically ill and may display the following symptoms:
 • Lethargy
 • Poor feeding
 • Rapid breathing
 • Poor growth
 • Frequent respiratory infections
 • Cyanosis (blue discoloration of the skin)

PROGNOSIS
If left untreated, death may occur by age 1 in babies with more severe defects. With surgery, early repair provides excellent results. If there is no blockage of the pulmonary veins at the new connection into the heart.

DMN518 : Thyroid Disorder

THYROID DISORDER

Thyroglossal Disorders and Thyroid Gland

The thyroid gland controls many of the metabolic reactions in the body.

Thyroid disorders fall into two groups:
 1. Thyrotoxicosis is due to overactivity of the gland.
 2. Myxoedema is due to underactivity of the gland.

SYMPTOMS

- Thyrotoxicosis:** Sweating and being thirsty, Bulging eyes, Weight loss and increase in appetite.
- Myxoedema:** Shivering of hands and feet, Swollenness in the voice.

TREATMENT

- Thyrotoxicosis:** Surgical treatment, Radiotherapy treatment.
- Myxoedema:** Medication.

SUPPORTIVE CARE

- Thyrotoxicosis:** Take regular medicine.
- Myxoedema:** Use iodized salt, Get your doctor regularly for medical help.

DMN519 : Understanding Cancer

UNDERSTANDING CANCER

CAUSES

- Unhygienic working place
- Contaminated food
- Drinking Liquor
- Chewing Tobacco and smoking
- Intake of polluted air and viruses

SYMPTOMS

- Weight loss, Fatigue, loss of appetite
- Severe persistent headache, recurrent pain in stomach and continuous bleeding in females.
- Painless lumps, painless firm nodule & change in size of a nodule.
- Bleed vomiting
- Painless lumps in the breast.

TREATMENT

- Chemotherapy
- Radiation Therapy
- Surgery

SUPPORTIVE CARE

- Healthy Environment and cleanliness
- Taking medicine at proper time
- Balanced Diet
- Regular Medical Check-up

DMN520 : Understanding HIV and AIDS

UNDERSTANDING HIV AND AIDS

Microscopic View of HIV

HIV (Human Immunodeficiency Virus) spreads by the mixing of blood and body fluids making the immune system defective that causes AIDS (Acquired Immune Deficiency Syndrome). It spreads with a very slow speed in the body.

CAUSES

- Unprotected sex with an HIV infected person
- Using HIV infected syringes
- Transformation of infected blood to a person
- From infected mother to her born baby

SYMPTOMS

Body defence mechanism goes low in AIDS

- Mental Disturbance
- Swelling and brown or blue patches on the skin
- Paralysis
- Rashes
- Severe loss in weight
- Frequent fever
- Blindness

AIDS IS NOT TRANSMITTED THROUGH

- Cough & Sneezes
- mosquito bites
- Sharing food and drinks
- Casual touch or hug
- Public toilet

PRECAUTIONS

- Syringe should be germ free
- The blood used for transfusion should be tested for virus first
- Use condom for safe sex

DMN800 : Top 10 Foods for Lactation

TOP 10 FOODS FOR LACTATION

- Papaya
- Spinach
- Salmon
- Carrot Juice
- Hummus
- Oatmeal
- Asparagus
- Apricot
- Water
- Brown Rice

DMN801 : What to Eat When Breastfeeding

WHAT TO EAT WHEN BREASTFEEDING

BREASTFEEDING AND YOUR DIET

- EGG:** Perfect source of meeting your body's regular protein requirement. Perfect source of Vitamin D.
- LOW-FAT DAIRY PRODUCTS:** Calcium is required for your baby's bone structure development and equally essential for the mother's well being.
- LEGUMES:** To ensure proper milk production you need to stay well hydrated.
- LEAN MEATS:** Fish and chicken are rich in vital nutrients.
- SEASONAL FRUITS:** Fruits are rich sources of antioxidants, vitamins and minerals.
- LEAFY GREEN VEGETABLES:** Leafy green vegetables are store houses of vitamin A, vitamin C, iron, calcium and other antioxidants.
- WHOLE GRAINS:** Whole grains are a terrific source of essential nutrients like protein, vitamins, iron and other minerals.
- LEGUMES:** Legumes are a rich source of protein and iron, especially for vegan mothers. They are gas inducing foods and hence should be included in moderation.

DMN802 : Pregnancy Plate

PREGNANCY PLATE

Diet Plan & Portions in Pregnancy

Choose 2 to 3 servings of non-fat (1% milk or yogurt) or low-fat (2% milk or yogurt) milk. A serving is 8 oz. Choose yogurt with less than 15 g of sugar per serving.

Choose small amounts of healthy oils (olive and canola) for cooking or in fewer foods. Nuts, seeds, and avocado contain healthy fats.

Choose large portions of non-starchy vegetables, such as leafy greens, cruciferous vegetables, and other vegetables.

Choose protein sources such as poultry, beans, fish, lean meats, and eggs. For variety, eat a variety of protein sources. Choose lean meats, poultry, and fish. Choose low-fat dairy products. Choose whole grains, fruits, and vegetables.

Choose a variety of whole grains like wheat, rice, and oats. Choose a variety of fruits and vegetables. Choose a variety of protein sources like poultry, fish, and beans. Choose a variety of healthy fats like olive oil and avocado.

Drink mainly water, decaf tea or decaf coffee and avoid sugary beverages.

Aim for at least 30 minutes of walking or another physical activity each day.

DMN803 : Diet for Chronic Kidney Disease

DIET FOR CHRONIC KIDNEY DISEASE

Eat Foods with Less Sodium

Eat Foods and Drinks with Less Phosphorus

Eat Foods with Less Potassium

Eat The Right Amount and Right Types of Protein

Foods with less sodium: Fresh fruits, Spices & herbs, Pickles, Soy sauce, Canned soups, Extra added salt.

Foods with high sodium: Fast foods, Processed meats, Breads, Pasta, Dairy foods, Nuts, Seeds, Beans, Lentils.

Foods with less phosphorus: Fresh fruits and vegetables, White bread, Milk, Dairy foods, Nuts, Seeds, Beans, Lentils.

Foods with high phosphorus: Milk, Dairy foods, Nuts, Seeds, Beans, Lentils.

Foods with less potassium: Apples, Peaches, Carrots, White bread, Pasta, Rice, Beans, Lentils, Eggs, Yogurt.

Foods with high potassium: Bananas, Potatoes, Tomatoes, Spinach, White bread, Pasta, Rice, Beans, Lentils, Eggs, Yogurt.

Foods with less protein: Fresh fruits, Spices & herbs, Fresh-vegetables, Grains, Dairy foods, Nuts, Seeds, Beans, Lentils, Fish.

Foods with high protein: White bread, Pasta, Rice, Beans, Lentils, Eggs, Yogurt, Fish.

DMN804 : Diabetes Portion Plate

DIABETES PORTION PLATE

Non-starchy vegetables, Starchy foods, Protein, Fats & oils.

add a 1/2 glass of non-fat or low-fat milk

add a piece of fruit or a 1/2 cup of fruit salad

DMN805 : Diabetic Food Pyramid

DIABETIC FOOD PYRAMID

Do 30 minutes exercise daily

Drink 8 servings of water daily

Restrict These Food Types: sugary desserts, jams & jellies, deep-fried foods, ice-creams, bakery products, chips, soft drinks, sweetened fruit juices.

A healthy meal for diabetic people is generally the same as healthy eating for anyone – low in saturated fat, moderate in salt and sugar, with meals based on lean protein, non-starchy vegetables, whole grains, healthy fats, and fruits.

DMN806 : Small Meals: 5 Times a Day

SMALL MEALS: 5 TIMES A DAY

BRNKR (08:00 AM)

MORNING BREAKFAST (7:00 AM)

BRNKR (02:00 PM)

MORNING BREAKFAST (7:00 AM)

BRNKR (08:00 AM)

MORNING BREAKFAST (7:00 AM)

BRNKR (08:00 AM)

MORNING BREAKFAST (7:00 AM)

DMN807 : Acid-Alkaline Food & Drink

ACID/ALKALINE FOOD & DRINKS

All foods have a pH value and are either acid-forming, alkaline-forming or have neutral pH. Diets that stress high acid-forming foods can lead to chronic acidosis that will weaken health and ultimately create a breeding ground for adult degenerative diseases. The acid/alkaline food chart below is designed to help guide you to make better dietary choices based on the pH value of foods.

EAT LESS

EAT MORE

NEUTRAL (pH 7): Meat tap water, Most spring water & river water.

ACID (pH 1-6): Pickles, Vinegar, Soy sauce, Lamb, Hired liquors, Canned soups & Processed foods; Chicken, Eggs, Hard cheeses, Mustard, Peanut, Coffee, Beer & Wines; Honey, Bread, White rice, Potatoes, Milk, Sweet potatoes, Cashews, Figs & whole grains; Fat, Grapes, Wheat, Brown rice, Plums, Pineapple, Bananas, Walnuts, Mango & Peaches.

ALKALINE (pH 8-10): Olive oil, Pumpkin seeds, Nougat milk, Coconut, Barley & Sunflower seeds; Green cabbage, Almonds, Coconut water, Bell pepper, Dives & Millet; Tomatoes, Peas, Garlic, Red chili, Avocado, Green tea & Lemon grass; Spinach, Broccoli, Artichokes, Onions, Cauliflower, Carrot & Onions.

DMN808 : Food Pyramid

FOOD PYRAMID

Food pyramid is a pyramid-shaped nutrition guide divided into sections to show the recommended intake for each food group.

VEGETABLES (3-5 SERVINGS)

FRUITS (2-4 SERVINGS)

BREADS, GRAINS AND OTHER STARCHES (6-11 SERVINGS)

MILK AND MILK PRODUCTS (2-3 SERVINGS)

FATS, OILS AND SWEETS (USE SPARINGLY)

MEAT, BEAN, NUTS/EGGS AND OTHER PROTEINS (2-3 SERVINGS)

WATER (8 SERVINGS)

DMN900 Differentiation of Head & Pubic Hairs

DIFFERENTIATION OF HEAD & PUBIC HAIRS

LONGITUDINAL SECTION OF THE HAIR FOLLICLE

TRANSVERSE SECTION OF HAIR FOLLICLE

HEAD HAIRS

PUBIC HAIRS

Hair is a protein filament that grows from follicles found in the dermis, or skin. The human body, apart from areas of glabrous skin, is covered in follicles which produce thick terminal and fine vellus hair.

Head hair grows on the scalp, is the most noticeable of all human hair, which can grow longer than on most mammals. The average human head has about 100,000 hair follicles. Each follicle can grow about 20 individual hairs in a person's lifetime.

Head hair density is related to both race and hair color. Caucasians have the highest hair density, with an average growth rate, while Asians have the lowest density but fastest growing hair, and Africans have medium density and slowest growing hair.

Pubic hair is the hair in the frontal genital area of adolescents and adult humans. Pubic hair develops during puberty as an effect of rising levels of androgens. Pubic hair is therefore part of the androgenic hair or body hair and is a secondary sex characteristic. When it grows in one of the first signs of puberty, it starts as downy, straight hair, and then progresses to coarse, curly hair that starts to form a triangle above and around the genitals.

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HP12S : Male Reproductive System

MALE REPRODUCTIVE SYSTEM

MALE REPRODUCTIVE ORGANS

THE PROSTATE

SPERMATOGENESIS

CROSS-SECTION OF THE PENIS

THE TESTIS

THE EPIDIDYMIS

THE VASCULATURE

ANTERIOR VIEW OF PENIS

POSTERIOR VIEW

HP13S : Female Reproductive System

FEMALE REPRODUCTIVE SYSTEM

THE FEMALE REPRODUCTIVE ORGANS

STRUCTURE OF BREAST

OVUM

FEMALE REPRODUCTIVE ORGANS

The female reproductive system is specialized to produce offspring. It consists of the ovaries, fallopian tubes, uterus, vagina, and vulva. The ovaries produce eggs and hormones. The fallopian tubes transport eggs from the ovaries to the uterus. The uterus is where the embryo implants and develops. The vagina is the birth canal, and the vulva is the external opening.

OVARY, FALLOPIAN TUBE, UTERUS AND VAGINA

UTERUS

OVARY

HP14S : Human Embryology

HUMAN EMBRYOLOGY

OVARY, FALLOPIAN TUBE, UTERUS AND VAGINA

STEPS IN THE FERTILIZATION

THE EMBRYO

During the first 7 weeks of development, the unborn child is called an embryo. The embryo develops from a cluster of cells formed by repeated division of the fertilized egg. Some of these cells form the embryo proper, while the outer cells form the placenta and membranes which nourish the embryo and protect it from infection.

DEVELOPMENT OF EMBRYO

HP18S : Pregnancy And Birth

PREGNANCY AND BIRTH

Pregnancy is the state of having a developing fetus in the uterus, which extends from conception to labour (parturition). Pregnancy takes approximately 283 days from the first day of last menstrual period (approximately 267 days from conception).

STAGES OF LABOUR (PARTURITION)

Labour is the process in which the fetus moves from the uterus through the birth canal resulting in the birth of the baby. The process usually begins with the fetus being a head-down position against the cervix, accompanied by contractions of the uterus.

After the birth of the baby, the placenta gets separated from the uterine wall and is expelled by strong contractions through the birth canal.

HP30S : Menstrual Cycle

MENSTRUAL CYCLE

The principal sign that a girl has become sexually mature and is capable of reproduction is the onset of menstruation (bleeding from the vagina). During each menstrual cycle, either of the two ovaries releases an ovum. In the absence of fertilization, thickened uterine lining is shed along with blood vessels and mucus together. The menstrual cycle is regulated by several hormones secreted by the pituitary gland and the ovaries.

FOLLICULAR AND OVULATORY PHASES

LUTEAL PHASE

HORMONAL REGULATION

OVARIAN CYCLE

UTERINE CYCLE

HP31S : Contraception (Birth Control)

CONTRACEPTION (BIRTH CONTROL)

Various contraceptive methods not only prevent unwanted pregnancies but also are the most important measures to check population growth rate.

WHAT IS AN IDEAL CONTRACEPTIVE ?

- User-Friendly
- Easily Available
- Effective
- No or Least Side Effects
- Reversible
- No interference with Sexual Drive, Desire & Sexual Act

COMMON CONTRACEPTIVE METHODS

Natural/Traditional Methods

Avoid chance of sperm & eggs meeting

- Periodic abstinence
- Withdrawal (Coitus Interruptus)
- Lactational amenorrhoea

IUDs

Injectables (ICs)

Made up of progesterone compounds administered through deep intramuscular injections, preferably subcutaneously.

Barrier Methods

Surgical Methods

Uterine tube cut and sealed (Tubectomy)

Vasectomy

Oral Contraceptives

Progesterone or progesterone-estrogen combination pills

Diaphragm

Vasectomy

Hysterectomy

MP01 : Numerical Chart

NUMERICAL CHART

| | | | | | | | | | |
|----|----|----|----|----|----|----|----|----|-----|
| 1 | 11 | 21 | 31 | 41 | 51 | 61 | 71 | 81 | 91 |
| 2 | 12 | 22 | 32 | 42 | 52 | 62 | 72 | 82 | 92 |
| 3 | 13 | 23 | 33 | 43 | 53 | 63 | 73 | 83 | 93 |
| 4 | 14 | 24 | 34 | 44 | 54 | 64 | 74 | 84 | 94 |
| 5 | 15 | 25 | 35 | 45 | 55 | 65 | 75 | 85 | 95 |
| 6 | 16 | 26 | 36 | 46 | 56 | 66 | 76 | 86 | 96 |
| 7 | 17 | 27 | 37 | 47 | 57 | 67 | 77 | 87 | 97 |
| 8 | 18 | 28 | 38 | 48 | 58 | 68 | 78 | 88 | 98 |
| 9 | 19 | 29 | 39 | 49 | 59 | 69 | 79 | 89 | 99 |
| 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |

MP02 : Addition

ADDITION

Symbol +

One and one are two: $1 + 1 = 2$

Three and two are five: $3 + 2 = 5$

Six and two are eight: $6 + 2 = 8$

Four and three are seven: $4 + 3 = 7$

Three are two and one: $3 = 2 + 1$

Eight are three and five: $8 = 3 + 5$

10 + 10 = 20, 20 + 10 = 30, 30 + 10 = 40, 40 + 10 = 50, 50 + 10 = 60, 60 + 10 = 70, 70 + 10 = 80, 80 + 10 = 90, 90 + 10 = 100

100 + 10 = 110, 110 + 10 = 120, 120 + 10 = 130, 130 + 10 = 140, 140 + 10 = 150, 150 + 10 = 160, 160 + 10 = 170, 170 + 10 = 180, 180 + 10 = 190, 190 + 10 = 200

MP03 : Subtraction

SUBTRACTION

Symbol -

Birds 6 - Fly 2 = Balance 4: $6 - 2 = 4$

I had Mangoes 6 - I ate 3 = Balance 3: $6 - 3 = 3$

I had Books 4 - I gave 1 = Balance 3: $4 - 3 = 1$

I had Balloons 5 - Burst 2 = Balance 3: $5 - 2 = 3$

Mother gave me Toffees 5 - I ate Toffees 6 = Balance I had - 1: $5 - 6 = -1$

Father gave me Apples 3 - I gave to sister Apple 1 = Balance = 2: $3 - 1 = 2$

Tens Units: $56 - 34 = 22$

Hundreds Tens Units: $864 - 432 = 432$

Hundreds Tens Units: $874 - 485 = 389$

MP04 : Multiplication

MULTIPLICATION

Symbol X

Four times three: $3 + 3 + 3 + 3 = 3 \times 4 = 12$

10 + 10 + 10 + 10 = 40: $10 \times 4 = 40$

10 + 10 + 10 + 10 + 10 = 50: $10 \times 5 = 50$

20 + 20 + 20 = 60: $20 \times 3 = 60$

30 + 30 + 30 = 90: $30 \times 3 = 90$

40 + 40 + 40 = 120: $40 \times 3 = 120$

50 + 50 + 50 = 150: $50 \times 3 = 150$

60 + 60 + 60 = 180: $60 \times 3 = 180$

70 + 70 + 70 = 210: $70 \times 3 = 210$

80 + 80 + 80 = 240: $80 \times 3 = 240$

90 + 90 + 90 = 270: $90 \times 3 = 270$

MP05 : Division

DIVISION

Symbol ÷

1 Part of the collection is shaded. There are 3 equal parts of the collection. So one-third or 1/3 of the collection is shaded.

1 Part of the collection is shaded. There are 4 equal parts of the collection. So one-fourth or 1/4 of the collection is shaded.

1 Part of the collection is shaded. There are 2 equal parts of the collection. So one-half or 1/2 of the collection is shaded.

9 Divided by 3 equals 3: $9 \div 3 = 3$

Mother has 12 Mangoes she divided them among her 4 children. Each gets 3: $12 \div 4 = 3$

One half of 4 is 2: $4 \div 2 = 2$

One third of 6 is 2: $6 \div 3 = 2$

One fourth of 20 is 5: $20 \div 4 = 5$

How many 7 are there in 28? $28 \div 7 = 4$

Divide 5 Tens 3 Units by 3: $53 \div 3 = 17 \text{ R } 2$

6 Tens = 3 Tens, 3 Units = 1 Unit, 2 Tens 1 Unit = 21

The sum which is divided by a number is called DIVIDEND. The number by which it is divided is called DIVISOR. The answer is called QUOTIENT. The left over number is REMAINDER.

$8 \overline{) 812}$ = 101 R 4

$24 \text{ (Quotient)} \times 33 \text{ (Divisor)} = 792$

$812 - 792 = 20$ (Remainder)

Dividend = Quotient × Divisor + Remainder

Divisor = (Dividend - Remainder) / Quotient

MP06 : Multiplication Tables

MULTIPLICATION TABLES

| NUMBERS | MULTIPLICATION BY TWO | MULTIPLICATION BY THREE | MULTIPLICATION BY FOUR | MULTIPLICATION BY FIVE |
|---------|-----------------------|-------------------------|------------------------|------------------------|
| 1 | 2 | 3 | 4 | 5 |
| 2 | 4 | 6 | 8 | 10 |
| 3 | 6 | 9 | 12 | 15 |
| 4 | 8 | 12 | 16 | 20 |
| 5 | 10 | 15 | 20 | 25 |
| 6 | 12 | 18 | 24 | 30 |
| 7 | 14 | 21 | 28 | 35 |
| 8 | 16 | 24 | 32 | 40 |
| 9 | 18 | 27 | 36 | 45 |
| 10 | 20 | 30 | 40 | 50 |
| 11 | 22 | 33 | 44 | 55 |
| 12 | 24 | 36 | 48 | 60 |
| 13 | 26 | 39 | 52 | 65 |
| 14 | 28 | 42 | 56 | 70 |
| 15 | 30 | 45 | 60 | 75 |
| 16 | 32 | 48 | 64 | 80 |
| 17 | 34 | 51 | 68 | 85 |
| 18 | 36 | 54 | 72 | 90 |
| 19 | 38 | 57 | 76 | 95 |
| 20 | 40 | 60 | 80 | 100 |

MP07 : Roman Numeral Chart

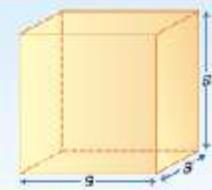
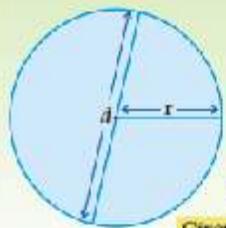
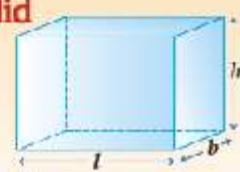
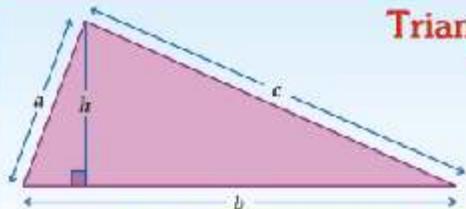
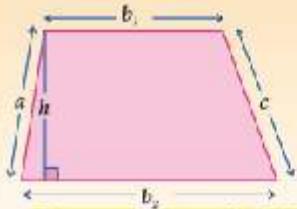
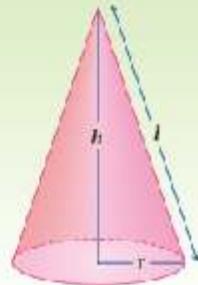
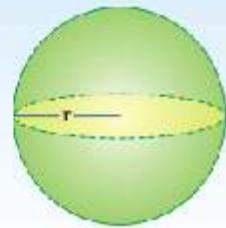
ROMAN NUMERAL CHART

| I-V | VI-X | XI-XV | XVI-XX | XXI-XXV |
|------|------|-------|--------|---------|
| I | VI | XI | XVI | XXI |
| 1 | 6 | 11 | 16 | 21 |
| II | VII | XII | XVII | XXII |
| 2 | 7 | 12 | 17 | 22 |
| III | VIII | XIII | XVIII | XXIII |
| 3 | 8 | 13 | 18 | 23 |
| IV | IX | XIV | XIX | XXIV |
| 4 | 9 | 14 | 19 | 24 |
| V | X | XV | XX | XXV |
| 5 | 10 | 15 | 20 | 25 |
| VI | XI | XVI | XXI | XXVI |
| 6 | 11 | 16 | 21 | 26 |
| VII | XII | XVII | XXII | XXVII |
| 7 | 12 | 17 | 22 | 27 |
| VIII | XIII | XVIII | XXIII | XXVIII |
| 8 | 13 | 18 | 23 | 28 |
| IX | XIV | XIX | XXIV | XXIX |
| 9 | 14 | 19 | 24 | 29 |
| X | XV | XX | XXV | XXX |
| 10 | 15 | 20 | 25 | 30 |

MKS06a : Mensuration

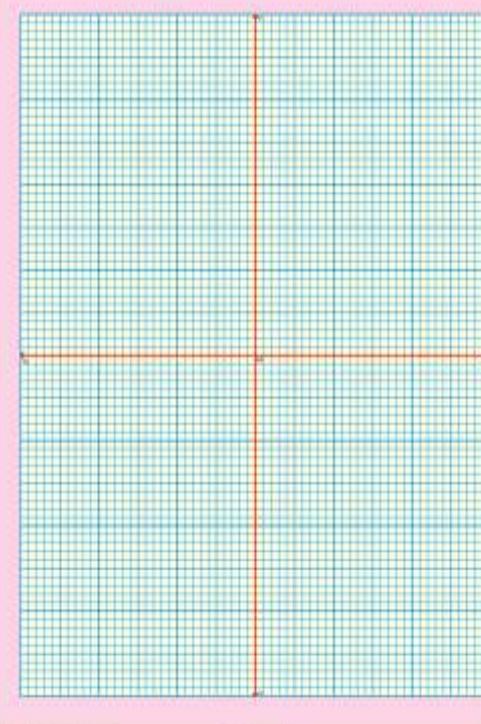
MENSURATION

A graphical list of the formulas for measurement concepts

| | |
|--|--|
|  <p>Rectangle</p> <p>Perimeter = $2(\text{Length} + \text{Breadth}) = 2(l + b)$ Area = $\text{Length} \times \text{Breadth} = lb$</p> |  <p>Cube</p> <p>Lateral Surface Area = $4 \times \text{Side} \times \text{Side} = 4s^2$ Total Surface Area = $6 \times \text{Side} \times \text{Side} = 6s^2$ Volume = $\text{Side} \times \text{Side} \times \text{Side} = s^3$</p> |
|  <p>Circle</p> <p>($\pi = 3.14$)</p> <p>Area = $\pi \times \text{radius}^2 = \pi r^2$ Diameter = $2 \times \text{radius} = 2r$ Circumference = $\pi \times \text{diameter} = \pi d$ Circumference = $2\pi \times \text{radius} = 2\pi r$</p> |  <p>Rectangular Solid (Cuboid)</p> <p>Lateral Surface Area = $2h(l + b)$ Total Surface Area = $2(lb + bh + lh)$ Volume = $\text{Length} \times \text{Breadth} \times \text{Height} = lbh$</p> |
|  <p>Triangle</p> <p>Area = $1/2 \times \text{Base} \times \text{Height} = 1/2 bh$ Perimeter = $\text{Sum of Three Sides} = a + b + c$</p> |  <p>Cylinder</p> <p>($\pi = 3.14$, $r = \text{radius}$, $h = \text{height}$)</p> <p>L. Surface Area = $2\pi rh$ T. Surface Area = $2\pi r(r + h)$ Volume = $\pi r^2 h$</p> |
|  <p>Trapezium</p> <p>Perimeter = $\text{Sum of All Sides} = a + b_1 + b_2 + c$ Area = $1/2 (\text{Sum of Parallel Sides}) \times \text{Height}$ Area = $1/2 (b_1 + b_2) h$</p> |  <p>Cone</p> <p>($\pi = 3.14$, $r = \text{radius}$, $l = \text{slant height}$, $h = \text{height}$)</p> <p>L. Surface Area = πrl T. Surface Area = $\pi r(l + r)$ Volume = $1/3 \pi r^2 h$</p> |
|  <p>Parallelogram</p> <p>Area = $\text{Base} \times \text{Height} = bh$</p> |  <p>Sphere</p> <p>Surface Area = $4\pi r^2$ Volume = $4/3 \pi r^3$</p> |

MKS06b : Graph Chart

GRAPH CHART



MKS06d : Mathematical Symbol

MATHEMATICAL SYMBOL

| | |
|--|---|
| <ul style="list-style-type: none"> $+$ Plus; Positive $-$ Minus; Negative \pm Plus or minus; error margin \mp Minus or plus \times Multiplied by \div Divided by $=$ Equal to \neq Not equal to \approx Approximately equal to \therefore Ratio or such that $>$ Greater than $<$ Less than \propto Directly proportional to ∞ Infinity $\sqrt{\quad}$ Square root $!$ Factorial $\%$ Percent ∇ Del (differential operator) $^\circ$ Degrees | <ul style="list-style-type: none"> \int Integral \angle Angle \perp Perpendicular \parallel Parallel \cong Congruent to \therefore Therefore \because Because \forall For all \setminus Set \cup Union \cap Intersection \subset Is a subset of $\not\subset$ Is not a subset of \Rightarrow Implies that \Leftarrow Is implied by \Leftrightarrow If and only if \dots etc. \circ Composite function Δ Increment Σ Sum |
|--|---|

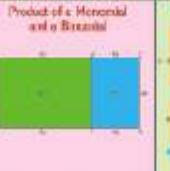
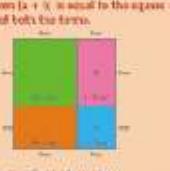
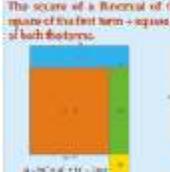
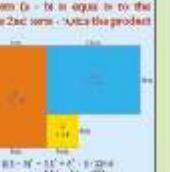
MKS06c : Shapes And Figures

SHAPES AND FIGURES

| | | |
|--|--|---|
|  <p>Irregular Polygon</p> <p>A five-sided closed figure.</p> |  <p>Sector</p> <p>A part of a circle cut off by a chord and two radii.</p> |  <p>Polygon</p> <p>A closed figure with three or more sides.</p> |
|  <p>Triangle</p> <p>A three-sided polygon. The sum of the angles is constant at 180 degrees.</p> |  <p>Isosceles Triangle</p> <p>Two sides are equal in length.</p> |  <p>Equilateral Triangle</p> <p>All three sides are equal in length. All angles are 60 degrees.</p> |
|  <p>Scalene Triangle</p> <p>No two sides are equal in length.</p> |  <p>Right-angled Triangle</p> <p>One angle is a right angle (90 degrees).</p> |  <p>Obtuse-angled Triangle</p> <p>One angle is obtuse (greater than 90 degrees).</p> |
|  <p>Quadrilateral</p> <p>A four-sided polygon. The sum of the angles is 360 degrees.</p> |  <p>Trapezium</p> <p>A quadrilateral with one pair of parallel sides.</p> |  <p>Parallelogram</p> <p>A quadrilateral with two pairs of parallel sides.</p> |
|  <p>Rectangle</p> <p>A quadrilateral with four right angles. Opposite sides are equal.</p> |  <p>Square</p> <p>A quadrilateral with four equal sides and four right angles.</p> |  <p>Rhombus</p> <p>A quadrilateral with four equal sides.</p> |
|  <p>Regular Polygon</p> <p>All sides and angles are equal.</p> |  <p>Pentagon</p> <p>A five-sided polygon.</p> |  <p>Hexagon</p> <p>A six-sided polygon.</p> |
|  <p>Heptagon</p> <p>A seven-sided polygon.</p> |  <p>Octagon</p> <p>An eight-sided polygon.</p> |  <p>Nonagon</p> <p>A nine-sided polygon.</p> |

MKS06e : Algebraic Identities

ALGEBRAIC IDENTITIES

| | | |
|---|---|---|
| <p>Product of 2 Monomials</p>  <p>$(a + b)(c + d) = ac + ad + bc + bd$</p> | <p>Product of a Monomial and a Binomial</p>  <p>$a(b + c) = ab + ac$</p> | <p>Multiplication of Binomials</p>  <p>$(a + b)(a - b) = a^2 - b^2$</p> |
| <p>The square of a Binomial of the form (a + b) is equal to the square of the first term + square of the 2nd term + twice the product of both the terms.</p>  <p>$(a + b)^2 = a^2 + 2ab + b^2$</p> | <p>The square of a Binomial of the form (a - b) is equal to the square of the first term - square of the 2nd term - twice the product of both the terms.</p>  <p>$(a - b)^2 = a^2 - 2ab + b^2$</p> | <p>The square of a Binomial of the form (a + b) is equal to the square of the first term + square of the 2nd term + twice the product of both the terms.</p>  <p>$(a + b)^2 = a^2 + 2ab + b^2$</p> |
| <p>The product of the sum and difference of two quantities is equal to the difference of their squares.</p>  <p>$(a + b)(a - b) = a^2 - b^2$</p> | <p>The product of the sum and difference of two quantities is equal to the difference of their squares.</p>  <p>$(a + b)(a - b) = a^2 - b^2$</p> | <p>The product of the sum and difference of two quantities is equal to the difference of their squares.</p>  <p>$(a + b)(a - b) = a^2 - b^2$</p> |

MUP09 : Quadrilaterals चतुर्भुज

Quadrilaterals are closed figures with four sides. They are named after the number of sides they have.

Properties of Quadrilateral:

- Sum of interior angles = 360°
- Sum of exterior angles = 360°
- Diagonals bisect each other in a parallelogram.

Types of Quadrilaterals:

- Parallelogram:** Opposite sides are equal and parallel. Diagonals bisect each other.
- Rectangle:** All angles are 90°. Opposite sides are equal.
- Square:** All sides are equal. All angles are 90°.
- Rhombus:** All sides are equal. Opposite angles are equal.
- Trapezium:** One pair of opposite sides is parallel.
- Kite:** Two pairs of adjacent sides are equal.

MUP10 : Circle वृत्त

A circle is a closed curve such that any line segment drawn between two points on the curve lies entirely within the curve.

Parts of a Circle:

- Center:** The point from which all points on the circle are equidistant.
- Radius (r):** The distance from the center to the circumference.
- Diameter (d):** A line segment passing through the center, with both ends on the circumference. $d = 2r$.
- Chord:** A line segment with both ends on the circumference.
- Arc:** A part of the circumference.
- Angle subtended by an arc at the center:** The angle formed by two radii drawn to the endpoints of the arc.
- Angle subtended by an arc at any point on the circumference:** Half the angle subtended by the arc at the center.

Properties of Circles:

- All radii of a circle are equal.
- The center of a circle is the midpoint of every chord.
- The perpendicular from the center to a chord bisects the chord.
- The line joining the center to the midpoint of a chord is perpendicular to the chord.
- The angle subtended by a chord at the center is double the angle subtended by it at any point on the circumference.
- Angles in the same segment are equal.
- The angle subtended by a diameter is a right angle.
- The locus of a point which moves such that it subtends a right angle to a given line segment is a circle with the line segment as diameter.

MUP11 : Congruent Triangles सर्वांगसम त्रिभुज

Two triangles are said to be congruent if they have the same shape and size. They are denoted by the symbol \cong .

Criteria for Congruence:

- SSS (Side-Side-Side):** If three sides of one triangle are equal to three sides of another triangle, then the triangles are congruent.
- SAS (Side-Angle-Side):** If two sides and the included angle of one triangle are equal to two sides and the included angle of another triangle, then the triangles are congruent.
- ASA (Angle-Side-Angle):** If two angles and the included side of one triangle are equal to two angles and the included side of another triangle, then the triangles are congruent.
- AAS (Angle-Angle-Side):** If two angles and a non-included side of one triangle are equal to two angles and a non-included side of another triangle, then the triangles are congruent.
- HL (Hypotenuse-Leg):** If the hypotenuse and one leg of a right-angled triangle are equal to the hypotenuse and one leg of another right-angled triangle, then the triangles are congruent.

Properties of Congruent Triangles:

- Corresponding sides are equal.
- Corresponding angles are equal.
- Corresponding parts of congruent triangles are equal (C.P.C.T.).

MUP12 : Properties of Circle वृत्त के गुण

Properties of a Circle:

- The center of a circle is the midpoint of every chord.
- The perpendicular from the center to a chord bisects the chord.
- The line joining the center to the midpoint of a chord is perpendicular to the chord.
- The angle subtended by a chord at the center is double the angle subtended by it at any point on the circumference.
- Angles in the same segment are equal.
- The angle subtended by a diameter is a right angle.
- The locus of a point which moves such that it subtends a right angle to a given line segment is a circle with the line segment as diameter.

Properties of Angles in a Circle:

- Angle subtended by an arc at the center is double the angle subtended by it at any point on the circumference.
- Angles in the same segment are equal.
- The angle subtended by a diameter is a right angle.
- The locus of a point which moves such that it subtends a right angle to a given line segment is a circle with the line segment as diameter.

MUP13 : Mensuration - I क्षेत्रमिति - I

| Figure | Area | Perimeter | Illustrations |
|---------------|---|--------------------|--|
| Rectangle | $l \times b$ | $2 \times (l + b)$ | l = length (दीर्घत्व) b = breadth (विष्टत्व) |
| Square | $s \times s$ | $4 \times s$ | s = side (बाहु) |
| Quadrilateral | $\frac{1}{2} \times d \times (h_1 + h_2)$ | $p + q + r + s$ | d = diagonal (दीर्घ) h_1, h_2 = altitudes (उचाई) p, q, r, s = sides (बाहु) |
| Triangle | $\frac{1}{2} \times b \times h$ or $\frac{s}{2} \times (s-a) \times (s-b) \times (s-c)$ | $a + b + c$ | h = altitude (उचाई) a, b, c = sides (बाहु) $s = \frac{a+b+c}{2}$ |
| Parallelogram | $b \times h$ | $2 \times (a + b)$ | h = altitude (उचाई) a = side (बाहु) b = base (आधार) |
| Rhombus | $\frac{1}{2} \times d_1 \times d_2$ or $h \times s$ | $4 \times s$ | d_1, d_2 = diagonals (दीर्घ) h = altitude (उचाई) s = side (बाहु) |
| Trapezium | $\frac{1}{2} \times (a + b) \times h$ | $a + b + c + d$ | a, d = parallel sides (समान बाहु) b, c = non-parallel sides (असमान बाहु) h = altitude (उचाई) |
| Circle | πr^2 | $2\pi r$ | $\pi = 3.14$ or $22/7$ r = radius (त्रिज्या) |

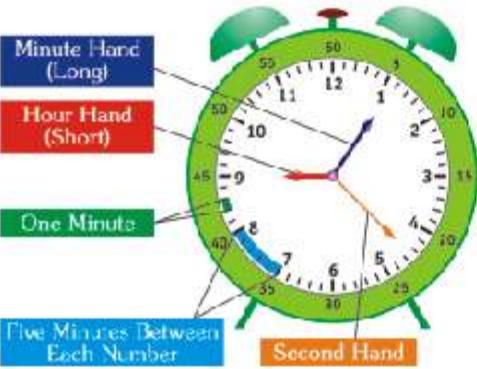
MUP14 : Mensuration - II क्षेत्रमिति - II

| Figure | Area | Volume | Illustrations |
|-------------------|-------------------|-------------------------|---|
| Rectangular Prism | $2(l+b) \times h$ | $l \times b \times h$ | l = Length (दीर्घत्व) b = Breadth (विष्टत्व) h = Height (उचाई) |
| Cube | $4s^2$ | s^3 | s = Side (बाहु) |
| Cylinder | $2\pi r h$ | $\pi r^2 h$ | r = Radius (त्रिज्या) h = Height (उचाई) |
| Conical Prism | $\pi r l$ | $\frac{1}{3} \pi r^2 h$ | r = Radius (त्रिज्या) h = Height (उचाई) l = Slant Height (तिर्यक बाहु) $l^2 = r^2 + h^2$ |
| Sphere | $4\pi r^2$ | $\frac{4}{3} \pi r^3$ | r = Radius (त्रिज्या) |
| Cap | $2\pi r^2$ | $\frac{2}{3} \pi r^3$ | r = Radius (त्रिज्या) |

MUP15 : Profit & Loss लाभ व हानि

| | | |
|----|--|--|
| 1 | $\text{Profit} = \text{Selling Price} - \text{Cost Price}$ when $(\text{Selling Price} > \text{Cost Price})$ | $\text{लाभ} = \text{बिक्रय मूल्य} - \text{क्रय मूल्य}$ जब $(\text{बिक्रय मूल्य} > \text{क्रय मूल्य})$ |
| 2 | $\text{Loss} = \text{Cost Price} - \text{Selling Price}$ when $(\text{Cost Price} > \text{Selling Price})$ | $\text{हानि} = \text{क्रय मूल्य} - \text{बिक्रय मूल्य}$ जब $(\text{क्रय मूल्य} > \text{बिक्रय मूल्य})$ |
| 3 | $\text{Profit \%} = \frac{\text{Profit} \times 100}{\text{Cost Price}}$ | $\text{लाभ \%} = \frac{\text{लाभ} \times 100}{\text{क्रय मूल्य}}$ |
| 4 | $\text{Loss \%} = \frac{\text{Loss} \times 100}{\text{Cost Price}}$ | $\text{हानि \%} = \frac{\text{हानि} \times 100}{\text{क्रय मूल्य}}$ |
| 5 | $\text{Selling Price} = \frac{100 + \text{Profit \%}}{100} \times \text{Cost Price}$ | $\text{बिक्रय मूल्य} = \frac{(100 + \text{लाभ \%}) \times \text{क्रय मूल्य}}{100}$ |
| 6 | $\text{Selling Price} = \frac{100 - \text{Loss \%}}{100} \times \text{Cost Price}$ | $\text{बिक्रय मूल्य} = \frac{(100 - \text{हानि \%}) \times \text{क्रय मूल्य}}{100}$ |
| 7 | $\text{Cost Price} = \frac{\text{Selling Price} \times 100}{100 + \text{Profit \%}}$ | $\text{क्रय मूल्य} = \frac{\text{बिक्रय मूल्य} \times 100}{100 + \text{लाभ \%}}$ |
| 8 | $\text{Cost Price} = \frac{\text{Selling Price} \times 100}{100 - \text{Loss \%}}$ | $\text{क्रय मूल्य} = \frac{\text{बिक्रय मूल्य} \times 100}{100 - \text{हानि \%}}$ |
| 9 | $\text{Discount} = \text{List Price} - \text{Selling Price}$ | $\text{बट्टा} = \text{अंकित मूल्य} - \text{बिक्रय मूल्य}$ |
| 10 | $\text{Discount \%} = \frac{\text{Discount} \times 100}{\text{List Price}}$ | $\text{बट्टे की दर (दर \%)} = \frac{\text{बट्टा} \times 100}{\text{अंकित मूल्य}}$ |
| 11 | $\text{Selling Price} = \frac{\text{List Price} \times (100 - \text{Discount \%})}{100}$ | $\text{बिक्रय मूल्य} = \frac{\text{अंकित मूल्य} \times (100 - \text{बट्टे \%})}{100}$ |
| 12 | $\text{List Price} = \frac{100 \times \text{Selling Price}}{100 - \text{Discount \%}}$ | $\text{अंकित मूल्य} = \frac{100 \times \text{बिक्रय मूल्य}}{100 - \text{बट्टे \%}}$ |

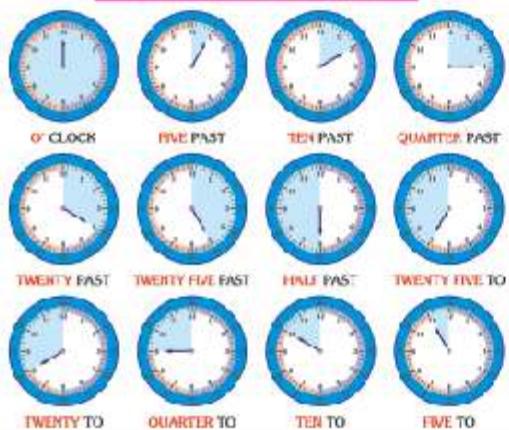
Time



- ### : TIME PERIODS :
- 60 SECONDS in each MINUTE
 - 60 MINUTES in each HOUR
 - 24 HOURS in each DAY
 - 7 DAYS in each WEEK
 - 4 WEEKS in each MONTH
 - 12 MONTHS in each YEAR
 - 100 YEARS in each CENTURY
 - 1000 YEARS in each MILLENNIUM

| O' Clock | Quarter Past | Half Past | Quarter To |
|--------------|--------------|------------|---------------|
| | | | |
| 6:00 | 7:15 | 1:30 | 10:45 |
| Morning Time | School Time | Lunch Time | Sleeping Time |

What's The Time



Converting 12 Hour Clock to 24 Hour Clock

- 12 Midnight to 12 Noon (a.m.)
- 0000 hrs = 12 Midnight
 - 0100 hrs = 1 a.m.
 - 0200 hrs = 2 a.m.
 - 0300 hrs = 3 a.m.
 - 0400 hrs = 4 a.m.
 - 0500 hrs = 5 a.m.
 - 0600 hrs = 6 a.m.
 - 0700 hrs = 7 a.m.
 - 0800 hrs = 8 a.m.
 - 0900 hrs = 9 a.m.
 - 1000 hrs = 10 a.m.
 - 1100 hrs = 11 a.m.
- 12 Noon to 12 Mid-night (p.m.)
- 1200 hrs = 12 Noon
 - 1300 hrs = 1 p.m.
 - 1400 hrs = 2 p.m.
 - 1500 hrs = 3 p.m.
 - 1600 hrs = 4 p.m.
 - 1700 hrs = 5 p.m.
 - 1800 hrs = 6 p.m.
 - 1900 hrs = 7 p.m.
 - 2000 hrs = 8 p.m.
 - 2100 hrs = 9 p.m.
 - 2200 hrs = 10 p.m.
 - 2300 hrs = 11 p.m.

Sets

A set is a well-defined collection of objects. A set can contain any number of members or objects and these are called **elements**.

Sets are usually denoted by capital letters A, X, Y etc. The elements of a set, are written inside curly braces.

Set A = {1, 3, 5, 7, 9, 11}
Set B = {2, 4, 6, 8, 10, 12}

U - Universal Elements

Two Methods of Representing a Set

- ROSTER OR TABULAR FORM**: all elements of a set are listed, separated by commas and enclosed within braces {}.
- SET BUILDER FORM**: all elements of a set possess a single common property and are enclosed by elements within braces {}.

VENN DIAGRAMS

- UNION (\cup)**: a union contains all elements from each set.
- INTERSECTION (\cap)**: means the elements which are common to all sets.
- SUBSETS (\subset)**: means that if set B is contained within set A, then B is a subset of A.
- COMPLEMENT (A')**: A means complement of A, is either word, all elements which are not in A.

HCF and LCM

Common Factors and Highest Common Factor

When we multiply two or more numbers, we get a product. These numbers are called the **factors** of the product.

Factors of 18: 1, 2, 3, 6, 9, 18
Factors of 24: 1, 2, 3, 4, 6, 8, 12, 24

6 is the Highest Common Factor (HCF) of 18 and 24.

Common Multiples and Least Common Multiple

When we multiply a number by an integer we get a multiple.

Multiples of 12: 12, 24, 36, 48, 60, 72, 84, 96, 108, 120, 132, 144, 156, 168, 180, 192, 204, 216, 228, 240, 252, 264, 276, 288, 300, 312, 324, 336, 348, 360, 372, 384, 396, 408, 420, 432, 444, 456, 468, 480, 492, 504, 516, 528, 540, 552, 564, 576, 588, 600, 612, 624, 636, 648, 660, 672, 684, 696, 708, 720, 732, 744, 756, 768, 780, 792, 804, 816, 828, 840, 852, 864, 876, 888, 900, 912, 924, 936, 948, 960, 972, 984, 996, 1008, 1020, 1032, 1044, 1056, 1068, 1080, 1092, 1104, 1116, 1128, 1140, 1152, 1164, 1176, 1188, 1200, 1212, 1224, 1236, 1248, 1260, 1272, 1284, 1296, 1308, 1320, 1332, 1344, 1356, 1368, 1380, 1392, 1404, 1416, 1428, 1440, 1452, 1464, 1476, 1488, 1500, 1512, 1524, 1536, 1548, 1560, 1572, 1584, 1596, 1608, 1620, 1632, 1644, 1656, 1668, 1680, 1692, 1704, 1716, 1728, 1740, 1752, 1764, 1776, 1788, 1800, 1812, 1824, 1836, 1848, 1860, 1872, 1884, 1896, 1908, 1920, 1932, 1944, 1956, 1968, 1980, 1992, 2004, 2016, 2028, 2040, 2052, 2064, 2076, 2088, 2100, 2112, 2124, 2136, 2148, 2160, 2172, 2184, 2196, 2208, 2220, 2232, 2244, 2256, 2268, 2280, 2292, 2304, 2316, 2328, 2340, 2352, 2364, 2376, 2388, 2400, 2412, 2424, 2436, 2448, 2460, 2472, 2484, 2496, 2508, 2520, 2532, 2544, 2556, 2568, 2580, 2592, 2604, 2616, 2628, 2640, 2652, 2664, 2676, 2688, 2700, 2712, 2724, 2736, 2748, 2760, 2772, 2784, 2796, 2808, 2820, 2832, 2844, 2856, 2868, 2880, 2892, 2904, 2916, 2928, 2940, 2952, 2964, 2976, 2988, 3000, 3012, 3024, 3036, 3048, 3060, 3072, 3084, 3096, 3108, 3120, 3132, 3144, 3156, 3168, 3180, 3192, 3204, 3216, 3228, 3240, 3252, 3264, 3276, 3288, 3300, 3312, 3324, 3336, 3348, 3360, 3372, 3384, 3396, 3408, 3420, 3432, 3444, 3456, 3468, 3480, 3492, 3504, 3516, 3528, 3540, 3552, 3564, 3576, 3588, 3600, 3612, 3624, 3636, 3648, 3660, 3672, 3684, 3696, 3708, 3720, 3732, 3744, 3756, 3768, 3780, 3792, 3804, 3816, 3828, 3840, 3852, 3864, 3876, 3888, 3900, 3912, 3924, 3936, 3948, 3960, 3972, 3984, 3996, 4008, 4020, 4032, 4044, 4056, 4068, 4080, 4092, 4104, 4116, 4128, 4140, 4152, 4164, 4176, 4188, 4200, 4212, 4224, 4236, 4248, 4260, 4272, 4284, 4296, 4308, 4320, 4332, 4344, 4356, 4368, 4380, 4392, 4404, 4416, 4428, 4440, 4452, 4464, 4476, 4488, 4500, 4512, 4524, 4536, 4548, 4560, 4572, 4584, 4596, 4608, 4620, 4632, 4644, 4656, 4668, 4680, 4692, 4704, 4716, 4728, 4740, 4752, 4764, 4776, 4788, 4800, 4812, 4824, 4836, 4848, 4860, 4872, 4884, 4896, 4908, 4920, 4932, 4944, 4956, 4968, 4980, 4992, 5004, 5016, 5028, 5040, 5052, 5064, 5076, 5088, 5100, 5112, 5124, 5136, 5148, 5160, 5172, 5184, 5196, 5208, 5220, 5232, 5244, 5256, 5268, 5280, 5292, 5304, 5316, 5328, 5340, 5352, 5364, 5376, 5388, 5400, 5412, 5424, 5436, 5448, 5460, 5472, 5484, 5496, 5508, 5520, 5532, 5544, 5556, 5568, 5580, 5592, 5604, 5616, 5628, 5640, 5652, 5664, 5676, 5688, 5700, 5712, 5724, 5736, 5748, 5760, 5772, 5784, 5796, 5808, 5820, 5832, 5844, 5856, 5868, 5880, 5892, 5904, 5916, 5928, 5940, 5952, 5964, 5976, 5988, 6000, 6012, 6024, 6036, 6048, 6060, 6072, 6084, 6096, 6108, 6120, 6132, 6144, 6156, 6168, 6180, 6192, 6204, 6216, 6228, 6240, 6252, 6264, 6276, 6288, 6300, 6312, 6324, 6336, 6348, 6360, 6372, 6384, 6396, 6408, 6420, 6432, 6444, 6456, 6468, 6480, 6492, 6504, 6516, 6528, 6540, 6552, 6564, 6576, 6588, 6600, 6612, 6624, 6636, 6648, 6660, 6672, 6684, 6696, 6708, 6720, 6732, 6744, 6756, 6768, 6780, 6792, 6804, 6816, 6828, 6840, 6852, 6864, 6876, 6888, 6900, 6912, 6924, 6936, 6948, 6960, 6972, 6984, 6996, 7008, 7020, 7032, 7044, 7056, 7068, 7080, 7092, 7104, 7116, 7128, 7140, 7152, 7164, 7176, 7188, 7200, 7212, 7224, 7236, 7248, 7260, 7272, 7284, 7296, 7308, 7320, 7332, 7344, 7356, 7368, 7380, 7392, 7404, 7416, 7428, 7440, 7452, 7464, 7476, 7488, 7500, 7512, 7524, 7536, 7548, 7560, 7572, 7584, 7596, 7608, 7620, 7632, 7644, 7656, 7668, 7680, 7692, 7704, 7716, 7728, 7740, 7752, 7764, 7776, 7788, 7800, 7812, 7824, 7836, 7848, 7860, 7872, 7884, 7896, 7908, 7920, 7932, 7944, 7956, 7968, 7980, 7992, 8004, 8016, 8028, 8040, 8052, 8064, 8076, 8088, 8100, 8112, 8124, 8136, 8148, 8160, 8172, 8184, 8196, 8208, 8220, 8232, 8244, 8256, 8268, 8280, 8292, 8304, 8316, 8328, 8340, 8352, 8364, 8376, 8388, 8400, 8412, 8424, 8436, 8448, 8460, 8472, 8484, 8496, 8508, 8520, 8532, 8544, 8556, 8568, 8580, 8592, 8604, 8616, 8628, 8640, 8652, 8664, 8676, 8688, 8700, 8712, 8724, 8736, 8748, 8760, 8772, 8784, 8796, 8808, 8820, 8832, 8844, 8856, 8868, 8880, 8892, 8904, 8916, 8928, 8940, 8952, 8964, 8976, 8988, 9000, 9012, 9024, 9036, 9048, 9060, 9072, 9084, 9096, 9108, 9120, 9132, 9144, 9156, 9168, 9180, 9192, 9204, 9216, 9228, 9240, 9252, 9264, 9276, 9288, 9300, 9312, 9324, 9336, 9348, 9360, 9372, 9384, 9396, 9408, 9420, 9432, 9444, 9456, 9468, 9480, 9492, 9504, 9516, 9528, 9540, 9552, 9564, 9576, 9588, 9600, 9612, 9624, 9636, 9648, 9660, 9672, 9684, 9696, 9708, 9720, 9732, 9744, 9756, 9768, 9780, 9792, 9804, 9816, 9828, 9840, 9852, 9864, 9876, 9888, 9900, 9912, 9924, 9936, 9948, 9960, 9972, 9984, 9996, 10000.

60 is the Least Common Multiple (LCM) of 12 and 15.

Fractions, Decimal & Percentage

FRACTIONS

A fraction is a Part of a Whole.

Mixed Number

PERCENTAGE

Percent Simply Mean Per Hundred. Percent is a Ratio that Compares a Number to 100.

DECIMAL

Decimal Numbers are Another Way of Writing Fraction Numbers.

CHANGING FRACTION TO PERCENT TO DECIMAL

Fraction \leftrightarrow Percent \leftrightarrow Decimal

Ratio and Proportion

Ratio

A ratio is a comparison of two numbers. These numbers are called the **terms** of the ratio.

STEP 1: Count the number of apples - 6 and Count the number of mangoes - 7
STEP 2: Write a ratio to compare. Ratio can be written in three different ways.

| Ratio | Fraction Form | Word Form | Using a Colon |
|---------------------------------------|----------------|-----------|---------------|
| Apples to mangoes | $\frac{6}{7}$ | 6 to 7 | 6 : 7 |
| Mangoes to the Total Number of Fruits | $\frac{7}{13}$ | 7 to 13 | 7 : 13 |
| Apples to the Total Number of Fruits | $\frac{6}{13}$ | 6 to 13 | 6 : 13 |

Proportion

A proportion is an equation showing that two ratios are equal. Ratios that are equal to each other are called equivalent fractions.

- The above situation shows every tent can accommodate 1 child.
- Therefore 12 \times $\frac{1}{12}$
- There are 2 tents and 4 children, the ratio is 2:4 or $\frac{2}{4}$
- There are 3 tents and 6 children, the ratio is 3:6 or $\frac{3}{6}$

UNDERSTANDING MATHS
 A set of 21 Charts
 Synthetic, Size 70 x 100 cm (Available in English only)

UM104 : Number Patterns

Number Patterns

A PATTERN IS FORMED WHEN THERE IS A COMMON RELATIONSHIP IN A LIST OF NUMBERS.

Triangular numbers
1, 3, 6, 10, 15, 21, 28, 36, 45, 55, 66, 78, 91, 105, 120, 136, 153, 171, 190, 210

Square numbers
1, 4, 9, 16, 25, 36, 49, 64, 81, 100, 121, 144, 169, 196, 225, 256, 289, 324, 361, 400, 441, 484, 529, 576, 625, 676, 729, 784, 841, 900, 961, 1024, 1089, 1156, 1225, 1296, 1369, 1444, 1521, 1600, 1681, 1764, 1849, 1936, 2025, 2116, 2209, 2304, 2401, 2500, 2601, 2704, 2809, 2916, 3025, 3136, 3249, 3364, 3481, 3600, 3721, 3844, 3969, 4096, 4225, 4356, 4489, 4624, 4761, 4900, 5041, 5184, 5329, 5476, 5625, 5776, 5929, 6084, 6241, 6400, 6561, 6724, 6889, 7056, 7225, 7396, 7569, 7744, 7921, 8100, 8281, 8464, 8649, 8836, 9025, 9216, 9409, 9604, 9801, 10000

Arithmetic progression
Common difference: d
1st term: a
nth term: $a + (n - 1)d$
Sum of n terms: $\frac{n}{2} [2a + (n - 1)d]$

Geometric progression
Common ratio: r
1st term: a
nth term: $a \cdot r^{(n-1)}$
Sum of n terms: $\frac{a(r^n - 1)}{r - 1}$

There are other useful square numbers between the square of the number n and $(n+1)$:
 $n^2 + 2n + 1 = (n+1)^2$
 $n^2 + 4n + 4 = (n+2)^2$
 $n^2 + 6n + 9 = (n+3)^2$
 $n^2 + 8n + 16 = (n+4)^2$
 $n^2 + 10n + 25 = (n+5)^2$
 $n^2 + 12n + 36 = (n+6)^2$
 $n^2 + 14n + 49 = (n+7)^2$
 $n^2 + 16n + 64 = (n+8)^2$
 $n^2 + 18n + 81 = (n+9)^2$
 $n^2 + 20n + 100 = (n+10)^2$

UM201 : Simple Equations

Simple Equations

An equation is a condition on a variable. It is like a weighing balance with equal weights on its two pans. Left hand side and the right hand side of the equation represent the same amount.

Let's form an equation for finding number of apples in the bag. Each of the apple weighs the same amount and one kilo. The bag of apple is 8 kilograms. Weight of three more apples added to the weight of the bag equals the weight of eight apples.

Written algebraically this is:
 $X + 3 = 8$

Solving Equation

To solve the equation we need to find the value of the unknown number (variable) by performing the same operation on each side.

1. The equation $3x + 2 = 14$ is represented by the following diagram.
The bag represent the unknown value x and the oranges represent the number in the equation.
Subtract 2 from both sides of the equation.
Written algebraically, this is:
 $3x + 2 - 2 = 14 - 2$
 $3x = 12$

2. Divide both sides by 3.
Written algebraically, this is:
 $\frac{3x}{3} = \frac{12}{3}$
 $x = 4$

UM202 : Inequalities

Inequalities

An inequality has a less than or greater than sign between the two sides and the sides are not equal. It is like a weighing balance with unequal weights on its two pans.

Means 'less than' $<$ means 'less than or equal to' \leq
means 'greater than' $>$ means 'greater than or equal to' \geq

Example:
If $a = 3$, then $b = 4, 5, 6, \dots$ (b is greater than, but not equal to 3, so don't include the 3).
If $b \leq 6$ then $b = \dots, -2, -1, 0, 1, 2, 3, 4, 5, 6$ (b is less than or equal to 6, so do include the 6).

Solving Inequalities Using Graphs

Below graphs show regions defined by inequalities.

Graph showing $x < 2$: Solid line shows that the boundary is not included. Region to the left of the boundary is shaded.

Graph showing $x \geq 5$: Dotted line shows that the boundary is included. Region to the right of the boundary is shaded.

Graph showing both $x < 1$ and $y < 5$: Change area shown where both inequalities are true.

UM301 : Polygons

Polygons

Close shapes or figures in a plane with three or more sides are called polygons. Polygon is derived from a greek word meaning 'many-angled'.

Convex: A polygon is convex if all its interior angles are less than 180° .
Concave: A polygon is concave if at least one of its interior angles is greater than 180° .

Parts of Polygon
Vertices: Corners of the polygon.
Sides: Lines connecting two vertices.
Interior angle: Angle inside the polygon.
Exterior angle: Angle outside the polygon.

Interior Angle Sum of a Polygon
Sum of interior angles of a polygon with n sides is $(n - 2) \times 180^\circ$.

Exterior Angle Sum of a Polygon
Sum of exterior angles of a polygon is 360° .

UM302 : Similarity and Congruency

Similarity and Congruency

Similarity

Two figures having same shape and not necessarily the same size are called similar figures.

Similar Triangles
Two triangles are similar, if:
(i) Their corresponding angles are equal and
(ii) Their corresponding sides are in the same ratio.

Conditions for Similarity of Two Triangles
AAA similarity
SSS similarity
SAS similarity

Congruency

Two figures are congruent if they have the same shape and the same size. Congruent figures are exactly the same when one figure is placed on top of the other.

Conditions for Congruency of Two Triangles
SSS
SAS
ASA
AAS
RHS

UM303 : Solids and Their Nets

Solids and Their Nets

A solid 3D figure has flat surface (faces), line segments of its edges (edges), and corners (vertices). A net is a 2D shape of a solid that can be folded to make it. The same solid can have several type of nets. The total surface area of a solid figure is equal to the total area of its net.

Cube: Faces (6), Edges (12), Vertices (8)
Cuboid: Faces (6), Edges (12), Vertices (8)
Triangular-based Pyramid (Tetrahedron): Faces (4), Edges (6), Vertices (4)
Square-based Pyramid: Faces (5), Edges (8), Vertices (5)
Cone: Faces (2), Edges (1), Vertices (1)
Cylinder: Faces (3), Edges (2), Vertices (0)

UM304 : Coordinate Geometry

Coordinate Geometry

Distance between Two Points
Distance between $P(x_1, y_1)$ and $Q(x_2, y_2)$ is
 $PQ = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$

Area of a Triangle
Area of a triangle with vertices $A(x_1, y_1)$, $B(x_2, y_2)$, and $C(x_3, y_3)$ is
 $\Delta ABC = \frac{1}{2} [x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2)]$

Slope of a Line
Slope of a line is the ratio of the change in y to the change in x.
 $m = \frac{y_2 - y_1}{x_2 - x_1}$

Equation of a Line
Equation of a line with slope m and y-intercept c is $y = mx + c$.

UM305 : Transformation Geometry

Transformation Geometry

Transformation Geometry involves moving a pre-image in the coordinate plane and transforming it in some way to produce an image.

TWO DIFFERENT CATEGORIES OF TRANSFORMATION
1. RIGID TRANSFORMATION: Pre-image and the image both have the exact size and shape.
2. NON-RIGID TRANSFORMATION: The size is changed but not the shape of the pre-image.

TYPES OF RIGID TRANSFORMATIONS
1. Translation: Sliding a pre-image across a line without changing its size or shape.
2. Reflection: Flipping a pre-image about a line without changing its size or shape.
3. Rotation: Turning a pre-image around a point without changing its size or shape.

TYPES OF NON-RIGID TRANSFORMATIONS
1. Dilation: Enlarging or contracting a pre-image without changing its shape or orientation.

UM401 : Trigonometry

Trigonometry

Trigonometry is the study of relationships between the sides and angles of a triangle. The word trigonometry is derived from the Greek word 'tri' meaning three, 'gon' meaning sides, and 'metry' (measuring measure).

Triangle of most interest in trigonometry is right-angled triangle. If an angle of a right-angled triangle is considered to be θ , then:

- Side opposite to angle θ is Hypotenuse
- Side adjacent to angle θ is Perpendicular
- Side adjacent to angle θ is Base

TRIGONOMETRIC RATIOS OF ACUTE ANGLE θ IN A RIGHT TRIANGLE

| S. No. | Trigonometric Functions | Ratio | Symbolic Form |
|--------|--|--|---------------|
| 1. | Sine θ or (Sin θ) | Length of Perpendicular / Length of Hypotenuse | $\frac{P}{H}$ |
| 2. | Cosine θ or (Cos θ) | Length of Base / Length of Hypotenuse | $\frac{B}{H}$ |
| 3. | Tangent θ or (Tan θ) | Length of Perpendicular / Length of Base | $\frac{P}{B}$ |
| 4. | Cosecant θ or (Cosec θ) | Hypotenuse / Perpendicular | $\frac{H}{P}$ |
| 5. | Secant θ or (Sec θ) | Hypotenuse / Base | $\frac{H}{B}$ |
| 6. | Cotangent θ or (Cot θ) | Base / Perpendicular | $\frac{B}{P}$ |

APPLICATIONS OF TRIGONOMETRY

- Measuring heights of buildings
- Measuring distances between two points
- Measuring angles of depression and elevation
- Measuring heights of towers
- Measuring distances between two points
- Measuring heights of towers
- Measuring distances between two points

UM402 : Trigonometric Ratios and Values

Trigonometric Ratios and Values

Values of all Trigonometric Ratios for Different Values of Angle (θ)

| θ | 0° | 30° | 45° | 60° | 90° |
|----------------|----|----------------------|----------------------|----------------------|-----|
| Sin θ | 0 | $\frac{1}{2}$ | $\frac{1}{\sqrt{2}}$ | $\frac{\sqrt{3}}{2}$ | 1 |
| Cos θ | 1 | $\frac{\sqrt{3}}{2}$ | $\frac{1}{\sqrt{2}}$ | $\frac{1}{2}$ | 0 |
| Tan θ | 0 | $\frac{1}{\sqrt{3}}$ | 1 | $\sqrt{3}$ | ∞ |
| Cosec θ | ∞ | 2 | $\sqrt{2}$ | $\frac{2}{\sqrt{3}}$ | 1 |
| Sec θ | 1 | $\frac{2}{\sqrt{3}}$ | $\sqrt{2}$ | 2 | ∞ |
| Cot θ | ∞ | $\sqrt{3}$ | 1 | $\frac{1}{\sqrt{3}}$ | 0 |

Unit Circle and the Relation between Degree and Radian

Quadrant I, II, III, IV

Signs of Trigonometric Functions

| Quadrant | Sin | Cos | Tan |
|----------|-----|-----|-----|
| I | + | + | + |
| II | + | - | - |
| III | - | - | + |
| IV | - | + | - |

Behaviour of Trigonometric Functions

1 radian = $\frac{180^\circ}{\pi} = 57.3^\circ$ approx.

1° = $\frac{\pi}{180}$ radian = 0.01746 radian approx.

UM403 : Trigonometric Identities

Trigonometric Identities

Reciprocal Identities

$\sin \theta = \frac{1}{\text{cosec } \theta}$, $\cos \theta = \frac{1}{\text{sec } \theta}$, $\tan \theta = \frac{1}{\text{cot } \theta}$

Quotient Identities

$\tan \theta = \frac{\sin \theta}{\cos \theta}$, $\cot \theta = \frac{\cos \theta}{\sin \theta}$

Pythagorean Identities

$\sin^2 \theta + \cos^2 \theta = 1$, $1 + \tan^2 \theta = \sec^2 \theta$, $1 + \cot^2 \theta = \text{cosec}^2 \theta$

Co-Function Identities

$\sin(90^\circ - \theta) = \cos \theta$, $\cos(90^\circ - \theta) = \sin \theta$, $\tan(90^\circ - \theta) = \cot \theta$, $\cot(90^\circ - \theta) = \tan \theta$

Sum & Difference Identities

$\sin(\theta \pm \phi) = \sin \theta \cos \phi \pm \cos \theta \sin \phi$, $\cos(\theta \pm \phi) = \cos \theta \cos \phi \mp \sin \theta \sin \phi$

Double Angle Identities

$\sin 2\theta = 2 \sin \theta \cos \theta$, $\cos 2\theta = \cos^2 \theta - \sin^2 \theta$, $\tan 2\theta = \frac{2 \tan \theta}{1 - \tan^2 \theta}$

Triple Angle Identities

$\sin 3\theta = 3 \sin \theta - 4 \sin^3 \theta$, $\cos 3\theta = 4 \cos^3 \theta - 3 \cos \theta$

UM404 : Graph of Trigonometric Functions

Graph of Trigonometric Functions

Graphs of $y = \sin x$, $y = \cos x$, $y = \tan x$, $y = \cot x$, $y = \text{cosec } x$, $y = \text{sec } x$

Domain and Range for each function.

UM501 : Data Handling

Data Handling

All data give us some sort of information. The collection, recording and presentation of data help us organise our experiences and draw inferences from them.

ORGANISATION OF DATA

A class teacher organises data of students' performance in maths as follows:

| Marks Obtained | Tally Marks | Number of Students | Marks Obtained | Tally Marks | Number of Students |
|----------------|-------------|--------------------|----------------|-------------|--------------------|
| 0 - 10 | | 5 | 90 - 100 | | 5 |
| 10 - 20 | | 5 | 80 - 90 | | 5 |
| 20 - 30 | | 5 | 70 - 80 | | 5 |
| 30 - 40 | | 5 | 60 - 70 | | 5 |
| 40 - 50 | | 5 | 50 - 60 | | 5 |

DISPLAYING DATA

Pictographs, Line Graphs, Bar Graphs, Pie Charts (Circle Graph)

UM502 : Measures of Central Tendency

Measures of Central Tendency

A measure of central tendency is a single value that attempts to describe a set of data by identifying the central position within that set of data.

MEAN

The Mean of n number of observations $(x_1, x_2, x_3, \dots, x_n)$ is the sum of the values of all the observations divided by the total number of observations (n). Mean is denoted by \bar{x} .

$$\bar{x} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n}$$

MEDIAN

Median is the middle-most observation (n odd) or the average of the two middle observations (n even).

MODE

Mode is the value which occurs most frequently in the data.

RANGE

Range is the difference between the highest and the lowest data values.

UM503 : Probability

Probability

Probability is used in everyday life to predict the chance of things happening.

Probability is measured on a scale of 0 to 1, $0 \leq P(E) \leq 1$.

$P(E) = \frac{\text{Number of favourable outcomes}}{\text{Total number of outcomes}}$

Tree Diagram Showing Probability of an Event

When the outcome of one event does not affect the outcome of another, the events are independent.

UM504 : Interest & Depreciation

Interest and Depreciation

SIMPLE INTEREST

Interest Paid on the Principal Only and not on any Accumulated Interest.

Simple Interest = $\frac{\text{Principal} \times \text{Time} \times \text{Rate of Interest}}{100}$

COMPOUND INTEREST

Basic Principle of Compound Interest is Earning Additional Interest on Interest.

Compound Interest = $A - P$

DEPRECIATION

Decrease in Value of Assets Over a Period of Time.

Depreciation = $P - A$

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GCM01 : Heavenly Bodies

HEAVENLY BODIES नभ मण्डल

NORTHERN HEAVEN उत्तरी आकाश

SOUTHERN HEAVEN दक्षिणी आकाश

CONSTELLATIONS नक्षत्रमण्डल

| | | | | | | | |
|--------|-------|----------|-------|-------------|------|-------------|---------|
| FIBES | मेष | AQUARIUS | कुम्भ | CAPRICORNUS | मकर | SAGITTARIUS | धनु |
| ARIES | मेष | | | | | SCORPIO | वृश्चिक |
| TAURUS | वृष | | | | | LIBRA | तुला |
| GEMINI | मिथुन | CANCER | कर्कट | LEO | सिंह | VRGO | कन्या |

TYPES OF GALAXIES मंदाकिनी के प्रकार

THE CARTEL GALAXY | U1: THE ANDROMEDA SPIRAL | THE SPIRAL GALAXY M100

MILKY WAY GALAXY

Our Solar System हमारा सौर मण्डल

Labels: Sun, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto.

GCM02 : Solar System

SOLAR SYSTEM सौर मण्डल

| PLANET | Distance from Sun (AU) | Radius (km) | Mass (Earth masses) | Surface Temp (°C) | Atmosphere |
|---------|------------------------|-------------|---------------------|-------------------|--------------------------------------|
| MERURY | 0.38 | 2,439 | 0.055 | 160 | None |
| VENUS | 0.72 | 6,051 | 0.815 | 460 | CO ₂ |
| EARTH | 1.00 | 6,371 | 1.000 | 15 | N ₂ , O ₂ |
| MARS | 1.52 | 3,798 | 0.107 | -55 | CO ₂ |
| JUPITER | 5.20 | 71,492 | 317.8 | -110 | H ₂ , He |
| SATURN | 9.54 | 59,238 | 95.2 | -180 | H ₂ , He |
| URANUS | 19.20 | 25,362 | 45.9 | -220 | H ₂ , He, CH ₄ |
| NEPTUNE | 30.06 | 24,462 | 47.3 | -220 | H ₂ , He, CH ₄ |

GCM04 : Structure of the Earth

STRUCTURE OF THE EARTH भू-संरचना

Labels: Crust, Mantle, Core, Lithosphere, Asthenosphere, Outer Core, Inner Core.

GCM03 : Earth & Its Motions

EARTH & ITS MOTIONS पृथ्वी और उसकी गतियाँ

Labels: Rotation, Revolution, Axial Tilt, Seasons.

GCM05 : Rocks & Minerals

ROCKS & MINERALS शैले एवं खनिज

Labels: Igneous, Sedimentary, Metamorphic, Minerals.

GCM06 : Atmosphere And Space

ATMOSPHERE AND SPACE वायुमण्डल और अंतरिक्ष

This chart illustrates the layers of the Earth's atmosphere and the surrounding space. It shows the troposphere, stratosphere, mesosphere, and thermosphere, along with the ionosphere and exosphere. It also depicts the aurora borealis and aurora australis, and the relationship between the atmosphere and space.

GCM07 : Pressure & Winds

PRESSURE & WINDS वायुमण्डलीय दाब तथा पवन

This chart explains the concepts of atmospheric pressure and wind. It includes diagrams of pressure distribution, wind formation, and various weather symbols. It also covers topics like wind speed, wind direction, and the relationship between pressure and wind.

GCM08 : Weather Map Symbols

WEATHER MAP SYMBOLS मौसम मानचित्र के चिन्ह

This chart provides a comprehensive list of weather map symbols. It is organized into four main categories: Cloud Cover, Wind Conditions, Weather Conditions, and Sea Conditions. Each category contains various symbols used to represent different weather phenomena on a map.

GCM09 : Ocean

OCEAN महासागर

This chart explores the ocean's depths and features. It includes diagrams of the ocean floor, marine life, and ocean currents. It also discusses the importance of the ocean in the global climate system and the distribution of heat.

GCM10 : Surveying

SURVEYING सर्वेक्षण

CHAIN AND TAPE SURVEY जलिया तथा क्रीचे द्वारा सर्वेक्षण

This chart details the chain and tape surveying method. It includes a diagram of the surveying process and a list of instruments required. It also covers the method of surveying and the instruments used.

LAND MEASURING CHAIN क्रीचेद्वारा जलिया

This chart illustrates the land measuring chain method. It includes a diagram of the surveying process and a list of instruments required. It also covers the method of surveying and the instruments used.

PLANE TABLE SURVEY सर्वेक्षण-पट्टे द्वारा सर्वेक्षण

This chart details the plane table surveying method. It includes a diagram of the surveying process and a list of instruments required. It also covers the method of surveying and the instruments used.

GCM11 : Conventional Signs

CONVENTIONAL SIGNS रुढ़ि चिन्ह

This chart provides a comprehensive list of conventional signs used in maps. It is organized into several categories: Boundaries, Communication, Vegetation, Physical Features, Settlements, and Others. Each category contains various signs used to represent different geographical features on a map.

GCM12 : Map Projections

MAP PROJECTIONS मानचित्र-प्रक्षेप

This chart explains different map projections. It includes diagrams of various projections such as Mercator, Robinson, and others. It also discusses the advantages and disadvantages of each projection and how they affect the representation of the Earth's surface.

GCM13S : Storm and Ocean Current

Storm and Ocean Current

This chart explores the formation and effects of storms and ocean currents. It includes diagrams of storm formation, ocean currents, and the relationship between the two. It also discusses the impact of storms and ocean currents on the global climate system.

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GCS01 : Phases of the Moon

PHASES OF THE MOON चन्द्रमा की कलाएँ

Waning Crescent
When the Moon is getting smaller it is said to be waning.
बढ़ता हुआ चन्द्रमा

Last Quarter
अन्तिम चरण

Gibbous
The Moon is three quarters full.
अर्धधिक

Full
The side of the Moon that faces Earth is fully lit by the Sun.
पूर्ण चरण का अन्तिम चरण

Gibbous
अर्धधिक

First Quarter
प्रथम चरण
The Moon is a quarter of the way around its orbit so we see half its sunlit side.
बढ़ता हुआ चरण का अन्तिम चरण

Waxing Crescent
बढ़ता हुआ चन्द्रमा

Area of the Moon lit by sunlight
चन्द्रमा का प्रकाशित भाग

SUN सूर्य

FACE OF THE MOON

The nearest of the moon that always faces the earth
चन्द्रमा का वह भाग जो हमेशा पृथ्वी की ओर रहता है।

As the Moon orbits the Earth, we see different amount of its sunlit side. When the Moon lies between the Earth and Sun we do not see it at all; this is known as new Moon. Then it becomes a young crescent and appears low in the western sky in the evening. A few days later it becomes half-illuminated, known as first quarter. The phase between half and full Moon is called Gibbous. After full Moon there are the same phases but in reverse, ending with a crescent Moon rising in the morning sky shortly before the Sun.

जैसे-जैसे चन्द्रमा पृथ्वी के चारों ओर घूमता जाता है, हमें उसका प्रकाशित भाग बढ़ता या बढ़ता हुआ दिखाई देता है। जब चन्द्रमा पृथ्वी और सूर्य के बीच में आ जाता है तो चन्द्रमा का अन्तर्भाग चन्द्रमा की ओर होता है और तब चन्द्रमा दिखाई नहीं देता। वह दिन अन्तर्भाग छद्मता है। धीरे-धीरे चन्द्रमा का प्रकाशित भाग बढ़ता जाता है। सूर्योदय प्रकाशित चन्द्रमा पहले दिन को पूर्णमासी कहते हैं। पूर्णमासी के बाद चन्द्रमा का प्रकाशित भाग घटता जाता है। चन्द्रमा की दर्शन बढ़ती-बढ़ती अन्तर्भाग को चन्द्रमा कहते हैं।

MOON DATA

| | |
|---------------------------------------|---|
| Age | 4500 Million Years (Approx.) |
| Diameter | 3476.15 km |
| Maximum Distance from Earth | 406,697 km |
| Minimum Distance from Earth | 356,410 km |
| Average Distance from Earth | 384,400 km |
| Time to orbit Earth | 27.32 days |
| Time to spin on axis | 27.32 days |
| Interval between successive new moons | 29 Days 12 hours 44 minutes |
| Mass | 1/81 the Earth's mass |
| Volume | 1/60 the Earth's volume |
| Surface Gravity | 0.165 the Earth's gravity |
| Average Density | 3.3 x water |
| Surface Temperature | 120°C max. to -153°C at night |
| First Man on Moon | Neil Armstrong on 21st July 1969 in Apollo 11 |

GCS02 : Solar & Lunar Eclipse

SOLAR & LUNAR ECLIPSE सूर्य व चन्द्र ग्रहण

Solar Eclipse
A solar eclipse occurs when the Moon passes between the Sun and Earth, blocking the Sun's light. This can be a total eclipse, where the Sun is completely covered, or a partial eclipse, where only part of the Sun is covered. A ring eclipse occurs when the Moon is too far from Earth to completely cover the Sun, leaving a ring of sunlight visible.

Lunar Eclipse
A lunar eclipse occurs when the Earth passes between the Sun and the Moon, blocking the Sun's light from reaching the Moon. This can be a total eclipse, where the Moon is completely covered, or a partial eclipse, where only part of the Moon is covered. A penumbral eclipse occurs when the Moon passes through the Earth's penumbra, causing a slight dimming of the Moon's light.

GCS03 : Seasons

SEASONS ऋतु परिवर्तन

The Earth's seasons are caused by the tilt of the Earth's axis. The Earth's axis is tilted at an angle of 23.5 degrees to the perpendicular of the plane of its orbit around the Sun. This tilt causes different parts of the Earth to receive different amounts of sunlight throughout the year, creating the seasons.

| Month | Season | Approx. Temperature |
|-------|--------|---------------------|
| Jan | Winter | Low |
| Feb | Winter | Low |
| Mar | Winter | Low |
| Apr | Spring | Low to High |
| May | Spring | Low to High |
| Jun | Spring | Low to High |
| Jul | Summer | High |
| Aug | Summer | High |
| Sep | Summer | High |
| Oct | Autumn | High to Low |
| Nov | Autumn | High to Low |
| Dec | Autumn | High to Low |

GCS04 : Tides

TIDES ज्वार भाटा

Spring Tides
Spring tides occur when the Sun, Earth, and Moon are in a straight line. This happens during a new moon or a full moon. The gravitational pull of the Sun and Moon combine, resulting in the highest high tides and the lowest low tides.

Neap Tides
Neap tides occur when the Sun, Earth, and Moon form a right-angled triangle. This happens during a first quarter moon or a third quarter moon. The gravitational pull of the Sun and Moon are at right angles to each other, resulting in the lowest high tides and the highest low tides.

GCS05 : Sun and Planets

SUN AND PLANETS सूर्य तथा ग्रह

Structure of Sun
The Sun is a star made of hot gases. It has a core where nuclear fusion occurs, producing energy. The energy then moves through the radiative zone and the convective zone to the surface, where it is emitted as light and heat.

| Planet | Distance from Sun (km) | Approx. Temperature |
|---------|------------------------|---------------------|
| Mercury | 57,909,175 | Low |
| Venus | 108,208,460 | Low to High |
| Earth | 149,597,870 | Low to High |
| Mars | 227,939,200 | Low to High |
| Jupiter | 778,547,048 | High |
| Saturn | 1,429,857,360 | High |
| Uranus | 2,874,695,600 | High |
| Neptune | 4,504,554,400 | High |

GCS06 : Water Cycle in Nature

WATER CYCLE IN NATURE प्रकृति में जल चक्र

The water cycle consists of the evaporation of water from the oceans, land, together with transpiration from plants.

Water cycle is a continuous process. It starts with evaporation of water from the oceans, land, and plants. This water vapor rises into the atmosphere and condenses into clouds. Precipitation falls as rain or snow. Some water infiltrates the ground, becoming groundwater, while some flows as runoff into rivers and oceans.

Through the water cycle, water purifies itself naturally. The water cycle is a continuous process. It starts with evaporation of water from the oceans, land, and plants. This water vapor rises into the atmosphere and condenses into clouds. Precipitation falls as rain or snow. Some water infiltrates the ground, becoming groundwater, while some flows as runoff into rivers and oceans.

GCS07 : Directions and How to Find Them

DIRECTIONS AND HOW TO FIND THEM दिशाओं का ज्ञान

Directions are the directions in which we move. They are North, South, East, and West. To find these directions, we use a compass.

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GCS08 : Conventional Signs

CONVENTIONAL SIGNS रुढ़िगत संकेत

Conventional signs are symbols used to represent different features on a map. They include buildings, roads, rivers, and trees.

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GCS09 : Earth is Round

Earth Is Round पृथ्वी गोल है

The Earth is round. This is proven by the fact that ships disappear over the horizon and the Earth's shadow on the Moon is round.

The Earth is round. This is proven by the fact that ships disappear over the horizon and the Earth's shadow on the Moon is round. Other evidence includes the fact that the Earth's circumference is the same in all directions.

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GCS10 : Physical Features of Earth

PHYSICAL FEATURES OF EARTH पृथ्वी के भौतिक लक्षण

Physical features of Earth include mountains, rivers, oceans, and plains.

Physical features of Earth include mountains, rivers, oceans, and plains. These features are shaped by natural forces like erosion and tectonic activity.

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GCS11 : Day & Night

DAY & NIGHT दिन और रात

Day and night occur because the Earth rotates on its axis. The side facing the Sun is day, and the side facing away is night.

Day and night occur because the Earth rotates on its axis. The side facing the Sun is day, and the side facing away is night. The length of day and night varies throughout the year.

Day and night occur because the Earth rotates on its axis. The side facing the Sun is day, and the side facing away is night. The length of day and night varies throughout the year.

GCS12 : Earthquake

Earthquake भूकम्प

Earthquakes are caused by the sudden release of energy in the Earth's crust. They can cause buildings to collapse and people to be injured.

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GCS13 : Latitude and Longitude

Latitude and Longitude

Latitude and longitude are lines of imaginary measurement that divide the Earth into a grid. They are used to locate places on the globe.

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GCS14 : Types of Clouds

Types of Clouds मेघों के प्रकार

High Clouds
Check an altitude higher than 4,000 meters (13,000 feet) to identify these clouds. They are the wispy clouds that are often seen in the sky.

Medium Clouds
Check an altitude of 2,000 to 4,000 meters (6,500 to 13,000 feet) to identify these clouds. They are the clouds that are often seen in the sky.

Low Clouds
Check an altitude of 2,000 meters (6,500 feet) or lower to identify these clouds. They are the clouds that are often seen in the sky.

Clouds with Vertical Development
Check an altitude of 2,000 meters (6,500 feet) or lower to identify these clouds. They are the clouds that are often seen in the sky.

Clouds with Horizontal Development
Check an altitude of 2,000 meters (6,500 feet) or lower to identify these clouds. They are the clouds that are often seen in the sky.

GCS15 : Hill Features, Contours & Map Setting

HILL FEATURES, CONTOURS & MAP SETTING

पर्वतीय आकृतियाँ, समोच्च रेखाएँ तथा मानचित्र अध्ययन

MAP SETTING
Map setting has to be done with the help of a magnetic compass, the position of the sun, some prominent place on earth, straight features, local details and other contours.

GCS16 : Factors That Affect Climate

जलवायु को प्रभावित करते कारक

Average weather pattern of an area over a long period of time is climate. It is determined by rainfall & temperature. Factors affecting climate are -

Latitude
The amount of heat received by an area depends on its latitude. The closer the area is to the equator, the more heat it receives.

Winds & Air Masses
Winds and air masses can bring in different weather patterns from other parts of the world.

Distance from Water Bodies
Water bodies have a moderating effect on the climate of the land areas near them.

Altitude
The temperature decreases as the altitude increases.

Relief
The shape of the land can affect the climate. For example, a valley will be warmer than a hillside.

Distance from Water Bodies
Water bodies have a moderating effect on the climate of the land areas near them.

GCS17 : Weather Instruments

WEATHER INSTRUMENTS

Wind Vane
Shows the direction of the wind.

Anemometer
Measures the speed of the wind.

Barometer
Measures atmospheric pressure.

Thermometer
Measures temperature.

Rain Gauge
Measures the amount of rainfall.

GCS18 : Volcano

VOLCANO ज्वालामुखी

Volcanoes are vents or fissures in the Earth's crust through which molten rocks called magma, ash, and gases escape to the surface.

Structure of Volcano
A volcano consists of a magma chamber, a conduit, and a vent.

Classification based on cone structure
Volcanoes are classified into shield, cinder cone, and composite volcanoes.

Activity Based Classification
Volcanoes are classified into active, dormant, and extinct.

Active Volcanoes of the World
A world map showing the locations of active volcanoes.

GCS19 : Ocean Currents

Ocean Currents सागरीय धाराएँ

Ocean currents are the continuous movement of water within the ocean, driven by wind, density differences, and the Earth's rotation.

Types of Ocean Currents
Ocean currents are classified into surface and deep-sea currents.

Factors That Influence Ocean Currents
Wind, density differences, and the Earth's rotation are the main factors that influence ocean currents.

MAP OF WORLD'S OCEAN CURRENTS
A world map showing the major ocean currents.

Direction and Speed of Ocean Currents
A diagram showing the direction and speed of major ocean currents.

GCS20 : Sunlight and Rainbow

SUNLIGHT AND RAINBOW

Sunlight takes 8.3 minutes to reach the Earth. The total frequency spectrum of electromagnetic radiation given off by the Sun is called Sunlight.

Composition of Sunlight
Sunlight is composed of visible light, ultraviolet, and infrared radiation.

RAINBOW
A rainbow is formed when sunlight is refracted, dispersed, and reflected by water droplets in the atmosphere.

Double Rainbow
A double rainbow is formed when light is reflected twice by water droplets.

Colour and Light
White light is composed of all the colors of the visible spectrum.

CF01 : Changing Face of the Earth

CHANGING FACE OF THE EARTH

पृथ्वी का बदलता स्वरूप

GLACIER हिमनद

RIVER नदी

SEA WATER समुद्री जल

GROUND WATER भूमिगत जल

WIND पवन

प्रकृतिसत्त्वों के कारक
AGENTS OF EXTERNAL PROCESSES

CF02 : Denudation

DENUATION अनाच्छादन

The geomorphological forms are established and compressed by processes, get subjected, wear, operate or stream, fold and provided by denudation from weathering processes. The resultant material is transported by stream-process to the sea. This combined process is called Denudation.

प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

I Weathering अखण्ड

Weathering is the process of breaking down of rocks into smaller and smaller particles. It is the first step in the process of denudation.

अखण्डण प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

II Mass-movement द्रव्य-संचालन

Mass-movement is the movement of soil and rocks down a slope. It is the second step in the process of denudation.

द्रव्य-संचालन प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

III Erosion अपरदन

Erosion is the process of wearing away of the earth's surface. It is the third step in the process of denudation.

अपरदन प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

CF03 : Streams (River)

STREAMS (Rivers) जलधाराएँ (नदियाँ)

A river system consists of a main channel & all of the tributaries that flow into it. It is the main channel that carries the water to the sea.

जलधाराएँ प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

CONVEYANCE OF WATER IN CURVED CHANNEL

Water flows in a curved channel in a spiral motion. The water moves faster in the outer bank and slower in the inner bank.

जलधाराएँ प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

RIVERS-BUILD LEAVES

Rivers build leaves in three ways: (A) River Bedding, (B) River Cutting, and (C) River after repeated flood.

जलधाराएँ प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

CF04 : River's Landscape

RIVER'S LANDSCAPE नदी-स्थलाकृतियाँ

Rivers create various landscapes as they flow through the land. These include erosion and deposition features.

नदी-स्थलाकृतियाँ प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

EROSIONAL LANDFORMS अपरदनीय भू-आकृतियाँ

Waterfalls, rapids, and meanders are examples of erosional landforms.

अपरदनीय भू-आकृतियाँ प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

DEPOSITIONAL LANDFORMS निक्षेपण भू-आकृतियाँ

Flood plains, alluvial fans, and deltas are examples of depositional landforms.

निक्षेपण भू-आकृतियाँ प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

CF05 : Streams (River's Patterns)

Streams (River's Patterns) जलधाराएँ (नदियों के प्रतिरूप)

Drainage patterns are the way in which water flows from the land to the sea. They are determined by the shape of the land.

जलधाराएँ प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

DRAINAGE PATTERNS

There are several types of drainage patterns: Dendritic, Trellis, Rectangular, Radial, and Centric.

जलधाराएँ प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

WORK OF SEA WATER

Sea water works on the coast through erosion and deposition. It creates various coastal features.

जलधाराएँ प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

CF06 : Sea Water

SEA WATER समुद्री जल

Sea water is the water in the oceans and seas. It is a mixture of fresh water and salt water.

समुद्री जल प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

WORK OF SEA WATER

Sea water works on the coast through erosion and deposition. It creates various coastal features.

समुद्री जल प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

DIFFERENT TYPES OF MASS

There are different types of mass movement: Slump, Landslide, and Earthquake.

समुद्री जल प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

CF07 : Coastal Landscape

COASTAL LANDSCAPE समुद्र तटवर्ती भू-आकृतियाँ

Coastal landscapes are the features found along the coast. They are created by the interaction of land and sea.

समुद्र तटवर्ती भू-आकृतियाँ प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

MARINE EROSIONAL LANDFORMS समुद्री तटवर्ती अपरदनीय भू-आकृतियाँ

Cliffs, sea stacks, and wave-cut platforms are examples of marine erosional landforms.

समुद्र तटवर्ती अपरदनीय भू-आकृतियाँ प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

DEPOSITIONAL LANDFORMS निक्षेपण भू-आकृतियाँ

Beaches, sand dunes, and salt marshes are examples of depositional landforms.

निक्षेपण भू-आकृतियाँ प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

CF08 : Sea Water Shorelines

SEA WATER SHORELINES समुद्री किनारे

Sea water shorelines are the boundaries between land and sea. They are shaped by erosion and deposition.

समुद्री किनारे प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

REEFS AND ATOLL

Reefs and atolls are special types of shorelines. They are formed by coral reefs.

समुद्री किनारे प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

Classification of Shorelines

Shorelines are classified into different types based on their shape and formation.

समुद्री किनारे प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता। प्रकृतिसत्त्वों के कारक के अभाव में पृथ्वी का स्वरूप नहीं बदलता।

CHANGING FACE OF THE EARTH
A set of 15 charts
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CF09 : Wind

WIND पवन (EOLIAN SYSTEM)

Geomorphic processes performed by the wind are called Eolian processes. पवन प्रणाली में वायु द्वारा किए जाने वाले भू-आकृतिक प्रक्रियाएँ कहली जाती हैं।

MAJOR CONCEPTS

- Wind is not an effective agent of erosion in most areas, but it can transport loose, unconsolidated fragments of rock & soil. Wind transports sand by saltation & dunes, silt by suspension & loess, and clay by deflation. Wind is a major agent of erosion in arid & semi-arid regions.
- Wind erosion requires an arid region, loose soil, and a windward side. Wind erosion is most effective in arid & semi-arid regions where the windward side is exposed to the wind.
- A typical cycle of erosion and sedimentation involves the wind picking up loose soil, sand, silt, and clay from the surface, transporting it, and depositing it elsewhere. Wind erosion is most effective in arid & semi-arid regions where the windward side is exposed to the wind.

EROSIONAL WORK OF WIND

DEFLATION - The process of wind erosion that removes soil and rock particles from the surface of the land. It is the most common type of wind erosion in arid & semi-arid regions.

ABRASION - The process of wind erosion that removes soil and rock particles from the surface of the land by the action of sand and silt. It is the most common type of wind erosion in arid & semi-arid regions.

DEPOSITIONAL WORK

SAND DUNE - A mound of sand that is formed by the wind. It is the most common type of wind deposition in arid & semi-arid regions.

LOESS - A fine-grained sediment that is formed by the wind. It is the most common type of wind deposition in arid & semi-arid regions.

TRANSPORTATIONAL WORK

SAHARA DESERT - A large desert in North Africa. It is the most common type of wind erosion in arid & semi-arid regions.

CF10 : Wind : Desert Landscape

Wind: Desert Landscape पवन: मरुस्थलीय भू-दृश्य

EROSIONAL DESERT LANDSCAPES

DEFLATION - The process of wind erosion that removes soil and rock particles from the surface of the land. It is the most common type of wind erosion in arid & semi-arid regions.

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CF11 : Glaciers

GLACIERS हिमानी (हिमनद)

GLACIER is a large accumulation of ice that flows slowly under its own weight. It is the most common type of ice mass in the world.

PROCESS CONTRIBUTING TOWARDS GLACIER FORMATION

- Accumulation of snow
- Compaction of snow
- Compression of snow
- Flow of snow

TYPES OF GLACIERS

CONTINENTAL GLACIERS - These glaciers cover large areas of land. They are the most common type of glacier in the world.

VALLEY GLACIERS - These glaciers flow in valleys. They are the most common type of glacier in the world.

WORKS OF GLACIERS

EROSIONAL WORK

DEPOSITIONAL WORK

TRANSPORTATIONAL WORK

CF12 : Glacial Landforms

GLACIAL LANDFORMS हिमनदीय भू-आकृतियाँ

Glacial landforms are created due to erosion, transportation and glacio-fluvial deposition. In the continental regions, extension of ice sheets and other features along with other ice-deposition makes the study of glaciers a very slow process.

EROSIONAL LANDFORMS

ROCK MOUNTAINS - These mountains are formed by the wind. They are the most common type of wind erosion in arid & semi-arid regions.

GLACIAL VALLEY - A valley that is formed by the action of a glacier. It is the most common type of glacial erosion in the world.

DEPOSITIONAL LANDFORMS

LOESS - A fine-grained sediment that is formed by the wind. It is the most common type of wind deposition in arid & semi-arid regions.

GLACIO-FLUVIAL DEPOSITS - These deposits are formed by the action of a glacier and a river. They are the most common type of glacial deposition in the world.

CF13 : Ground Water

GROUND WATER भूमिगत जल

Water seeps into the ground through pores spaces in the rock and soil. It passes first through the zone of aeration, in which the pores are not completely filled with water, and then into the zone of saturation, in which all the pores are filled with water.

MAJOR CONCEPTS

- The movement of ground water is controlled largely by the permeability of the rocks through which it flows.
- The water table is the surface below which all pores are filled with water.
- Ground water moves slowly downward through the pores spaces in the rocks by the pull of gravity. In artesian systems, it is moved by hydrostatic pressure.
- The natural discharge of ground water is generally into streams & lakes.
- Artesian wells in confined aquifers, the water is a liquid & occurs in permeable rocks bounded by impermeable formations.

WORK OF GROUND WATER

EROSIONAL WORK - The process of ground water erosion that removes soil and rock particles from the surface of the land. It is the most common type of ground water erosion in arid & semi-arid regions.

DEPOSITIONAL WORK - The process of ground water deposition that deposits soil and rock particles on the surface of the land. It is the most common type of ground water deposition in arid & semi-arid regions.

CF14 : Ground Water

GROUND WATER भूमिगत जल

SEEP AND SPRINGS - These are the most common types of ground water discharge. They are the most common type of ground water discharge in arid & semi-arid regions.

ARTESIAN WATER - This is water that is under pressure. It is the most common type of ground water discharge in arid & semi-arid regions.

WORK OF GROUND WATER

EROSIONAL WORK - The process of ground water erosion that removes soil and rock particles from the surface of the land. It is the most common type of ground water erosion in arid & semi-arid regions.

DEPOSITIONAL WORK - The process of ground water deposition that deposits soil and rock particles on the surface of the land. It is the most common type of ground water deposition in arid & semi-arid regions.

CF15 : Ground Water

GROUND WATER भूमिगत जल

MAJOR CONCEPTS

- The movement of ground water is controlled largely by the permeability of the rocks through which it flows.
- The water table is the surface below which all pores are filled with water.
- Ground water moves slowly downward through the pores spaces in the rocks by the pull of gravity. In artesian systems, it is moved by hydrostatic pressure.
- The natural discharge of ground water is generally into streams & lakes.
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WORK OF GROUND WATER

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MR01 : Direction and How to Find Them

MR02 : Conventional Signs

MR03 : True, Grid and Magnetic North

MR04 : Hill Features, Contours & Map Setting

MR05 : Section Drawing

CONTOUR CHARTS

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ME01 : Man & Environment

MAN & ENVIRONMENT

BIOSPHERE

ATMOSPHERE

HYDROSPHERE

GEOSPHERE

DEFINITION: The entire life on this planet and the environment in which it exists, together with the physical and chemical conditions that surround it, form the biosphere. The biosphere is the zone of life on the earth. It includes all plants and animals including humans. The life is possible only in this zone. The atmosphere, hydrosphere, lithosphere, and geosphere are all part of the natural environment that is a part of the biosphere.

IMPORTANCE: The biosphere is a dynamic system. The various organisms in the biosphere are constantly interacting with each other and with their environment. This interaction is essential for the survival of the biosphere. The biosphere is a complex system that is constantly changing. The various organisms in the biosphere are constantly evolving. The biosphere is a dynamic system that is constantly changing. The various organisms in the biosphere are constantly evolving.

FACTORS AFFECTING THE BIOSPHERE: The biosphere is affected by a number of factors. These factors include the physical environment, the chemical environment, and the biological environment. The physical environment includes the climate, the topography, and the geology. The chemical environment includes the composition of the atmosphere, the hydrosphere, and the soil. The biological environment includes the interactions between the various organisms in the biosphere.

IMPACT OF HUMAN ACTIVITIES: Human activities have a significant impact on the biosphere. This impact includes the destruction of natural habitats, the depletion of natural resources, and the release of pollutants into the environment. Human activities also contribute to global climate change, which has a major impact on the biosphere.

CONSERVATION OF THE BIOSPHERE: It is essential to conserve the biosphere in order to ensure the survival of all life on the planet. Conservation efforts include the protection of natural habitats, the sustainable use of natural resources, and the reduction of human activities that are harmful to the biosphere.

ME02 : Air & Noise Pollution - Causes

AIR & NOISE POLLUTION - CAUSES

AIR POLLUTION CAUSES: Air pollution is caused by a variety of sources, including factories, power plants, vehicles, and household activities. The most common sources of air pollution are factories and power plants, which release large amounts of smoke and dust into the atmosphere. Vehicles are also a major source of air pollution, releasing exhaust gases and particulates. Household activities such as burning coal, wood, and garbage also contribute to air pollution.

NOISE POLLUTION CAUSES: Noise pollution is caused by a variety of sources, including traffic, construction, and industrial activities. The most common sources of noise pollution are traffic and construction, which produce high levels of noise. Industrial activities such as manufacturing and mining also produce noise.

HEALTH EFFECTS: Air and noise pollution can have serious health effects on humans. Air pollution can cause respiratory problems, such as asthma and bronchitis, and can also increase the risk of heart disease and cancer. Noise pollution can cause hearing loss, stress, and sleep disturbances.

ENVIRONMENTAL EFFECTS: Air and noise pollution can also have significant environmental effects. Air pollution can contribute to global climate change and acid rain. Noise pollution can disturb wildlife and disrupt ecosystems.

CONTROL MEASURES: There are several measures that can be taken to reduce air and noise pollution. These measures include the use of clean energy sources, the implementation of strict regulations on factories and vehicles, and the use of noise barriers and soundproofing techniques.

ME03 : Air Pollution (Effects & Remedies)

AIR POLLUTION (Effects & Remedies)

RESPIRATORY SYSTEM: Air pollution enters the body through the respiratory system. The respiratory system consists of the lungs, trachea, and bronchi. Air pollution can irritate the lining of the respiratory system, leading to inflammation and the formation of mucus. This can cause symptoms such as coughing, wheezing, and shortness of breath.

HEALTH EFFECTS: Air pollution can have a wide range of health effects, including respiratory problems, heart disease, and cancer. Long-term exposure to air pollution can lead to chronic respiratory diseases and a higher risk of premature death.

ENVIRONMENTAL EFFECTS: Air pollution can contribute to global climate change and acid rain. It can also damage crops and forests, and harm wildlife.

REMEDIES: There are several remedies for air pollution, including the use of clean energy sources, the implementation of strict regulations, and the use of air purifiers. Individuals can also take steps to reduce their own contribution to air pollution, such as driving less and conserving energy.

PREVENTION: The best way to prevent air pollution is to reduce the amount of pollution that is released into the atmosphere. This can be done by using clean energy sources, reducing energy consumption, and supporting policies that promote clean air.

ME04 : Flora & Fauna

FLORA & FAUNA

INDIA IS HOME TO ABOUT 37,000 SPECIES OF WILD PLANTS AND 4,500 SPECIES OF WILD ANIMALS.

FLORA: India has a rich diversity of wild plants, including a wide variety of trees, shrubs, and herbs. The most common types of plants found in India are deciduous trees, evergreen trees, and grasses.

FAUNA: India is home to a wide variety of wild animals, including mammals, birds, reptiles, and amphibians. Some of the most famous animals of India are the tiger, elephant, and rhinoceros.

ENDANGERED ANIMAL SPECIES: Many species of plants and animals in India are endangered. This is due to a variety of factors, including habitat loss, overhunting, and pollution. Some of the most endangered species in India are the tiger, elephant, and rhinoceros.

CONSERVATION: It is essential to conserve the flora and fauna of India in order to protect the country's biodiversity. Conservation efforts include the protection of natural habitats, the sustainable use of natural resources, and the implementation of strict regulations.

ME05 : Water Pollution

WATER POLLUTION

SOURCES OF WATER POLLUTION: Water pollution is caused by a variety of sources, including factories, power plants, and household activities. The most common sources of water pollution are factories and power plants, which release large amounts of waste into water bodies. Household activities such as dumping garbage and using pesticides also contribute to water pollution.

HEALTH EFFECTS: Water pollution can have serious health effects on humans. Drinking contaminated water can lead to a variety of diseases, including cholera, typhoid, and hepatitis. Water pollution can also cause skin irritation and other health problems.

ENVIRONMENTAL EFFECTS: Water pollution can also have significant environmental effects. It can harm aquatic life, such as fish and birds, and can damage ecosystems. Water pollution can also contribute to global climate change.

CONTROL MEASURES: There are several measures that can be taken to reduce water pollution. These measures include the use of clean energy sources, the implementation of strict regulations on factories and households, and the use of water filtration systems.

PREVENTION: The best way to prevent water pollution is to reduce the amount of pollution that is released into water bodies. This can be done by using clean energy sources, reducing energy consumption, and supporting policies that promote clean water.

ME06 : Impact of Forests

IMPACT OF FORESTS

IMPORTANCE OF FORESTS: Forests play a vital role in the environment. They provide a habitat for a wide variety of plants and animals, and they help to regulate the climate. Forests also provide a source of wood and other natural resources.

ENVIRONMENTAL BENEFITS: Forests have a number of environmental benefits. They help to reduce air pollution by absorbing carbon dioxide and releasing oxygen. Forests also help to prevent soil erosion and protect water resources.

ECONOMIC BENEFITS: Forests provide a source of income for many people, particularly in rural areas. They provide wood for construction and other uses, and they provide a source of food and medicine.

SOCIAL BENEFITS: Forests provide a source of recreation and relaxation for many people. They provide a place where people can enjoy nature and get exercise.

CONSERVATION: It is essential to conserve forests in order to protect the environment and the benefits that they provide. Conservation efforts include the protection of natural habitats, the sustainable use of forest resources, and the implementation of strict regulations.

ME07 : Soil Conservation

SOIL CONSERVATION

IMPORTANCE OF SOIL: Soil is a vital resource that supports all life on the planet. It provides a source of nutrients for plants and animals, and it helps to regulate the climate. Soil also provides a source of water and a habitat for many organisms.

SOIL DEGRADATION: Soil can be degraded by a variety of factors, including deforestation, overgrazing, and the use of pesticides. Soil degradation can lead to a loss of nutrients and a decrease in soil fertility.

SOIL CONSERVATION TECHNIQUES: There are several techniques that can be used to conserve soil. These techniques include the use of cover crops, the implementation of crop rotation, and the use of no-till farming.

PREVENTION: The best way to prevent soil degradation is to reduce the amount of soil that is lost. This can be done by using conservation techniques and by supporting policies that promote soil conservation.

ME08 : Population Explosion

POPULATION EXPLOSION

17.8% OF WORLD POPULATION LIVES IN INDIA ON 2.4% OF WORLD LAND AREA.

CAUSES OF POPULATION EXPLOSION: There are several factors that have led to population explosion. These factors include a decline in mortality rates, a decline in fertility rates, and a decline in the age at which people have children.

CONSEQUENCES: Population explosion has a number of consequences, including a decrease in the availability of natural resources, an increase in air and water pollution, and a decrease in the quality of life.

CONTROL MEASURES: There are several measures that can be taken to control population growth. These measures include the implementation of family planning programs, the provision of education, and the improvement of healthcare.

PREVENTION: The best way to prevent population explosion is to reduce the number of children that are born. This can be done by using family planning techniques and by supporting policies that promote population control.

ME09 : Impact of Environment Degradation on Humans

IMPACT OF ENVIRONMENT DEGRADATION ON HUMANS

The greenhouse effect is a natural process that warms the Earth's surface. When the Sun's rays hit the Earth, the energy is absorbed by the land and water. This energy is then transferred to the air, which warms the surface. The warm air then radiates the energy back to the Earth, which warms the surface. This process is called the greenhouse effect.

The increase in quantity of carbon dioxide in the atmosphere due to the increase in quantity of carbon dioxide in the atmosphere has led to the increase in the quantity of carbon dioxide in the atmosphere. This is because the greenhouse effect, the atmosphere temperature will increase on high level of carbon dioxide. The increase in carbon dioxide has led to the increase in the quantity of carbon dioxide in the atmosphere.

HEALTHY LIFESTYLE

A healthy lifestyle is a lifestyle that is characterized by a number of factors, including a balanced diet, regular exercise, and good sleep. A healthy lifestyle can help to reduce the risk of many chronic diseases, such as heart disease, diabetes, and cancer.

DISEASES

Chronic kidney disease (CKD) is a long-term condition that affects the kidneys. The kidneys are responsible for filtering waste and extra fluid from the blood. When the kidneys are damaged, they cannot do their job properly, and this can lead to a buildup of waste and fluid in the body. This can cause a number of symptoms, including fatigue, weakness, and swelling.

ME10 : Non-Conventional Sources of Energy

NON-CONVENTIONAL SOURCES OF ENERGY

WIND ENERGY

Wind energy is a form of renewable energy that is generated by the wind. Wind turbines are used to capture the kinetic energy of the wind and convert it into electricity.

SOLAR ENERGY

Solar energy is a form of renewable energy that is generated by the sun. Solar panels are used to capture the energy of the sun and convert it into electricity.

BIOMASS ENERGY

Biomass energy is a form of renewable energy that is generated from organic materials, such as wood, crops, and animal waste. Biomass can be burned to produce heat or electricity.

HYDRO ENERGY

Hydro energy is a form of renewable energy that is generated from the flow of water. Hydroelectric power plants are used to capture the energy of the water and convert it into electricity.

GEOTHERMAL ENERGY

Geothermal energy is a form of renewable energy that is generated from the heat of the Earth's interior. Geothermal power plants are used to capture the heat and convert it into electricity.

BIOMASS ENERGY

Biomass energy is a form of renewable energy that is generated from organic materials, such as wood, crops, and animal waste. Biomass can be burned to produce heat or electricity.

ENVIRONMENTAL SCIENCE

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ES01 : Garbage Management

GARBAGE MANAGEMENT

TYPES OF GARBAGE

BIODEGRADABLE

Biodegradable waste is waste that can be broken down by natural processes. Examples include food waste, paper, and cloth.

NON-BIODEGRADABLE

Non-biodegradable waste is waste that cannot be broken down by natural processes. Examples include plastic, metal, and glass.

THE 3 R'S (Reduce, Reuse, Recycle)

REDUCE

Reduce means to use less of something. This can help to reduce the amount of waste that is produced.

REUSE

Reuse means to use something again. This can help to reduce the amount of waste that is produced.

RECYCLE

Recycle means to process waste into new products. This can help to reduce the amount of waste that is produced.

SOME USEFUL FRUITS

Fruits are a healthy part of a diet. They contain vitamins, minerals, and fiber. Some examples of fruits include apples, oranges, and bananas.

ES02 : Sewage Treatment Plant

SEWAGE TREATMENT PLANT

A sewage treatment plant is a facility that treats wastewater before it is discharged into the environment. The process involves several stages, including screening, primary treatment, secondary treatment, and tertiary treatment.

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DMS01 : What is Disaster

WHAT IS DISASTER आपदा क्या है

Disaster is the sudden, calamitous event bringing great damage, loss, destruction and devastation to life and property. Generally, disaster has the following effects in the concerned areas-

1. It negatively influences the emergency systems.
2. Normal day to day life, needs and processes like food, shelter, health, etc. are badly affected and deteriorate.

Disaster has the following main features-

| | | |
|----------------------|-------------------|------------|
| (a) Unpred stability | (b) Unfamiliarity | (c) Speed |
| (d) Urgency | (e) Uncertainty | (f) Threat |

आपदा एक अचानक हुई घटना है जो जीवन और संपत्ति को नुकसान देती है और विनाश पहुंचाती है। सामान्यतः आपदा के प्रभावित क्षेत्र में निम्न परिणाम देखने को मिलते हैं-

1. नकारात्मक रूप में आपदाकालीन प्रणाली प्रभावित होती है।
2. रोजमर्रा की जीवन व्यवस्था, जल्दबाजी से जीवन के बुनियादी आवश्यकताएं, स्वास्थ्य संबंधी कार्यों जैसे खाना, आवास, स्वास्थ्य, आदि को बहुत बुरा प्रभावित और खराब करती है।

आपदा की निम्न प्रमुख विशेषताएँ हैं-

| | | |
|-------------------|----------------|----------|
| (क) अप्रत्याशितता | (ख) अज्ञानिता | (ग) गति |
| (घ) तत्कालता | (ङ) अनिश्चितता | (च) खतरा |

TYPES OF DISASTER आपदा के प्रकार

MAJOR NATURAL DISASTERS मुख्य प्राकृतिक आपदाएँ

| | | |
|-----------------------------------|--|-----------------------------------|
| <p>1 EARTHQUAKE भूकम्प</p> | <p>2 TSUNAMI सुनामी</p> | <p>3 FLOOD बाढ़</p> |
| <p>4 CYCLONE चक्रवात</p> | <p>5 FOREST FIRE जंगल की आग</p> | <p>6 LANDSLIDE भूस्खलन</p> |

MAJOR MAN MADE DISASTERS मुख्य मानवनिर्मित आपदाएँ

| | | |
|---|---|--|
| <p>1 NUCLEAR DISASTER नाभिकीय आपदा</p> | <p>2 CHEMICAL DISASTER रासायनिक आपदा</p> | <p>3 BIOLOGICAL DISASTER जैविक आपदा</p> |
|---|---|--|

Main Components of a Disaster आपदा के मुख्य अवयव

Risk- Measure of the expected losses due to a hazardous event.
Vulnerability- The extent to which a community, structure, service, and geographic area is likely to be damaged or disrupted by the impact of particular hazard.
Hazards- Phenomena that pose a threat to people, structures, or economic assets and which may cause a disaster.

खतरा- विनाशपूर्ण घटना से हुई अनुमानित हानि का माप (जोखिम) है।
 संवेदनशीलता- किसी संरचना, सेवा, क्षेत्र और भौतिक क्षेत्र को किस-किसी तरह एक विशेष खतरा प्रभावित कर नुकसान पहुंचाने में साक्ष्यित करता है।
 खतरा- घटना के लोगों, संरचनाओं या आर्थिक क्षेत्रों को नुकसान पहुंचाने और जो एक आपदा का कारण हो।

DISASTER RISK आपदा जोखिम = **HAZARD संकट** + **VULNERABILITY संवेदनशीलता**

DMS02 : Disaster Management Cycle-1

DISASTER MANAGEMENT CYCLE-1 आपदा प्रबंधन चक्र-1

Disaster management is a sequence of activities that are undertaken to prevent or reduce the damage caused by a disaster. It involves the identification, assessment, and management of hazards and risks. This cycle is repeated as a disaster management cycle consisting of four stages: Hazard Identification, Risk Assessment, Preparedness, and Response.

PREVENTION AND MITIGATION

RESPONSE AND RELIEF

RECOVERY AND RECONSTRUCTION

PREPAREDNESS

DMS03 : Disaster Management Cycle-2

DISASTER MANAGEMENT CYCLE-2 आपदा प्रबंधन चक्र-2

Disaster management is a sequence of activities that are undertaken to prevent or reduce the damage caused by a disaster. It involves the identification, assessment, and management of hazards and risks. This cycle is repeated as a disaster management cycle consisting of four stages: Hazard Identification, Risk Assessment, Preparedness, and Response.

RESPONSE AND RELIEF

RECOVERY AND RECONSTRUCTION

PREPAREDNESS

DMS04 : Earthquake

EARTHQUAKE भूकम्प

An earthquake is the sudden shaking of the Earth's surface due to the release of energy stored below the surface of the Earth. Earthquakes can have disastrous effects. People that don't have emergency plans in place are most vulnerable to the aftermath of an earthquake. To stay safe during an earthquake, you should follow these steps:

BEFORE EARTHQUAKE

DURING EARTHQUAKE

AFTER EARTHQUAKE

DMS05 : Tsunami

TSUNAMI सुनामी

Tsunami are the waves generated by the sudden displacement of water in the ocean. They are caused by earthquakes, volcanic eruptions, and landslides. Tsunami can be very destructive and cause significant damage to coastal areas. To stay safe during a tsunami, you should follow these steps:

BEFORE TSUNAMI

DURING TSUNAMI

AFTER TSUNAMI

DMS06 : Flood

FLOOD बाढ़

PREPARATION BEFORE FLOOD तैयारी से पहले की तैयारी

PREPARATION WHEN FLOOD IS IMMINENT तैयारी तब की तैयारी जब बाढ़ आने से पहले

BE PREPARED DURING THE FLOOD बाढ़ के समय तैयारी

AFTER FLOOD बाढ़ के बाद

DMS07 : Cyclone

CYCLONE चक्रवात

BEFORE CYCLONE ARRIVAL चक्रवात आने से पहले

DURING CYCLONE ALERTS चक्रवात की चेतावनी के समय

AFTER CYCLONE चक्रवात के बाद

DMS08 : Forest Fire

FOREST FIRE जंगल की आग

SAFETY TIPS सुरक्षा के सुझाव

DURING A FOREST FIRE जंगल में आग के समय

DMS09 : Landslide

LANDSLIDE भूस्खलन

BEFORE LANDSLIDE भूस्खलन से पहले

DURING LANDSLIDE भूस्खलन के समय

AFTER LANDSLIDE भूस्खलन के बाद

DMS10 : Nuclear Disaster

NUCLEAR DISASTER परमाणु आपदा

CAUSES OF NUCLEAR DISASTERS परमाणु आपदा के कारण

PREVENTION OF NUCLEAR DISASTERS परमाणु आपदा से निवारण

HEALTH AND ENVIRONMENT स्वास्थ्य और पर्यावरण

DMS11 : Chemical Disaster

CHEMICAL DISASTER रासायनिक आपदा

CAUSES OF CHEMICAL DISASTERS रासायनिक आपदा के कारण

PREVENTION OF CHEMICAL DISASTERS रासायनिक आपदा से निवारण

HEALTH AND ENVIRONMENT स्वास्थ्य और पर्यावरण

DMS12 : Biological Disaster

BIOLOGICAL DISASTER जैविक आपदा

PREVENTION AND PROPHYLAXIS निवारण और रोकथाम

WITH-YEAM AND RESPONSE तैयारी और प्रतिक्रिया

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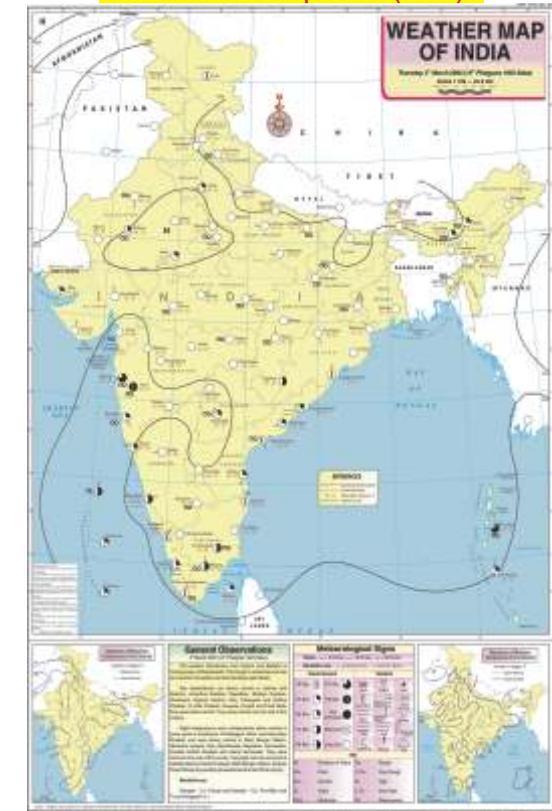
WMI01 : Weather Map of India (January)



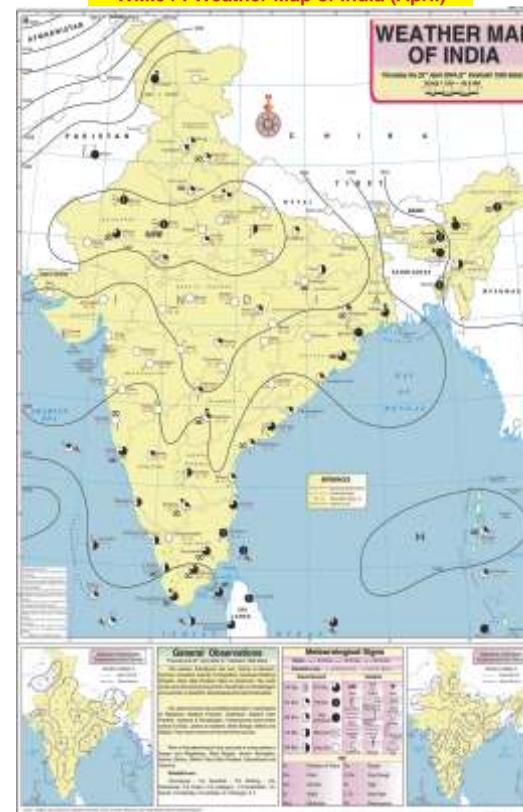
WMI02 : Weather Map of India (February)



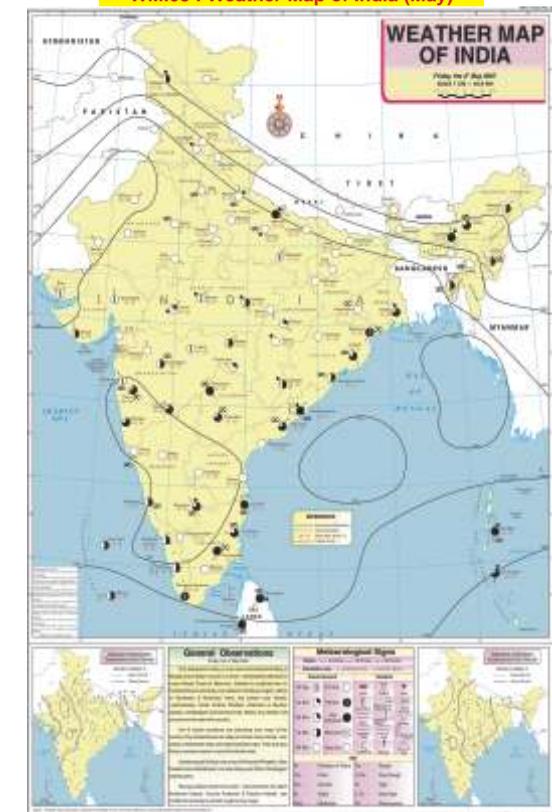
WMI03 : Weather Map of India (March)



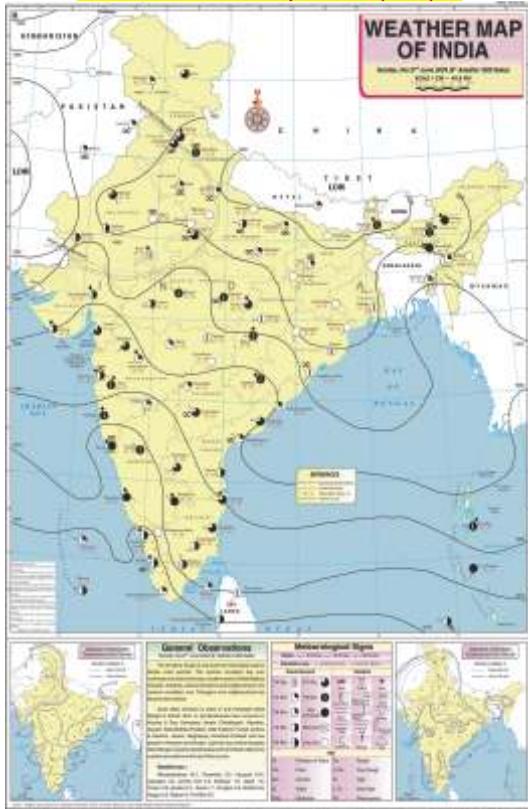
WMI04 : Weather Map of India (April)



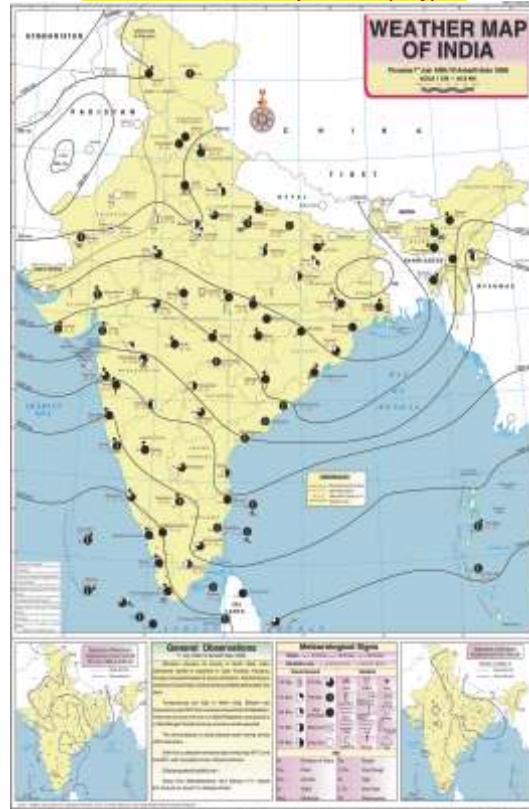
WMI05 : Weather Map of India (May)



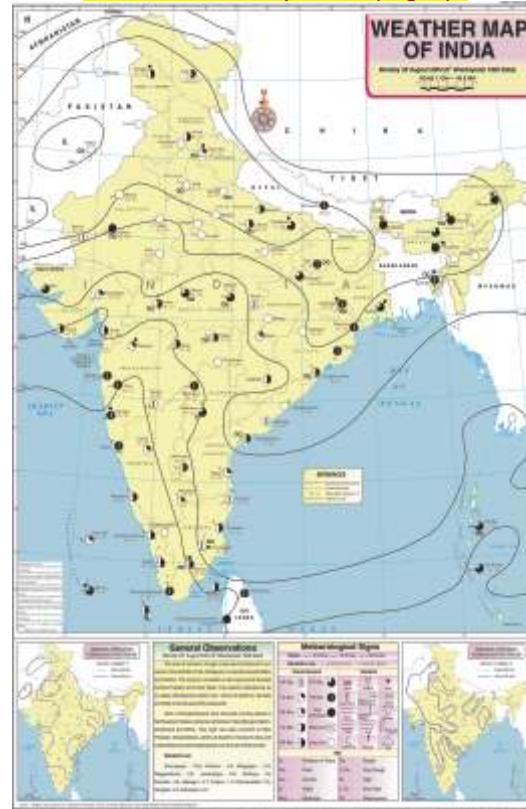
WMI06 : Weather Map of India (June)



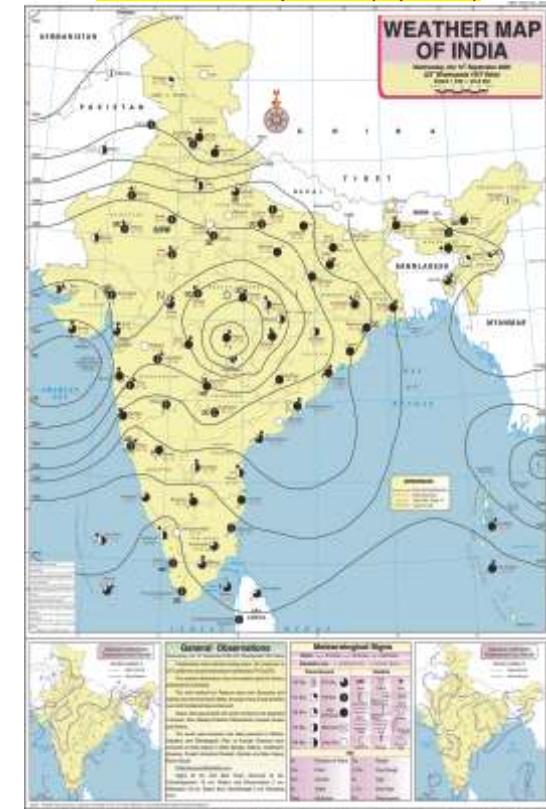
WMI07 : Weather Map of India (July)



WMI08 : Weather Map of India (August)



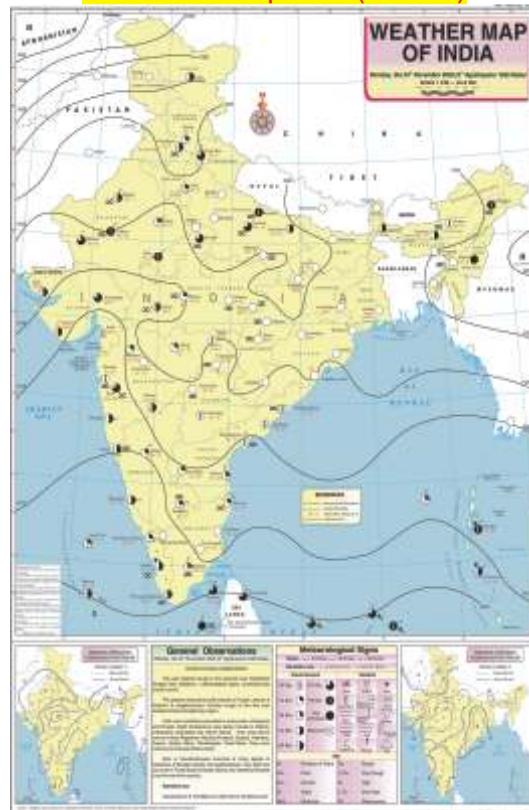
WMI09 : Weather Map of India (September)



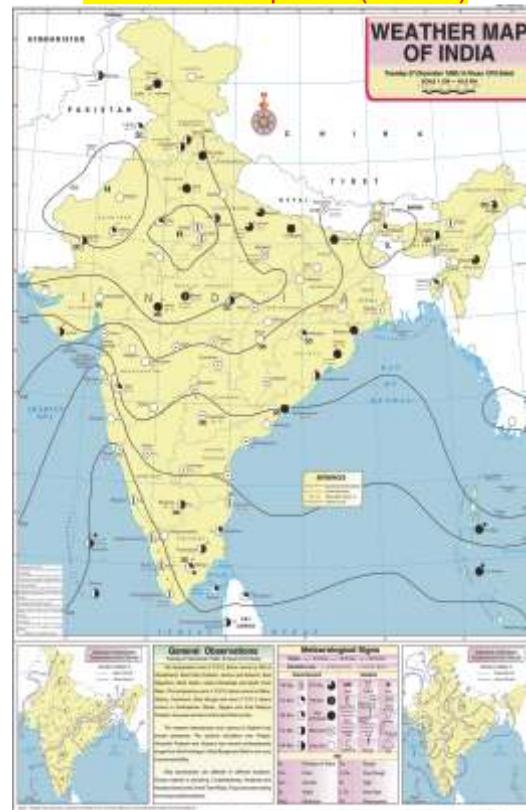
WMI10 : Weather Map of India (October)



WMI11 : Weather Map of India (November)



WMI12 : Weather Map of India (December)



WEATHER MAPS OF INDIA
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ALPHABET CHARTS

Laminated, Size 70 x 100 cm

AC01 : English Alphabet

| ENGLISH ALPHABET | | | |
|----------------------------|---------------------------|-------------------------|------------------------|
| A a Apple | B b Boy | C c Cat | D d Dog |
| E e Elephant | F f Fish | G g Goat | H h Horse |
| I i Ice Cream | J j Juice | K k Key | L l Lion |
| M m Monkey | N n Nose | O o Orange | P p Power |
| Q q Queen | R r Rose | S s Swan | |
| T t Tiger | U u Umbrella | V v Van | |
| W w Wheat | X x X-ray | Y y Yacht | Z z Zebra |

AC02 : Hindi Varnamala

| हिन्दी वर्णमाला | | | | |
|-----------------|---|---|-----|-----|
| अ | आ | इ | ई | उ |
| ए | ऐ | ओ | औ | अं |
| क | ख | ग | घ | ङ |
| च | छ | ज | झ | ञ |
| ट | ठ | ड | ढ | ण |
| त | थ | द | ध | न |
| प | फ | ब | भ | म |
| य | र | ल | व | श |
| ष | स | ह | क्ष | त्र |

AC03 : Barakhari Chart

| बारह खड़ी चाई | | | | | | | | | | |
|---------------|------|------|------|------|------|------|------|------|------|------|
| क | का | के | की | कु | कु | के | के | को | की | कः |
| ख | खा | खे | खी | खु | खु | खे | खे | खो | खी | खः |
| ग | गा | गे | गी | गु | गु | गे | गे | गो | गी | गः |
| घ | घा | घे | घी | घु | घु | घे | घे | घो | घी | घः |
| ङ | ङा | ङे | ङी | ङु | ङु | ङे | ङे | ङो | ङी | ङः |
| च | चा | चे | ची | चु | चु | चे | चे | चो | ची | चः |
| छ | छा | छे | छी | छु | छु | छे | छे | छो | छी | छः |
| ज | जा | जे | जी | जु | जु | जे | जे | जो | जी | जः |
| झ | झा | झे | झी | झु | झु | झे | झे | झो | झी | झः |
| ञ | जा | जे | जी | जु | जु | जे | जे | जो | जी | जः |
| ट | टा | टे | टी | टु | टु | टे | टे | टो | टी | टः |
| ठ | ठा | ठे | ठी | ठु | ठु | ठे | ठे | ठो | ठी | ठः |
| ड | डा | डे | डी | डु | डु | डे | डे | डो | डी | डः |
| ढ | ढा | ढे | ढी | ढु | ढु | ढे | ढे | ढो | ढी | ढः |
| ण | णा | णे | णी | णु | णु | णे | णे | णो | णी | णः |
| त | ता | ते | ती | तु | तु | ते | ते | तो | ती | तः |
| थ | था | थे | थी | थु | थु | थे | थे | थो | थी | थः |
| द | दा | दे | दी | दु | दु | दे | दे | दो | दी | दः |
| ध | धा | धे | धी | धु | धु | धे | धे | धो | धी | धः |
| न | ना | ने | नी | नु | नु | ने | ने | नो | नी | नः |
| प | पा | पे | पी | पु | पु | पे | पे | पो | पी | पः |
| फ | फा | फे | फी | फु | फु | फे | फे | फो | फी | फः |
| ब | बा | बे | बी | बु | बु | बे | बे | बो | बी | बः |
| भ | भा | भे | भी | भु | भु | भे | भे | भो | भी | भः |
| म | मा | मे | मी | मु | मु | मे | मे | मो | मी | मः |
| य | या | ये | यी | यु | यु | ये | ये | यो | यी | यः |
| र | रा | रे | री | रु | रु | रे | रे | रो | री | रः |
| ल | ला | ले | ली | लु | लु | ले | ले | लो | ली | लः |
| व | वा | वे | वी | वु | वु | वे | वे | वो | वी | वः |
| श | शा | शे | शी | शु | शु | शे | शे | शो | शी | शः |
| ष | षा | षे | षी | षु | षु | षे | षे | षो | षी | षः |
| स | सा | से | सी | सु | सु | से | से | सो | सी | सः |
| ह | हा | हे | ही | हु | हु | हे | हे | हो | ही | हः |
| क्ष | क्षा | क्षे | क्षी | क्षु | क्षु | क्षे | क्षे | क्षो | क्षी | क्षः |
| त्र | त्रा | त्रे | त्री | त्रु | त्रु | त्रे | त्रे | त्रो | त्री | त्रः |

AC04 : Tamil Alphabet

| உயிர் மெய் எழுத்துக்கள் | | | | |
|-------------------------|---|---|---|-----|
| அ | ஆ | இ | ஈ | உ |
| ஊ | எ | ஏ | ஐ | ஓ |
| ஔ | ஒ | க | ங | ச |
| ஞ | ட | ண | த | ந |
| ப | ம | ய | ர | ல |
| வ | ழ | ள | ற | ன |
| வட மொழி எழுத்துக்கள் | | | | |
| ஐ | ஹ | ஷ | ஸ | க்ஷ |

AC05 : Telugu Alphabet

| తెలుగు వర్ణమాల | | | | |
|----------------|---|---|-----|-----|
| అ | ఆ | ఇ | ఈ | ఉ |
| ఊ | ఋ | ౠ | ఌ | ౡ |
| క | ఖ | గ | ఘ | ఙ |
| చ | ఛ | జ | ఝ | ఞ |
| ట | ఠ | డ | ఢ | ణ |
| త | థ | ద | ధ | న |
| ప | ఫ | బ | భ | మ |
| య | ర | ల | వ | శ |
| ష | స | హ | క్ష | త్త |

AC06 : Tamil Barakhari

| தமிழ் எழுத்துக்கள் | | | | | | | | | |
|--------------------|----|----|----|----|----|----|----|----|----|
| அ | ஆ | இ | ஊ | ஋ | ஌ | ஡ | ஃ | ஄ | அ |
| க | கா | கே | கி | கூ | கூ | கே | கே | கி | கா |
| க | கா | கே | கி | கூ | கூ | கே | கே | கி | கா |
| க | கா | கே | கி | கூ | கூ | கே | கே | கி | கா |
| க | கா | கே | கி | கூ | கூ | கே | கே | கி | கா |
| க | கா | கே | கி | கூ | கூ | கே | கே | கி | கா |

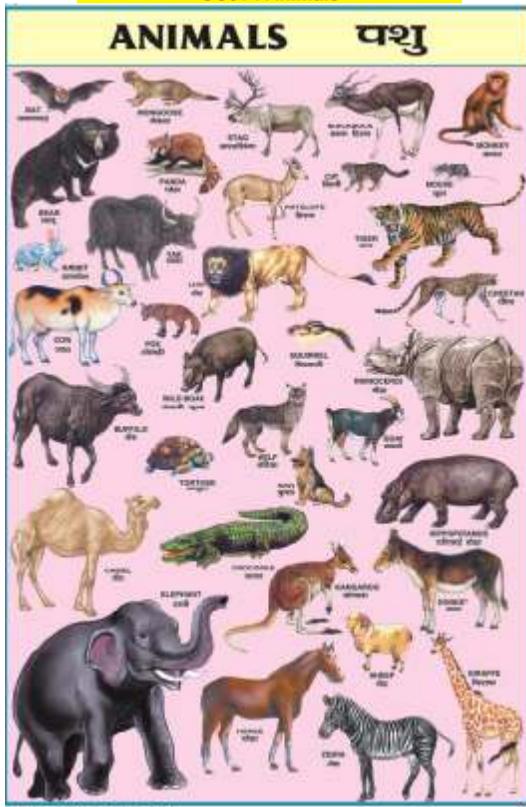
AC07 : Telugu Barakhari

| గుణింతాలు | | | | | | | | | |
|-----------|----|----|----|----|----|----|----|----|----|
| అ | ఆ | ఇ | ఈ | ఉ | ఊ | ఋ | ౠ | ఌ | ౡ |
| క | కా | కే | కి | కూ | కూ | కే | కే | కి | కా |
| ఖ | ఖా | ఖే | ఖి | ఖూ | ఖూ | ఖే | ఖే | ఖి | ఖా |
| గ | గా | గా | గి | గూ | గూ | గా | గా | గి | గా |
| ఘ | ఘా | ఘే | ఘి | ఘూ | ఘూ | ఘే | ఘే | ఘి | ఘా |
| ఙ | ఙా | ఙే | ఙి | ఙూ | ఙూ | ఙే | ఙే | ఙి | ఙా |

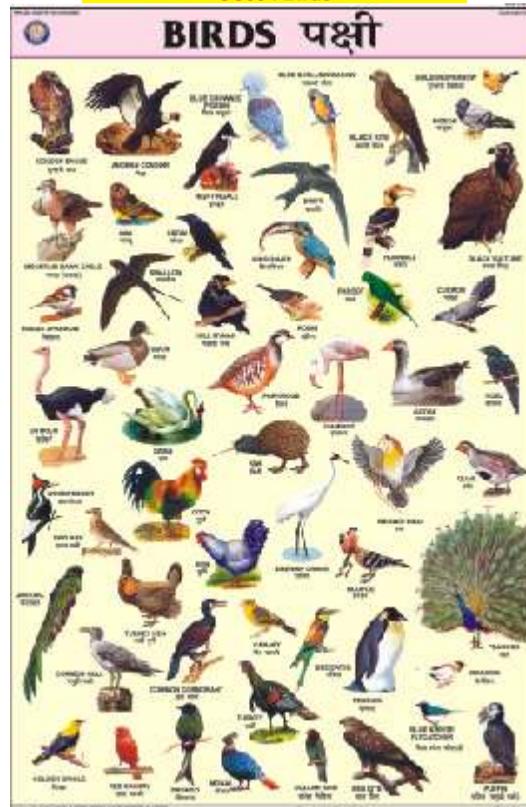
AC08 : Malayalam Alphabet

| മലയാള അക്ഷരമാല | | | | |
|----------------|---------|---|---|---|
| അ | ആ | ഇ | ഈ | ഉ |
| ഊ | എ | ഈ | ഐ | ഓ |
| ഔ | ഘ | ങ | ച | ട |
| ത | ത്രിശ്ശ | ാ | ി | ു |
| എ | ഈ | ഊ | ഈ | ഊ |

CC01 : Animals



CC03 : Birds



CC05 : Vegetables



CC06 : Fruits



CC07 : Symbols of National Unity

Symbols of National Unity राष्ट्रीय एकता के चिन्ह

NATIONAL ANTHEM राष्ट्रगान **NATIONAL SONG** राष्ट्रगीत

जय-गंधर्व-मन अधिपतिवत् जय हे
भारत-भारत विधाता।
पंजाब-सिंध-गुजरात-मराठा-
राजस्थान-उत्तरप्रदेश-बंग,
विंध्य-हिमालय-यमुना-गंगा
उत्कल-कन्या-सरेंग।
तव शुभ नाम जग,
तव शुभ आशिर माग,
गाहे तव जय गाथा।
जय-गंधर्व-मन अधिपतिवत् जय हे,
भारत-भारत विधाता।
जय हे, जय हे, जय हे,
जय जय जय जय हे॥

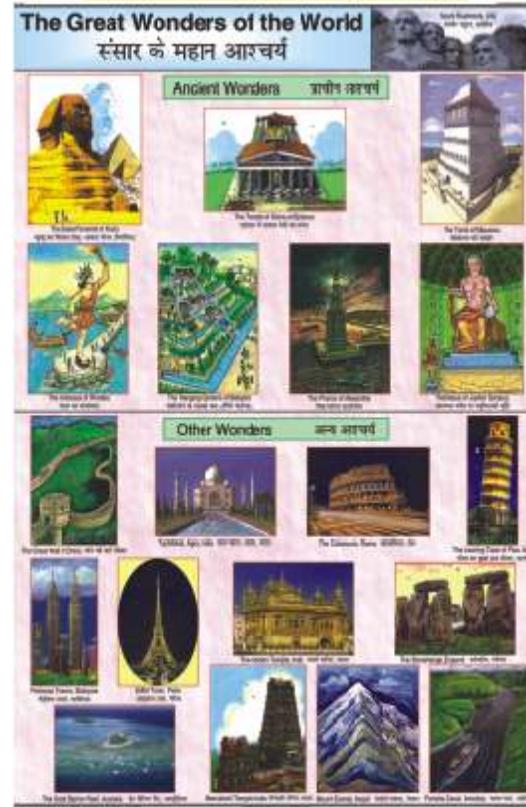
वंदे मातरम्।
सुजलां सुफलां
मलायज सौजत्याम्
शस्यशयानलां मातरम् ।
शुभ्र ज्योत्सना-पुलकित यामिनीम्
फुल्लकुसुमित-द्रुमदलशोभिनीम्
सुहासिनीं सुमधुर भ्रषिणीम्
सुखदा, वरदा मातरम् ॥
वंदे मातरम् . . .

National Flag **राष्ट्रीय ध्वज**
National Emblem **राष्ट्रीय चिन्ह**
National Animal **राष्ट्रीय प्राणी**
National Bird **राष्ट्रीय पक्षी**
National Tree **राष्ट्रीय वृक्ष**
National Fruit **राष्ट्रीय फल**

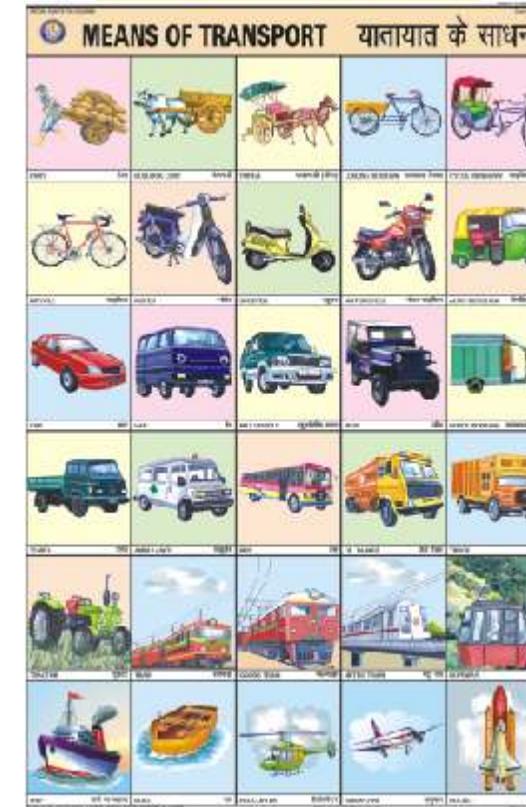
CC08 : Flowers



CC09 : The Great Wonders of the World



CC10 : Means of Transport



SPECIAL CHARTS FOR CHILDREN
Laminated, Size 50 x 70 cm (Available in English and Hindi Combined)

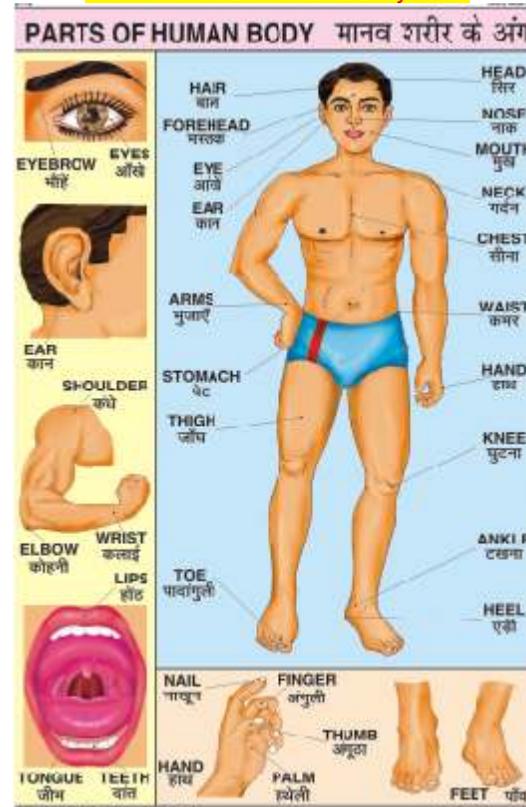
CC11 : Road Traffic Signs



CC12 : Health Rules



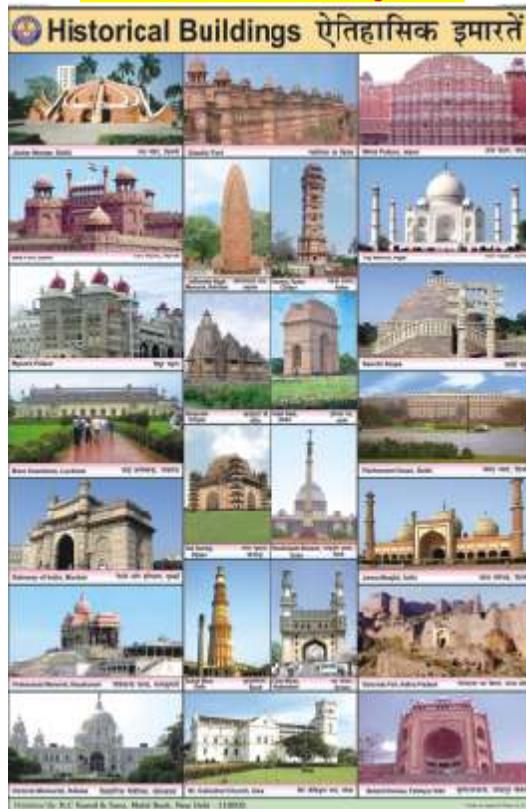
CC13 : Parts of Human Body



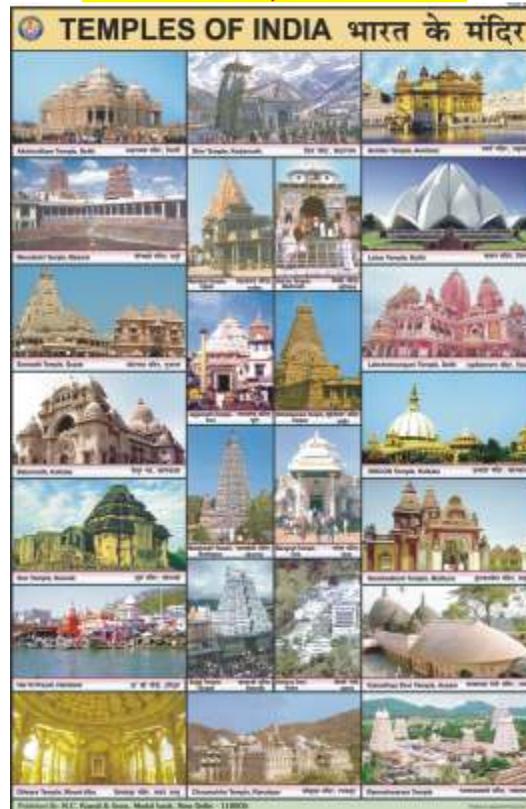
CC14 : Flags of Nations



CC15 : Historical Buildings



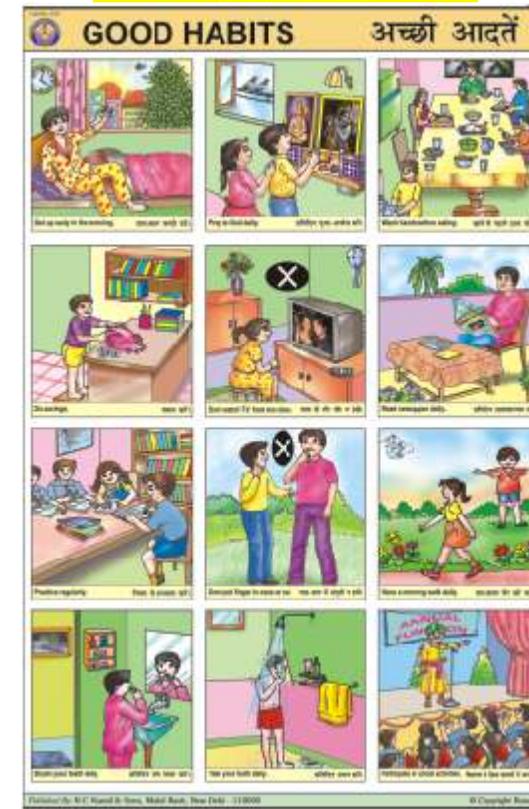
CC16 : Temples of India



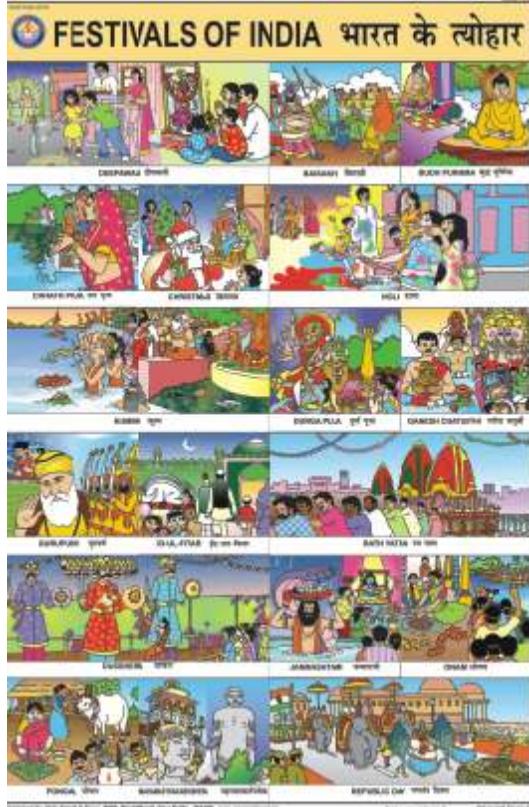
CC17 : Good Manners



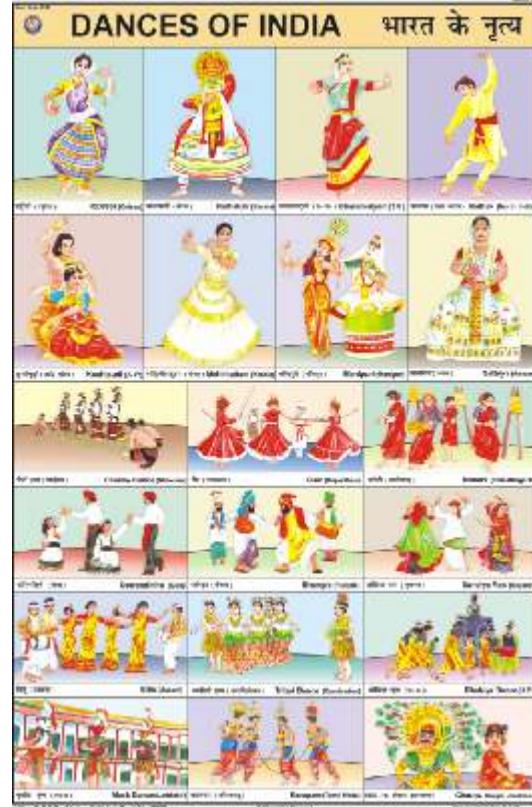
CC18 : Good Habits



CC19 : Festivals of India



CC20 : Dances of India



CC22 : Dresses of India



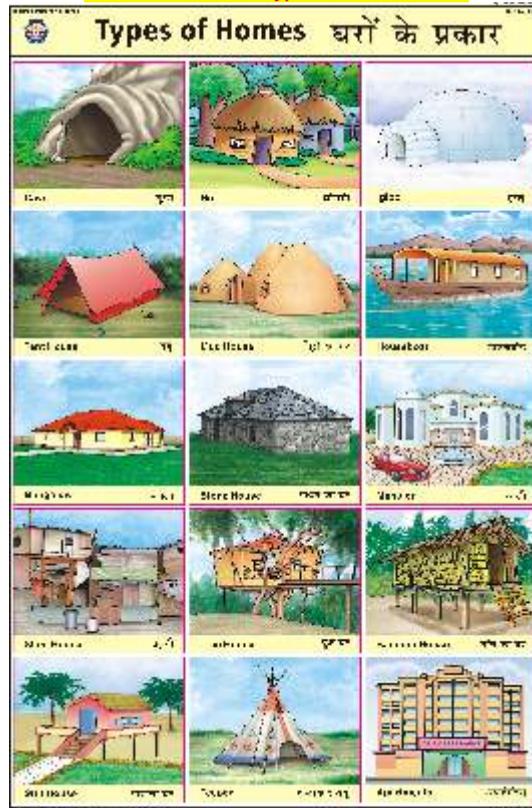
CC23 : My Family



CC24 : Opposites



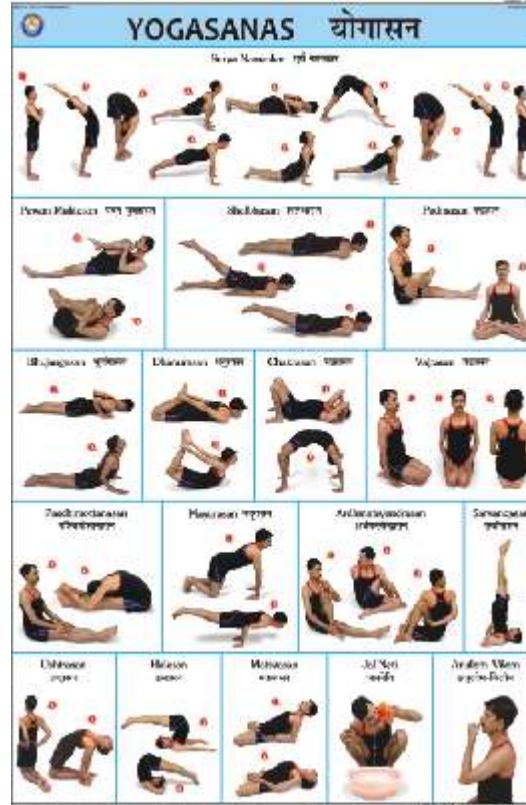
CC25 : Types of Homes



CC62 : Computer- An Overview



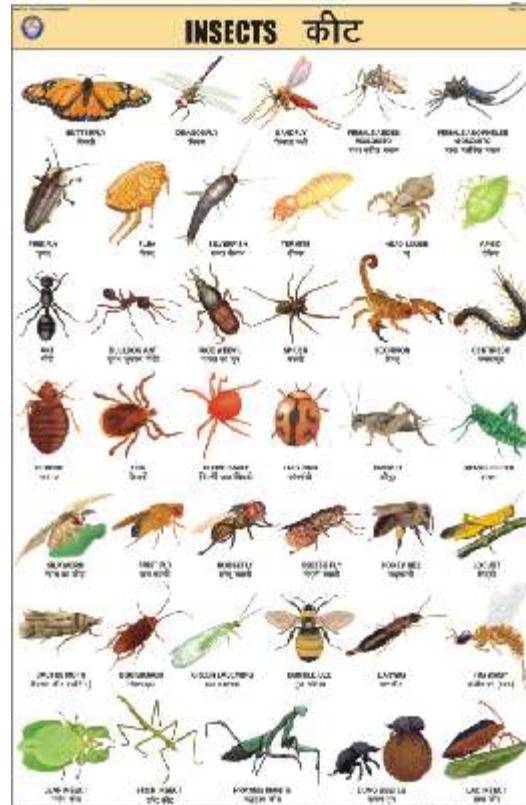
CC63 : Yogasanas



CC64 : Inventions and Their Inventors



CC65 : Insects



The following titles are available in size 70 x 100 cm, Laminated, English and Hindi combined

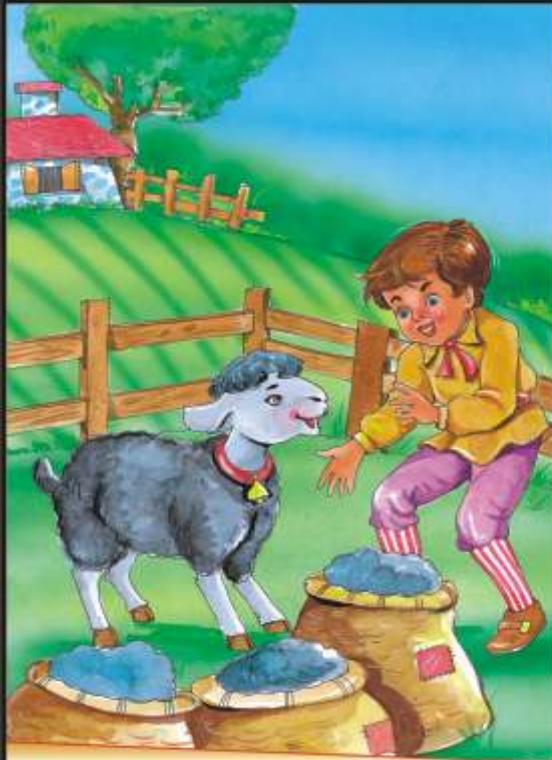
Chart Code

Title

- CC51 Animals
- CC52 Birds
- CC53 Vegetables
- CC54 Fruits
- CC55 Flowers
- CC56 Great Wonders of the world
- CC57 Means of Transport
- CC58 Road Traffic Signs
- CC59 Parts of Body
- CC60 Flags of all Nations



NURSERY RHYMES - 1

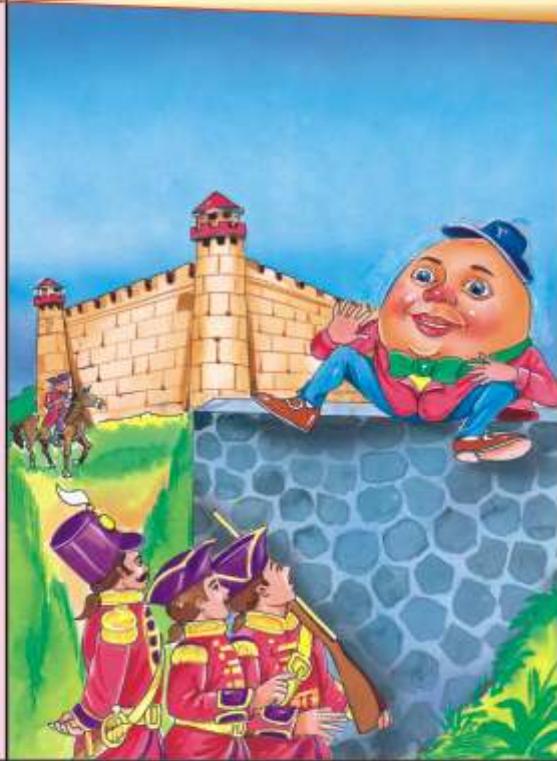


BAA, BAA, BLACK SHEEP

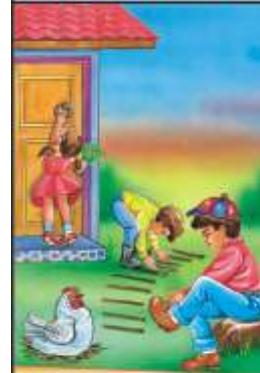
Baa, Baa, black sheep,
Have you any wool ?
Yes sir, yes sir,
Three bags full
One for my master,
One for his dame,
And one for the little boy,
Who lives down the lane.

HUMPTY DUMPTY

Humpty Dumpty sat
on a wall,
Humpty Dumpty had
a great fall.
All the king's horses
And all the king's men
Couldn't put Humpty
Dumpty together again.



NURSERY RHYMES - 2

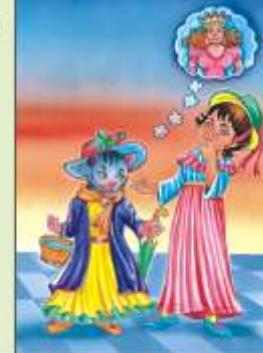


ONE, TWO, BUCKLE MY SHOE

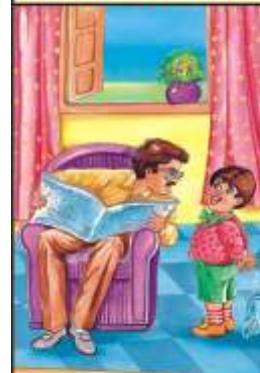
One - two,
buckle my shoe ;
Three - four,
shut the door ;
Five - six,
pick up sticks.
Seven - eight
lay them straight ;
Nine - ten,
a big fat hen ;
Eleven - twelve,
dig and delve.

PUSSY CAT, PUSSY CAT

Pussy cat, Pussy cat,
Where have you been ?
I've been to London
To look at the queen.
Pussy cat, Pussy cat,
What did you there ?
I frightened a little mouse
under the chair.



NURSERY RHYMES - 4



JOHNNY ! JOHNNY

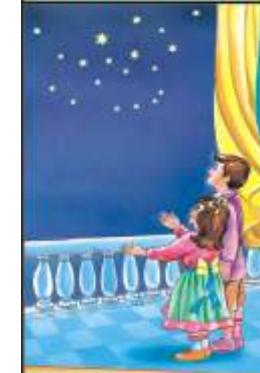
"Johnny ! Johnny !"
"Yes Papa"
"Eating sugar ?"
"No Papa"
"Telling a lie ?"
"No Papa"
"Open your mouth"
"Ha, Ha, Ha."

CHUBBY CHEEKS

Chubby cheeks, dimpled chin,
Rosy lips, teeth within.
Curly hair, very fair,
Eyes are blue, lovely two,
Teacher's pet, is that you ?
Yes ! Yes ! Yes !



NURSERY RHYMES - 3

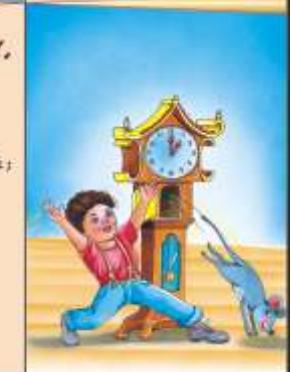


TWINKLE, TWINKLE

Twinkle, Twinkle, little star,
How I wonder what you are ?
Up above the world so high,
Like a diamond in the sky.
When the blazing Sun is gone,
When there nothing shines upon,
Then you show your little light,
Twinkle, Twinkle, all the night.

HICKORY, DICKORY, DOCK !

Hickory, Dickory, Dock,
The mouse ran up the clock ;
The clock struck one,
The mouse ran down,
Hickory, dickory, dock !



NURSERY RHYMES - 5



JACK & JILL

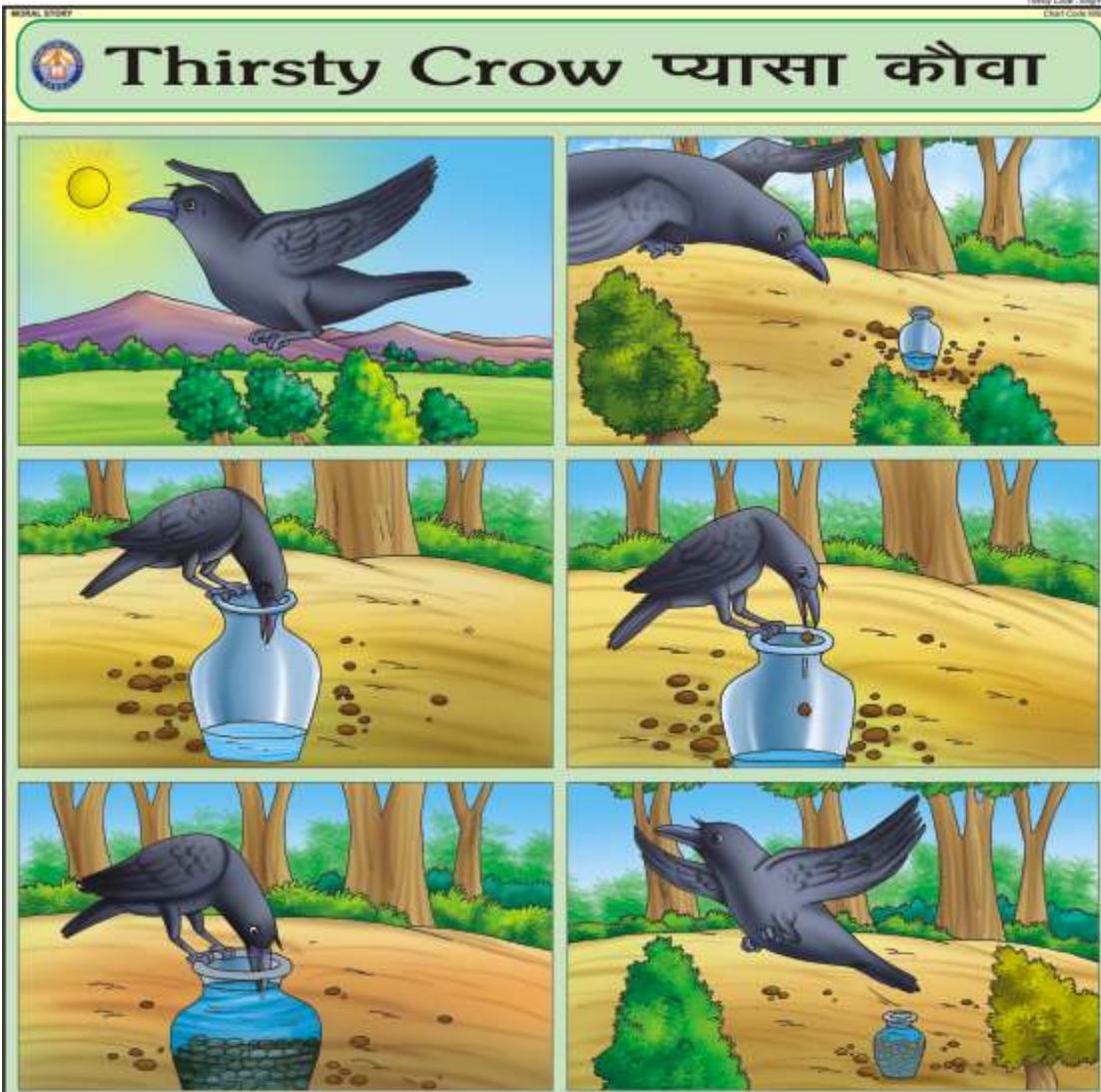
Jack & Jill,
Went up the hill
To fetch a pail of water ;
Jack fell down,
And broke his crown,
And Jill came tumbling after.

DING, DONG, BELL

Ding, dong, bell,
Pussy's in the well !
Who put her in ?
Little Johnny tin.
Who pulled her out ?
Little Johnny Stout.
What a naughty boy was that !
To worry poor Pussy Cat.



MS01 : Thirsty Crow



Once in the month of summer, a thirsty crow was flying here and there in search of water. Suddenly he saw a jug with a very small amount of water. When he tried to drink the water he could not do so as the level of the water was very low.

The crow was very clever and he hit upon an idea. He collected some pebbles and dropped them into the jug. As the level of water rose, he quenched his thirst heartily and flew away.

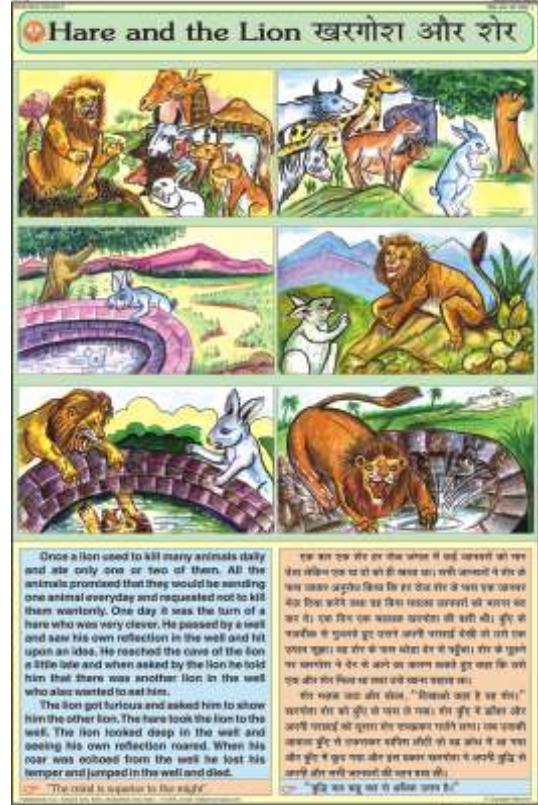
"Where there is a will, there is a way".

गर्मी के महीने में एक प्यासा कौवा पानी की तलाश में इधर-उधर उड़ रहा था। अचानक उसने एक जग में थोड़ा पानी देखा। उसने जग का पानी पीने की कोशिश की लेकिन पानी का स्तर नीचा होने के कारण वह पानी नहीं पी सका।

कौवा बहुत चालाक था। उसे एक युक्ति सूझी। वह कहीं से छोटे-छोटे कंकर के टुकड़े ले आया और जग में डालने लगा। जैसे ही पानी का स्तर ऊपर आया कौवे ने ऊपर आए पानी से अपनी प्यास बुझाई और उड़ गया।

"जहाँ चाह, वहाँ राह।"

MS02 : Hare & the Lion



Once a lion used to kill many animals daily and ate only one or two of them. All the animals promised that they would be sending one animal everyday and requested not to kill them suddenly. One day it was the turn of a hare who was very clever. He passed by a well and saw his own reflection in the well and hit upon an idea. He reached the cave of the lion a little late and when asked by the lion he told him that there was another lion in the well who also wanted to eat him.

The lion got furious and asked him to show him the other lion. The hare took the lion to the well. The lion looked deep in the well and seeing his own reflection roared. When his roar was echoed from the well he lost his temper and jumped in the well and died.

"The road is superior to the night."

MS04 : Monkeys and the Hawker

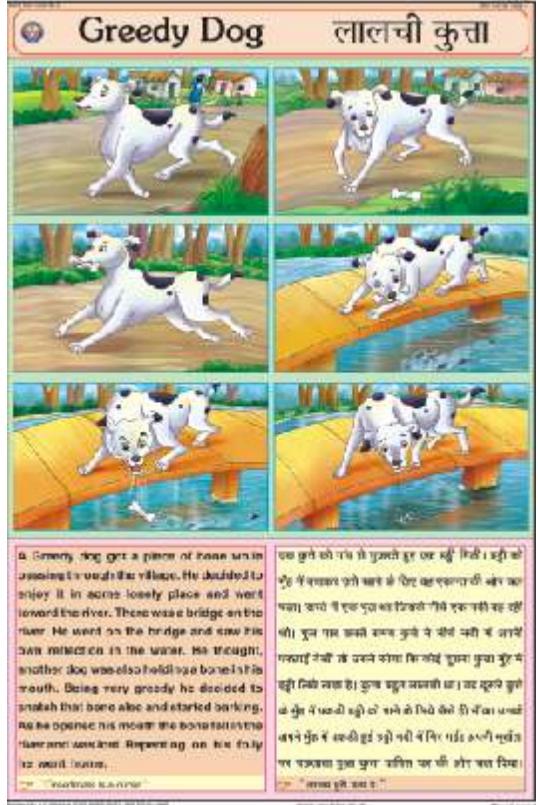


Once a hawker was going to a town for selling his caps in the market. On the way he sat down under a tree for a rest. Soon he fell asleep. There were quite a few monkeys on the tree. They came down and opened the box of the caps and put all the caps on their head one by one. The hawker when awake was very much surprised to see the box empty and the monkeys wearing his caps.

The hawker knew that the monkeys are very greedy to copying. He put off his own cap and threw it on the ground. All the monkeys when saw this, put off their caps one by one and threw them on the ground. The hawker collected the caps, put them back in the box and proceeded towards the market pondering happily on his idea and good luck.

"An idea can make the garden fruitful."

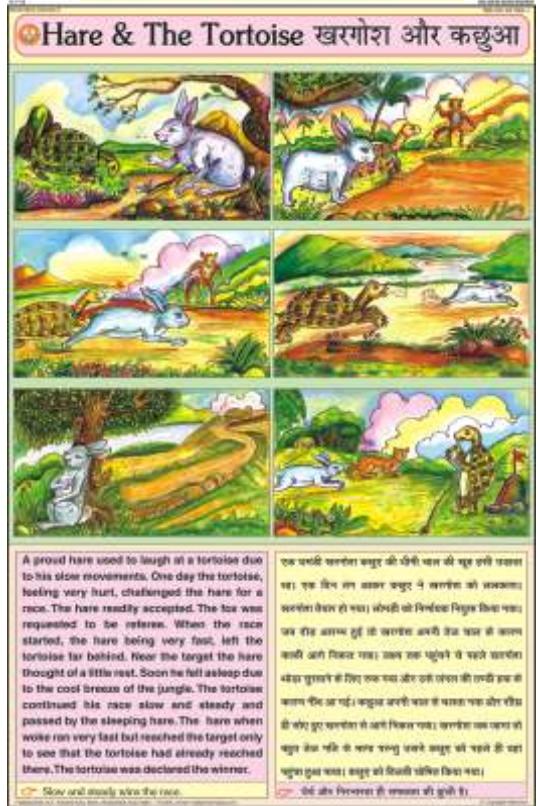
MS03 : Greedy Dog



A Greedy dog got a piece of bone when crossing a road in a village. He decided to enjoy it in some lonely place and went toward the river. There was a bridge on the river. He went on the bridge and saw his own reflection in the water. He thought, another dog was also holding a bone in his mouth. Being very greedy he decided to snatch that bone also and started barking. He opened his mouth and the bone fell into the water. Hearing an loud splash he went to look for it.

"आजकल के लोग हैं।"

MS05 : Hare & the Tortoise



A proud hare used to laugh at a tortoise due to his slow movements. One day the tortoise, feeling very hurt, challenged the hare for a race. The hare readily accepted. The race was requested to be intense. When the race started, the hare being very fast, left the tortoise far behind. Near the target the hare thought of a little rest. Soon he fell asleep due to the cool breeze of the jungle. The tortoise continued his race slow and steady and passed by the sleeping hare. The hare when woke ran very fast but reached the target only to see that the tortoise had already reached there. The tortoise was declared the winner.

"Slow and steady wins the race."

MS06 : Fox and the Crow

Fox and the Crow लोमड़ी और कौवा

Once a crow got a piece of bun and settled on a branch of tree to eat it. A fox chanced to come that way and when he saw the crow he wanted to grab the bun. The fox thought of a plan. He started praising the crow "Your skin is very soft and your voice also should be very sweet. I hope that you are king of all the birds. Please, can you sing a song for me". The crow was completely taken in by the flattery and began to sing "Caw, Caw". When the crow opened his mouth, the piece of bun fell on the ground. The fox took the bun and ran away. The crow repented on his folly but to no avail.

एक बार एक कौवा को भोजी के पीछे का टुकड़ा मिल और उसे अपने कंधे पर रख कर एक पेड़ की शाखा पर बैठा। एक लोमड़ी उस के पास चली आई। उस लोमड़ी को कौवा के चूने में लोटी का टुकड़ा देखा तो उसको खान में लेनी को पाने का उपाय सोच ले गया। उसने एक उपाय सोचा और उसे कौवा को प्रशंसा करने लगी। उसने कहा "आपकी त्वचा तो बहुत नरम है और आपकी आवाज भी बहुत मीठी है। मुझे तो उम्मीद है कि आप सब पक्षियों की राजा हैं। क्या आप मुझे एक गीत गा सकते हैं?" कौवा उसकी प्रशंसा में आ गया और "काँ, काँ" करने लगा। उस क्षण में उसका मुँह खुल गया और टुकड़ा नीचे गिर पड़ा। लोमड़ी ने लोटी उठाई और भाग गई। कौवा अपनी लोटी का टुकड़ा खाने लगा और उसका मन बहुत दुःखी था।

"Never get flattered."

"कौवा प्रशंसा में ली चला चला।"

MS07 : Grapes are Sour

Grapes are Sour अंगूर खट्टे हैं

A fox in search of food reached a beautiful garden where bunches of grapes were hanging. The grapes looked very ripe and sweet. Fox's appetite increased and he tried to get at the grapes. He held the grape vine firmly and tried to shake it so that the grapes might fall down but even one grape did not fall. Then he jumped again and again with all his might but could not reach the grapes. Being tired he decided to give up the efforts and went away saying "Grapes are sour. I don't like to eat them".

एक भोजन खान में जाते-जाते लोमड़ी को एक खूबसूरत बगीचा में, एक लंबी लता की शाखा में लटकी हुई अंगूरों का गुच्छा दिखाई दिया। अंगूरों के गुच्छे बहुत ही खूबसूरत थे। लोमड़ी को अंगूरों का स्वाद खाने में बहुत ही मजा आ रहा था। उसने सोचा कि अगर मैं इस लता को पकड़ूँ तो अंगूर गिर सकते हैं। उसने लता को पकड़ लिया और जोर-जोर से हिलने-डोलने लगा। एक बार-बार उसने ऐसा किया लेकिन अंगूर गिरने नहीं सके। लोमड़ी बहुत ही थका हुआ था। उसने सोचा कि मैं थक गया हूँ और अंगूर नहीं गिर पा रहा। अंगूरों को खाने में मैं नहीं सकेगा। मैं थक गया हूँ और अंगूर खाने में मैं नहीं चाहता। मैं सोचता हूँ कि अंगूर खट्टे हैं, मैं उन्हें खाने नहीं चाहता।

"An unassailable person resorts to lame excuses."

"एक अजेय व्यक्ति लोमड़ी को खाने का बहाना देता है।"

MS08 : Unity is Strength

Unity is Strength एकता में बल है

Once a hunter spread his net and scattered some food grains on it. Quite a few pigeons were caught in. Realising their folly, the pigeons struggled hard to escape but could not. An old wise crow suggested that they should work in unison and can fly with the net. Being encouraged by the advice, the pigeons flew together with the net. The hunter was bewildered and disappointed. The birds took the net to a mouse who helped them by cutting the net with his sharp teeth.

एक शिकारी ने अपना जाल बिछाया और उस पर कुछ अन्न के दाने बिखारे। कुछ पक्षियों ने जाल में फँस जाकर पकड़ लिए। वे सोचने लगे कि हमें कैसे भागना है। एक बुद्धिमान कौवा ने सुझाव दिया कि हम सब मिलकर जाल को उड़ाने में मदद करेंगे। इस सुझाव से प्रभावित होकर पक्षियों ने एक साथ जाल को उड़ाने में मदद की। शिकारी को यह देखकर बहुत ही हैरत हुई। पक्षियों ने जाल को एक चूहे को दे दिया जो उसने अपने दाँतों से काट दिया।

"Unity is strength."

"एकता ही बल है।"

MS09 : Who will bell the Cat

Who will bell the Cat बिल्ली के गले में घंटी कौन बांधेगा

Once all the rats gathered together to discuss their safety from their enemy 'The Cat'. After a long discussion, one rat stood up and suggested "We should fix a bell around the neck of the cat and whenever she is around, we will come to know". Every one greeted the idea with a prolonged applause but when the question came up who will bell the cat, no one dared to come forward. They were pondering over the idea when suddenly the cat appeared there. All the rats ran for their lives.

एक बार चूहों ने बिल्ली के खतरों की सुरक्षा के विषय में एक बैठक बुलाई। एक लम्बी चर्चा के बाद एक चूहा ने प्रस्ताव रखा कि हमें बिल्ली के गले में घंटी बांधनी चाहिए ताकि हमें बिल्ली के आने का पता चले। सभी चूहों ने इस विचार को प्रशंसा की लेकिन जब यह प्रस्ताव पेश किया गया तो कोई भी चूहा आगे नहीं बढ़ा। वे सोच रहे थे कि बिल्ली का खतरा हमारे लिए बहुत बड़ा है। हमें सोचना है कि हमें बिल्ली को घंटी बांधनी चाहिए या नहीं।

"Don't make coffee in the uk."

"कॉफी बिल्ली के घर में नहीं बनाई जाती।"

MS10 : Lion and the Mouse

Lion and the Mouse शेर और चूहा

Once a lion was sleeping outside his cave. A mouse came there and started playing on his back. Being disturbed the lion became furious and caught him. Repenting on his folly the mouse prayed "Please spare me. I will help you some day". The lion laughed and said that how a tiny creature like a mouse could help him. But he freed the little mouse.

एक दिन एक शेर अपने गुहा के बाहर सो रहा था। एक चूहा उसके पीछे से गुजरने लगा था। शेर को यह देखकर बहुत ही गुस्सा आया। उसने चूहा को पकड़ लिया। चूहा ने अपनी गलती का एहसास किया और प्रार्थना की कि उसे क्षमा कर दें। शेर ने हँसकर कहा कि मैं कैसे एक छोटी सी चीज से मदद कर सकता हूँ। शेर ने चूहा को छोड़ दिया।

One day a hunter spread his net and the lion was caught in it. He did his best to free himself but could not. Lying on his back the little mouse came out and cut the net with his sharp teeth. The mouse paid back the kindness shown by the lion.

एक दिन एक शिकारी ने अपना जाल बिछाया और शेर उसमें फँस गया। शेर ने बहुत जोर लगाया लेकिन उसे नहीं निकाल पाया। उसी समय एक छोटी सी चूहा आया और उसने अपने दाँतों से जाल काट दिया। शेर को यह देखकर बहुत ही खुशी हुई।

"As you sow, so shall you reap."

"जो बोए, सो काटे।"

MS11 : Hen that laid Golden Eggs

Hen that laid Golden Eggs सोने का अण्डा देने वाली मुर्गी

Once a villager named Heno bought a hen from the market. When he brought the hen home he was surprised to know that his hen laid a golden egg each day. By selling the golden eggs, he became the richest person of the village.

एक गाँव में एक किसान ने एक मुर्गी खरीदी और उसे घर लाया। उसने देखा कि उसकी मुर्गी रोज सोने के अण्डे देती है। उसने सोचा कि मैं बहुत धनी बन सकता हूँ। उसने अपने अण्डों को बेचना शुरू कर दिया।

Heno was a very greedy person and wanted to become more and more rich. One day he thought why he should not get all the eggs stored in the hen's stomach at one stroke and become the richest person of the state. He brought a sharp knife from the kitchen and cut open the stomach of the hen. To his utter disappointment he could find only blood and flesh there. He repented upon his folly but now it was of no use.

हैनो एक बहुत ही लालची व्यक्ति था और अधिक धनी बनना चाहता था। एक दिन उसे सोचा कि मैं क्यों नहीं अपने अण्डों को एक साथ ही निकाल लेता हूँ। उसने अपनी मुर्गी को पेट काट दिया। उसने देखा कि वहाँ केवल खून और मांस ही था। उसने अपनी गलती का एहसास किया लेकिन अब उसे कुछ भी नहीं बचा था।

"We should think before we act."

"हमें सोचने के बाद ही काम करना चाहिए।"

MS12 : Selfish Friendship

Selfish Friendship स्वार्थपूर्ण मित्रता

Once a mouse saw a cat caught in a hunter's net and being overjoyed started playing around him. Suddenly the rat saw a mangoose ready to jump at him. Seeing the impending danger, the mouse requested the cat to save his life in exchange of freeing her from the net. The cat agreed and the mouse cut the net and all look to their heels.

एक बार एक चूहा ने एक बिल्ली को शिकारी के जाल में फँसते देखा। चूहा बहुत खुश हुआ कि बिल्ली को बचाने में मदद कर सकता हूँ। उसने बिल्ली के पास जाकर उसे बचाने के लिए कहा। बिल्ली ने चूहा को जाल से निकाल दिया।

A few days later, the cat feeling very hungry, came near the hole of the mouse and challenged him for a game. The mouse wisely replied "I sought your friendship only to save my life, Now you may take your way".

कुछ दिनों बाद, बिल्ली को बहुत भूख लगी थी। उसने चूहा के पास जाकर उसे चुनौती दी कि उससे खेलेंगे। चूहा ने बुद्धिपूर्वक जवाब दिया कि मैं आपकी मित्रता केवल अपनी जान बचाने के लिए किया था। अब आप अपना रास्ता चुन सकते हैं।

"A selfish friend can cheat at any time."

"स्वार्थपूर्ण मित्रता कभी-कभी धोखा देती है।"

MS13 : Wolf and the Lamb

Wolf and the lamb भेड़िया और मेमना

Once a lamb got separated from his flock and reached the bank of the stream. There he started drinking water. A wolf was also drinking water up stream. He wanted to eat the lamb and shouted "Why are you spoiling my water?" The poor lamb trembled and replied humbly "Sir! The water is coming from your side, How can I spoil it?". The wolf again made a lame excuse and shouted "You abused me a year back". The poor lamb answered, "Sir! I am only four months old". The wolf had no intention to listen. He pounced upon the poor lamb saying "It must have been your father and ate him up."

एक दिन एक भेड़िया एक मेमना को एक नदी के किनारे से अलग होकर पानी पी रहा था। भेड़िया ने भेड़िया को पानी पीते देखा और उससे कहा कि तू मेरा पानी खराब कर रहा है। मेमना ने कहा कि पानी मेरे पास से ही आ रहा है, मैं इसे खराब कैसे कर सकता हूँ। भेड़िया ने फिर एक बहाना दिया कि तूने मुझे एक साल पहले धोखा दिया था। मेमना ने कहा कि मैं केवल चार महीने का हूँ। भेड़िया ने भेड़िया को सुनना नहीं चाहा। उसने भेड़िया को पकड़ लिया और उसे खा लिया।

"As evil persons make love enemies to justify his deeds."

"एक बुरा व्यक्ति अपने दुश्मनों को बचाने के लिए बहाने देता है।"

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MS21 : The Fox and the Crane

The Fox and the Crane लोमड़ी और सारस. Illustrations showing a fox and a crane at a dinner table.

MS22 : The Faithful Dog

The Faithful Dog स्वामिभक्त कुत्ता

Once a man loved his pet dog very much. The dog was also very faithful. One night when the master was sleeping, a thief entered the house. The dog started barking and the thief fled. The master searched the house and when he could not find anything wrong, thought that the dog had valuably disturbed his sleep. Next day the dog barked.

After some days the thief again entered the house and stole some jewellery and money. This time the dog barked and barked the thief fled. The thief went to an open place and buried the valuables there. The next day when the master came to know about the theft, the dog pulled his clothes and took him to the place where his valuables were safely stored. The master feeling his material, was very happy and petted his pet with love and affection.

"Always be devoted to our duty."

"धर्म से हमेशा समर्पित रहना हमारा कर्तव्य है।"

MS23 : We Can Never Please Everyone

We Can Never Please Everyone हम सभी को प्रसन्न नहीं कर सकते

Once a father and a son went together to the market. On the way two vendors asked them, "Do you like this? Why don't you ride on the Donkey rather than walk?" The father asked his son to ride on the donkey.

A man came and asked the man to ride with him. "Where are you going? A young man is riding with you. Let me ride on this." "Letting the father ride on the donkey was foolish," thought the man. "If you can carry more than your weight, let the father ride on the donkey." "You will never please everyone," said the man to the father.

Listening to this, the boy got off the donkey and rode on his own. "Let the father ride on the donkey," thought the man. "If you can carry more than your weight, let the father ride on the donkey." "You will never please everyone," said the man to the father.

"Letting the father ride on the donkey was foolish," thought the man. "If you can carry more than your weight, let the father ride on the donkey." "You will never please everyone," said the man to the father.

"Listen to someone and take care of your duty."

"किसी का कहनाई नहीं सुनना हमें चाहिए।"

MS24 : Elephant's Revenge

Elephant's Revenge हाथी का बदला

One day a man and a donkey were going to a river for a bath. The man used to give him some things to eat. One day the man was very angry with the donkey and when he stepped on the donkey, he kicked a needle in his back. The donkey was very angry and the man was very sad. The donkey decided to get revenge on the man. It hid a bundle of clothes in the man's basket. The man was very happy and took the bundle to the river. The donkey saw the man and the bundle and it was very angry. It took the bundle and hid it in a hole. The man was very sad and the donkey was very happy.

"Don't be angry with anyone and always be kind to everyone."

"को किसी से गुस्सा न आना हमें चाहिए।"

MS25 : Monkey and the Crocodile

Monkey and the Crocodile बन्दर और मगरमच्छ

Once upon a time, a monkey living on a tree near a river developed a friendship with a crocodile. The monkey used to give some things to eat to the crocodile. One day the crocodile asked the monkey to go with him to the river. The monkey was very happy and went with the crocodile. The crocodile wanted to eat the monkey but he was afraid of the monkey. The monkey saw this and he was very happy. He decided to get revenge on the crocodile. He jumped on the crocodile's back and he was very angry. The crocodile was very sad and the monkey was very happy.

"Think before making friends."

"धर्म से हमेशा समर्पित रहना हमारा कर्तव्य है।"

MS26 : Two Wise Goats

Two Wise Goats दो बुद्धिमान बकरियाँ

Once two goats were crossing a bridge over a river. The bridge was very narrow and the goats were very old. One goat was very wise and the other was very foolish. The wise goat asked the foolish goat to go first. The foolish goat refused and the wise goat went first. The foolish goat was very angry and the wise goat was very happy.

"Don't be angry with anyone and always be kind to everyone."

"को किसी से गुस्सा न आना हमें चाहिए।"

MS27 : Horse & the Buffalo

Horse & the Buffalo घोड़ा और भैंस

Once a buffalo and a horse fought with each other. Buffalo was mightier and could beat the horse mercilessly with her horns. Thinking of taking revenge, the horse approached the man and requested him to ride on his back and beat the buffalo with his cane. When the man asked the horse why he should do so, the horse leaked the secret that buffalo gives very tasty and nourishing milk. The man was very wise. He did the same and beat the buffalo mercilessly and when the buffalo became tired, he milked her and got very tasty milk. Now the horse requested the man to let him free. The man laughed and replied that he will keep the both. Horse is very good for riding while buffalo will serve him with milk. The horse repeated on his folly, but now nothing could be done.

"Be fighting is foolish."

"लड़ना ही बुद्धिहीनता है।"

MS28 : Truthful Woodcutter

Truthful Woodcutter सच्चा लकड़हारा

Once there was a very poor woodcutter. One day, while he was cutting a branch of a tree, he saw a snake lying on the ground. The woodcutter was very scared and he ran away. The snake followed him and he was very angry. The woodcutter decided to get revenge on the snake. He hid a bundle of clothes in the man's basket. The man was very happy and took the bundle to the river. The woodcutter saw the man and the bundle and it was very angry. It took the bundle and hid it in a hole. The man was very sad and the woodcutter was very happy.

"Honesty is the best policy."

"सच्चाई ही हमारे लिए सबसे अच्छा नीति है।"

MS29 : Think before you act

Think before you act बिना विचारे जो करे, सो पीछे पछताय

Once in a village, a woman had a mongoose. The pet was very intelligent and faithful. One day while going to the village well to fetch water, she asked the mongoose to take care of her son. Suddenly a snake appeared and came very near to the sleeping child. Mongoose jumped at the snake, fought bravely and succeeded in killing the snake. Mongoose expecting a reward from his mistress walked out side the house. When the woman came home and saw the body of the mongoose covered with blood, thought that he had killed her son. Being furious, she threw the pitcher filled with water on the mongoose who was killed instantaneously. She rushed inside the house and saw her son safe and sound and a snake lying dead near the cot. She immediately realised her folly, came outside, embraced the body of the pet and started weeping.

"Think before you act, or you will regret it."

"जो बिना सोच के करे, उसे पछताव होगी।"

MS30 : Honesty is the Best Policy

Honesty is the Best Policy ईमानदारी सर्वोत्तम नीति है

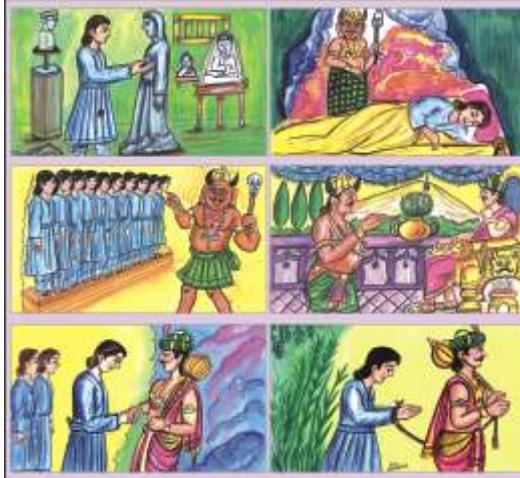


Gopal Das was a perfect sculptor and was very proud of his workmanship. One night he dreamt that the messenger of Yamraj would come after 10 days and would take him with them. Gopal prepared a plan. He made nine sculptures of himself and placed them in his room. After 10 days when the messenger of death came there, he was perplexed to see 10 Gopal Das in place of one as Gopal Das himself was standing among the sculptures. The messenger reported to Yamraj the whole story who decided to spare them. Yamraj himself could not recognise the real one but he hit upon an idea. He said that all the sculptures were perfect but there was one mistake. Gopal Das could not tolerate it and immediately asked where was the mistake and was laugh.

“Dishonesty is dangerous.”

MS31 : Pride has a fall

Pride has a fall भूल कहां होती है

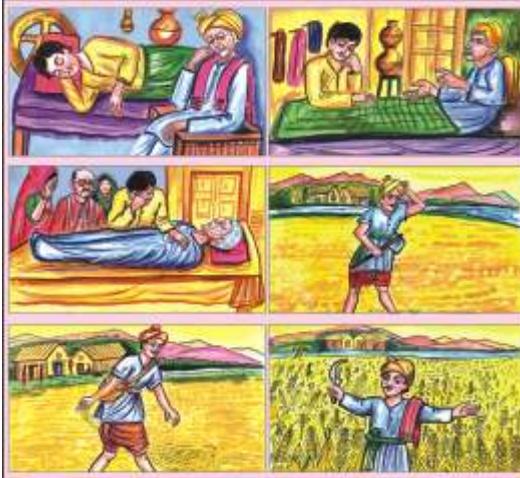


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“Dishonesty is dangerous.”

MS32 : Gold from the Mother Earth

Gold from the Mother Earth जमीन में दबा सोना

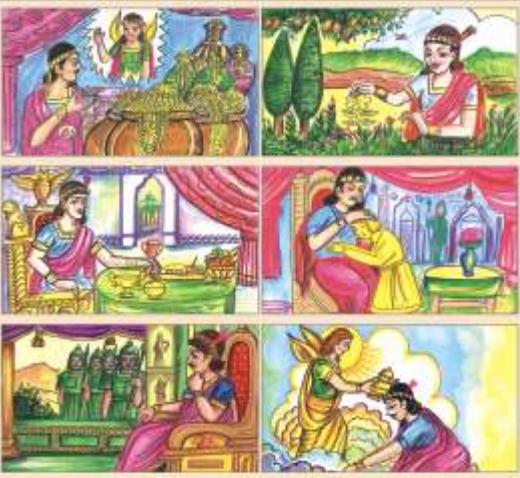


Once a farmer named Ramdeo lived in a village. His son Birju was very lazy and used to sleep for the whole day. One day Ramdeo fell sick and called his son Birju and said " Dear son, it seems my end is very near. Since I loved you very much I have kept a rich treasure hidden in our fields". After some days Ramdeo died and Birju had to shoulder the responsibilities of the entire family. Birju remembered his father's words and dug the field extensively in search of gold. After a very hard work for some days he could not find anything. Being disappointed he saw the maize seeds. Since the fields were properly prepared, he had a rich crop. Now he realised the truth of what his father had said.

“Hardwork is the real treasure.”

MS33 : King Mayadas

King Mayadas लालची राजा मायादास



The Greek king Mayadas was very greedy. One day when he was looking at his treasures an angel appeared and approached his wealth. The king realised that it was not enough and begged a boon that every thing which may be touched by him, may turn into gold. The angel granted his wish and disappeared. The king touched the things around him and felt very happy to see all the things turning into gold. After sometimes, he felt hungry and ordered his cooks. To his dismay, his lunch became gold and he could not eat it. Soon his daughter came to him but to his horror when he touched her, she became a gold statue. The king started weeping and repenting upon his greed. The angel reappeared and the king begged pardon and requested to withdraw the boon. The angel withdrew the boon and the king heaved a sigh of relief and lived happily thereafter.

“Man made money for his own facilities.”

MS34 : The Great Scholar

The Great Scholar महान ज्ञानी

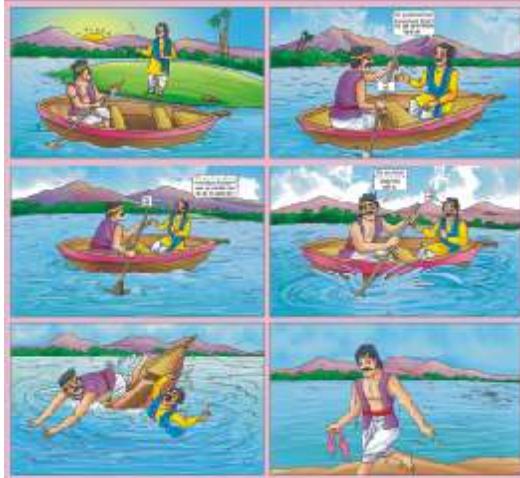


In ancient times, some scholars were studying together in a gurukul. One of them was very diligent and hardworking. He used to study day and night. He was very busy with his books. One day he was asked to teach a lesson to a group of children. He was very confident and happy to teach them. He was very busy with his books. One day he was asked to teach a lesson to a group of children. He was very confident and happy to teach them.

“Dishonesty is dangerous.”

MS35 : Brahmin and the Boatman

Brahmin and the Boatman ब्राह्मण और नाविक

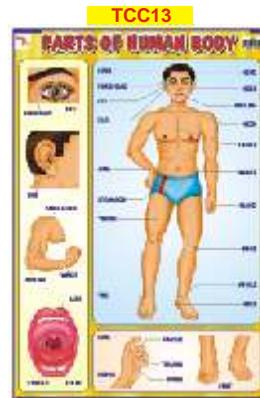
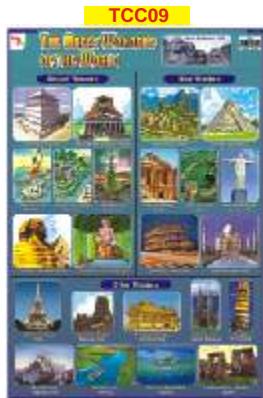
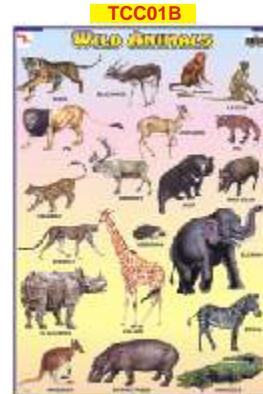


Once a learned Brahmin tried to cross the river. On the way the Brahmin asked the boatman, "Do you know how to read scriptures?" The boatman replied in the negative. The Brahmin asked him if he knew anything about religion and knowledge. The Brahmin again replied in the negative. Being frustrated the Brahmin said, "You have wasted half of your life." After sometime the boat was caught in a whirlpool. The Brahmin could not swim the boat so he asked the boatman, "Do you know how to swim?" When the Brahmin with fear on his face replied in the negative, the boatman said, "So you have wasted whole of your life." So the Brahmin jumped and swam to safety with the Brahmin's help.

“Dishonesty is dangerous.”

NEW

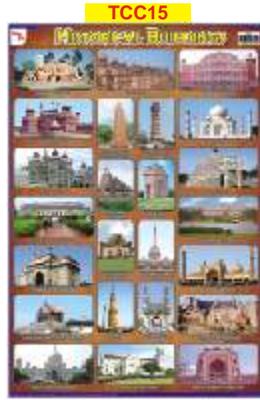
EARLY LEARNING CHARTS
Size: 33x48cm Quality: 250 gsm Paper, Laminated, Wall Stickable



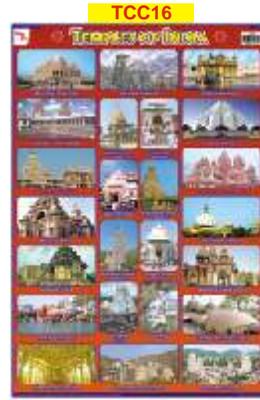
NEW

EARLY LEARNING CHARTS
Quality: 250 gsm Paper, Laminated, Wall Stickable

Size: 33x48cm



TCC15



TCC16



TCC17



TCC18



TCC19



TCC20



TCC22



TCC23



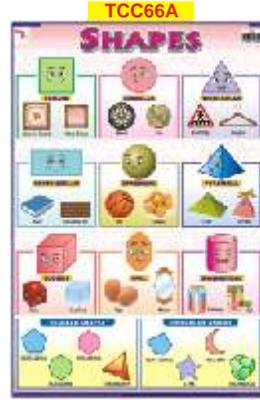
TCC62



TCC64



TCC65



TCC66A



TCC66B



TMP01



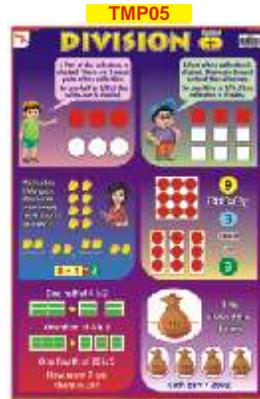
TMP02



TMP03



TMP04



TMP05



TMP06



TMS01E

TMS01H
बहोला बकिया

एक दिन बहोला बकिया खेत में खाने के लिए दाने खा रहा था। तभी एक चूहा उसके पास आया। चूहा ने बकिया से कहा, 'तुमने जो दाने खाए हैं, वे मेरे हैं। मैं तुम्हें दाने दे रहा हूँ।' बकिया ने चूहा को दाने दिए। चूहा ने दाने खाए और बकिया को धकका दिया।

TMS02E
HARE AND THE LION

एक दिन हार और शेर एक झील के पास मिले। शेर ने हार से कहा, 'तुमने जो पानी पीया है, वह मेरा है। मैं तुम्हें पानी दे रहा हूँ।' हार ने शेर को पानी दिए। शेर ने पानी पीया और हार को धकका दिया।

TMS02H
कालीशेर और बकिया

एक दिन कालीशेर और बकिया एक झील के पास मिले। कालीशेर ने बकिया से कहा, 'तुमने जो पानी पीया है, वह मेरा है। मैं तुम्हें पानी दे रहा हूँ।' बकिया ने कालीशेर को पानी दिए। कालीशेर ने पानी पीया और बकिया को धकका दिया।

TMS03E
GREEDY DOG

A greedy dog ate a bone in some water. Another dog came along and asked for the bone. The greedy dog gave the bone to the other dog. The other dog ate the bone and the greedy dog was left with nothing.

TMS03H
कालीशेर और बकिया

एक दिन कालीशेर और बकिया एक झील के पास मिले। कालीशेर ने बकिया से कहा, 'तुमने जो पानी पीया है, वह मेरा है। मैं तुम्हें पानी दे रहा हूँ।' बकिया ने कालीशेर को पानी दिए। कालीशेर ने पानी पीया और बकिया को धकका दिया।

TMS04E
MOON AND THE BANANA

एक दिन एक बंदर एक आम खा रहा था। तभी एक चूहा उसके पास आया। चूहा ने बंदर से कहा, 'तुमने जो आम खाया है, वह मेरा है। मैं तुम्हें आम दे रहा हूँ।' बंदर ने चूहा को आम दिए। चूहा ने आम खाया और बंदर को धकका दिया।

TMS04H
बंदर और आम

एक दिन एक बंदर एक आम खा रहा था। तभी एक चूहा उसके पास आया। चूहा ने बंदर से कहा, 'तुमने जो आम खाया है, वह मेरा है। मैं तुम्हें आम दे रहा हूँ।' बंदर ने चूहा को आम दिए। चूहा ने आम खाया और बंदर को धकका दिया।

TMS05E
HARE AND THE TORTISE

एक दिन हार और कछुआ एक दौड़ में मिले। हार ने कछुआ से कहा, 'तुमने जो दौड़ जीती है, वह मेरी है। मैं तुम्हें दौड़ दे रहा हूँ।' कछुआ ने हार को दौड़ दिये। हार ने दौड़ जीती और कछुआ को धकका दिया।

TMS05H
कालीशेर और बकिया

एक दिन कालीशेर और बकिया एक झील के पास मिले। कालीशेर ने बकिया से कहा, 'तुमने जो पानी पीया है, वह मेरा है। मैं तुम्हें पानी दे रहा हूँ।' बकिया ने कालीशेर को पानी दिए। कालीशेर ने पानी पीया और बकिया को धकका दिया।

TMS07E
GREASY BREAD SOUP

A lion made a bowl of greasy bread soup. A poor man came along and asked for the soup. The lion gave the soup to the poor man. The poor man ate the soup and the lion was left with nothing.

TMS07H
कालीशेर और बकिया

एक दिन कालीशेर और बकिया एक झील के पास मिले। कालीशेर ने बकिया से कहा, 'तुमने जो पानी पीया है, वह मेरा है। मैं तुम्हें पानी दे रहा हूँ।' बकिया ने कालीशेर को पानी दिए। कालीशेर ने पानी पीया और बकिया को धकका दिया।

TMS10E
LION AND THE MOUSE

एक दिन शेर और चूहा एक झील के पास मिले। शेर ने चूहा से कहा, 'तुमने जो पानी पीया है, वह मेरा है। मैं तुम्हें पानी दे रहा हूँ।' चूहा ने शेर को पानी दिए। शेर ने पानी पीया और चूहा को धकका दिया।

TMS10H
शेर और चूहा

एक दिन शेर और चूहा एक झील के पास मिले। शेर ने चूहा से कहा, 'तुमने जो पानी पीया है, वह मेरा है। मैं तुम्हें पानी दे रहा हूँ।' चूहा ने शेर को पानी दिए। शेर ने पानी पीया और चूहा को धकका दिया।

TMS14E
UNITED WE STAND, DIVIDED WE FALL

एक दिन एक समूह के लोग मिले। वे एक साथ काम किया और जीत गए। तभी वे बिछड़े हुए और हार गए।

TMS14H
एक ही शक्ति मिलकर ही बढ़े

एक दिन एक समूह के लोग मिले। वे एक साथ काम किया और जीत गए। तभी वे बिछड़े हुए और हार गए।

TMS18E
THE SHEPHERD BOY

एक दिन एक चरवाहे के बच्चे ने एक भेड़ को बतलाया कि एक लोहा है। लोहा ने चरवाहे को बतलाया कि एक लोहा है। चरवाहे ने भेड़ को बतलाया कि एक लोहा है।

TMS18H
चरवाहे के बच्चे

एक दिन एक चरवाहे के बच्चे ने एक भेड़ को बतलाया कि एक लोहा है। लोहा ने चरवाहे को बतलाया कि एक लोहा है। चरवाहे ने भेड़ को बतलाया कि एक लोहा है।

TMS021E
एक ही शक्ति मिलकर ही बढ़े

एक दिन एक समूह के लोग मिले। वे एक साथ काम किया और जीत गए। तभी वे बिछड़े हुए और हार गए।

TMS021H
एक ही शक्ति मिलकर ही बढ़े

एक दिन एक समूह के लोग मिले। वे एक साथ काम किया और जीत गए। तभी वे बिछड़े हुए और हार गए।

TMS26E
TWO WISE GOATS

एक दिन दो बकियाएँ एक झील के पास मिले। एक बकिया ने दूसरी बकिया से कहा, 'तुमने जो पानी पीया है, वह मेरा है। मैं तुम्हें पानी दे रहा हूँ।' दूसरी बकिया ने पहली बकिया को पानी दिए। पहली बकिया ने पानी पीया और दूसरी बकिया को धकका दिया।

NEW

EARLY LEARNING CHARTS
Quality: 250 gsm Paper, Laminated, Wall Stickable

TMS26H



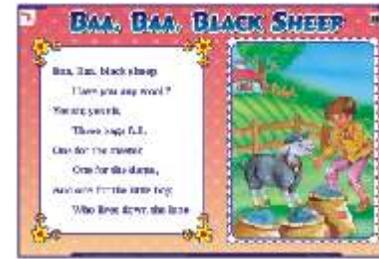
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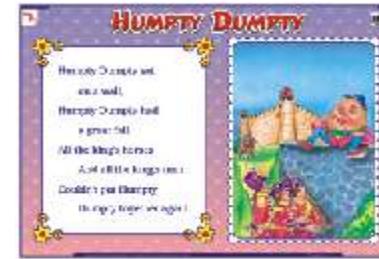
TMS28H



TNR01A



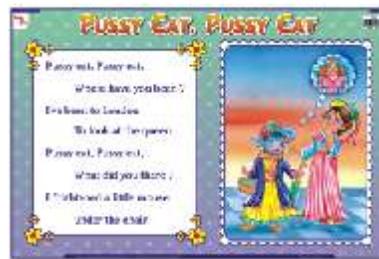
TNR01B



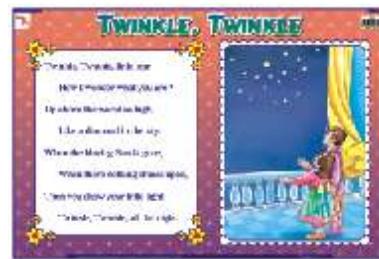
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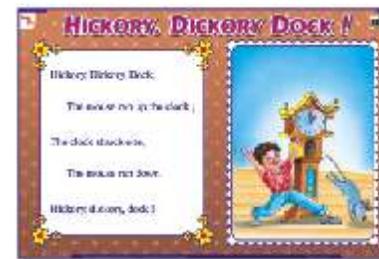
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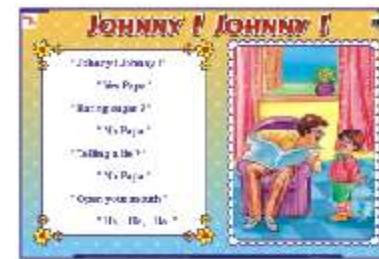
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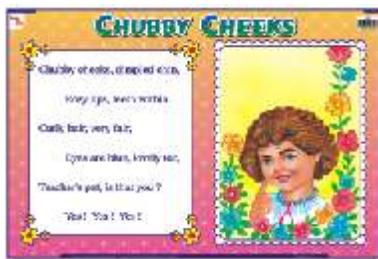
TNR03B



TNR04A



TNR04B



TNR05A



TNR05B



TNR21



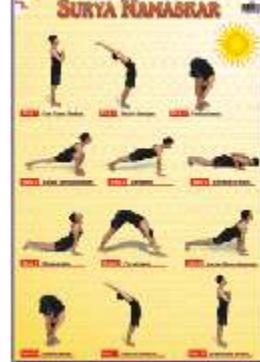
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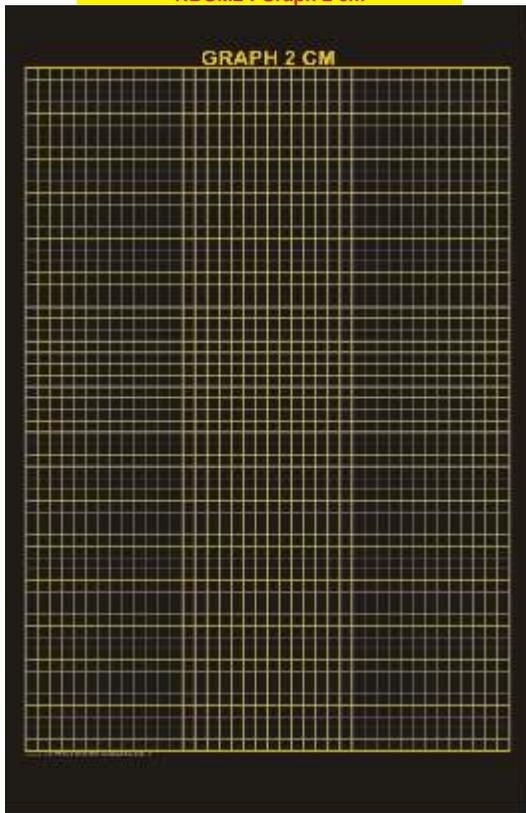
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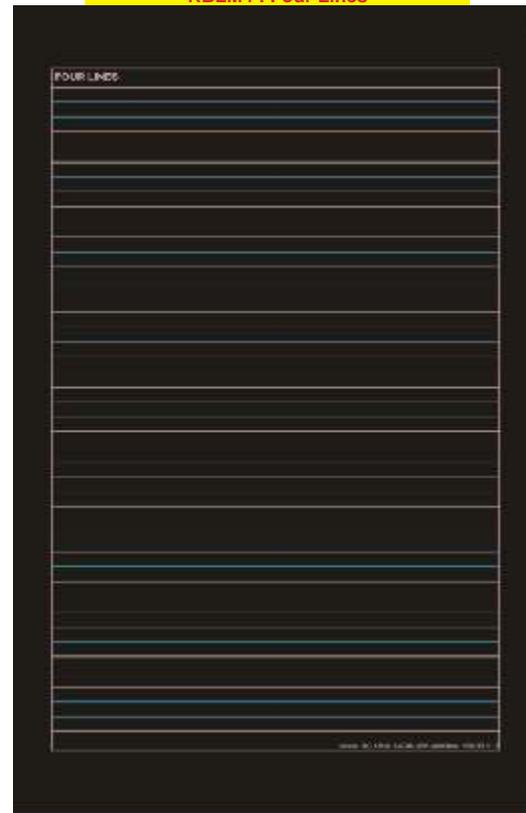
TYO03



RBGM2 : Graph 2 cm



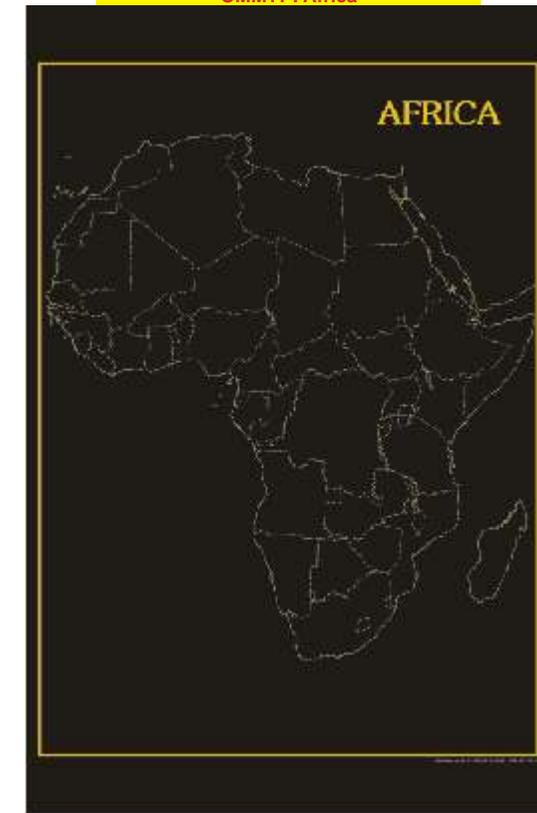
RBLM4 : Four Lines



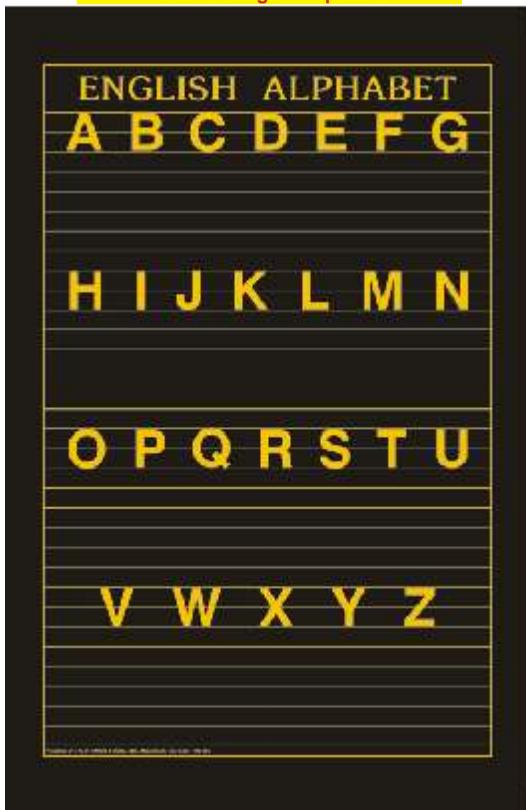
RBLM2 : Two Lines



OMM11 : Africa



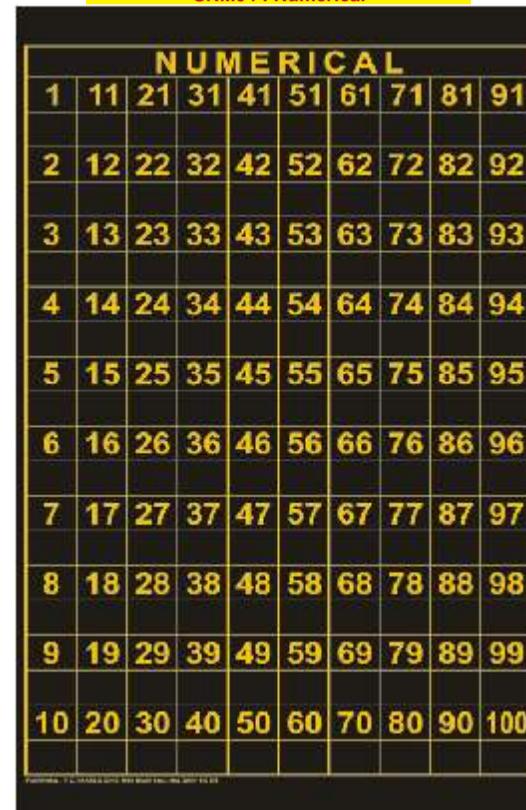
SRM01 : English Alphabet



SRM03 : Hindi Varnamala



SRM04 : Numerical



SRM05 : Multiplication Table



Size 67 x 100 cm, Printed on Jet Black PVC Sheet, Can write with chalk

SPECIAL ROLLUPS

GEN01 : Constitution of India

CONSTITUTION OF INDIA

A constitution is a body of laws, which lays down the basic structure of the government and its functions according to which a country is governed.

FRAMERS OF CONSTITUTION OF INDIA

PREAMBLE

WE, THE PEOPLE OF INDIA, having solemnly resolved to constitute India into a SOVEREIGN, SOCIALIST, SECULAR, DEMOCRATIC REPUBLIC and to secure to all its citizens :

JUSTICE, social, economic and political;

LIBERTY of thought, expression, belief, faith and worship;

EQUALITY of status and of opportunity and to promote among them all;

FRATERNITY assuring the dignity of the individual and the unity and integrity of the nation;

IN OUR CONSTITUENT ASSEMBLY this twenty-sixth day of November, 1949, do **HEREBY ADOPT, ENACT AND GIVE TO OURSELVES THIS CONSTITUTION.**

FUNDAMENTAL RIGHTS

FUNDAMENTAL DUTIES

- To abide by the constitution and respect the national flag and the national anthem;
- To cherish and follow the noble ideals which inspired our national struggle for freedom;
- To protect the Sovereignty, Unity and Integrity of India;
- To defend the country and render national service when called upon to do so;
- To promote the spirit of common brotherhood amongst all the people of India;
- To value and preserve the rich heritage of our composite culture;
- To protect and improve the natural environment;
- To develop the scientific temper and spirit of inquiry and reform;
- To safeguard public property and to abjure violence;
- To strive towards excellence in all spheres of individual and collective activity;

DIRECTIVE PRINCIPLES

- Free and compulsory education for all upto the age of 14 years.
- Equal pay for equal work for both men and women.
- Promotion and development of Panchayati Raj.
- Proper health facilities.
- Promotion of handicraft and cottage industries.
- Promotion of international peace and security.

OUR NATIONAL SYMBOLS

| | | |
|----------------------------|----------------------------|--|
| National Flag | National Emblem | National Flower |
| National Bird | National Animal | National Song Bharat Mata Ki Jai |
| National Anthem | | |

CONSTITUTIONAL ORGANISATION OF GOVERNMENT OF INDIA

LEGISLATURE

At Centre Level

Parliament

President
House of People (Lok Sabha)
Council of States (Rajya Sabha)

At State Level

Governor
Legislative Assembly
Legislative Council

EXECUTIVE

Centre Level

President
Vice President
Prime Minister
Cabinet
Attorney General

State Level

Governor
Chief Minister
Cabinet
Advocate General

JUDICIARY

Supreme Court

High Courts

District Courts

Lower Courts

GEN02 : United Nations

UNITED NATIONS

A 1945 treaty created the United Nations. It replaced the League of Nations, which had failed to prevent the outbreak of World War II.

SECRETARY GENERAL

GENERAL ASSEMBLY

SECURITY COUNCIL

INTERNATIONAL COURT OF JUSTICE

ECONOMIC AND SOCIAL COUNCIL

Special Agencies, Programs and Funds of United Nations

GEN03 : Birth of Earth and Evolution

BIRTH OF EARTH AND EVOLUTION

DIFFERENTIATION OF EARTH

About 4 billion years ago, collections of planetesimals and nebulae began to clump together. The clumps grew larger and larger, and finally, about 4 billion years ago, the sun and planets were born.

FORMATION OF SOLAR SYSTEM AND EARTH'S ORIGIN

About 4 billion years ago, the solar system was born. The sun and planets were born from a cloud of gas and dust. The sun is the center of the solar system, and the planets orbit around it.

CONTINENTAL DRIFT & PLATE TECTONICS

Continental drift is the movement of the Earth's continents. Plate tectonics is the study of the movement of the Earth's plates.

PREHISTORIC LIFE

SF01 : Impact of British Rule

IMPACT OF BRITISH RULE

Ruin of Agriculture & Industries, Social Ignorance & Miserable condition of Peasantry

POLITICAL: The British introduced the system of indirect rule through the princely states. They set up a system of 'Divide and Rule' to weaken the nationalist movement. The British used the press and propaganda to create a sense of national unity among Indians.

ECONOMIC: The British ruined Indian agriculture and industries. They introduced a system of land revenue that was heavy and unfair. Indian industries were destroyed by British competition. The peasantry was impoverished and miserable.

SOCIAL: The British introduced a system of social discrimination. They created a caste system and a system of untouchability. They also introduced a system of religious intolerance.

MILITARY: The British introduced a system of military rule. They used the army to suppress the nationalist movement. They also introduced a system of military training for Indians.

RELIGIOUS & SOCIAL: The British introduced a system of religious and social reforms. They introduced a system of education and a system of social services. They also introduced a system of religious tolerance.

SF02 : Social Reformers

SOCIAL REFORMERS

Awakened the masses against Untouchability, Blind Faith & Superstitions

POLITICAL: Social reformers were awakened to the need for social and political reforms. They fought against the caste system and untouchability. They also fought against blind faith and superstitions.

ECONOMIC: Social reformers were also concerned about the economic condition of the masses. They fought against the exploitation of the peasantry and the working class. They also fought against the system of land revenue.

SOCIAL: Social reformers were also concerned about the social condition of the masses. They fought against the system of social discrimination and the caste system. They also fought against the system of religious intolerance.

MILITARY: Social reformers were also concerned about the military condition of the masses. They fought against the system of military rule and the use of force. They also fought against the system of military training for Indians.

RELIGIOUS & SOCIAL: Social reformers were also concerned about the religious and social condition of the masses. They fought against the system of religious intolerance and the caste system. They also fought against the system of social discrimination.

SF03 : The Revolt of 1857 - Causes

THE REVOLT OF 1857 - CAUSES

Annexation of Kingdoms, Impoverishment & Exploitation Caused All Round Disaffection

POLITICAL: The British introduced a system of annexation of kingdoms. This caused all round disaffection among the masses. They were also impoverished and exploited by the British.

ECONOMIC: The British introduced a system of economic exploitation. They introduced a system of land revenue that was heavy and unfair. They also introduced a system of industrial competition that destroyed Indian industries.

MILITARY: The British introduced a system of military rule. They used the army to suppress the nationalist movement. They also introduced a system of military training for Indians.

RELIGIOUS & SOCIAL: The British introduced a system of religious and social reforms. They introduced a system of education and a system of social services. They also introduced a system of religious tolerance.

SF04 : The Revolt of 1857 - Events

THE REVOLT OF 1857 - EVENTS

They Struggled Hard to Free Humanity from Injustice & Exploitation

POLITICAL: The British introduced a system of political rule. They used the army to suppress the nationalist movement. They also introduced a system of political training for Indians.

ECONOMIC: The British introduced a system of economic rule. They used the army to suppress the nationalist movement. They also introduced a system of economic training for Indians.

MILITARY: The British introduced a system of military rule. They used the army to suppress the nationalist movement. They also introduced a system of military training for Indians.

RELIGIOUS & SOCIAL: The British introduced a system of religious and social rule. They used the army to suppress the nationalist movement. They also introduced a system of religious and social training for Indians.

SF05 : Emergence of Nationalism

EMERGENCE OF NATIONALISM

Unconscious Result of 1857 Insurrection, A Spirit of Sacrifice for the Mother

POLITICAL: The British introduced a system of political rule. They used the army to suppress the nationalist movement. They also introduced a system of political training for Indians.

ECONOMIC: The British introduced a system of economic rule. They used the army to suppress the nationalist movement. They also introduced a system of economic training for Indians.

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RELIGIOUS & SOCIAL: The British introduced a system of religious and social rule. They used the army to suppress the nationalist movement. They also introduced a system of religious and social training for Indians.

SF06 : Indian National Congress

INDIAN NATIONAL CONGRESS

To Provide a Constitutional Outlet to the Discontentment and Aroused Consciousness

POLITICAL: The Indian National Congress was formed to provide a constitutional outlet to the discontentment and aroused consciousness of the masses. It was the first step towards the formation of a national party.

ECONOMIC: The Indian National Congress was also concerned about the economic condition of the masses. It fought against the exploitation of the peasantry and the working class. It also fought against the system of land revenue.

SOCIAL: The Indian National Congress was also concerned about the social condition of the masses. It fought against the system of social discrimination and the caste system. It also fought against the system of religious intolerance.

MILITARY: The Indian National Congress was also concerned about the military condition of the masses. It fought against the system of military rule and the use of force. It also fought against the system of military training for Indians.

RELIGIOUS & SOCIAL: The Indian National Congress was also concerned about the religious and social condition of the masses. It fought against the system of religious intolerance and the caste system. It also fought against the system of social discrimination.

SF07 : National Movement

NATIONAL MOVEMENT

The Partition of Bengal led to the growth of EXTREMISM & SPLIT in the Congress.

POLITICAL: The British introduced a system of political rule. They used the army to suppress the nationalist movement. They also introduced a system of political training for Indians.

ECONOMIC: The British introduced a system of economic rule. They used the army to suppress the nationalist movement. They also introduced a system of economic training for Indians.

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RELIGIOUS & SOCIAL: The British introduced a system of religious and social rule. They used the army to suppress the nationalist movement. They also introduced a system of religious and social training for Indians.

SF08 : Militant Nationalism

MILITANT NATIONALISM

ATROCITIES AT JALIANWALA BAGH & DEATH OF LALLU BHAI GADKARI GAVE BIRTH TO MILITANT NATIONALISM

POLITICAL: The British introduced a system of political rule. They used the army to suppress the nationalist movement. They also introduced a system of political training for Indians.

ECONOMIC: The British introduced a system of economic rule. They used the army to suppress the nationalist movement. They also introduced a system of economic training for Indians.

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RELIGIOUS & SOCIAL: The British introduced a system of religious and social rule. They used the army to suppress the nationalist movement. They also introduced a system of religious and social training for Indians.

STRUGGLE FOR INDIAN FREEDOM
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STRUGGLE FOR INDIAN FREEDOM

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SF09 : Revolutionaries

REVOLUTIONARIES

They were full of sacrifices & preferred the use of force to drive out the British.

Revolutionaries in India were full of sacrifices and preferred the use of force to drive out the British. They were full of sacrifices and preferred the use of force to drive out the British. They were full of sacrifices and preferred the use of force to drive out the British.

SF10 : Non-Cooperation Movement

NON-COOPERATION MOVEMENT

Non-violent, peaceful resistance for Truth & Justice, with no beating or hatred

Non-violent, peaceful resistance for Truth & Justice, with no beating or hatred. The Non-Cooperation Movement was a significant step towards Indian independence.

SF11 : Fight For Purna Swaraj

FIGHT FOR PURNA SWARAJ

Indian Nationalism matured. Freedom struggle became Mass movement

Indian Nationalism matured. Freedom struggle became Mass movement. The demand for Purna Swaraj was a call for complete independence from British rule.

SF12 : India & World War - II

INDIA & WORLD WAR - II

India tried to use World War - II as pressure for getting INDEPENDENCE from British Rule.

India tried to use World War - II as pressure for getting INDEPENDENCE from British Rule. The war provided an opportunity for India to demand independence.

SF13 : 'Quit India' Movement

'QUIT INDIA' MOVEMENT

The Movement marked the culmination of the Indian Freedom Movement

The Movement marked the culmination of the Indian Freedom Movement. It was a call for the British to leave India immediately.

SF14 : Muslim League & Partition

MUSLIM LEAGUE & PARTITION

Communal Riots throughout India compelled the leaders to accept Partition.

Communal Riots throughout India compelled the leaders to accept Partition. The Muslim League's demand for a separate state for Muslims led to the Partition of India.

SF15 : India Achieves Independence

INDIA ACHIEVES INDEPENDENCE

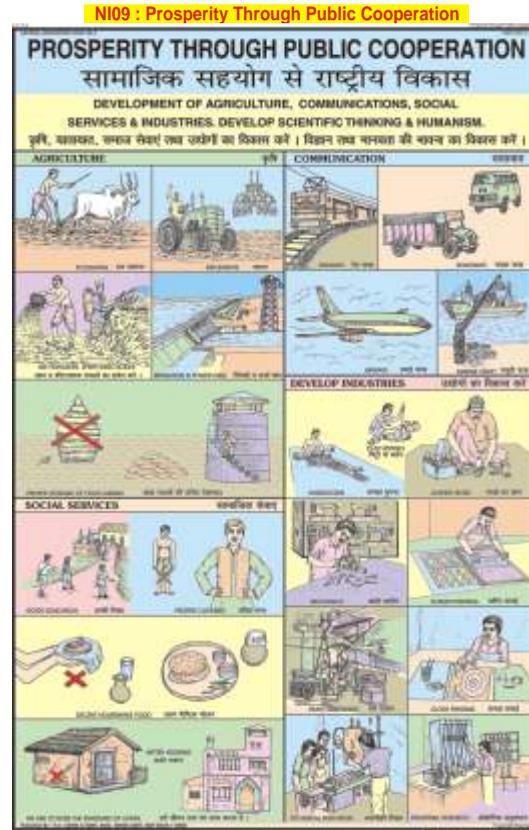
India got freedom from British Dominion on August 15, 1947 through Non-Violence

India got freedom from British Dominion on August 15, 1947 through Non-Violence. This day is celebrated as Independence Day in India.

NATIONAL INTEGRATION

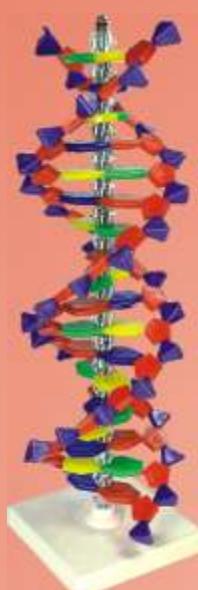
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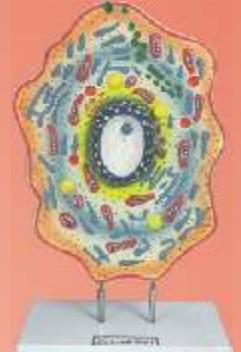
DNA Model



Plant Cell



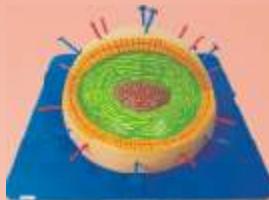
Frog Dissection



Animal Cell



AIDS Virus



Influenza Virus



Typical Flower



Mitochondria



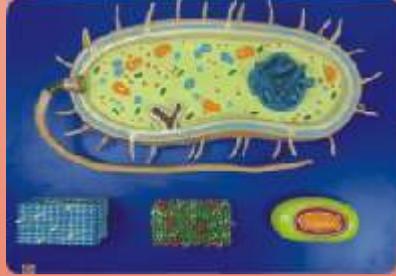
Cardiac Muscle Fibre



Rabies Virus

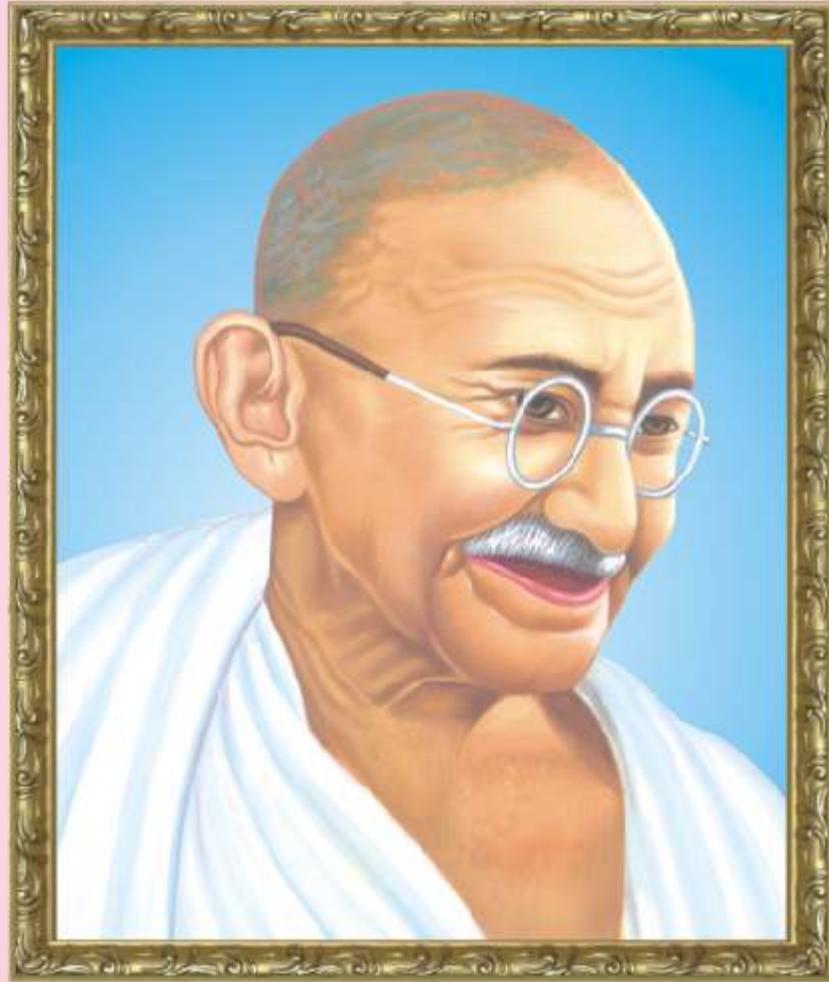


Smooth Muscle Fibre



Bacterium

LS01 : Mahatma Gandhi



Mahatma Gandhi

Mohandas Karamchand Gandhi, commonly known as Mahatma Gandhi, had the greatest and sustained influence on our freedom struggle. Born on 2nd October 1869 at Porbandar, he got his early education there. Later on the family shifted to Rajkot. Gandhiji was not very brilliant in studies but had a burning passion for self improvement and truth. He studied in Samaldas College, Bhavnagar and in 1888 went to England to study law. He came back to India in 1891 as a barrister.

He went to South Africa representing a business firm of his town. While in South Africa, Gandhiji found that the Indians were not well treated by the whites due to race and colour discriminations. He started Satyagraha Movement in South Africa. The jails were filled with satyagrahis and Government was forced. General Smuts had to negotiate with Gandhiji and the major points were conceded. As a result the satyagraha was called off.

By the time he came to India in 1915 he had developed his own political philosophy. Gandhiji was much honoured for his role in South African struggle. All through the year, he toured India and familiarised himself with the social, economic and cultural make up of the diverse regions of the country. He then established Sabarmati Ashram near Ahmedabad where people took vows for speaking the truth, practicing non-violence, vegetarianism and leading simple dedicated life.

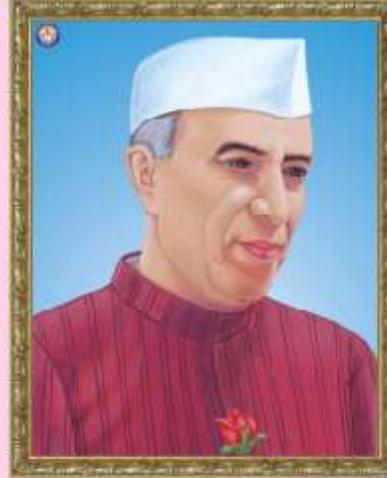
Gandhi's patience was snapped by Jallianwala Massacre and Government's response to Khilafat Movement. He presented his non-violent programme of boycotting central and provincial councils, use of swadeshi or home made goods and boycotting convent schools. His clarion call of "Swaraj" within the year and his articles in "Young India" and "Harijan" roused the nation. Gandhiji was imprisoned and sent to Yerwada prison in Pune.

In December 1928 the demand for Dominion Status was raised and in January 1930 Civil Disobedience Movement was launched with the famous Dandi March. During World War II, he wanted not to embarrass the Government but in 1942, after the failure of Cripps Missions, Gandhiji launched the Quit India Movement. There were some violent outbreaks and Gandhiji went on a 21 days fast to atone for the wrong turn of the movement.

By 1944 when India's independence was much talked about, communal problem has raised its ugly head. The Muslims led by Jinnah were demanding a portion of the densely populated muslim areas in the northwest and east of the country. At last independence came but with a heavy price. East and West Pakistan were carved out of India and bloody riots accompanied the partition. While glittering ceremonies were being held in Delhi, Gandhiji was touring places like Noakhali in Bengal and other areas in Bihar which were being torn apart by communal riots.

Ironically the man who was called Mahatma for his non-violence was shot at point blank range by a fanatic Nathuram Godse on January 30, 1948 and died instantaneously with the words 'He Ram' on his lips.

LS02 : Pandit Jawahar Lal Nehru



Pandit Jawahar Lal Nehru

Pandit Jawahar Lal Nehru was one of the foremost leaders of Indian freedom movement. He was born on 14th September, 1889 at Allahabad in a prominent family. He studied at the University of Cambridge in England. He was a member of the Indian National Congress and the Indian Independence Movement. He was the first Prime Minister of India from 1947 to 1964. He was a member of the Indian National Congress and the Indian Independence Movement. He was the first Prime Minister of India from 1947 to 1964. He was a member of the Indian National Congress and the Indian Independence Movement. He was the first Prime Minister of India from 1947 to 1964.

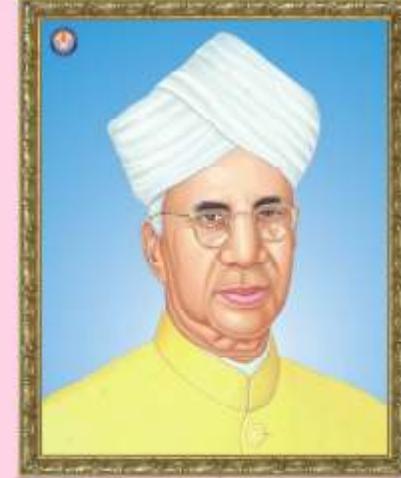
LS04 : Dr. Bhimrao Ramji Ambedkar



Dr. Bhimrao Ramji Ambedkar

Dr. Bhimrao Ramji Ambedkar was a prominent leader of the Indian independence movement. He was born on 14th April 1889 in Maharashtra. He studied law in England and became a barrister. He was a member of the Indian National Congress and the Indian Independence Movement. He was the first Deputy Prime Minister of India from 1950 to 1952. He was a member of the Indian National Congress and the Indian Independence Movement. He was the first Deputy Prime Minister of India from 1950 to 1952.

LS03 : Dr. Sarvepalli Radhakrishnan



Dr. Sarvepalli Radhakrishnan

Dr. Sarvepalli Radhakrishnan was a prominent philosopher and statesman. He was born on 29th September, 1888 in Andhra Pradesh. He studied at the University of Madras and the University of London. He was a member of the Indian National Congress and the Indian Independence Movement. He was the second President of India from 1962 to 1967. He was a member of the Indian National Congress and the Indian Independence Movement. He was the second President of India from 1962 to 1967.

LS05 : Netaji Subhash Chandra Bose



NETAJI SUBHASH CHANDRA BOSE

Netaji Subhash Chandra Bose was a prominent leader of the Indian independence movement. He was born on 23rd January 1897 in West Bengal. He studied at the University of Cambridge in England. He was a member of the Indian National Congress and the Indian Independence Movement. He was the second-in-command of the Indian National Army from 1941 to 1945. He was a member of the Indian National Congress and the Indian Independence Movement. He was the second-in-command of the Indian National Army from 1941 to 1945.

LIFE SKETCH OF GREAT MEN
Laminated, Size 50 x 70 cm (Available in English and Hindi Separately)

LS06 : Maharana Pratap



MAHARANA PRATAP

Representative of Rajput valor and heroism, he was a warrior Maharana Pratap was recognized for his immense gallantry and his leadership of courage and valour. In the battle of Haldighati in 1576, he defeated the superior army of Akbar. He is remembered as a great warrior and a great leader. He is also known for his leadership of the Rajputs during the Mughal rule in Rajasthan.

He was born on 26th May, 1542 to Maharaja Asha Singh of Sisodia clan and his wife, Jivani Devi. He was a brave warrior and a great leader. He is also known for his leadership of the Rajputs during the Mughal rule in Rajasthan.

He was born on 26th May, 1542 to Maharaja Asha Singh of Sisodia clan and his wife, Jivani Devi. He was a brave warrior and a great leader. He is also known for his leadership of the Rajputs during the Mughal rule in Rajasthan.

LS07 : Rani Jhansi Lakshmi Bai



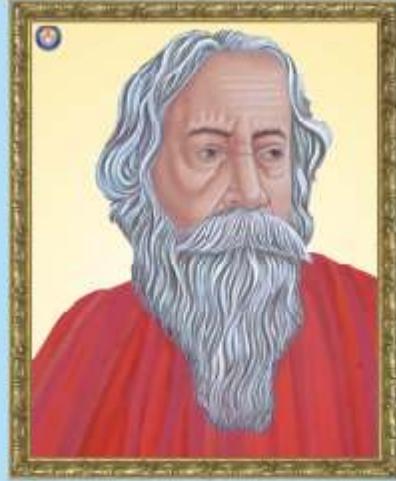
Rani Jhansi Lakshmi Bai

From every town and village of India we hear the glorious history of Lakshmi Bai, the queen of Jhansi. She was born on 19th November, 1812 at Kailash, she was the daughter of Bhonsle and Bhagwati Bai. Later in Marathas she was married to Nizam of his family. Her mother died when she was 8 years old and her childhood was spent playing with her brothers, her father died when she was 12 years old and she was left an orphan.

When she was 18 years old she had to marry a king, son of a powerful and famous Maratha ruler of the Kingdom of Jhansi. At the age of 19 she was married to the King of Jhansi, the King of Jhansi and became Lakshmi Bai, the Queen of Jhansi. She was a brave warrior and a great leader. She is also known for her leadership of the Rajputs during the Mughal rule in Rajasthan.

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LS08 : Gurudev Rabindranath Tagore



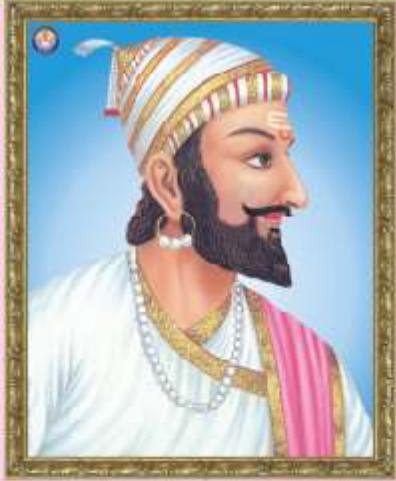
Gurudev Rabindranath Tagore

The greatest Indian poet, novelist, dramatist, and philosopher, Rabindranath Tagore was born on 7th April, 1861 in Calcutta. He was a great leader and a great warrior. He is also known for his leadership of the Rajputs during the Mughal rule in Rajasthan.

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LS09 : Chhatrapati Shivaji



Chhatrapati Shivaji

Chhatrapati Shivaji Maharaj was a great leader and a great warrior. He is also known for his leadership of the Rajputs during the Mughal rule in Rajasthan.

He was born on 19th February, 1627 in Shivajinagar, Shivajinagar. He was a great leader and a great warrior. He is also known for his leadership of the Rajputs during the Mughal rule in Rajasthan.

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LS10 : Swami Vivekanand



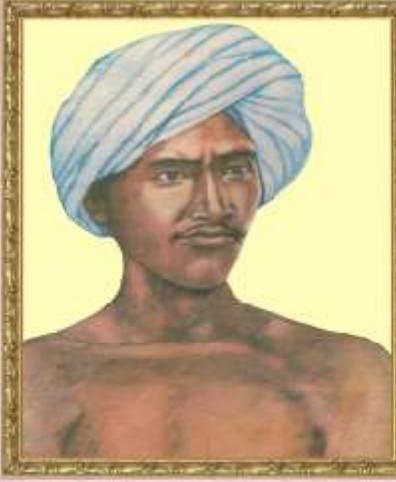
Swami Vivekanand

Swami Vivekanand was a great leader and a great warrior. He is also known for his leadership of the Rajputs during the Mughal rule in Rajasthan.

He was born on 12th January, 1862 in Calcutta. He was a great leader and a great warrior. He is also known for his leadership of the Rajputs during the Mughal rule in Rajasthan.

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LS11 : Bhagwan Birsa Munda



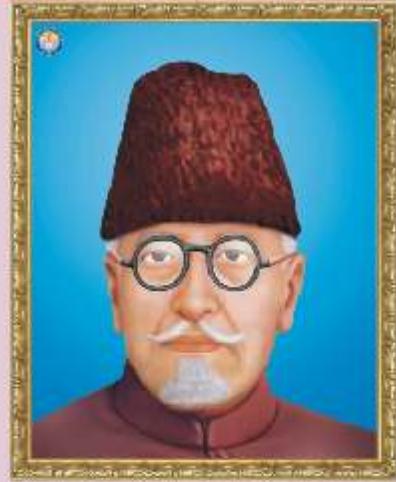
भगवान बिरसा मुण्डा

Bhagwan Birsa Munda was a great leader and a great warrior. He is also known for his leadership of the Rajputs during the Mughal rule in Rajasthan.

He was born on 15th December, 1874 in Udaypur, Bihar. He was a great leader and a great warrior. He is also known for his leadership of the Rajputs during the Mughal rule in Rajasthan.

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LS12 : Maulana Abul Kalam Azad



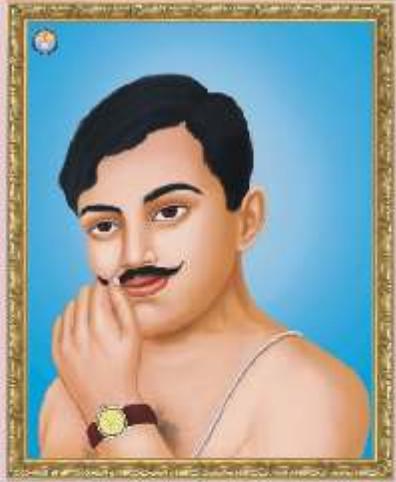
Maulana Abul Kalam Azad

Maulana Abul Kalam Azad was a great leader and a great warrior. He is also known for his leadership of the Rajputs during the Mughal rule in Rajasthan.

He was born on 11th October, 1888 in Allahabad. He was a great leader and a great warrior. He is also known for his leadership of the Rajputs during the Mughal rule in Rajasthan.

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LS13 : Chandrashekhar Azad



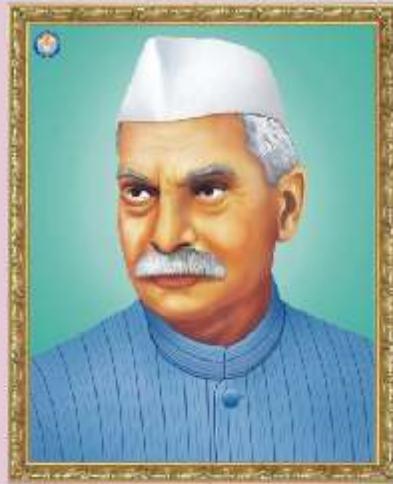
Chandrashekhar Azad

Chandrashekhar Azad was a great leader and a great warrior. He is also known for his leadership of the Rajputs during the Mughal rule in Rajasthan.

He was born on 7th October, 1906 in Meerut. He was a great leader and a great warrior. He is also known for his leadership of the Rajputs during the Mughal rule in Rajasthan.

He was born on 7th October, 1906 in Meerut. He was a great leader and a great warrior. He is also known for his leadership of the Rajputs during the Mughal rule in Rajasthan.

LS14 : Dr. Rajender Prasad



Dr. Rajendra Prasad

Dr. Rajendra Prasad was an Indian politician and the first president of independent India (1950-1962). He was also the president of the Constituent Assembly of India...

LS15 : Bal Gangadhar Tilak



Bal Gangadhar Tilak

Bal Gangadhar Tilak was an Indian nationalist leader. He was a prominent leader of the Indian independence movement and is known for his slogan 'Swaraj is for all'...

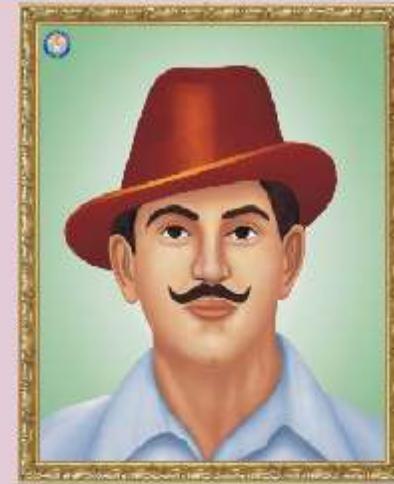
LS16 : Mother Teresa



Mother Teresa

Mother Teresa was a Roman Catholic nun and missionary. She is best known for her work with the poor and the sick in Calcutta, India...

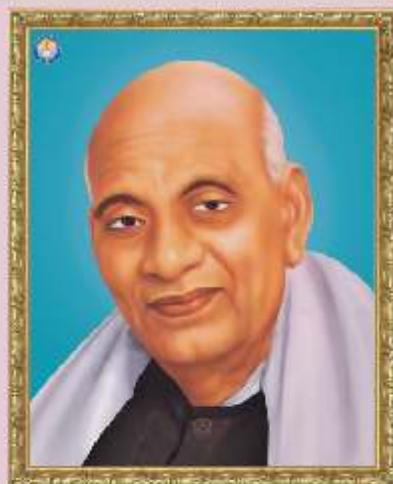
LS17 : Bhagat Singh



Bhagat Singh

Bhagat Singh was an Indian revolutionary and socialist. He was a prominent leader of the Indian independence movement and is known for his role in the Lahore Conspiracy Case...

LS18 : Sardar Vallabhbhai Patel



Sardar Vallabhbhai Patel

Sardar Vallabhbhai Patel was an Indian politician and the second prime minister of India. He is known for his role in the integration of princely states into the Indian Union...

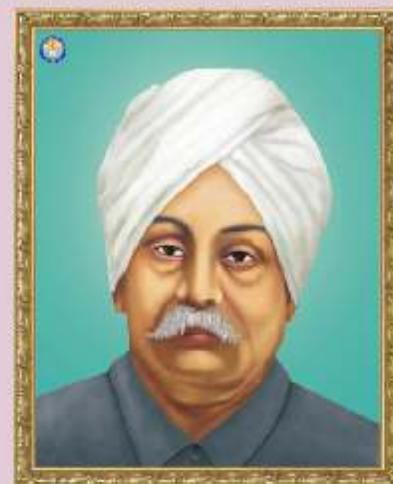
LS19 : Indira Gandhi



Indira Gandhi

Indira Gandhi was an Indian politician and the first female prime minister of India. She is known for her role in the Emergency and the Green Revolution...

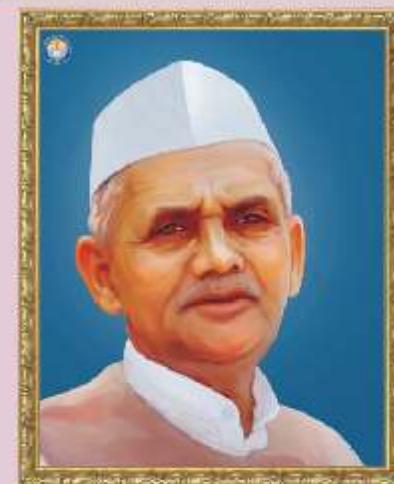
LS20 : Lala Lajpat Rai



Lala Lajpat Rai

Lala Lajpat Rai was an Indian nationalist leader and a prominent leader of the Indian independence movement. He is known for his role in the Jallianwallah Bagh massacre...

LS21 : Lal Bahadur Shastri



Lal Bahadur Shastri

Lal Bahadur Shastri was an Indian politician and the third prime minister of India. He is known for his role in the 1965 Indo-Pakistani War and the Tashkent Declaration...

LIFE SKETCH OF GREAT MEN Laminated, Size 50 x 70 cm (Available in English and Hindi Separately)

ET01 : English Teaching Charts (Lesson 1)

English Teaching Charts 1 Lesson

Part A - Vocabulary

boy fan pen cow bag
bat box dog man map

This That Is A

Part B - Substitution table

| | | | | |
|------|----|---|-----|-----|
| This | is | a | boy | bat |
| That | | | fan | box |
| | | | pen | dog |
| | | | cow | man |
| | | | bag | map |

Part C - Sentences to read

This is a pen.
 That is a map.
 This is a bag.
 That is a bat.
 This is a box.
 That is a dog.

ET02 : English Teaching Charts (Lesson 2)

English Teaching Charts 2 Lesson

Part A - Vocabulary

book doll shoe girl bell
desk bank tree bird

Part B - Substitution table

| | | | | |
|------|----|---|------|------|
| This | is | a | book | desk |
| That | | | girl | shoe |
| | | | bank | lion |
| | | | doll | bird |

Part C - Sentences to read

This is a book.
 That is a doll.
 This is a shoe.
 That is a desk.
 This is a girl.
 That is a tree.

ET03 : English Teaching Charts (Lesson 3)

English Teaching Charts 3 Lesson

Part A - Vocabulary

hen horse doll table ball
inkpot nose watch pen sheep

My Your His Her

Part B - Substitution table

| | | | | |
|------|----|------|--------|-------|
| This | is | my | doll | hen |
| That | | your | map | ball |
| It | | his | inkpot | cow |
| | | her | watch | sheep |
| | | | house | book |
| | | | pen | bag |

Part C - Sentences to read

This is your inkpot.
 That is my hen.
 This is your watch.
 That is my map.
 This is his sheep.
 It is her doll.

ET04 : English Teaching Charts (Lesson 4)

English Teaching Charts 4 Lesson

Part A - Vocabulary

cat rat mat bed
almirah house cage shed

is on the is in the is under the

Part B - Substitution table

| | | | | |
|------|------|--------------|---------|-------|
| Your | cat | is on the | table | bed |
| My | book | is under the | desk | shed |
| His | pen | | | |
| Her | doll | is in the | almirah | house |

Part C - Sentences to read

My cat is on the bed.
 Her doll is under the bed.
 Your cat is in the house.
 My inkpot is under the desk.
 His pen is on the table.
 Your bag is in the almirah.

ET05 : English Teaching Charts (Lesson 5)

English Teaching Charts 5 Lesson

Part A - Vocabulary

orange egg aeroplane elephant
apple umbrella eye inkpot

Is An My

Part B - Substitution table

| | | | | |
|------|----|------|-----------|--------|
| This | is | an | orange | egg |
| That | | my | aeroplane | apple |
| It | | your | elephant | inkpot |
| | | his | umbrella | |
| | | her | | |

Part C - Sentences to read

This is her orange.
 That is an egg.
 This is an elephant.
 That is my inkpot.
 This is your aeroplane.
 This is his apple.

ET06 : English Teaching Charts (Lesson 6)

English Teaching Charts 6 Lesson

Part A - Vocabulary

book pen ball bag bat
books pens balls bags bats

These are Those are

Part B - Substitution table

| | | | |
|-------|-----|-------|------|
| These | are | books | bags |
| Those | | balls | bats |
| | | pens | hats |

Part C - Sentences to read

These are bags.
 Those are bats.
 These are books.
 Those are pens.
 These are balls.

ET07 : English Teaching Charts (Lesson 7)

English Teaching Charts 7 Lesson

Part A - Vocabulary

chair table desk dog cow
chairs tables desks dogs cows

Our Their

Part B - Substitution table

| | | | |
|-------|-----|-------|--------|
| These | are | her | boxes |
| Those | | my | chairs |
| | | your | desks |
| | | our | tables |
| | | his | dogs |
| | | their | cows |

Part C - Sentences to read

These are their chairs.
 Those are their dogs.
 These are your desks.
 Those are our cows.
 These are his boxes.
 Those are our tables.

ET08 : English Teaching Charts (Lesson 8)

English Teaching Charts 8 Lesson

Part A - Vocabulary

umbrella tree box desk
bags pens bats dogs

What Where Is Are

Part B - Substitution table

| | | | |
|-------|-----|---------|---------|
| What | is | this ? | that ? |
| Where | are | these ? | those ? |

Part C - Sentences to read

What is this? What are these?
 This is an umbrella. These are bats.
 What is that? What are those?
 That is a tree. Those are bags.
 Where is this? Where are these?
 This is in the box. These are behind the wall.
 Where is that? Where are those?
 That is on the desk. Those are near the tree.

ET09 : English Teaching Charts (Lesson 9)

English Teaching Charts 9 Lesson

Part A - Vocabulary

nose eye arm leg tongue
head eyes arms legs mouth

Part B - Substitution table

| | | | |
|---------|------|------|--------|
| This is | my | head | mouth |
| That is | your | nose | tongue |
| | his | leg | arm |
| | her | | |

| | | | |
|-----------|------|-------|------|
| These are | my | eyes | arms |
| Those are | your | legs | ears |
| | his | hands | feet |
| | her | | |

Part C - Sentences to read

This is my head.
That is her nose.
These are my eyes.
Those are your arms.

ET10 : English Teaching Charts (Lesson 10)

English Teaching Charts 10 Lesson

Part A - 'Look and Say' Words

touch show open shut

Part B - Substitution table

| | | | |
|-------|------|-------|------|
| Touch | my | head | ear |
| Show | your | eyes | leg |
| | his | mouth | nose |
| | her | | hand |

| | | | |
|------|------|-------|------|
| I | my | hands | leg |
| You | your | nose | head |
| We | his | mouth | eyes |
| They | her | ear | |

Part C - Sentences to read

Touch my head.
Show your tongue.
I touch his nose.
You touch her hand.
They show their legs.

ET11 : English Teaching Charts (Lesson 11)

English Teaching Charts 11 Lesson

Part A - Vocabulary

train bird bell camel horse
goat basket shirt shoe

Part B - Substitution table

| | | | |
|-------|------|--------|-------|
| There | a | train | horse |
| Here | my | basket | shirt |
| | your | bird | goat |

Part C - Sentences to read

Here is a bird.
There is a horse.
Here is a goat.
There is my basket.
Here is your shirt.

ET12 : English Teaching Charts (Lesson 12)

English Teaching Charts 12 Lesson

Part A - Vocabulary

postman driver doctor guard student
washerman teacher gardener tailor farmer

Part B - Substitution table

| | | |
|---------|---------|---------|
| He is | doctor | farmer |
| I am | postman | guard |
| You are | driver | tailor |
| | student | teacher |

Part C - Sentences to read

He is a doctor.
I am a farmer.
You are a tailor.
He is a driver.
I am a guard.
You are a student.

ET13 : English Teaching Charts (Lesson 13)

English Teaching Charts 13 Lesson

Part A - Vocabulary

son daughter uncle mother father
sister brother aunt cousin

Part B - Substitution table

| | | | | |
|-------|-------|---------|-------|----------|
| He is | my | father | my | daughter |
| | our | brother | our | mother |
| | your | son | your | sister |
| | their | uncle | their | aunt |
| | his | cousin | his | cousin |
| | her | | her | |

Part C - Sentences to read

He is your father.
She is my aunt.
He is his uncle.
She is your sister.
He is our brother.
She is my mother.

ET14 : English Teaching Charts (Lesson 14)

English Teaching Charts 14 Lesson

Part A - Vocabulary

school hospital post office office bank

Part B - Substitution table

| | | | |
|------|-------|-------------|----------|
| It | a | school | office |
| That | their | bank | house |
| | my | post office | hospital |
| | your | | |
| | our | | |

| | | | |
|-------|----|-------|------------|
| Where | is | the | school ? |
| | | my | hospital ? |
| | | your | house ? |
| | | our | bank ? |
| | | their | office ? |

Part C - Sentences to read

Where is their school?
It is our school.
That is their hospital.
It is our office.

ET15 : English Teaching Charts (Lesson 15)

English Teaching Charts 15 Lesson

Part A - Vocabulary

room door window black board
lock key

Part B - Substitution table

| | | | | |
|------|-------|-------|--------|-------|
| I | open | the | room | box |
| We | close | our | door | desk |
| You | shut | your | book | eyes |
| They | clean | their | window | mouth |
| | | | office | |

Part C - Sentences to read

I close the room.
They open their book.
We clean our desk.
You shut your mouth.
Open the lock with the key.

ET16 : English Teaching Charts (Lesson 16)

English Teaching Charts 16 Lesson

Part A - Vocabulary

reading writing playing running jumping
eating drinking walking sitting

Part B - Substitution table

| | | | |
|----------|---------|----------|---------|
| I am | reading | sitting | running |
| You are | writing | drinking | jumping |
| They are | playing | walking | eating |
| We are | | | |

| | | | |
|-----|----|---------|---------|
| He | is | writing | sitting |
| She | | playing | walking |
| It | | | |

Part C - Sentences to read

You are reading your book.
I am eating my lunch.
We are reading our books.
They are playing football.
He is writing in his book.

EG01 : Sentence

SENTENCE

A Sentence Is a Group of Words Conveying a Complete Sense.

Assertive Sentence States a fact. It ends with a full stop.

Interrogative Sentence Asks a question. It ends with a question mark.

Imperative Sentence Expresses a command, request or advice. It ends with a full stop.

Exclamatory Sentence Shows a strong feeling. It ends with an exclamation mark.

Optative Sentence Shows a wish. It ends with an exclamation mark or full stop.

EG02 : Noun : Kinds

NOUN : Kinds

Noun is a Naming Word That Can Name a Person, Place, Thing, Quality, State, Idea etc.

KINDS OF NOUN

- Common Noun** : A noun that is shared by every member of the same class.
- Proper Noun** : Name of a particular person or thing.
- Collective Noun** : Name of a group of people or collection of things of same kind.
- Abstract Noun** : Name of a quality, state or idea.

EG03 : Noun : Gender

NOUN : Gender

MASCULINE GENDER Denotes male.

FEMININE GENDER Denotes female.

COMMON GENDER Denotes both a male or a female.

NEUTER GENDER Denotes a non living thing or a thing that is neither male nor female.

FORMATION OF FEMININE NOUN

Using entirely different words.

By adding -ness, -ity, etc.

By placing a word after or before or changing some word.

EG04 : Noun : Number

NOUN : Number

Noun Can be Singular or Plural. Singular Nouns Denote One Person or Thing Whereas Plural Nouns Denote More Than One Person or Things.

SINGULAR NOUNS

PLURAL NOUNS

PLURAL FORMATION

COUNTABLE NOUNS

UNCOUNTABLE NOUNS

EG05 : Noun : Case

NOUN : Case

Nominative Case Noun is used as the subject of a verb.

Objective Case (Accusative) Noun is used as the direct object of a verb.

Dative Case Noun is used as an indirect object.

Possessive Case Noun is used to show possession.

Case is Apposition When noun nouns are used for the same purpose, place or thing in a sentence, then the second noun is Case in Apposition of the first noun.

Vocative Case Nouns used in remembrance of address are vocative cases.

EG06 : Pronouns - I

PRONOUNS - I

Words Which are Used in Place of Nouns are Pronouns.

Personal Pronouns

First Person

Second Person

Third Person

Possessive Pronouns

Reflexive Pronouns

Emphatic Pronouns

EG07 : Pronouns - II

PRONOUNS - II

Pronouns are the Words Used in Place of Nouns.

Demonstrative Pronouns

Distributive Pronouns

Indefinite Pronouns

Interrogative Pronouns

Relative Pronouns

Reciprocal Pronouns

EG08 : Conjunction

CONJUNCTION

Conjunction is a Word That Joins Two Words, Clauses or Sentences.

Coordinating Conjunction

Subordinating Conjunction

INTERJECTION

Interjection is a Word Which Expresses Some Sudden Feeling or Emotion.

EG09 : Adjective

ADJECTIVE

Adjective is a Word That Adds Something to the Meaning of a Noun or a Pronoun.

Beautiful lady, Honest person, Sweet mangoes, Some help, Sharp knife, That tree, Moon's salary, Your gloves.

Formation of Adjectives

| From Nouns | | From Verbs | | From Other Adjectives | |
|------------|----------|------------|-----------|-----------------------|------------|
| Glory | Glorious | Move | Movable | Black | Blackish |
| Dirty | Dirty | Love | Loveable | Whole | Wholesome |
| Hope | Hopeful | Thin | Thinless | Sick | Sickly |
| Fool | Foolish | Care | Careless | Comic | Comical |
| Gold | Golden | Talk | Talkative | Correct | Corrective |

Degree of Comparison

| Positive (no comparison) | Comparative (Comparison between two) | Superlative (Comparison among more than two) |
|--------------------------|--------------------------------------|--|
| | | |
| This bowl is large. | Green bowl is larger than the red. | Green bowl is the largest of all. |

| Positive | Comparative | Superlative | Positive | Comparative | Superlative |
|----------|-------------|-------------|----------|-------------|-------------|
| Tall | Taller | Tallest | Wise | Wiser | Wisest |
| Brave | Braver | Bravest | Hot | Hotter | Hottest |
| Thin | Thinner | Thinnest | Easy | Easier | Easiest |
| Heavy | Heavier | Heaviest | Wary | More wary | Most wary |
| Gay | Gayier | Gayest | Late | Latter | Latest |
| Larger | Larger | Largest | Fore | Former | Former |
| Good | Better | Best | Bad | Worse | Worst |
| Little | Less | Least | | | |

EG10 : Adjective : Kinds - I

ADJECTIVE : Kinds-I

Adjectives of Quality (Descriptive Adjectives)

Show the kind or quality of person or thing. Answer the question : of what kind ?

Mahatma Gandhi was a brave leader. The doctor's decision was just. The old man died.

Adjectives of Quantity

Show how much of a thing is meant. Answer the question : how much ?

We have had enough exercise. She did not need any help. I ate some porridge.

Adjectives of Number

Show how many persons or things are meant or in what order persons or things stand.

| | | |
|----------------------------|------------------------------|--------------------------------|
| Definite Numeral adjective | Indefinite Numeral Adjective | Distributive Numeral Adjective |
| | | |
| The hand has five fingers. | Here are some ripe mangoes. | Each boy took his seat. |

Proper Adjectives

Adjectives derived from proper nouns.

I am proud of our Indian culture. Red Fort is a fine example of Mughal architecture. Chinese noodles are very popular among kids.

EG11 : Adjective : Kinds - II

ADJECTIVE : Kinds-II

Demonstrative Adjectives

Adjectives which point out which person or thing is meant : These answer the question : which ?

Don't be in such a hurry. This glass is green. These pens are black.

Interrogative Adjectives

Adjectives used with nouns to ask questions.

Whose game is lying on the table? Whose time is it? Which umbrella is better?

Possessive Adjectives

Adjectives which show belonging or possession.

This is her cow. It is my motorcycle. Accuse him of his guilt.

Emphasizing Adjectives

Adjectives which add emphasis to a noun.

Meet your own business. This is the very book I wanted. I opened the lid with my very hands.

Exclamatory Adjectives

Adjectives which help to express a strong emotion.

What a game! What an idea! What a blessing!

EG12 : Adverb

ADVERB

An Adverb is a Word That Modifies the Meaning of a Verb, an Adjective or Another Adverb.

Modifies Verb, Modifies Adverb, Modifies Adjective, Modifies Sentence.

KINDS OF ADVERBS

Adverbs of Time

Adverbs of Frequency

Adverbs of Reason

Adverbs of Affirmation & Negation

Adverbs of Degree or Quantity

Adverbs of Place or Position

Adverbs of Manner

Relative Adverbs

Interrogative Adverbs

EG13 : Articles

ARTICLES

Indefinite Articles (A, An)

A is used before a singular noun beginning with a consonant sound.

An is used before a singular noun beginning with a vowel sound.

A book, A woman, An apple, An octopus.

All is used before a singular noun beginning with h and not accented on the first syllable.

A/An is used before certain phrases.

All hands, All honest men, A woman judge, An honest job.

A/An is used before countable singular nouns suggesting one.

A/An is used before nouns denoting religion, title, abbreviations, profession, post etc.

A bird, An eagle, A doctor, An MP.

Definite Article (The)

This is used to point out some particular person or thing.

This is used with a singular noun meant to represent a whole class.

This is used with names of rivers, seas, mountains ranges etc.

This is the book I want. This cow is a useful animal. The Himalaya are to the north of India.

This is used with superlative degree of adjectives.

This is used with common nouns which are already referred.

This is used before adjectives which are used as nouns.

Diamond is the hardest substance known. There was a tree. The tree was hungry. You do not know how the poor live.

EG14 : Preposition

PREPOSITION

Preposition is a Word Placed Before a Noun or a Pronoun to Show the Relation Between the Person or Thing Denoted by it and Something else Mentioned in the Sentence.

Simple Preposition

at, by, for, from, in, off, on, out, through, till, to, up, with etc.

Compound Preposition

about, above, across, along, around, before, behind, below, beside, beyond, inside, outside, within etc.

Phrase Preposition

according to, along with, by virtue of, for the sake of, in addition to, in front of, in place of, in spite of, instead of, in account of, with reference to, with regard to etc.

Participial Preposition

barring, concerning, during, pending, regarding etc.

Relations Expressed by Prepositions

| | | |
|-----------------------------------|--|---------------------------------------|
| Time | Place | Agency |
| | | |
| I have known him for five years. | She sits behind behind the wall. | Milk is used by the milkman. |
| Manner | Cause/Purpose/Reason | Possession |
| | | |
| She will give help to the poor. | He is busy with his books. | The boy will give help to his friend. |
| Measure/Rate/Value | Contrast/Concession | Inference/Motive/Origin |
| | | |
| Mangoes are sold at Rs 60 per kg. | You are all his wealth, he is not content. | His skills come from practice. |

EG15 : Verbs

VERBS

Verb is a Word That Says or Asserts Something About a Person or Thing. No Sentence Can Exist Without a Verb.

A Verb Will Tell

What a person or thing does, What a person or thing is, What is done to a person or thing, What a person or thing has.

John is flying a kite. He is sitting in a chair. The man is hitting me. An eagle has two feet of arms.

Transitive Verb

Action passes over from the doer to an object.

The player hit the ball. The boy kicked the ball. That singer is playing a guitar. Some player basketball.

Intransitive Verb

Action does not pass over to an object.

They are playing a game. The boy is sitting. The girl is playing a game. Baby is crying.

Verbs of Incomplete Predication

Needs another word to make complete sense.

Water smells sweet. The man carries food and vegetables. The sun is hot. The girl looks beautiful.

Auxiliary Verb

A helping verb which helps main verb in forming tense, mood or voice.

I can swim across the river. She is looking beautiful. Did you visit the zoo? The man is laughing.

EG16 : Non-Finites : Infinitives

NON-FINITES : Infinitives

Infinitives Work as Nouns, Adjectives or Adverbs in the Sentence.

FORM : to + verb in its first form

SIMPLE INFINITIVES : Infinitives used as nouns

As subject of a verb, As object of a verb, As complement of a verb, As object of a preposition.

To swim is a good exercise. The teacher likes to see. He helped me to catch the fish. He asked her to read a newspaper.

GERUNDIAL INFINITIVES : Infinitives used as adjectives or adverbs

Qualify a verb, Qualify an adjective, Qualify a noun, Qualify a sentence.

We sat in this. He is sitting in an easy chair. The house is so big. To catch the train, I had to leave the station.

INFINITIVES WITHOUT TO : Bare Infinitives

After the verbs let, make, bid, see, hear, feel, help etc.

Father made her sit. Call him the way you see the train. Let him do that.

After need/can/could in negative sentences.

You need not sit. He does not sit against the wall. You need not worry for the good and bad.

After the expressions had better, would rather, sooner than, rather than, had rather.

I would rather do this rather than. I would sooner resign than see this hardship. You had better consult a doctor.

EG17 : Non-Finites : Gerunds & Participles

NON-FINITES : Gerunds & Participles

GERUNDS Gerunds act as nouns in the sentence and are formed by adding -ing in the first form of the verb.

| | | | |
|----------------------|-------------------------------|----------------------|--------------------------------------|
| General as a Subject | General as Complement of Verb | General as an Object | General as the object of Preposition |
|----------------------|-------------------------------|----------------------|--------------------------------------|

PARTICIPLES Participles act as verbal adjectives in the sentence.

Present Participles : Form : first form of verb + ing

| | | | |
|--------------|-----------------------|----------------------|-----------------------|
| As Adjective | As Subject Complement | As Object Complement | As an Absolute Phrase |
|--------------|-----------------------|----------------------|-----------------------|

Past Participles : Represent completed action or state of the thing spoken of

| | | |
|--------------|-----------------------|-------------------|
| As Adjective | As Subject Complement | Object Complement |
|--------------|-----------------------|-------------------|

EG19 : Past Tense

PAST TENSE

A Verb That Refers to Past Time is Said to be in Past Tense.

| | |
|------------------------------|------------------------------|
| Past Indefinite Tense | Past Continuous Tense |
|------------------------------|------------------------------|

| | |
|---------------------------|--------------------------------------|
| Past Perfect Tense | Past Perfect Continuous Tense |
|---------------------------|--------------------------------------|

EG18 : Present Tense

PRESENT TENSE

A Verb That Refers to Present Time is in Present Tense.

| | |
|---------------------------------|---------------------------------|
| Present Indefinite Tense | Present Continuous Tense |
|---------------------------------|---------------------------------|

| | |
|------------------------------|---|
| Present Perfect Tense | Present Perfect Continuous Tense |
|------------------------------|---|

EG20 : Future Tense

FUTURE TENSE

A Verb That Refers to the Future Time is Said to be in Future Tense.

| | |
|--------------------------------|--------------------------------|
| Future Indefinite Tense | Future Continuous Tense |
|--------------------------------|--------------------------------|

| | |
|-----------------------------|--|
| Future Perfect Tense | Future Perfect Continuous Tense |
|-----------------------------|--|

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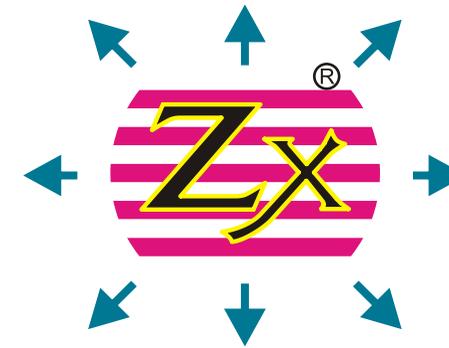
ZX-1221PN Muscular Arm Model 7 parts



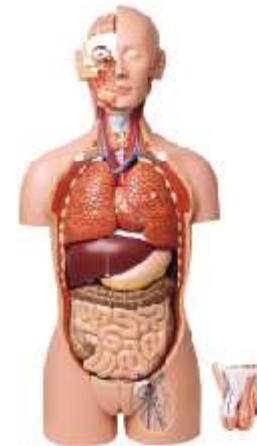
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प्रवेशिका पाठशाला-1

पाठ.1 स्वर
अ आ इ ई उ ऊ
ए ऐ ओ औ अं अः

पाठ.2 व्यंजन
क ख ग घ ङ, च छ ज झ व
ट ठ ड ढ ण, त थ द ध न
प फ ब भ म, य र ल व श
ष स ह, क्ष त्र ज्ञ

पाठ.3 अ की मात्रा तथा अक्षरों की पहचान
रथ घर फल बस
बतख डर मत घर चल
रथ पर चढ़ बन सब नर

प्रवेशिका पाठशाला-5

पाठ.10 ऐ की मात्रा= $\text{ऐ} = \text{ऐ} + \text{ऐ} = \text{ऐ}$
ऐनक बैल थैला सैनिक
किसान खेत में हल चला रहा है
बैठ पैसा मैदान पैदल
भैया मेल जैसा बैरागी
मैना बैठक तैसा फैशन

पाठ.11 ओ की मात्रा= $\text{ओ} = \text{ओ} + \text{ओ} = \text{ओ}$
ओखली घोड़ा केला खाओ मोर देखो
सोनिया कपड़े की गुड़िया बनाती है
गोल खोल तोल मोहन
सोना डोली बोल सोहन
होली तोड़ चोर धोवन

प्रवेशिका पाठशाला-2

पाठ.4 आ की मात्रा= $\text{आ} = \text{आ} + \text{आ} = \text{आ}$
आम गाय अनार लड़का
आम खा अनार ला मदन भला था
खाना खा हमारा भारत राम पढ़
मामा नाना दादा चाचा आना पाना
लाला आया ताला लाया रामायण

पाठ.5 इ की मात्रा= $\text{इ} = \text{इ} + \text{इ} = \text{इ}$
किताब हिरन चिड़िया किसान
लिख मिल दिया पिता आया
लिया पिया गिन हिल दिल
खिला किसका इस दिन

प्रवेशिका पाठशाला-6

पाठ.12 औ की मात्रा= $\text{औ} = \text{औ} + \text{औ} = \text{औ}$
औरत कौवा पंथा तौलिया
दो मानव नौका से नदी पार कर रहे हैं
बौना फौजी दौड़ा और
चौक कौन मौसा लौकी
पकौड़े बिछौना रौनक गौशाला

पाठ.13 अं की मात्रा= $\text{अं} = \text{अं} + \text{अं} = \text{अं}$
अंगूर पतंग पंखा झंडा
गंगा किनारे मंदिर यह हमारा झंडा है
तंग आंख रंग भंग बंदर
शंख पंख गेंद जंगल
गांधी पंछी टंडा बसंत

प्रवेशिका पाठशाला-3

पाठ.6 ई की मात्रा= $\text{ई} = \text{ई} + \text{ई} = \text{ई}$
हाथी छतरी मछली चीता
सीटी बीन रीछ दादी तीन
खीर सीख पानी रानी
कील ठीक चाची सीता
कमीज़ अमीर नानी खीर रख आ

पाठ.7 उ की मात्रा= $\text{उ} = \text{उ} + \text{उ} = \text{उ}$
फुटबाल बुढ़ापा धनुष गुड़िया
बुढ़ापा बुरा सुनीता चली गई बुलबुल आई
खुश दुम धनुष पुल पर चल
कुश कुल सुन सुख
सुराही बुनाई यह नदी का पुल फुलवारी

प्रवेशिका पाठशाला-7

पाठ.14 विसर्ग : ओर संयुक्त अक्षर
प्रातः उठ इन्जन पत्ता बच्चा
प्रातः चक्की कुत्ता बाल्टी स्कूल
मुन्ना प्यारा पत्थर अम्मा ज्ञान
दिल्ली प्याला लट्टू
उन्हें अग्नि लैम्प

पाठ.15 संयुक्त अक्षर
काली बिल्ली बड़ी छबीली,
जाने को वह बैठी दिल्ली।
दूध धरा था प्याले में,
पहुँच गई वह आले में।
चप चप कर है वह पी जाती,
चूहों को भी है खा जाती।
प्यारा भारत देश हमारा

प्रवेशिका पाठशाला-4

पाठ.8 ऊ की मात्रा= $\text{ऊ} = \text{ऊ} + \text{ऊ} = \text{ऊ}$
कबूतर फूल चूहा भालू
सूरज निकला पूजा आभूषण चुन
धूप सूर धूल चूना शूल
पूर्व जूता मूली चूरन भूरा
भूल गुलाब खूब पढ़ ऊन चूड़ियां

पाठ.9 ए की मात्रा= $\text{ए} = \text{ए} + \text{ए} = \text{ए}$
शेर पड़ मेड़ सब
पेड़ पर आम ठेला चला राम खेल
पेट चेला तेल गणेश
मीठे देख रेल महेश
भेड़ आई किसान खेत में

प्रवेशिका पाठशाला-8

पाठ.16 संयुक्त अक्षर
च-च = अच्छा क-क = क्या
स-स = बस्ता ष-ष = पुष्पा
श-श = श्याम ध-ध = ध्यान

प्रातः काल प्रणाम प्रथम
प्रार्थना प्रतिज्ञा स्कूल

प्रातः काल सवेरे उठो।
अपना बिस्तर स्वयं इकट्ठा करो।
प्रथम माता पिता को प्रणाम करो।
फिर हाथ मुँह धो डालो।
शीतल जल के छींटे मारकर आखें
साफ करो। दांत साफ कर स्नान करो।
बस्ता लेकर स्कूल जाओ।
श्याम पुष्पा के पास बैठो।
क्यारी में काम करो।
अच्छे लड़के लड़की बनो।

HT09 : Hindi Teaching (Chart 9)

बालगीत - 1

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|--|--|
| <p>मछली मछली जल की रानी है। जीवन हर जगह पर है। दाढ़ लकड़ी इत नमकीनी। बहार निकलने पर जलपरी।</p>  | <p>सड़क लकड़ी-सड़क सड़क गली, दिखाने के वह बढ़ी करी। उस पर गाड़ी आती है, चू-चू सेती जाती है। सड़क खेप का फलन तुम, चलो कहें मछली तुम। घंट गाड़ी तो खाली, फिर कोई मछली खाली।</p>  |
| <p>कैक मेरा कम दिख सब अना, मेरी चिन्ता का गुलाम। पता खर फेंक लगीला, खर्चा वाला नम गरीब। दुखि उनी भरी लहई, खान नाम फुली न लम्हाई। धम्मी रणु रणु प्यरे, कपड़े पहने ल्यारे ल्यारे।</p>  | <p>राखी मेरी छोटी भाई है, सुन्दर राखी भाई है। वारी खेल-छोली है, खाल गुलामी चोली है। आंखों का पूँछियागी है, खन के मा को मागी है। दीदी ने यमनई है, बरको मुझे खिताई है। कुपरा गुपरा कपड़े लारी, डिब्बा एक फिताई का। कन-कन चमके कुं नोवे, फलन एक फलनई बर।</p>  |

HT13 : Hindi Teaching (Chart 13)

लोमड़ी और कौवा

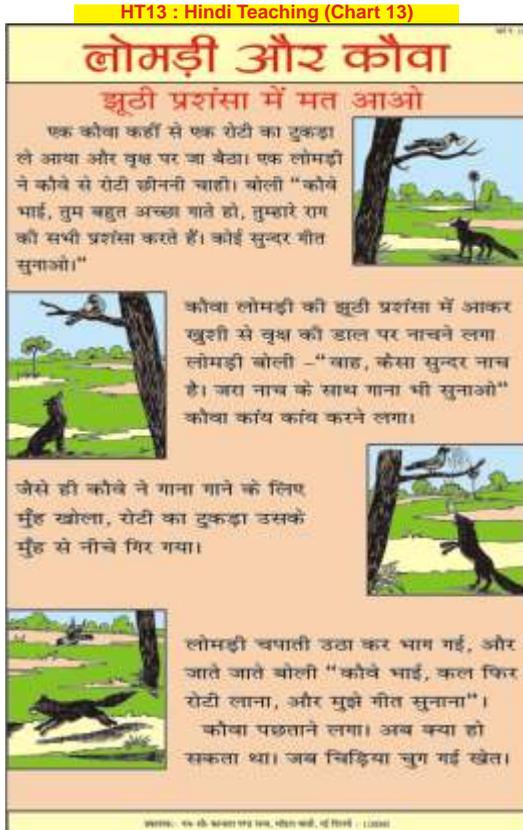
झूठी प्रशंसा में मत आओ

एक कौवा कहीं से एक रोटी का टुकड़ा ले आया और वृक्ष पर जा बैठा। एक लोमड़ी ने कौवे से रोटी छीननी चाही। बोली "कौवे भाई, तुम बहुत अच्छा गाते हो, तुम्हारे राग की सभी प्रशंसा करते हैं। कोई सुन्दर गीत सुनाओ।"

कौवा लोमड़ी की झूठी प्रशंसा में आकर खुशी से वृक्ष की डाल पर नाचने लगा लोमड़ी बोली - "बाह, कैसा सुन्दर नाच है। जरा नाच के साथ गाना भी सुनाओ।" कौवा कांथ कांथ करने लगा।

जैसे ही कौवे ने गाना गाने के लिए मुँह खोला, रोटी का टुकड़ा उसके मुँह से नीचे गिर गया।

लोमड़ी चपाली उठा कर भाग गई, और जाते जाते बोली "कौवे भाई, कल फिर रोटी खाना, और मुझे गीत सुनाना।" कौवा पछताने लगा। अब क्या हो सकता था। जब चिड़िया चुग गई खेत।



HT10 : Hindi Teaching (Chart 10)

बाल गीत - 2

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| <p>घोड़ा घरि में भी वे ही खूब। और सड़क पर ही खूब। बादल भी वे इस का बहूला। सामर रुई कपी न अहूला। सबैय में वे खेल रिखला। पात चने खुस होकर खाला।</p>  | <p>तोता हरियाल तोता निकला, "देवा राम" कहलाता है। आप, लीची, रोम, नमने, भारत में वे खाल है। पिखरे में भी खुशी से खाल, राम-राम फिर भयम कहला।</p>  |
| <p>रेल एक एक करती जाती रेल। आप और पागी का खेला। दूर दूर की ओ करती। नरिये, पानी पार करती। किनी की दफनर, पर प्यारी। पिछडी का वे पुनः मिलाती।</p>  | <p>वायुयान इस में सर-का उड़न कार। कीन-अपन-का, अगरीका-अपन-अपन हो च-अपनीका कुल ही पेट में खूबकार, इस में सर-का उड़न कार। तुम में यह नम कावन, छोटी में अम-पूँचका। सभी यह वायुयान कहला। इस में सर-का उड़न कार।</p>  |
| <p>रक्षा बन्धन रक्षा बन्धन का त्योहार। धूम धाम से जाता है। भाई बहिनो का यह प्यार। गीत अनाले पाता है।</p>  | |

HT14 : Hindi Teaching (Chart 14)

एकता में बल है

शिकारी और कबूतर

एक शिकारी ने वन के पक्षियों को पकड़ने के लिये अपना जाल फैलाया था।

कुछ ही समय में आस पास के कबूतर उसमें आकर फँस गये। हर कबूतर अपने आप को छुड़ाने का प्रयत्न करता परन्तु विफल हो जाता।

इतने में वहाँ से एक कौवा जा रहा था। वह पक्षियों को जाल में फँसा देखकर सीधा उनके पास गया और कहा कि वह सब मिलकर जोर लगायें तथा जाल के साथ ही उड़ जायें।

कबूतरों ने कौवे की शिक्षा मानी और अपनी पूर्ण शक्ति के साथ जाल ले उड़े। शिकारी हाथ मलता ही रह गया।

'एकता में बल है'



HT11 : Hindi Teaching (Chart 11)

बाल गीत - 3

| | |
|--|---|
| <p>गाय प्यारी-प्यारी गाय हमारी, दूध हमें वे देती है। इसके बरले में केवल दूध, पात-पाती लेती है। इसके बरले बेल बने हैं, खेत में इल भलाते हैं। उन्की ही मेहनत से फिर, अनाम हम फले हैं।</p>  | <p>बन्दर बन्दर आया, बन्दर आया। सगरी के संर बन्दर आया। खी: खी: कल्पे हमें डराये। मुँह विषकामे कपी खुजामे। रीसा देखें टोपी पहने। बन्दरिया ने भी पहने पहने।</p>  |
| <p>कार मेरी प्यारी प्यारी कार। वहाँ कभी रहती बँकर। आप को दफनर ले जाती। और शाम को पार ले जाती। छट्टी के दिन हम सक्की पार। पिबनिका के वे पारे दिखाली।</p>  | <p>सेब सभी फलों में सेब है न्याता। खाल नाच आ प्यारे प्यारे। एक रोम को रोम है खाला। डोपनर को यह दूर पयाता। मम्मी मुसको सेब दिखाली। बरले एपल खूस पिलाली।</p>  |
| <p>बालक माँ मैं पढ़ने को जाऊँगा। छट्टी होने पर आऊँगा। गीत बोला के गाऊँगा। खीर चहादुर काहलाऊँगा।</p>  | |

HT15 : Hindi Teaching (Chart 15)

शेर और खरगोश

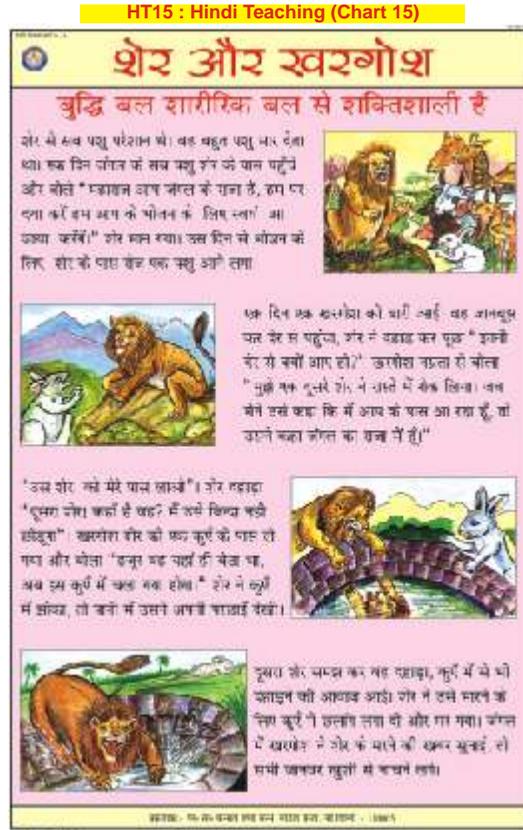
बुद्धि बल शारीरिक बल से शक्तिशाली है

शेर से सब पशु परेशम थे। वह बहुत पशु मार देता था। एक दिन जिन के सब पशु रोने के पान पड़ें और बोले "प्राधान्य जब जगत के राज है, हम पर दया करे हम अंग के मोनन के लिए ल्यारे आ उजवा करे।" शेर मन गया। उस दिन से मोनन के कि शेर के पात बंद एक स्तु उनी लया।

एक दिन एक खरगोश को गरी-खई वह जानपुत्र पार देर स पहुँचा, शेर ने बडाड कर पूछ "इसके देर ये कौन गाए हो?" खरगोश कलाती चीन्हा "मुझे एक दुसरे शेर ने उन्ने में कैक खिया। वह बोने उने कह कि मैं आप के पास आ रहा हूँ, तो उन्ने कहा जगत का राज मैं हूँ।"

"उस शेर से मेरे पास जानें।" शेर दहाड "दुसरा जगह कहीं है वह?" मैं उन्ने किन्तु कहे छोड़ूँगा। खरगोश शेर को एक कुर् के पार ले गया और बोला "इस पर पारों ही बेंब पार, अब इस कुर् में कह एक शेर।" शेर ने कुर् में जायन, तो जने में उन्ने जायने चाहाई रोने।

दूधर शेर पपत्र कर वह पहाड, कुर् में वे भी जाइन को आवाज अडे। शेर ने उने मारने के निरा कुर् ने उन्ने लया वे और गा गया। जगत में खरगोश ने शेर के पारने की खबर सुनई, तो सभी खरगोश खुशी से बचने लगे।



HT12 : Hindi Teaching (Chart 12)

स्वच्छता

प्यारे बच्चो स्वच्छ रहो।
जान से मन से स्वच्छ रहो।
जब में ऊँचा नाम करो।
स्वच्छता का पात पढ़ो।

सुपोषण से पहले उठो।
जाने जल से स्नान करो।
ओखें भी नित सफ करो।
नाखूने को नहीं बड़ाओ।

दात साफ, नाखून साफ।
कपड़े साफ, बरला साफ।
शिक्षा पाने का काम साफ।
पर और जगिन देते साफ।
बन्दरी कहीं फैलाओ मत।
सकियायों को भुलाओ मत।
कचरा कुड़ेदान में डालो।
अच्छी आदती के रूप पालो।
जैसी आपत सुभ डालोगे।
जैसे ही सुभ बन जाओगे।

भारत-बन्दन।
प्यार प्यार जग से न्याता।
भारत देरा हमार है।
इसका समक देना विनाय।
इसके नाच भी रता सायन।
संघा यमुना की धाराय।
बलौ लेह भरी निरा भाय।
हम सबकी आँखों का जारा।
भारत देरा हमार है।

काले घन पा डट जने।
जग से उतरा में हम।
जिन केन मुलक सब कने।
हम देन दुखी निरा किये।
वे सेवक बन सौरा हरि।
वे हैं अलक फले फलक।
उन्को लोह खूब कर जने।
जग हम देन सक्काड कुल।
अच्छे से निरा निरा कु लो।
जिन जग मन मारत का।
जग भवन रहे अधियन पूरे।
जोय हो गुड सल आन।
सुभ प्रेम सुभाव बराले।
जिन देन जने में जग निरा।
कोरन उनी पा हो जने।



HT16 : Hindi Teaching (Chart 16)

भारत माता

भारत पू को करे वंदना, यही हमारी माता है।
यही कर्म है, यही धर्म है, सबको भाव्य-विधाता है।
तुच्छ स्वार्थ से ऊपर उठकर, नव-नव संकल कार्य करे।
मिल-जुल कर सब रहें प्रेम से, सब का ही उत्थान करे।
जाति-पाति के बंधन तोड़े, वर्ग भेद को चूर करे।
मिल-जुलकर सब बौदें खार्, मेरा-मेरा सब दूर करे।
भारत माता सबको सांगी, सबको प्यार लुटाली है।
मेरा सब कुछ इसको अर्पण, सब कुछ इसकी धानी है।

देश मेरा है मेरा मन्दिर, एकता यहाँ लाएंगे।
अम से सींच इस माटी को, स्वर्न यहाँ हम लाएंगे।
फिर भरती सोना उगलेगी, यह देश सुखी हो जायेगा।
नया संसार बनायेगे, एकता समता लाएंगे।
देश मेरा है मेरा मन्दिर, एकता यहाँ लाएंगे।

हमारा नारा

राष्ट्र हित कार्य करना ही विरथ की आराधना है।
किसको नातु भूमि प्राणी से अधिक प्यारी नहीं वह नर नहीं पशु है।
विभिन्न जातियाँ धर्म व सम्प्रदाय एक ही वृक्ष की शाखाएँ हैं।
एक है अपनी जमी एक है अपना मन।
सारी दुनिया एक है एक है अपना सतन।

भारत की मिटटी मेरा स्वर्न है, भारत को कलचम में ही मेरा कल्याण है।
है शोक यही अरमान यही, हम कुछ कर दिखलाएंगे।
मरणे वाली दुनियाँ में हम, अमरी में नाम लिखाएंगे।
जो लोग हार कर बैठे हैं, उम्मीद मारकर बैठे हैं।
हम उनके बुझे दिमागों में, फिर से उत्साह जायाएंगे।



HV01 : Hindi Vyakaran (Chart 1)

हिन्दी व्याकरण-1

वर्ण और शब्द

भाषा की सबसे छोटी इकाई को **वर्ण** कहते हैं।
वर्ण के दो प्रकार हैं—
संज्ञा-वर्ण—जिन वर्णों के उच्चारण के लिए अन्य वर्णों की आवश्यकता नहीं होती है, उन्हें संज्ञा-वर्ण कहते हैं। जैसे—
अ आ इ ई उ ऊ ऋ ए ऐ ओ औ

अं और अँ: अर्धस्वर कहलाते हैं।
संज्ञा-वर्ण—जिन वर्णों के उच्चारण के लिए किसी भी संज्ञा-वर्ण की आवश्यकता नहीं होती है, उन्हें संज्ञा-वर्ण कहते हैं। जैसे—
क ख ग घ ङ **फ ब भ म**
च छ ज झ ञ **प फ व ध न**
ट ठ ड ढ ण **श ष स ह**
त् थ द ध न्

(-) अनुस्वार, (०) अनुस्वित्, (:) चिह्न, (.) श्वाचल तथा ख, ग, ज, झ, ङ को अनुस्वार मानना चाहते हैं।

शब्द: सार्थक अर्थ-सम्पन्न को शब्द कहते हैं। जैसे—पुस्तक, बचपन, आँखें, कविता आदि। शब्दों के प्रयोग का अर्थ है—

| तात्पर्य | संज्ञा | वैशब्द | विशेषण |
|----------|------------|--------|---------|
| | | | |
| पानी | माँ (माता) | पौता | किताबें |
| | | | |
| गाड़ी | कोठरी | घोड़ा | घोड़ा |

शब्दों के दो प्रकार होते हैं—**संज्ञा-वर्ण** और **संज्ञा-वर्ण**।
जिन वर्णों में शब्द का अर्थ स्पष्ट हो सके, उन्हें संज्ञा-वर्ण कहते हैं।
जिन वर्णों में शब्द का अर्थ स्पष्ट न हो सके, उन्हें संज्ञा-वर्ण कहते हैं।
जिन वर्णों में शब्द का अर्थ स्पष्ट न हो सके, उन्हें संज्ञा-वर्ण कहते हैं।

HV02 : Hindi Vyakaran (Chart 2)

हिन्दी व्याकरण-2

संज्ञा

हिन्दी व्याकरण, वस्तु, स्थान या भाव को **संज्ञा** कहते हैं। (संज्ञा शब्द का अर्थ है—)

संज्ञा-वर्ण—जिन वर्णों के उच्चारण के लिए अन्य वर्णों की आवश्यकता नहीं होती है, उन्हें संज्ञा-वर्ण कहते हैं। जैसे—
अ आ इ ई उ ऊ ऋ ए ऐ ओ औ

संज्ञा-वर्ण—जिन वर्णों के उच्चारण के लिए अन्य वर्णों की आवश्यकता नहीं होती है, उन्हें संज्ञा-वर्ण कहते हैं। जैसे—
क ख ग घ ङ **फ ब भ म**
च छ ज झ ञ **प फ व ध न**
ट ठ ड ढ ण **श ष स ह**
त् थ द ध न्

(-) अनुस्वार, (०) अनुस्वित्, (:) चिह्न, (.) श्वाचल तथा ख, ग, ज, झ, ङ को अनुस्वार मानना चाहते हैं।

HV03 : Hindi Vyakaran (Chart 3)

हिन्दी व्याकरण-3

लिंग और वचन

पुरुष या स्त्री लिंग का बोध कराने वाले शब्द **लिंग** कहते हैं।
लिंग के दो प्रकार होते हैं—

पुरुष-लिंग—जिन शब्दों का बोध पुरुष करने वाले शब्द **पुरुष-लिंग** होते हैं।
जैसे—
बच्चा (लिंग), **बच्ची** (स्त्री), **बच्चे** (बहुवचन)

स्त्री-लिंग—जिन शब्दों का बोध स्त्री करने वाले शब्द **स्त्री-लिंग** होते हैं।
जैसे—
बच्ची (स्त्री), **बच्चे** (बहुवचन)

बहुवचन—जिन शब्दों का बोध करने वाले शब्द **बहुवचन** होते हैं।
जैसे—
बच्चे (बहुवचन), **बच्चों** (बहुवचन)

HV04 : Hindi Vyakaran (Chart 4)

हिन्दी व्याकरण-4

कारक

क्रिया से जिसका संबंध हो या जो क्रिया का जनक हो, वह **कारक** होता है।
कारक के चार प्रकार हैं: **संज्ञा-कारक**, **संज्ञा-कारक**, **संज्ञा-कारक** और **संज्ञा-कारक**।

संज्ञा-कारक—जिन शब्दों का संबंध क्रिया से है, उन्हें संज्ञा-कारक कहते हैं।
जैसे—
बच्चा (संज्ञा-कारक), **खिला** (क्रिया)

संज्ञा-कारक—जिन शब्दों का संबंध क्रिया से है, उन्हें संज्ञा-कारक कहते हैं।
जैसे—
बच्चा (संज्ञा-कारक), **खिला** (क्रिया)

संज्ञा-कारक—जिन शब्दों का संबंध क्रिया से है, उन्हें संज्ञा-कारक कहते हैं।
जैसे—
बच्चा (संज्ञा-कारक), **खिला** (क्रिया)

संज्ञा-कारक—जिन शब्दों का संबंध क्रिया से है, उन्हें संज्ञा-कारक कहते हैं।
जैसे—
बच्चा (संज्ञा-कारक), **खिला** (क्रिया)

HV05 : Hindi Vyakaran (Chart 5)

हिन्दी व्याकरण-5

सर्वनाम

संज्ञा के स्थान पर प्रयोग होने वाले शब्दों को **सर्वनाम** कहते हैं। जैसे—

तुम, **मैं**, **वह**

सर्वनाम के प्रकार

- पुरुषसंबंधी सर्वनाम**—जिन शब्दों का संबंध पुरुष से है, उन्हें पुरुषसंबंधी सर्वनाम कहते हैं। जैसे—**तुम**, **मैं**, **वह**।
- स्त्रीसंबंधी सर्वनाम**—जिन शब्दों का संबंध स्त्री से है, उन्हें स्त्रीसंबंधी सर्वनाम कहते हैं। जैसे—**वह**।
- वस्तुसंबंधी सर्वनाम**—जिन शब्दों का संबंध वस्तु से है, उन्हें वस्तुसंबंधी सर्वनाम कहते हैं। जैसे—**यह**, **वह**।
- संज्ञासंबंधी सर्वनाम**—जिन शब्दों का संबंध संज्ञा से है, उन्हें संज्ञासंबंधी सर्वनाम कहते हैं। जैसे—**यह**, **वह**।

HV06 : Hindi Vyakaran (Chart 6)

हिन्दी व्याकरण-6

विशेषण

संज्ञा या सर्वनाम के गुण, संख्या एवं परिमाण आदि का बोध कराने वाले शब्दों को **विशेषण** कहते हैं।
विशेषण के चार प्रकार होते हैं—

- संज्ञासंबंधी विशेषण**—जिन शब्दों का संबंध संज्ञा से है, उन्हें संज्ञासंबंधी विशेषण कहते हैं। जैसे—**लाल**, **बड़ा**, **छोटा**।
- संख्यासंबंधी विशेषण**—जिन शब्दों का संबंध संख्या से है, उन्हें संख्यासंबंधी विशेषण कहते हैं। जैसे—**एक**, **दो**, **तीन**।
- परिमाणसंबंधी विशेषण**—जिन शब्दों का संबंध परिमाण से है, उन्हें परिमाणसंबंधी विशेषण कहते हैं। जैसे—**बड़ा**, **छोटा**, **लंबा**।
- गुणसंबंधी विशेषण**—जिन शब्दों का संबंध गुण से है, उन्हें गुणसंबंधी विशेषण कहते हैं। जैसे—**लाल**, **नीला**, **गुलाबी**।

HV07 : Hindi Vyakaran (Chart 7)

हिन्दी व्याकरण-7

क्रिया

किसी कार्य के करने या होने का बोध कराने वाले शब्द को **क्रिया** कहते हैं। जैसे—
जाना, खाना, लिखना, पढ़ना, खेलना।

क्रिया के प्रकार

- संज्ञासंबंधी क्रिया**—जिन शब्दों का संबंध संज्ञा से है, उन्हें संज्ञासंबंधी क्रिया कहते हैं। जैसे—**जाना**, **खाना**।
- संख्यासंबंधी क्रिया**—जिन शब्दों का संबंध संख्या से है, उन्हें संख्यासंबंधी क्रिया कहते हैं। जैसे—**एक**, **दो**।
- परिमाणसंबंधी क्रिया**—जिन शब्दों का संबंध परिमाण से है, उन्हें परिमाणसंबंधी क्रिया कहते हैं। जैसे—**बड़ा**, **छोटा**।
- गुणसंबंधी क्रिया**—जिन शब्दों का संबंध गुण से है, उन्हें गुणसंबंधी क्रिया कहते हैं। जैसे—**लाल**, **नीला**।

HV08 : Hindi Vyakaran (Chart 8)

हिन्दी व्याकरण-8

काल

क्रिया के लिए समय में प्रयोग होने वाले शब्दों को **काल** कहते हैं।
काल के चार प्रकार होते हैं—

- संज्ञासंबंधी काल**—जिन शब्दों का संबंध संज्ञा से है, उन्हें संज्ञासंबंधी काल कहते हैं। जैसे—**जाना**, **खाना**।
- संख्यासंबंधी काल**—जिन शब्दों का संबंध संख्या से है, उन्हें संख्यासंबंधी काल कहते हैं। जैसे—**एक**, **दो**।
- परिमाणसंबंधी काल**—जिन शब्दों का संबंध परिमाण से है, उन्हें परिमाणसंबंधी काल कहते हैं। जैसे—**बड़ा**, **छोटा**।
- गुणसंबंधी काल**—जिन शब्दों का संबंध गुण से है, उन्हें गुणसंबंधी काल कहते हैं। जैसे—**लाल**, **नीला**।

SS09 : SANSKRIT SHIKSHAN (CHARTS 9)

षष्ठी विभक्तिः

षष्ठी शेषे।
कारक से भिन्न स्वस्वाभिभाव सम्बन्ध में षष्ठी विभक्ति होती है।
सूर्यस्य आतपः प्रसरति।
इदं गोपालस्य पुस्तकम् अस्ति।
छात्राणां समूहः गच्छति।

अधिकरण-कारकम् (सप्तमी विभक्ति)

आधारो अधिकरणम्।
कर्ता और कर्म द्वारा उसमें रहने वाली क्रिया का आधार 'अधिकरण' होता है।
सिंहः घने वसति।
ऋषयः आश्रमेषु वसन्ति।
भारतवर्षस्य समीपे लङ्का अस्ति।

SS13 : SANSKRIT SHIKSHAN (CHARTS 13)

युष्मद्, अस्मद् (सर्वनामशब्दाः)

उभयलिङ्गशब्दाः
युष्मद्, अस्मद् शब्दानां रूपाणि त्रिषुलिङ्गेषु समानमेव भवन्ति।

प्रथमा विभक्तिः
त्वं किं पठसि? अहं पुस्तकं पठामि।
युवा किं पठथः? आवां पुस्तकं पठामः।
यूयं किं पठथ? वयं पुस्तकं पठामः।

द्वितीया विभक्तिः
सः त्वां पुस्तकं गच्छति, मां न गच्छति।
रमेशः युवां पश्यति, आवां न पश्यति।
विभा युष्मान् पश्यति, अस्मान् न पश्यति।
एतत्, किम्, यत्, तत्, युष्मद्,
अस्मद् इत्यादयः शब्दानां रूपाणि स्मरणं
कृत्वा वाक्ये प्रयोगं करणीयम्।

SS10 : SANSKRIT SHIKSHAN (CHARTS 10)

सम्बोधनम्

हे विजय! किं त्वं नित्यं क्रीडसि?
हे लते! किं त्वं नित्यं खावसि?
हे पुत्र! किमर्थं त्वम् अद्य पाठशालां न गच्छसि?

१ हे रमेश! त्वं कुत्र गच्छसि?
२ भो सुरेश! कः समयः जातः?
३ हे सरले! त्वं अहमदाबादनगरं कदा गमिष्यसि?
४ भो दिनेश! किं त्वं मया सह आगमिष्यसि?
५ भो राकेश! कुशलोऽस्ति भवान्?
६ भो अध्यापका! अध्यापनात् मा प्रमदितव्यम्।

SS14 : SANSKRIT SHIKSHAN (CHARTS 14)

आज्ञार्थ लोट्

रोशनः पुस्तकं पठतु।
बाली ओदनं खावताम्।
छात्राः छात्रावासेषु एव वसन्तु।
त्वं प्रतिदिनं शिवं भज।

युवाम् प्रातः सायं स्मरतम्।
यूयम् सवा सत्यं वदत।
किम् अहम् वनं गच्छानि?
किम् आवाम् दुग्धं पिबामः?
किम् वयम् लिखामः?

SS11 : SANSKRIT SHIKSHAN (CHARTS 11)

सर्वनाम-शब्दाः

एतत् एवं किम् (पुल्लिङ्गम् (प्रथमा विभक्तिः)
एषः कः धावति?
एतौ कौ धावतः?
एते के छात्राः धावन्ति?

(स्त्रीलिङ्गम् (प्रथमा विभक्तिः)
एषा का क्रीडति?
एते के क्रीडतः?
ताः काः क्रीडन्ति?

(नपुंसकलिङ्गम् (प्रथमा विभक्तिः)
एतत् किम् अस्ति? एतत् फलम् अस्ति।
एते के स्तः? एते फले स्तः।
एतानि कानि सन्ति?
एतानि फलानि सन्ति।

SS15 : SANSKRIT SHIKSHAN (CHARTS 15)

संख्यावाची शब्द प्रयोग

१ ईश्वरः एकः अस्ति।
२ द्वौ कर्णौ भवतः।
३ त्रयः लोकाः सन्ति।
४ चत्वारः वेदाः सन्ति।
५ हस्ते पञ्च अंगुलयः भवन्ति।
६ भारतवर्षे षट् ऋतवः भवन्ति।
७ सप्ताहे सप्तदिवसाः भवन्ति।
८ चत्वारि चत्वारि च अष्ट भवन्ति।
९ ग्रहाः नव भवन्ति।
१० दिशः दश भवन्ति।

SS12 : SANSKRIT SHIKSHAN (CHARTS 12)

यत् एवं तत् सर्वनामशब्दाः पुल्लिङ्गम् (प्रथमा, द्वितीया विभक्तिः)
यः अत्र पठति सः राकेशः अस्ति।
यौ अत्र पठतः तौ बालकौ स्तः।
ये अधुना पठन्ति ते परीक्षार्थिनः सन्ति।
यं त्वं नमसि तम् अहं नमामि।
यौ त्वं पश्यसि तौ अहं पश्यामि।
यान् त्वं वदसि तान् आवां वदावः।
स्त्रीलिङ्गम् (प्रथमा, द्वितीया विभक्तिः)
या प्रातः लिखति सा सायं न लिखति।
ये सायं लिखतः ते प्रातः न लिखतः।
याः अत्र लिखन्ति ताः तत्र न लिखन्ति।
यां सीता पश्यति, तां उर्मिला न पश्यति।
ये त्वं नमसि ते राधा न नमति।
याः रामः वदति ताः श्यामः न वदति।
नपुंसकलिङ्गम् (प्रथमा, द्वितीया विभक्तिः)
यत् फलम् अहम् खावामि तत् पक्वं न अस्ति।
ये फले करण्डके स्तः ते मम न स्तः।
यानि फलानि तत्र सन्ति तानि पक्वानि न सन्ति।
यत् फलम् त्वं खावसि तत् अहम् अपि खावामि।
ये फले मोहनः खावति ते प्रमा न खावसि।
यानि फलानि रामः नयति तानि त्वम् न पश्यसि।

SS16 : SANSKRIT SHIKSHAN (CHARTS 16)

शिक्षाप्रदाः श्लोकाः

अष्टादशपुराणेषु व्यासस्य वचनमुच्यते।
परोपकारः पुण्यस्य चाथाय परपीडनम् ॥
विद्वेषेण धर्मं विद्या, व्यसनेन धर्मं मतिः।
फलके धर्मं धर्मः, शीलं सर्वत्र वै धनम् ॥
यथा ह्येकेन चक्रेण न रथस्य गतिर्भवेत्।
एवं पुरुषकारेण किना देवं न सिद्ध्यति ॥
शौरं शूरेण न कुण्डलेन, घनेन घातिः न तु कर्दकोन।
विभाति कथयः कल्पवृक्षान्, परोपकारेण न चन्दनेन ॥
उद्यमः साहसं वैर्यं बुद्धिः शक्तिः पराक्रमः।
घडेते यत्र वर्तन्ते तत्र देवः सहायकः ॥
एक एव सुहृद् धर्मो निम्नेऽप्यनुयाति यः।
शरीरेण सर्वं नश्य सर्वमन्यन् गच्छति ॥
त्यज दुर्जनसंघं भज सधुसमागमम्।
कुरु पुण्यमहोरात्रं स्मर नाम इतः सदा ॥
आत्मस्य हि मनुष्याणां शरीरस्यो महारिपुः।
नास्त्वुद्यमस्यो बन्धुः कुन्वायं नावशीरयति ॥
सुखार्थिनः कृते विद्या कृते विद्यार्थिनः सुधम्।
सुखार्थी वा स्वजेद् विद्या विद्यार्थी वा स्वजेद् सुधम् ॥
यं माता-पितरौ कलेभ्यो सहेते सम्भवे नृणाम्।
न तस्य विधुक्तिः शक्या कर्तुं वर्षशतैरपि ॥
पिता पच्छति पुत्राय कल्पे विद्याधनं महत्।
पिताऽप्य किं तपस्तेषु इत्युक्तिस्तत्कृतज्ञता ॥
अज्ञान-निमित्तान्यस्य ज्ञानाज्जन-शलाकया।
चक्षुःकर्मोत्थितं येन तस्मै श्री गुरवे वसः ॥

CD01 : Your Duties During War

YOUR DUTIES — DURING WAR

युद्ध काल में आप के कर्तव्य

| | | |
|---|--|---|
| GIVE FULL SUPPORT & OBEY TO THE GOVERNMENT सर्वोच्च सहायता प्रदान करें और सरकार का हुक्म मानें। | RADIO WASTE बायो-हार्मिक कचरे को सुरक्षित ढंग से नष्ट करें। | SHARE YOUR NECESSITIES WITH NEARBY NEIGHBOURS आपके पास के लोगों को आवश्यकताओं से साझा करें। |
| STOP AT THE CHECK POSTS चेकपॉस्ट पर रुकें। | HEALTHY PRODUCE FROM HILLS AND FACTORIES पहाड़ों और कारखानों से स्वस्थ उत्पादों का उपयोग करें। | AVOID YOUR VEGETABLES AND FRUITS IF THEY ARE DROPPED जब वे गिरते हैं तो सब्जियों और फलों से बचें। |
| RESERVE INTERNAL ACTIVITY आंतरिक गतिविधियों को सुरक्षित रखें। | DO NOT GO AWAY FOR LONG PERIODS लंबे समय के लिए जाने न जाएं। | UNDER COFFRAT AND TRAINING आवरण और प्रशिक्षण के अधीन रहें। |
| AVOID STRAINS AND HAZARDS घुंटाव और खतरों से बचें। | CONTRIBUTE LIBRALS TO THE DEFENSE FUNDS रक्षा कोषों में उदारतापूर्वक योगदान दें। | LOOK FOR THE MISSING OR LOSTS खोजें कि कौन से लोग गायब या लौटे हैं। |
| SPREAD INFORMATION WITH HONESTY सच्चाई से जानकारी फैलाएं। | AVOID SMALL SPOKING CONVERSATIONS छोटी-छोटी बातचीत से बचें। | KEEP A SHARP EYE ON ENEMY ACTS दुश्मन की हर गति पर नज़र रखें। |
| KEEP THE WEAPONS MOVING हथियारों की गति बतानें। | REPORT BLOOD FROM THE WOUNDED IMMEDIATELY खून से लथपत लोगों को तुरंत सूचित करें। | DISPOSE OF SARCOPHAGI प्राणदायक कचरे को उचित ढंग से निपटाएं। |
| BUY AS LITTLE NECESSITIES AS POSSIBLE संभवतः कम से कम आवश्यकताएं खरीदें। | STRICTLY OBEY THE RAILWAY REGULATIONS रेलवे नियमों का कड़ाई से पालन करें। | HELP THE FAMILIES OF THE FALLEN SOLDIERS सैनिकों के परिवारों में मदद करें। |
| KEEP PHEASANTS AND LATELY खिलानों और लेटियों को सुरक्षित रखें। | JOIN H.O.C. AND RECEIVE THE WOUNDS एच.ओ.सी. में शामिल होकर घातकों को देखें। | BE PROUD OF YOUR VALLEY HEROES अपनी घाटी की वीरों से गर्व करें। |
| DO NOT HOARD WEAPONS हथियारों को जमा न करें। | JOIN THE ARMED FORCES OF THE COUNTRY देश की सशस्त्र सेना में शामिल हों। | |

CD02 : Air Raid Precautions Before the Raid

Air Raid Precautions Before the Raid

हवाई हमले से बचाव हमले से पहले



When you see the Air Raid Warning Signal, you should follow the instructions given below. The Air Raid Warning Signal is shown by a siren and a red light. The siren sounds a long note, followed by a short note. The red light flashes.



Go to an air raid shelter as soon as you see the signal. If there is no shelter, take cover under a sturdy table or desk. Lie flat on the ground and cover your head with your hands.



Wear a gas mask and a protective helmet. If you do not have one, use a handkerchief to cover your nose and mouth. Wear a thick coat and a hat.



Evacuate to an air raid shelter as soon as you see the signal. If there is no shelter, take cover under a sturdy table or desk. Lie flat on the ground and cover your head with your hands.



Do not use elevators or lifts. Use the stairs if you are in a multi-story building. Do not use lifts in a lift shaft.



Do not use lifts or elevators. Use the stairs if you are in a multi-story building. Do not use lifts in a lift shaft.

CD03 : Air Raid Precautions During the Raid

AIR RAID PRECAUTIONS DURING THE RAID

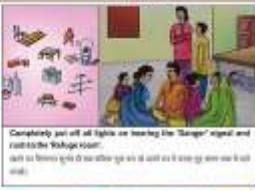
हवाई हमले से बचाव हमले की स्थिति में



When you see the Air Raid Warning Signal, you should follow the instructions given below. The Air Raid Warning Signal is shown by a siren and a red light. The siren sounds a long note, followed by a short note. The red light flashes.



Go to an air raid shelter as soon as you see the signal. If there is no shelter, take cover under a sturdy table or desk. Lie flat on the ground and cover your head with your hands.



Do not use lifts or elevators. Use the stairs if you are in a multi-story building. Do not use lifts in a lift shaft.



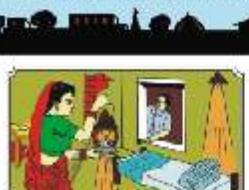
Do not use lifts or elevators. Use the stairs if you are in a multi-story building. Do not use lifts in a lift shaft.



Do not use lifts or elevators. Use the stairs if you are in a multi-story building. Do not use lifts in a lift shaft.

CD04 : Black Out Instructions

BLACK OUT INSTRUCTIONS रोशनी गुल के निर्देश



Turn off all lights at the time of a blackout. Do not use lights in the street. Do not use lights in the house. Do not use lights in the car.



Do not use lights in the street. Do not use lights in the house. Do not use lights in the car.



Do not use lights in the street. Do not use lights in the house. Do not use lights in the car.



Do not use lights in the street. Do not use lights in the house. Do not use lights in the car.



Do not use lights in the street. Do not use lights in the house. Do not use lights in the car.



Do not use lights in the street. Do not use lights in the house. Do not use lights in the car.

CD05 : Life Saving First Aid Instructions

Life Saving First Aid Instructions

जीवन बचाने के प्राथमिक उपचार

GENERAL INSTRUCTIONS



First aid instructions for various injuries and emergencies, including CPR, first aid for cuts, burns, and fractures.

FRACTURES

CUTS

BURNS

CPR

CD06 : Rescue Work After the Raid

RESCUE WORK AFTER THE RAID

घायलों की निकासी हवाई हमले के पश्चात्

IN AIR RAID PEOPLE MAY BE TRAPPED. MANY MAY BE UNLESS IMMEDIATELY RESCUED, ACT UPON THESE INSTRUCTIONS.



How to rescue people from a collapsed building, a burning building, and a building with a gas leak.



How to rescue people from a collapsed building, a burning building, and a building with a gas leak.



How to rescue people from a collapsed building, a burning building, and a building with a gas leak.

CD07 : Fire Fighting

FIRE FIGHTING आग से सुरक्षा



How to use a fire extinguisher, how to escape from a burning building, and how to prevent fires.



How to use a fire extinguisher, how to escape from a burning building, and how to prevent fires.



How to use a fire extinguisher, how to escape from a burning building, and how to prevent fires.

FC01 : What is Field Craft

क्षेत्र कौशल क्या है ?

यह कौशल वह कौशल है जो सैनिक को युद्ध के क्षेत्र में अपने शत्रु से छिपने में मदद करता है।

क्षेत्र कौशल की आवश्यकताएँ

1. युद्ध के क्षेत्र में शत्रु से छिपना।
2. युद्ध के क्षेत्र में शत्रु से छिपने में मदद करना।
3. युद्ध के क्षेत्र में शत्रु से छिपने में मदद करना।
4. युद्ध के क्षेत्र में शत्रु से छिपने में मदद करना।
5. युद्ध के क्षेत्र में शत्रु से छिपने में मदद करना।
6. युद्ध के क्षेत्र में शत्रु से छिपने में मदद करना।
7. युद्ध के क्षेत्र में शत्रु से छिपने में मदद करना।
8. युद्ध के क्षेत्र में शत्रु से छिपने में मदद करना।

WHAT IS FIELD CRAFT?

IT IS THE ART OF MAKING THE BEST USE OF THE AVAILABLE GROUND AND THE VEGETATION WITHIN THE VIEW OF THE ENEMY TO CONCEAL THE POSITION OF THE SOLDIERS AND TO PROTECT THEM FROM THE ENEMY'S FIRE AND TO GAIN ADVANTAGE IN THE FIGHT.

ESSENTIALS OF FIELD CRAFT

1. Intelligence and Observation
2. Physical Fitness
3. Mental Alertness
4. Good Knowledge of Weapons and Ammunition
5. Good Knowledge of the Terrain
6. Good Knowledge of the Weather
7. Good Knowledge of the Enemy
8. Good Knowledge of the Own Troop

A GOOD FIELD CRAFT MAN MUST HAVE

1. Intelligence and Observation
2. Physical Fitness
3. Mental Alertness
4. Good Knowledge of Weapons and Ammunition
5. Good Knowledge of the Terrain
6. Good Knowledge of the Weather
7. Good Knowledge of the Enemy
8. Good Knowledge of the Own Troop

FC02 : Ground Observation

Ground Observation क्षेत्र अवलोकन

Ground can be classified as below

1. High Ground - Higher than the surrounding area.
2. Low Ground - Lower than the surrounding area.
3. Level Ground - Same level as the surrounding area.
4. Sloping Ground - Sloping upwards or downwards.
5. Irregular Ground - Ground with many small hills and valleys.
6. Obstructed Ground - Ground with many trees and buildings.
7. Open Ground - Ground with few trees and buildings.
8. Waterlogged Ground - Ground with many water bodies.
9. Rocky Ground - Ground with many rocks.
10. Sandy Ground - Ground with many sand dunes.
11. Clayey Ground - Ground with many clay deposits.
12. Silty Ground - Ground with many silt deposits.
13. Salty Ground - Ground with many salt deposits.
14. Acidic Ground - Ground with many acid deposits.
15. Alkaline Ground - Ground with many alkaline deposits.

SEARCHING GROUND क्षेत्र की खोज

Method of searching ground

1. Visual Search
2. Aerial Search
3. Ground Search
4. Night Search
5. Day Search
6. Night Search
7. Day Search
8. Night Search
9. Day Search
10. Night Search
11. Day Search
12. Night Search
13. Day Search
14. Night Search
15. Day Search

FC03 : Judging Distance

JUDGING DISTANCE

IT ENABLES A SOLDIER TO ESTIMATE THE RANGE OF ENEMY & TO JUDGE THE WIND ELEVATION ETC. WHEN FIRING.

METHODS OF JUDGING DISTANCE

1. Unit of Measurement
2. Appearance Method
3. Braking Method
4. Range Marker
5. Number Average

MAIN CAUSES OF INACCURATE JUDGEMENT

1. Light
2. Fog
3. Smoke
4. Wind
5. Rain
6. Snow
7. Ice
8. Dust
9. Sand
10. Mud
11. Water
12. Oil
13. Grease
14. Wax
15. Resin
16. Gum
17. Sugar
18. Salt
19. Pepper
20. Mustard
21. Turmeric
22. Indigo
23. Red
24. Yellow
25. Green
26. Blue
27. Purple
28. Pink
29. Grey
30. Black

IMPORTANCE OF ACCURATE JUDGING DISTANCE

Accurate judgement of distance is essential for the success of the attack.

FC04 : Movements & Section Formations

MOVEMENTS & SECTION FORMATIONS

THE CAT WALK

THE BITTER CRAWL

THE HULL

THE LEOPARD CRAWL

THE MONKEY RUN

THE BELLY CRAWL

SECTION FORMATIONS

| PATTERN OF FILE | ADVANTAGES | DISADVANTAGES |
|---------------------|--|---|
| Single File | Good for narrow lanes, narrow streets, narrow paths. | Not for long lanes, narrow streets, narrow paths. |
| Double File | Good for narrow lanes, narrow streets, narrow paths. | Not for long lanes, narrow streets, narrow paths. |
| Column File | Good for narrow lanes, narrow streets, narrow paths. | Not for long lanes, narrow streets, narrow paths. |
| Arrow Head File | Good for narrow lanes, narrow streets, narrow paths. | Not for long lanes, narrow streets, narrow paths. |
| Spine and Tail File | Good for narrow lanes, narrow streets, narrow paths. | Not for long lanes, narrow streets, narrow paths. |
| Staggered Formation | Good for narrow lanes, narrow streets, narrow paths. | Not for long lanes, narrow streets, narrow paths. |

FC05 Camouflage & Concealment

CAMOUFLAGE & CONCEALMENT

CONCEALMENT - The art of making use of trees, bushes and other natural features to hide the position of the soldier.

CONCEALMENT - The art of making use of trees, bushes and other natural features to hide the position of the soldier.

COVERS FROM VIEW

Police Uncoloured Grouse

Birds

Trailing Camouflage in Shallow

Rocky Outcrops

Artificial Weeds to Hide Troops

COVERS FROM FIRE

Shallow and Shallow

Shallow and Shallow

Garden and Woods

Hills and Hills

Old Damaged Buildings

Remember Guy West BASSWOOD

FC06 : Indication & Recognition of Targets

INDICATION & RECOGNITION OF TARGETS

A soldier commander must be able to indicate and recognize the target fairly accurately to point out to his commander or to other soldiers.

REFERENCE POINT METHOD

Selected reference points are indicated by the target.

2. CHECK BY METHOD

Check by method is used to indicate the target.

3. USE OF DEGREES, HAND SIGNS, DEGREES METHOD

Use of degrees, hand signs, degrees method is used to indicate the target.

4. METHOD OF MEASUREMENT WITH INSTRUMENT OF BELL-CURVED

Method of measurement with instrument of bell-curved is used to indicate the target.

5. BEARINGS

Bearings is used to indicate the target.

FC07 : Field Signals

FIELD SIGNALS

FIELD SIGNALS - The use of hand, light, sound, or other means to convey messages.

REFERENCE POINTS

Reference points are used to indicate the target.

5. BEARINGS

Bearings is used to indicate the target.

NCC01 : The Oath & Aims of NCC

THE OATH & AIMS OF NCC

एन०सी०सी० की शपथ और उद्देश्य

THE OATH शपथ

I do hereby solemnly swear that I will serve my Motherland manly, and loyally, and shall abide by the rules & regulations of the National Cadet Corps. Further under the command and control of my Commanding Officer, will participate in every camp, exercise, march and manoeuvre, that may be ordered.

मैं यहाँ शपथ करता हूँ कि मैं सचमुचे और वफादारी के साथ ही अपनी मातृभूमि की रक्षा करूँगा। मैं राष्ट्रीय कैडेट कोर्स के नियमों और शर्तों का पालन करूँगा। मैं अपने कमाण्डिंग ऑफिसर के नियंत्रण और नियंत्रण में भाग लूँगा। मैं अपने कमाण्डिंग ऑफिसर के नियंत्रण में भाग लूँगा। मैं अपने कमाण्डिंग ऑफिसर के नियंत्रण में भाग लूँगा।

THE PLEDGE प्रतिज्ञा

We the cadets of the nation do solemnly pledge that we shall always uphold the unity of India. We resolve to be disciplined and responsible citizens of our nation. We shall undertake every duty bravely in the spirit of selflessness and concern for our fellow beings.

हम राष्ट्रीय कैडेट कोर्स के सदस्य हैं, हम प्रतिज्ञा करते हैं, कि हम हमेशा भारत की एकता बनाए रखेंगे। हम अपने देश के एक अनुशासित और जिम्मेदार नागरिक बनने का संकल्प लेते हैं। हम अपने देश के कल्याण के लिए अपने स्वयंसेवकता के भाव से अपने कर्तव्य को निष्ठापूर्वक निभाएंगे।

THE AIMS OF NCC राष्ट्रीय कैडेट कोर्स के उद्देश्य

- To develop character, confidence, discipline, leadership, social outlook, spirit of adventure and the skills of fitness service amongst the youth of the country.
- To create a human resource of organized, trained and motivated youth, to provide succour in all walks of life and a help as available to the services of the nation.
- To provide a suitable environment to motivate the youth to serve up-actively in the Armed Forces.




NCC02 : Duty & Discipline

करतव्य और अनुशासन DUTY & DISCIPLINE

अनुशासन की चार प्रधान धारें Four Cardinal of Discipline

- अभ्यास - अभ्यास ही अनुशासन का आधार है।
- अनुशासन - अनुशासन ही अनुशासन का आधार है।
- अभ्यास - अनुशासन ही अनुशासन का आधार है।
- अनुशासन - अनुशासन ही अनुशासन का आधार है।

मूल मूल नियम Fundamental Rules

- अभ्यास - अभ्यास ही अनुशासन का आधार है।
- अनुशासन - अनुशासन ही अनुशासन का आधार है।
- अभ्यास - अनुशासन ही अनुशासन का आधार है।
- अनुशासन - अनुशासन ही अनुशासन का आधार है।

दैनिक शिक्षा की शपथ NCC Cadet's Prayer

O, God, Our Father,
 Grant that we may be true to our duty and to our Motherland, and that we may be true to our duty and to our Motherland, and that we may be true to our duty and to our Motherland.

NCC04 : N.C.C. Organisation

N.C.C. ORGANISATION

DIRECTOR GENERAL N.C.C. NEW DELHI

TRAINING, ADMINISTRATION, P & C, INSPECTORATE

STATE N.C.C. DIRECTORATES

STATE N.C.C. HEADQUARTERS

N.C.C. GROUP H.Q.

N.C.C. BATTALION H.Q.

N.C.C. COMPANY HEADQUARTERS

AT02 : Principles of Musketry

PRINCIPLES OF MUSKETRY

मस्कट्री के सिद्धान्त

DEFINITIONS परिभाषाएँ

SECTION OF TRAJECTORY प्रक्षेप-पथ का खण्डचित्र

EFFECT OF WIND ON FLAGS ध्वजों पर पवन का प्रभाव

CORRECT AIM AND COMMON FAULTS सही और गलत निशाना

A103 : Rank Badges

RANK BADGES

POLICE, G.R.P.F., B.S.F., HOME GUARDS, FIRE SERVICES

AS03 : Rifle 7.62mm SLR

RIFLE 7.62mm SLR

राइफल 7.62 मिमी एस्क एल आर

Sectionalised View and Trigger Mechanism

विभाजित दृश्य तथा ट्रिगर मैकेनिज्म के दिवार को चलाने का ढंग

Size 50 x 70 cm

Size 70 x 100 cm

BGS01 : How to Hold the Arms

HOW TO HOLD THE ARMS

चट्टान जैसी मजबूत पकड़

Comfortable lying position helps in keeping the rifle steady. आरामदायक लेटी हुई अवस्था राईफल को स्थिर करने में मदद देती है।

Fig.1. Comfortable Lying Position (Top View) - Equilateral triangle formed by joining the points where the lower part of the chest leaves the ground, the left elbow and the right elbow rest on the ground.

चित्र-1 आरामदायक लेटी हुई अवस्था (पहला चरण) - छाती के खनीय को जोड़ने की जगह, बाईं कोहनी और दाईं कोहनी की जगह के काल्पनिक बिंदुओं को मिलाने से एक समभुज त्रिकोण बनता है।

Fig.2. Lying Position (Front View) - Vertical triangle has its corners at the left elbow, the right elbow and that part of the rifle falling vertically above them.

चित्र-2 लेटी हुई अवस्था (सहजाने से) - खड़ा त्रिकोण जो कि फायर करने वाले के सामने से देखा जाता है, बाईं और दाईं कोहनी की जगह और राईफल का वह हिस्सा जो रिवल्वर का बल्ले के बिन्दु को मिलाने से बनता है।

Fig.3. The body should be oblique to the line of the fire; legs well spread out and feet flat on the ground and without feeling any strain.

चित्र-3 फायर करने वाले का शरीर फायर करने की दिशा से तिरछा हो, खसकी टांगें खुली हुई और एड़ियाँ समतल, रिवल्वर बिना बल्ले के हो सके, इसी चाहिए।

Fig.4. Holding Rifle with Left Hand- Support the rifle at the point of balance as far forward as possible.

चित्र-4 बायें हाथ से राईफल का पकड़ना- बायें हाथ का काम राईफल को स्थिर रखने वाले स्थान पर सहाय देना है। राईफल को सिलसा हो रखे जाने को।

Fig.5. Function of the Right Hand- Right hand is the master hand for every round fired. It (except the index finger) grips the butt of the rifle firmly. The index finger to coil round the trigger.

चित्र-5 बायें हाथ का प्रयोग- बायाँ हाथ हर गोली के लिए मास्टर हैंड का काम करता है। इस हाथ द्वारा खनीय रिवल्वर के अतिरिक्त शेष भाग से बट को मजबूती से पकड़ना चाहिए। रिवल्वर घूमे के ठीक ऊपर घूमे को ठीक से पकड़ सकते हैं।

Fig.6. Function of the Right Shoulder- Thrust it forward to meet the butt of the rifle to such an extent that it is not possible for it to move any further and lock the butt firmly in the shoulder.

चित्र-6 बायें कंधे का प्रयोग- बायें कंधे को बट के साथ मिलाने करने के लिए इस इन्ड तक आगे धकेंगे कि और आगे न जा सकें। बट जो कंधे में ठीक प्रकार से जमा हो।

Fig.7. Position of the Butt Plate- The butt plate including the heel should bear on the anterior muscle pad of the shoulder joint. It should not rest in the collar bone.

चित्र-7 बट प्लेट की पोजीशन- बट प्लेट रिवल्वर बट इन्ड भी शामिल है, कंधे से पुटले पर फायर लगनी चाहिए। इसे छाती जगह का फले की हड्डी पर नहीं जमाव करिये।

Fig.8. Position of the Head- Its weight exerts pressure on the butt from left for further steadying the rifle and locking of the whole position. It should naturally be relaxed on the butt.

चित्र-8 शिर का उपयोग- शिर से बट पर बाईं ओर से थोड़ा दबाव दिये ताकि राईफल और भी स्थिर हो जाए और शारीरी कोशिका जकड़ जाए। शिर स्वाभाविक रूप से बट पर टिका हो।

BGS02 : Correct and Incorrect Aiming

CORRECT AND INCORRECT AIMING

ठीक और गलत शिस्त

BY AIMING AS UNDER THE BULLET WILL HIT AS INDICATED ON THE TARGET. फिजिकल प्रकृत के हिसाब से जो जगह पर फिजिकल प्रकृत पर गोली लगेगी।

UP - Taking eye too high. (आँखें बहुत ऊपर लेनी)

DOWN - Taking eye too low. (आँखें बहुत नीचे लेनी)

RIGHT UP - Aiming too high and to the right. (बायें ओर बहुत ऊपर लेनी)

LEFT DOWN - Aiming too low and to the left. (दायें ओर बहुत नीचे लेनी)

RIGHT DOWN - Aiming too low and to the right. (बायें ओर बहुत नीचे लेनी)

LEFT UP - Aiming too high and to the left. (दायें ओर बहुत ऊपर लेनी)

CORRECT - Aiming as under. (ठीक शिस्त)

SHOOT TO KILL. गोली घेरी मारो कि तुम्हारे शिर में जाएं

BGS03 : Correct Trigger Operation

CORRECT TRIGGER OPERATION

ट्रिगर की सही कार्यवाही

Correct trigger operation is essential for accurate shooting. सही ट्रिगर ऑपरेशन सटीक शूटिंग के लिए आवश्यक है।

Correct Trigger Operation: The trigger should be pulled straight back with the index finger. The trigger should not be pulled up or down.

Incorrect Trigger Operation: Pulling the trigger up or down will result in an inaccurate shot.

Diagram 1: Correct - Index finger pulls trigger straight back.

Diagram 2: Incorrect - Index finger pulls trigger up.

Diagram 3: Incorrect - Index finger pulls trigger down.

Diagram 4: Correct - Trigger is pulled straight back.

Diagram 5: Incorrect - Trigger is pulled up.

Diagram 6: Incorrect - Trigger is pulled down.

Diagram 7: Correct - Trigger is pulled straight back.

Diagram 8: Incorrect - Trigger is pulled up.

Diagram 9: Incorrect - Trigger is pulled down.

BGS04 : Firing Positions

FIRING POSITIONS

निशाना लगाने की अवस्था

PRONE POSITION (पहला चरण) - The soldier lies on their back, holding the rifle. This position provides the most stability.

SITTING POSITION (दूसरा चरण) - The soldier sits on the ground, holding the rifle. This position is used for short-range shooting.

STANDING POSITION (तीसरा चरण) - The soldier stands, holding the rifle. This position is used for long-range shooting.

KNEELING POSITION (चौथा चरण) - The soldier kneels on one knee, holding the rifle. This position is used for medium-range shooting.

BGS05 : Wind, Elevation & Minute Tables

WIND, ELEVATION & MINUTE TABLES

पवन, एलीवेशन और मिनट टेबल

ADAPTIVE WIND ALLOWANCE IS MOST IMPORTANT. IT DEPENDS ON THE STRENGTH AND DIRECTION OF THE WIND AND THE RANGE.

WIND STRENGTH:

- 1. GENTLE - 1 to 3 mph
- 2. MODERATE - 4 to 6 mph
- 3. STRONG - 7 to 9 mph
- 4. VERY STRONG - 10 to 12 mph

DEFLECTION OF THE WIND:

The wind deflection is in the direction of the wind. The deflection is greater at the beginning of the range and less at the end.

THE FORCE OF THE WIND AT THE Firing POINT AFFECTS THE BULLET THROUGHOUT ITS FLIGHT.

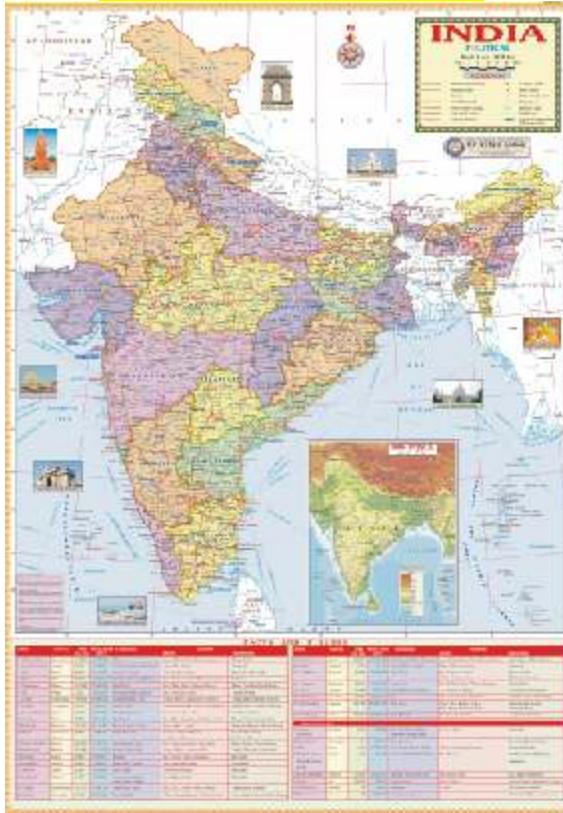
| RANGE | WIND | WIND OFF FOR 100 YARDS | WIND OFF FOR 200 YARDS | WIND OFF FOR 300 YARDS |
|-----------|-------|------------------------|------------------------|------------------------|
| 100 YARDS | 1 mph | 1.0 | 1.0 | 1.0 |
| | 2 mph | 2.0 | 2.0 | 2.0 |
| | 3 mph | 3.0 | 3.0 | 3.0 |
| | 4 mph | 4.0 | 4.0 | 4.0 |
| 200 YARDS | 1 mph | 2.0 | 2.0 | 2.0 |
| | 2 mph | 4.0 | 4.0 | 4.0 |
| | 3 mph | 6.0 | 6.0 | 6.0 |
| | 4 mph | 8.0 | 8.0 | 8.0 |
| 300 YARDS | 1 mph | 3.0 | 3.0 | 3.0 |
| | 2 mph | 6.0 | 6.0 | 6.0 |
| | 3 mph | 9.0 | 9.0 | 9.0 |
| | 4 mph | 12.0 | 12.0 | 12.0 |

ELEVATION TABLES:

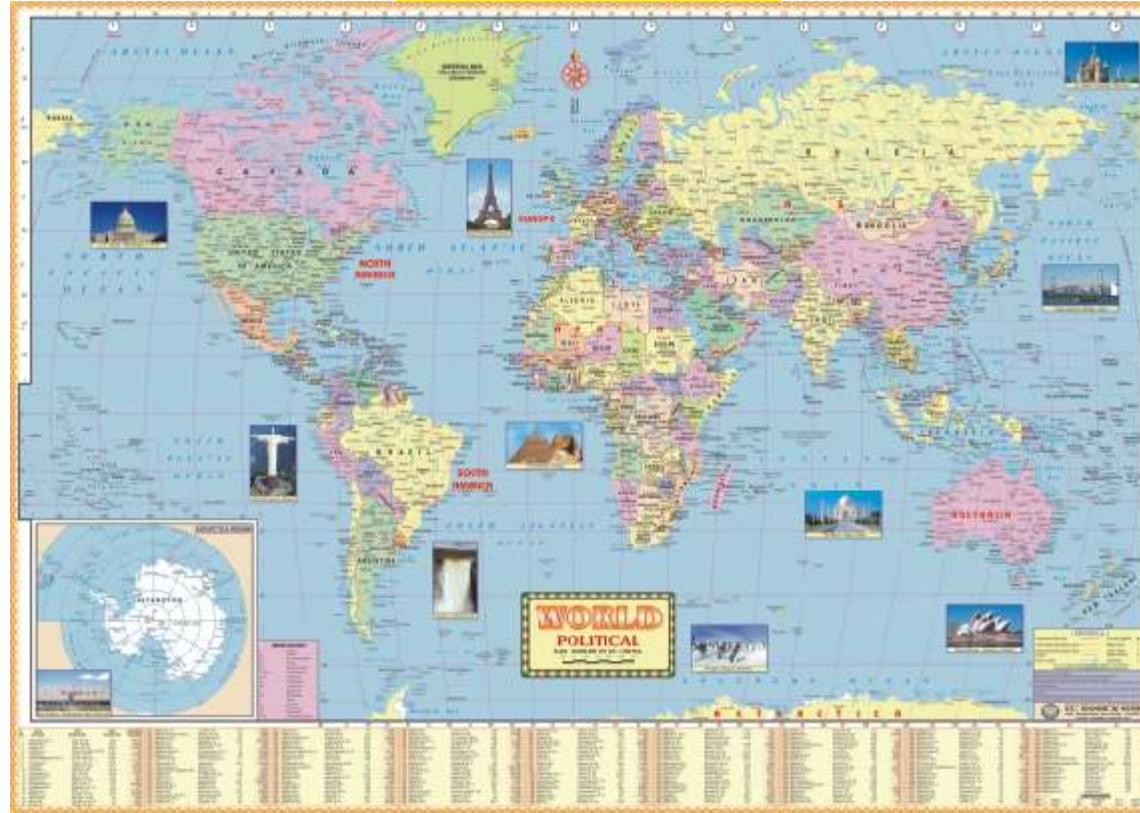
MINUTE TABLES:

These tables provide the necessary data for adjusting the rifle for wind and elevation. The wind tables show the deflection of the bullet in inches for various wind strengths and directions. The elevation tables show the necessary adjustments for different ranges and elevations. The minute tables show the necessary adjustments for different ranges and elevations.

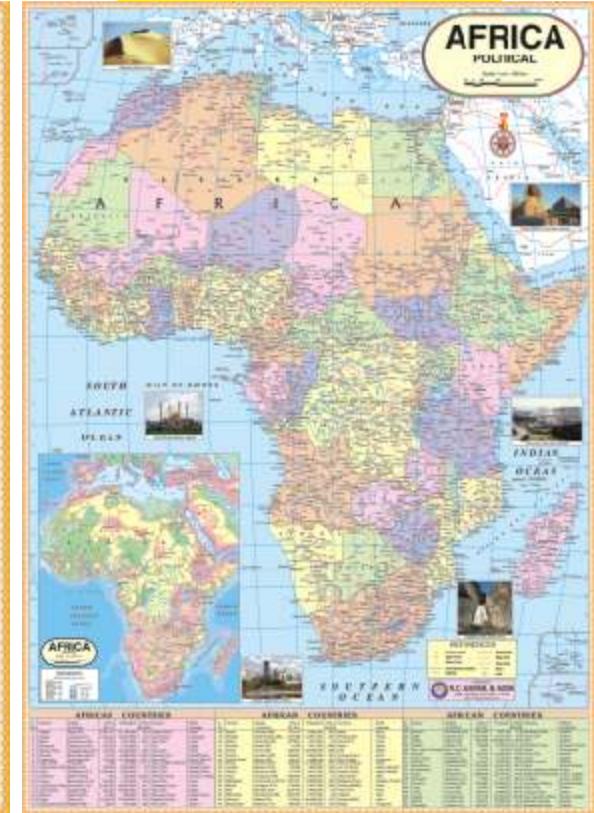
MWM01 : India Political



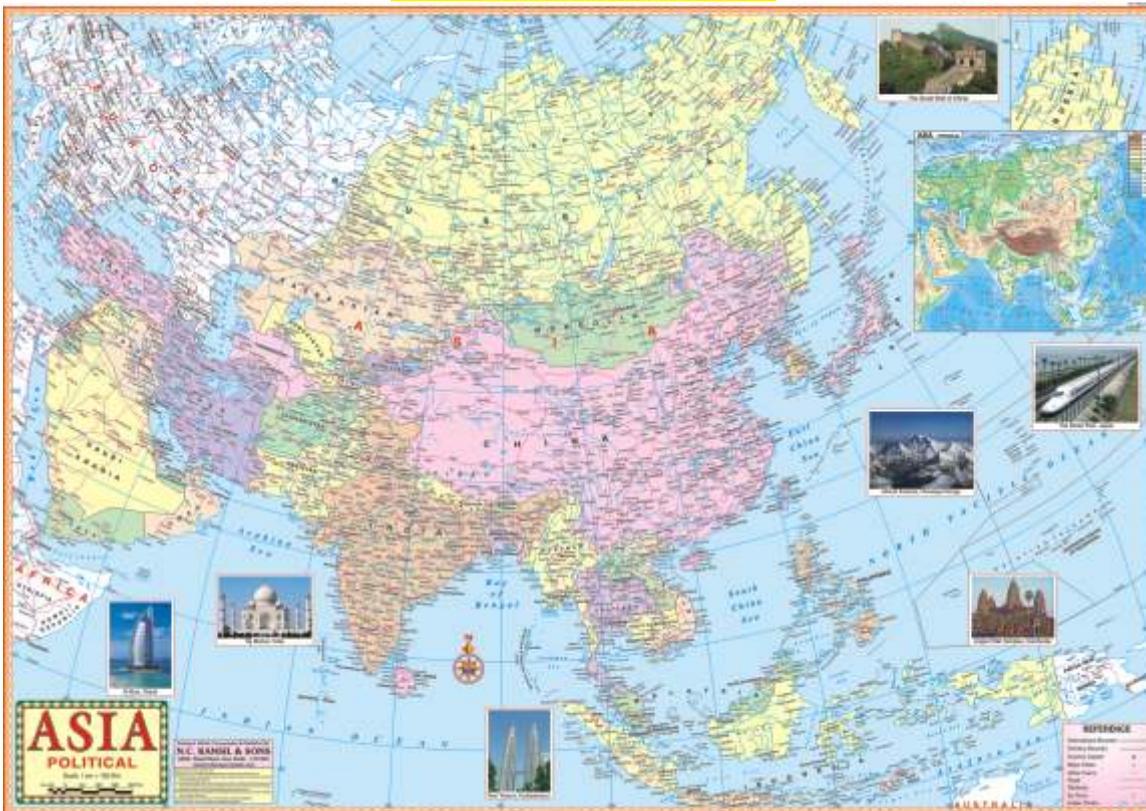
MWM02 : World Political



MWM04 : Africa Political



MWM03 : Asia Political



MWM05 : Australia Political



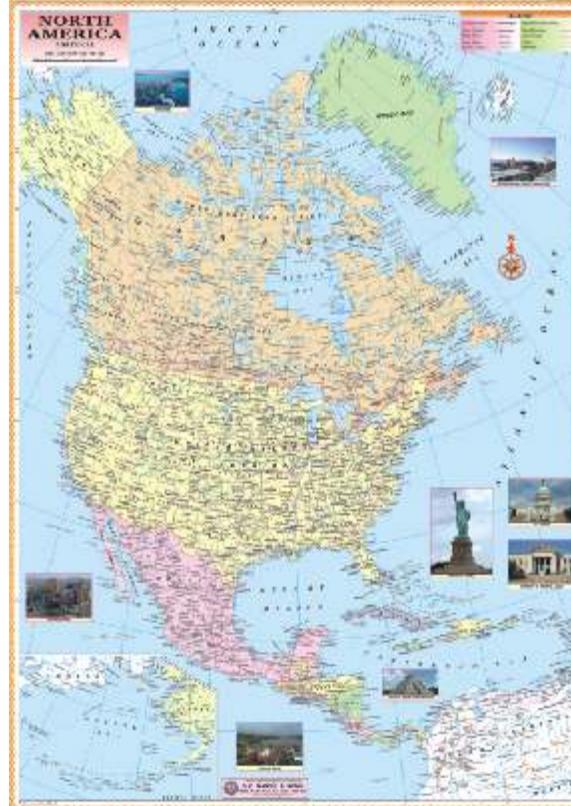
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MAPS

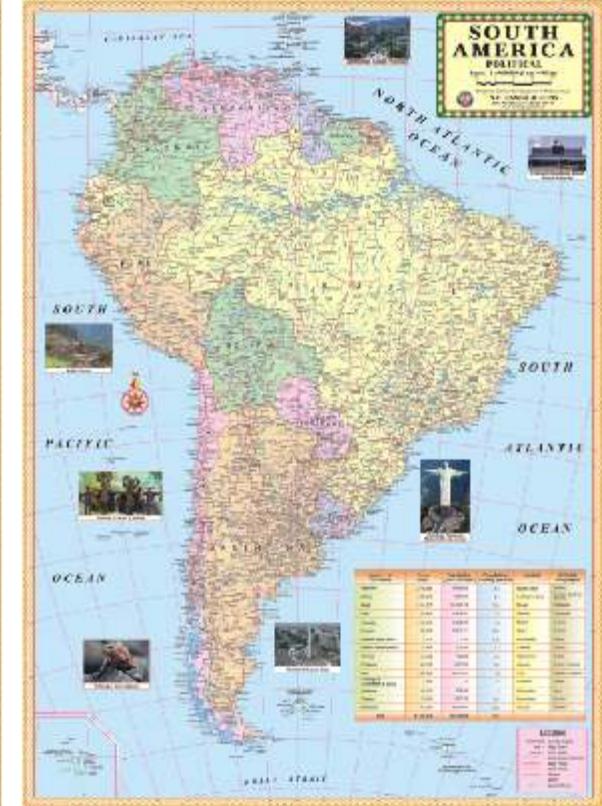
MWM06 : Europe Political



MWM07 : North America Political



MWM08 : South America Political



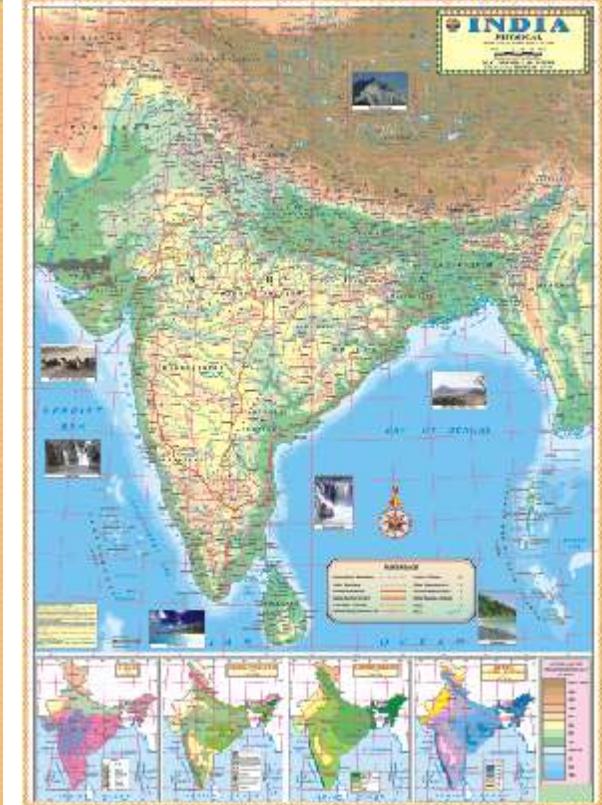
MWM26 : Sri Lanka Political



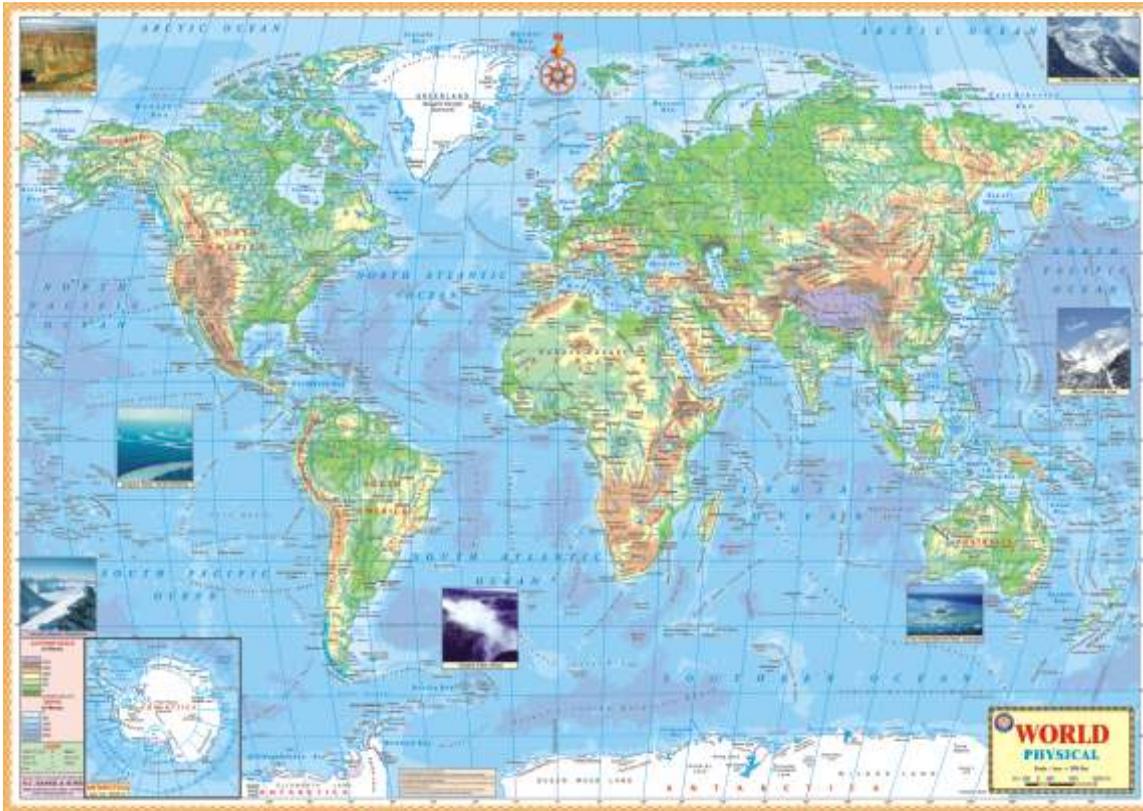
MWM27 : United States of America Political



MWM51 : India Physical



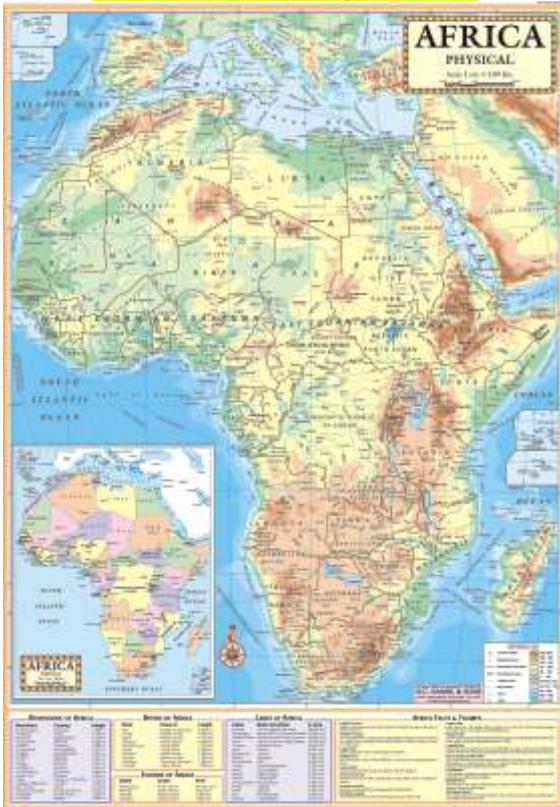
MWM52 : World Physical



MWM53 : Asia Physical



MWM54 : Africa Physical



MWM56 : Europe Physical



MWM58 : South America Physical



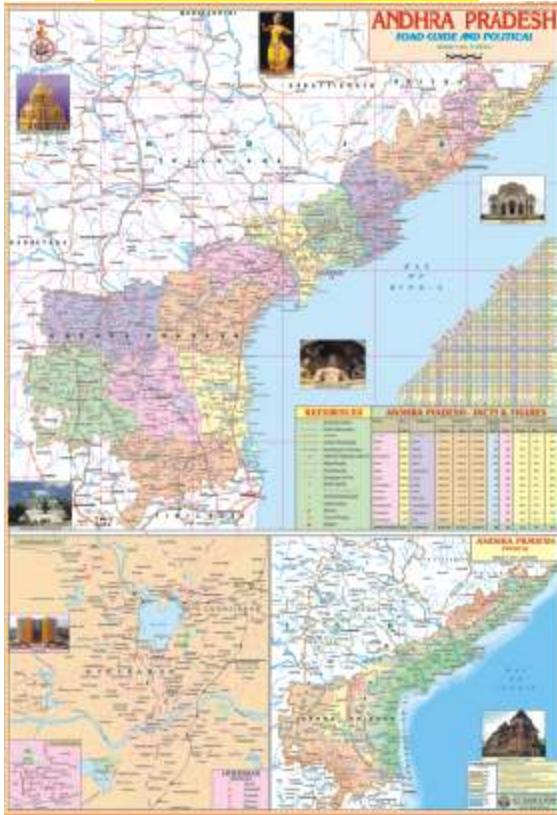
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MAPS

MAPS OF INDIAN STATES

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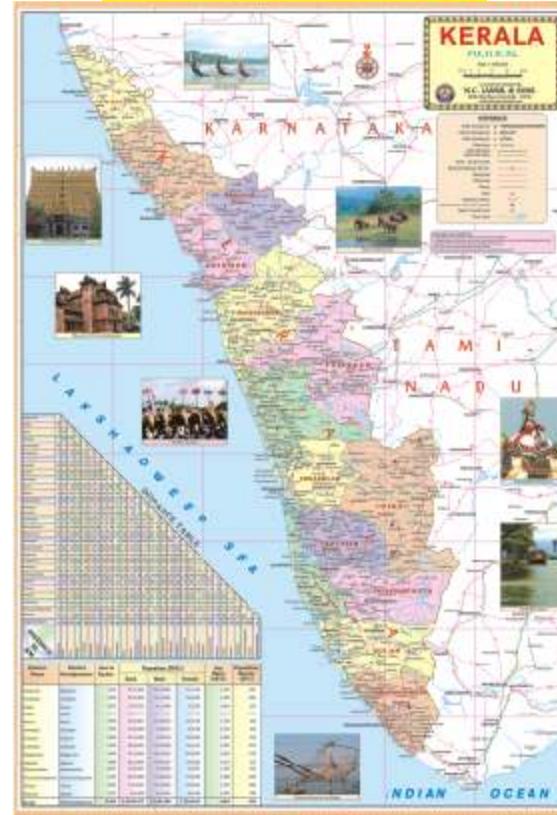
SM02 : Andhra Pradesh Political



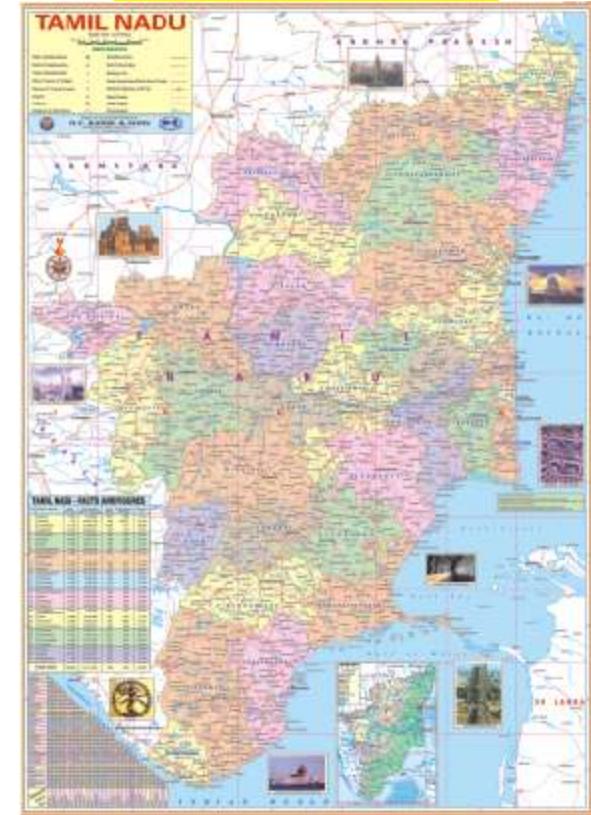
SM08 : Karnataka Political



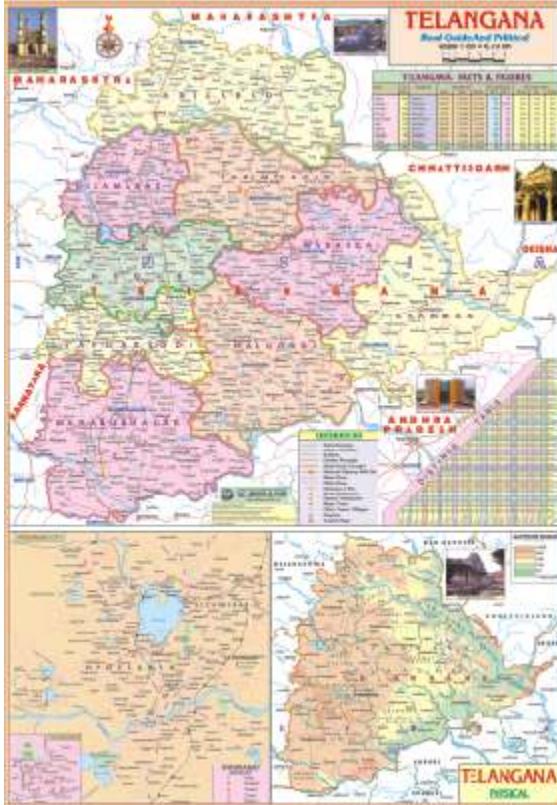
SM09 : Kerala Political



SM12 : Tamilnadu Political



SM16 : Telangana Political



SM65 : Kerala Physical



SM64 : Tamilnadu Physical





South Africa



Eastern Cape



Gauteng



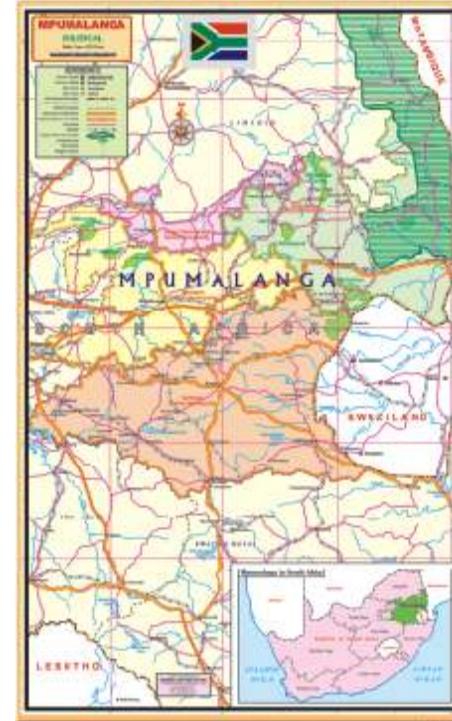
Kwazulu-natal



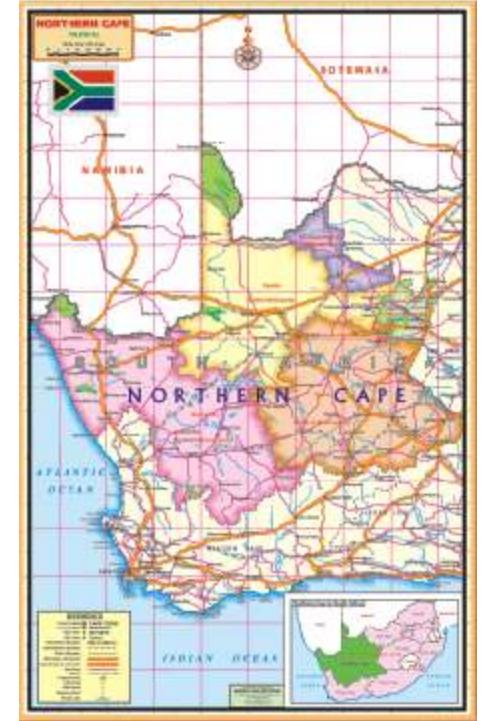
Free State



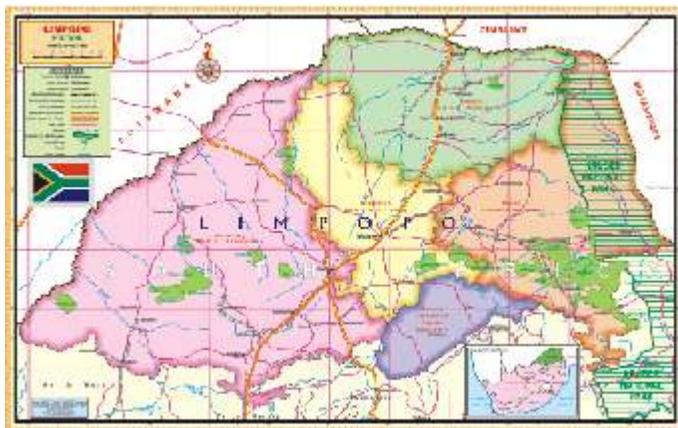
North West



Mpumalanga



North Cape



Limpopo



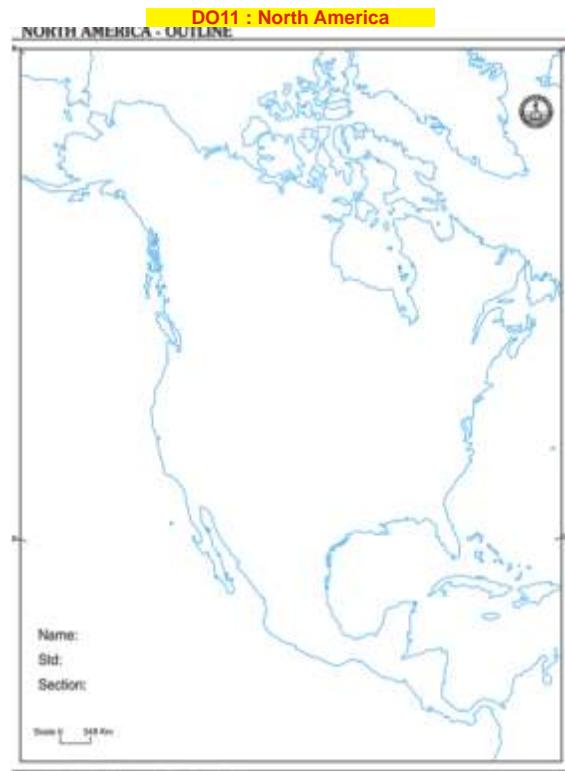
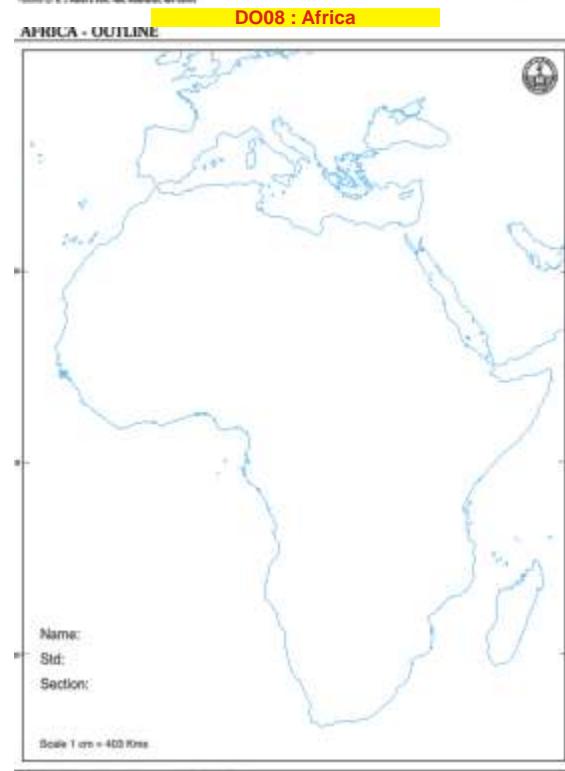
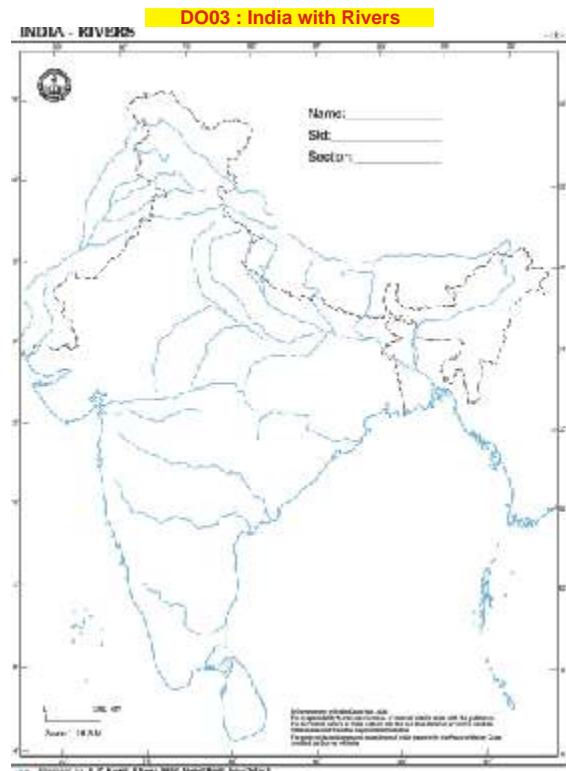
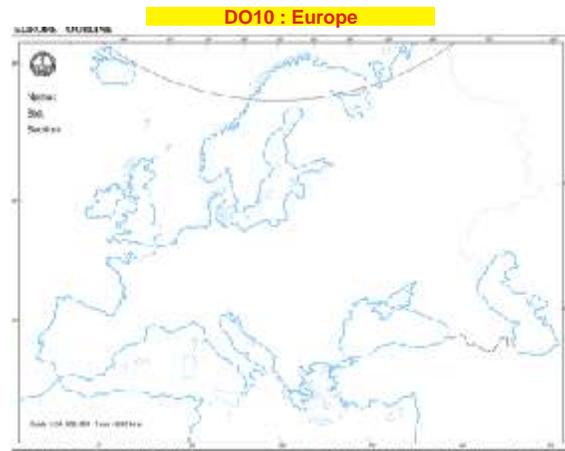
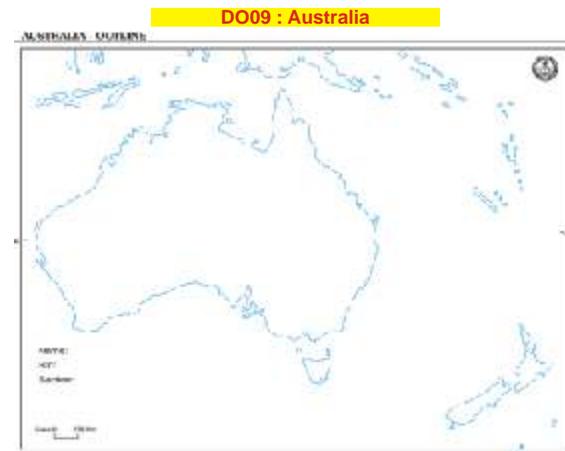
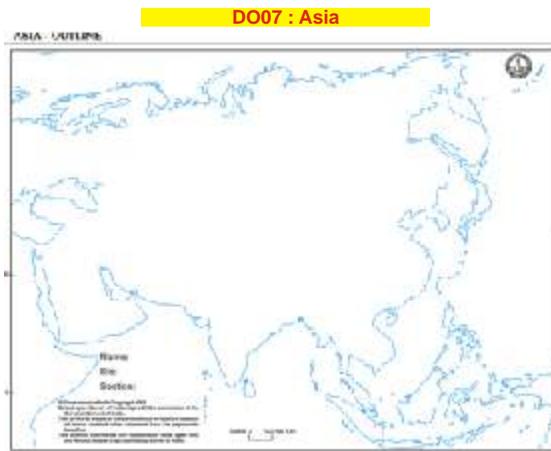
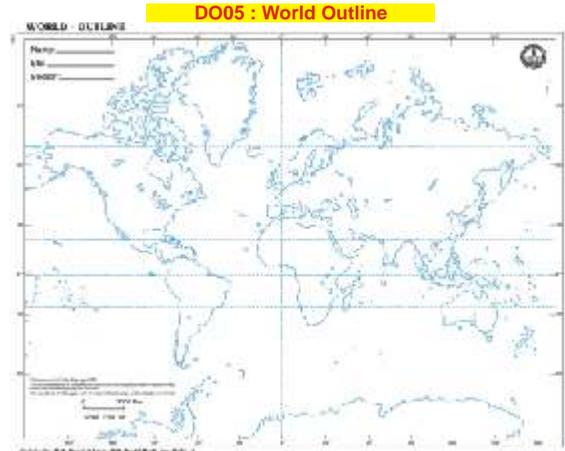
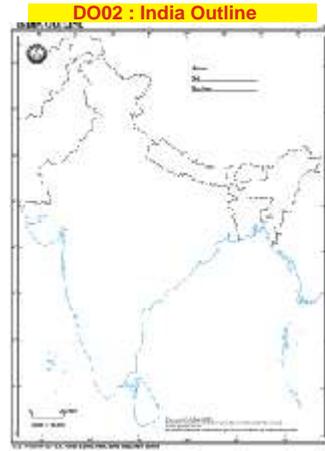
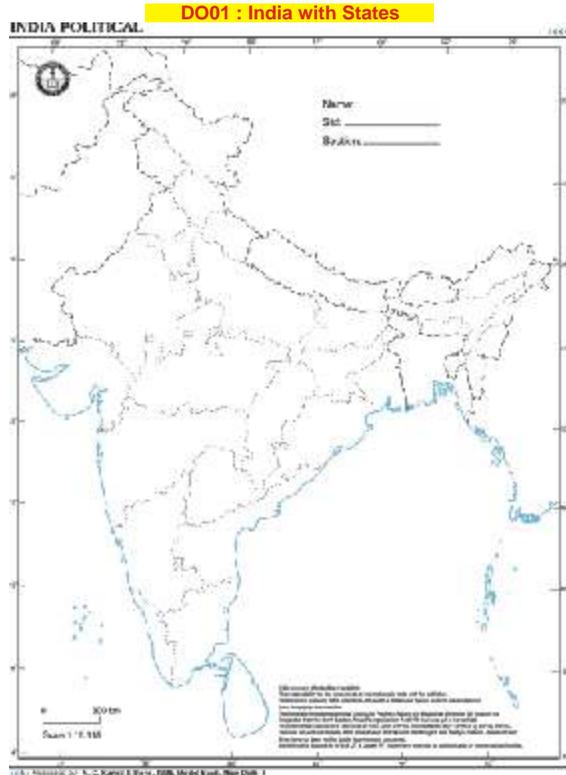
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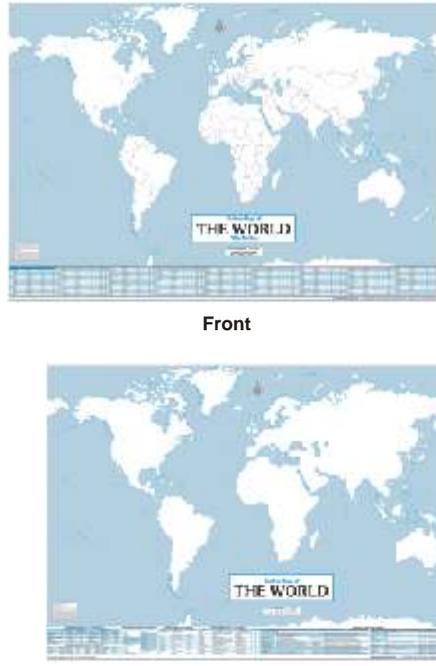
PMM01 : Practice Map of India



Front

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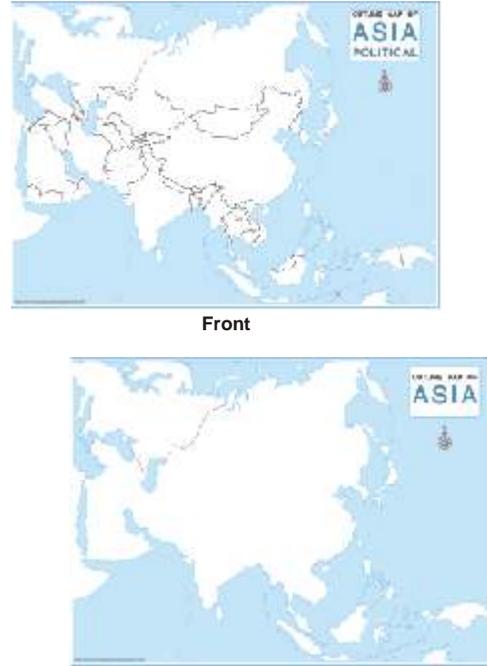
PMM02 : Practice Map of World



Front

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PMM03 : Practice Maps of Asia



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PMM04 : Practice Maps of Africa



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PMM05 : Practice Maps of Australia



Front

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PMM06 : Practice Maps of Europe



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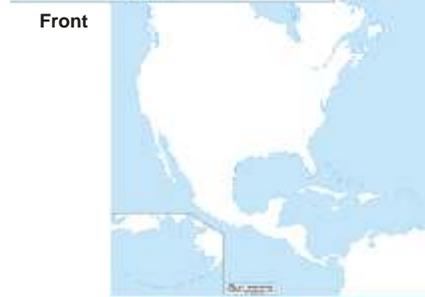


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PMM07 : Practice Maps of North America



Front

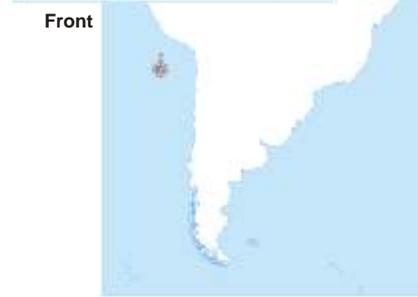


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PMM08 : Practice Maps of South America

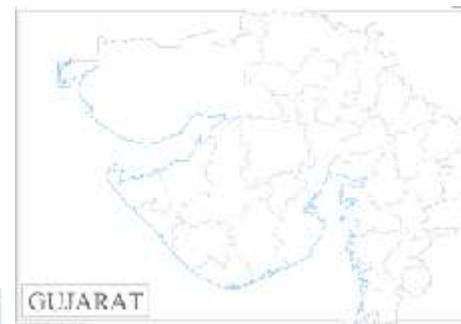


Front

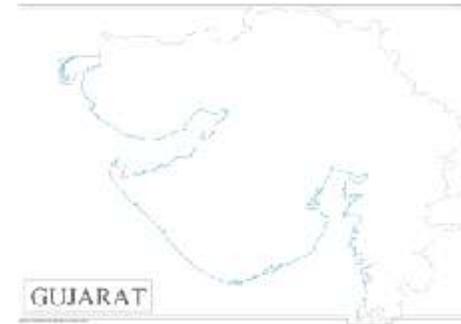


Back

PSM19 : Practice Maps of Gujarat



Front



Back

PMM51R : River Map of India



Single Side

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N. C. Kansil & Sons was established in 1932 by Late Shri N.C. Kansil, an engineer by profession and an educationist at heart, at Lahore (Undivided India). The firm shifted to the present place of its registered office in 1947. Since then we have engaged ourselves in the field of Teaching Learning Materials like maps, charts, globes and models. As the next generations continued to join the family business, from a small publisher of educational maps and charts, it has now grown into a very big establishment as a highly effective distribution center for schools and medical institutions.

Our products have always helped parents and teachers to foster creativity, instill a learning attitude, a positive behaviour and a spirit of enthusiasm in our young generation. We constantly strive to improve our product range in all aspects i.e practically and at the performance level so that our learning aids benefit the child. We constantly innovate new ideas, product techniques in order to offer the best services to our customers in this highly competitive global market.

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Cervical Spine & Occipital Bone

Foot Joint

Skin Model

Skeleton with Muscle Insertion & Ligaments

Teeth Pathologies

Kidney Pathologies

Heart Model

Brain Model

Diabetes Model

Newborn Baby Model Male

Advanced Adult CPR Training Manikin

Charts



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