UNIT -I : Chemical Substances : Nature and Behaviour

Chapter - 1 : Chemical Reactions and Equations

Flowcharts

Types of Chemical Reactions

- Combination Reaction
- Decomposition Reaction
- Displacement Reaction
- Neutralisation Reaction
- Redox Reaction
- Exothermic and Endothermic reactions

- Single displacement reactions
- Double displacement reactions

Thermal decomposition
Electrolysis
Photochemical decomposition
Oxidation Reaction
Reduction Reaction

CORROSION

Examples of Corrosion
(i) Rusting of iron
(ii) Formation of a green layer over copper
(iii) Tarnishing of silver

Conditions Necessary for Corrosion
(i) Presence of air
(ii) Presence of water

Effects of Corrosion
(i) Tonnes of various metals especially iron get wasted in the country

Methods to Prevent Corrosion
(i) By using paints on the iron articles
(ii) By galvanisation
(iii) By electroplating
(iv) By alloy formation

Chapter - 2 : Acids, Bases and Salts

Flowcharts

ACIDS, BASES AND SALTS

- Citric Acid
- Tartaric Acid
- Lactic Acid
- Lemon
- Tamarind
- Curd
- Acetic Acid
- Vinegar
- Sources of Organic Acids
- Ant Sting
- Formic Acid
- Guava
- Oranges and Amla
- Oxalic Acid
- Ascorbic Acid
### ACIDS and BASES

#### Physical Properties
- **Acids**
  1. Sour in taste
  2. Turn blue litmus red
  3. Give $H^+$ ions in aqueous solution
  4. Aqueous solution conducts electricity
- **Bases**
  1. Bitter in taste
  2. Turn red litmus blue
  3. Give $OH^-$ ions in aqueous solution
  4. Does not conduct electricity

#### Chemical Properties
- **Acids**
  1. React with metals to liberate hydrogen
  2. React with metal carbonate to liberate $CO_2$
- **Bases**
  1. Alkali (Soluble bases) react with metals to liberate $H_2$.
  2. Bases react with acidic oxides to form salts.

### SALTS

Formed when an acid and a base react with each other.

#### TYPES OF SALTS

- **Common salt**
  - Formula: $NaCl$
  - Preparation: $NaOH + HCl \rightarrow NaCl + H_2O$
- **Bleaching powder**
  - Formula: $CaOCl_2$
  - Preparation: $Ca(OH)_2 + Cl_2 \rightarrow CaOCl_2 + H_2O$
- **Baking Soda**
  - Formula: $NaHCO_3$
  - Preparation: $Na_2CO_3(aq) + CO_2(g) + H_2O(l) \rightarrow 2NaHCO_3(s)$
- **Washing soda**
  - Formula: $Na_2CO_3.10H_2O$
  - Preparation: $Na_2CO_3+10H_2O \rightarrow Na_2CO_3.10H_2O$
- **Plaster of Paris**
  - Formula: $CaSO_4.\frac{1}{2}H_2O$
  - Preparation: $CaSO_4.2H_2O \rightarrow CaSO_4.\frac{1}{2}H_2O + 1\frac{1}{2}H_2O$


Chapter - 3 : Metals and non-metals

Flowcharts

**METALS**

**Physical Properties**
(i) They are solids.
(ii) They have high M.P. and B.P.
(iii) They have high density.
(iv) They are malleable and ductile.
(v) They are good conductor of heat & electricity.

**Chemical Properties**
(i) Metal + O₂ → Metal oxide
(ii) Metal + H₂O → Metal hydroxide
(iii) Metal + dil acid → Salt + H₂
(iv) Metal + Cl₂ → Metal chloride
(v) Metal + H₂ → Metal hydride

**NON-METALS**

**Physical Properties**
(i) They are found in solid, liquid and gaseous form.
(ii) They have low M.P. and B.P.
(iii) They are not malleable and ductile.
(iv) They are poor conductor of heat & electricity.

**Chemical Properties**
(i) Non-metal + O₂ → Non-metal oxide
(ii) Non-metal + steam → H₂
(iii) Non-metal + acid → No reaction
(iv) Non-metal + Cl₂ → Non-metal chloride

**EXTRACTION OF METALS**

Ore

Concentration/Enrichment of Ore

Ore + Impurities (gangue)

Separation depends on the difference in the physical or chemical properties of ore and the gangue

Metals of high reactivity (Na, K, Mg, Al)

- Electrolysis of Molten Ore
  - Pure metal

Metal of medium reactivity (Zn, Fe, Pb)

- Carbonate Ore (ZnCO₃)
  - Calcination (heat in absence of air)
- Sulphide Ore (ZnS)
  - Roasting (heat in presence of air)
- Oxides of Metal
  - Reduction to metal using carbon
  - Purification of Metal

Metals of low reactivity (Cu, Ag)

- Sulphides Ores (CuFeS₂, CuS, Ag₂S)
  - Roasting (done for sulphide ores only)
- Metal Oxide
  - Reduction by C
- Metal (Impurities)
  - Refining to get Pure metal
Chapter - 4 : Carbon and its compounds

Flowchart

Classification of Hydrocarbons

- Aliphatic or open chain hydrocarbons
  - Saturated hydrocarbons (Hydrocarbons having Single bonds)
    - Alkanes
  - Unsaturated hydrocarbons (Hydrocarbons having Multiple bonds)
    - Alkenes
    - Alkynes
- Cyclic or closed chain hydrocarbons
  - Alicyclic hydrocarbons
  - Aromatic hydrocarbons

Chapter - 5 : Periodic Classification of Elements

Flowcharts

Classification of elements

- Arranged with increasing mass
- Group of three elements having similar properties.
  - Dobereiner’s Triad
    - Main Features: Atomic mass of middle element is arithmetic mean of atomic mass of other two
  - Newland’s Octave
    - Limitations led to
    - Main Features: Every eighth element has properties similar to that of the first
  - Mendeleev’s Periodic Table
    - Modified further
    - Main Features: Elements arranged in vertical groups and horizontal periods
  - Modern Periodic Table
    - Research led to
    - Main Features: Elements arranged on the basis of electronic configuration into 4 groups

- Arranged with increasing atomic number
- upto Ca out of 56 elements
- 63 elements
- 113 elements
UNIT - II : World of Living

Chapter - 6 : Life Processes

Flowcharts

**PATHWAY OF AIR ENTERING THROUGH RESPIRATORY SYSTEM**

- Nostril → Nasal Passage → Pharynx
- Lungs → Trachea → Larynx
- Bronchi → Bronchioles → Alveoli

**BODY PARTS IN ALIMENTARY CANAL AND THEIR SECRETIONS FOR DIGESTION**

- Mouth (Saliva) → Salivary amylase or ptyalin → Pharynx → Oesophagus → Stomach → Hydrochloric acid, Gastric juice, Mucus, Pepsin → Pancreas → Pancreatic juice (Pancreatic amylase), Bile juice (Liver) → Small Intestine → Intestinal Juice → Large Intestine → Anus
VARIOUS STEPS INVOLVED IN THE PROCESS OF NUTRITION

- **Ingestion**: Taking in of food
- **Digestion**: Complex food molecules are converted into simpler food molecules
- **Absorption**: The simple soluble food is absorbed by blood through diffusion
- **Assimilation**: Cells absorbed food through blood for its growth and repair of the body
- **Egestion**: Undigested material is moved to the surface of the cell and thrown out

DIFFERENT WAYS IN WHICH GLUCOSE IS OXIDISED TO PROVIDE ENERGY

- **Absence of oxygen** (In yeast):
  - **Glucose** → **Pyruvate** → **Ethanol + Carbon dioxide + Energy**
    - **(2 carbon molecules)**
- **Lack of Oxygen** (Muscle cells):
  - **Pyruvate** → **Lactic acid + Energy**
    - **(3 carbon molecules)**
- **Presence of oxygen** (In mitochondria):
  - **Pyruvate** → **Carbon dioxide + Water + Energy**

ORGANS INVOLVED IN EXCRETION IN HUMAN BEINGS AND FUNCTION

- **Bowman’s capsule and glomerulus**
  - Filter the blood passing through them
- **Tubular part of nephron**
  - Reabsorb some substances like glucose, amino acids, salts and a major amount of water
- **Collecting duct**
  - Collect urine from nephrons and joins the ureter
- **Ureter**
  - Excrete out urine from the body
Bowman’s capsule and glomerulus
Filter the blood passing through them
Tubular part of nephron
Reabsorb some substances like glucose, amino acids, salts and a major amount of water
Collecting duct
Collect urine from nephrons and joins the ureter
Ureter
Collect urine from kidney and pass it on to urinary bladder
Urinary bladder
Store urine until the pressure of expanded bladder leads to the urge to pass it out
Urethra
Excrete out urine from the body

Chapter - 7 : Control and Co-Ordination

Flowcharts

HUMAN NERVOUS SYSTEM

Central Nervous System (CNS)

Peripheral Nervous System (PNS)

Autonomic Nervous System (ANS)

Brain

Spinal Cord

Cranial nerves (12 pairs)

Spinal nerves (31 pairs)

Sympathetic

Parasympathetic

Forebrain

Mid brain

Hind brain

Cerebrum

Olfactory lobes

Cerebellum

Pons

Medulla Oblongata

1. Occipital lobe
2. Temporal lobe
3. Frontal lobe
4. Parietal lobe

REFLEX ARC PATHWAY

HOT PLATE
(Stimulus)

RECEPTORS
(Like Skin)

Sensory Neurons

SPINAL CORD

RESPONSE

EFFECTORS
(Like Muscles)

Motor Neurons
PLANT MOVEMENT IN RESPONSE TO EXTERNAL STIMULUS

**Directional or Tropic Movement**

- Phototropism (In response to light)
  - Shoots show positive phototropism
- Geotropism (In response to gravity)
  - Roots show positive geotropism
- Hydrotropism (In response to water)
  - Water plants
- Chemotropism (In response to chemicals)
  - Growth of pollen tube towards a chemical produced by ovule

**GLANDS**

**Exocrine Glands** (with ducts)
- Pituitary Gland: 1. Growth hormone
  2. Trophic hormone
- Thyroid Gland: Thyroxine hormone
- Parathyroid: Parathyroid hormone (PTH)
- Thymus: Thymosin
- Adrenal: 1. Adrenalin
  2. Cortisol
- Pancreas
- Gonads: Testes, Ovaries

**Endocrine Glands** (ductless)
- Pituitary Gland: Thyreroxine hormone
- Thyroid Gland
- Parathyroid: Parathyroid hormone (PTH)
- Thymus: Thymosin
- Adrenal: 1. Adrenalin
  2. Cortisol
- Pancreas
- Gonads: Testes, Ovaries

**Chapter - 8 : How Do Organisms Reproduce ?**

**Flowchart**

<table>
<thead>
<tr>
<th>Types of Reproduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sexual Reproduction</td>
</tr>
<tr>
<td>Asexual Reproduction</td>
</tr>
</tbody>
</table>

**Examples of organisms**

- **Sexual Reproduction**
  - Binary fission: Bacteria, Amoeba, Paramecium, Algae
  - Multiple fission: Yeast, Hydra

- **Asexual Reproduction**
  - Spore formation: Mould, Fern, Moss, Mushroom
  - Vegetative Propagation: Bryophyllum, Rose plant
  - Rejuvenation: Starfish, Flatworm
  - Fragmentation: Spirogyra, Planaria, Hydra

- **Examples of organisms**
  - Binary fission: Bacteria, Amoeba, Paramecium, Algae
  - Multiple fission: Yeast, Hydra
  - Spore formation: Mould, Fern, Moss, Mushroom
  - Vegetative Propagation: Bryophyllum, Rose plant
  - Rejuvenation: Starfish, Flatworm
  - Fragmentation: Spirogyra, Planaria, Hydra
Bisexual Flower
Unisexual Flower
Insect Pollination
Wind Pollination
Seed Formation
Fruit Formation
Dispersal of Seeds
Seeds Germination

Asexual Reproduction
Budding
Fragmentation
Spirogyra
Spores
moulds
Vegetative Propagation
Artificial
Sugar cane
Grafting
Potato, ginger
Fruit plants
Layering
jasmine
Tissue Culture
orchids

Examples of Sexual and Asexual Reproduction in Plants

Types of Pollination

1. Self pollination: pollen from the same flower
2. Self pollination: pollen from same plant but different flower
3. Cross pollination: pollen from flower of a different plant

Self Pollination: Pollen is transferred to the stigma of same flower or flowers borne to same plant.

Cross Pollination: Pollen is transferred to flowers of other plants of the same species.

Organ
Testis with seminiferous tubules
Collecting ducts
Epididymis
Vas deferens(sperm duct)
Seminal vesicles
Prostate gland
Cowper's gland
Urethra
Penis

Function
Sperm production
Transport and storage
Transport, maturation and ejaculation
Transport and ejaculation
Secrete thick liquid to transport sperm
Secretes thin alkaline solution to neutralise urine and female system
Secretions may lubricate, flush out urine or form a gelatinous plug
Passage for urine and sperm

Male Reproductive organs and their functions
Reproduction of Species To Avoid Extinction

Asexual Reproduction
1. One Parent
2. Fast
3. No Genetic Variety
   - if one clone gets sick, all the clones get sick

Sexual Reproduction
1. Two Parents
2. Slow
3. Genetic Variety

FEMALE REPRODUCTIVE CYCLE

Anterior pituitary
Releases
FSH
Causes
Primary follicle
To mature into
Secondary follicle
Causes
Estrogen
Anterior pituitary
To release
LH
Causes
Estrogen

Primary follicle
Causes
Secondary follicle
To mature into
Graafian follicle
Causes
Estrogen

Estrogen and progesterone
levels fall
LH and FSH secretion
Stops
Reaches peak
at the end of 28 day clock
Estrogen and progesterone
Maintains
Corpus luteum

Chapter - 9 : Heredity and Evolution

Flowcharts

<table>
<thead>
<tr>
<th>Character</th>
<th>Dominant trait</th>
<th>Recessive trait</th>
<th>Character</th>
<th>Dominant trait</th>
<th>Recessive trait</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed shape</td>
<td>Spherical/Round</td>
<td>Wrinkled</td>
<td>Flower position</td>
<td>Axial</td>
<td>Terminal</td>
</tr>
<tr>
<td>Seed color</td>
<td>Yellow</td>
<td>Green</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flower color</td>
<td>Purple</td>
<td>White</td>
<td></td>
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<td>[Image]</td>
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<td>[Image]</td>
<td>[Image]</td>
</tr>
</tbody>
</table>
**Experiment**

**Question:** When peas with two different traits—round and wrinkled seeds—are crossed, will their progeny exhibit one of those traits, both of those traits, or a "blended" intermediate trait?

1. To cross different varieties of peas, remove the anthers from flowers to prevent self-fertilization.

2. ...and dust the stigma with pollen from a different plant.

3. The pollen fertilizes ova within the flower, which develop into seeds.

4. The seeds grow into plants.

5. Mendel crossed two homozygous varieties of peas.

6. All the F₁ seeds were round. Mendel allowed plants grown from these seeds to self-fertilize.

**Results**

- **F₂ generation**
  - 5474 round seeds (3/4 round)
  - 1850 wrinkled seeds (1/4 wrinkled)

- 3/4 of F₂ seeds were round and 1/4 were wrinkled, a 3:1 ratio.

**Conclusion:** The traits of the parent plants do not blend. Although F₁ plants display the phenotype of one parent, both traits are passed to F₂ progeny in a 3:1 ratio.
UNIT -III : Natural Phenomena

Chapter - 10 : Light-Reflection and Refraction

Flowchart
Chapter - 11 : Human Eye and Colourful World

Flowchart

STRUCTURE OF EYE

ORGANS | FUNCTIONS
--- | ---
1. Cornea | It provides the refraction for light rays entering the eye.
2. Iris | It controls the size of the pupil.
3. Pupil | It controls the amount of light entering into the eyes.
4. Ciliary muscles | It helps in regulating the size of pupil.
5. Eye lens | It focus incoming light rays on the retina.
6. Retina | It helps in the formation of image on it.
7. Aqueous Humour | It provides nutrition to the eye tissues.
8. Vitreous Humous | It helps to keep retina in place by pressing it against the choroid.

Perspective-1

Position of object

- At infinity
- Between infinity and C
- At C
- Between F and C
- At F
- Between pole and F
- Behind the mirror

Perspective-2

At infinity
Beyond 2F₁
At 2F₁
Between F₁ and 2F₁
At F₁
Between F₁ and O
At F₂
Between F₂ and 2F₂
At 2F₂
Beyond 2F₂
At infinity
On the same side of lens as the object

Perspective-3

Correction

- Corrected by Concave lens
- Corrected by Convex lens
- Corrected by Bifocal lens

Corrected for

- Myopia
- Hypermetropia
- Presbyopia

Problems

- Human eye

Lens functioning in human beings

Related phenomenon can be studied with Lenses

- Concave/Diverging
- Convex/Converging

Uses

- Simple microscope
- Compound microscope
- Telescope
- Camera spectrometer
- Spectacles

Position of image

- At infinity
- Beyond 2F₁
- At 2F₁
- Between F₁ and 2F₁
- At F₁
- Between F₁ and O
- At F₂
- Between F₂ and 2F₂
- At 2F₂
- Beyond 2F₂
- At infinity
- On the same side of lens as the object

Corrected by

- Concave lens
- Convex lens
- Bifocal lens

Types of mirrors

- Mirrors
  - Converging or concave
  - Diverging or convex

Human beings

- Human eye
- Myopia
- Hypermetropia
- Presbyopia

Corrected by

- Simple microscope
- Compound microscope
- Telescope
- Camera spectrometer
- Spectacles

Problems
UNIT -IV : Effects of Current

Chapter - 12 : Electricity

Flowcharts

**ELECTRICITY**

**ELECTRIC POWER**
\[ P = \frac{w}{t} \]
Or
\[ VI = I^2R = \frac{V^2}{R} \]
Unit of Power - Watt

**ELECTRIC ENERGY**
Work = VIT = I^2RT
Unit of Energy – Watt-Hr or kWh
1kWhr = 3.6 × 10^6 J

**JOULE’S LAW**
\[ H = I^2RT \text{ or } H = VIT \]
Unit of heat energy - Joules

**RESISTANCE IN SERIES**
\[ R_S = R_1 + R_2 + R_3 \ldots \]

**RESISTANCE IN PARALLEL**
\[ \frac{1}{R_3} = \frac{1}{R_1} + \frac{1}{R_2} + \ldots \]

**RESISTIVITY**
\[ \rho = \frac{RA}{L} \]
Unit of Resistivity – Ohm-m

P. D = work done / charge
\[ V = \frac{W}{Q} \]
Unit of V is Volt

**OHM’S LAW**
\[ V = IR \]
Unit of R - Ohm

**RESISTANCE**
\[ R = \frac{PD}{current} \]

**SYMBOLS USED IN ELECTRIC CIRCUIT**

- Electric cell
- Battery
- Key
- Wire crossing
- Bulb
- Variable resistance
- Resistance
- Rheostat
- Ammeter
- Voltmeter
- AC Source
Chapter - 13 : Magnetic Effects Of Electric Current

Flowcharts
UNIT -V : Natural Resources

Chapter - 14 : Sources of Energy

Flowcharts

NON-RENEWABLE ENERGY

FOSSIL FUELS

COAL

PETROLEUM

COKE

NATURAL GAS

PRODUCTIONS

Remains of plants and animals got buried inside the earth millions of years ago.

Remains of plants & animals buried beneath earth into sea or porous rocks beneath earth.

Destructive distillation of coal.

Gas evolved when remains of plants & animals buried into porous rocks beneath the earth.

USES

(i) Used as a fuel in thermal power plants to generate electricity.
(ii) For heating purposes in homes.

(i) Used as a fuel for vehicles.
(ii) Used as industrial fuel in the form of LPG.

(i) Reducing agent in metallurgical processes.
(ii) Used for making bio gas.

(i) Used as CNG in transport vehicle.
(ii) Used as a source of carbon in the industry.
**SOURCES OF ENERGY**

- Renewable (Non-conventional)
  - Wind
  - Water
  - Biomass
  - Solar
  - Nuclear
  - Geothermal
- Non-Renewable (Conventional)
  - Coal
  - Petroleum

**SOURCES OF ALTERNATE SOURCES OF ENERGY**

- **SUN**
  - Solar energy
    - (i) Solar cooker
    - (ii) Solar Cell
    - (iii) Solar Panel
    - (iv) Solar water heater
    - (v) Solar power
- **WIND**
  - Wind energy
    - (i) Windmill
    - (ii) Wind generator
    - (iii) Wind Energy farms
    - (iv) Wind Power in India
- **WATER**
  - Hydro energy
    - (i) Hydroelectricity power plant
- **DEAD AND DECAY MATTER**
  - Bio energy
    - (i) Biogas
    - (ii) Biomass
- **SEA**
  - Tidal energy
    - (i) Surface followers
    - (ii) Oscillating water columns
    - (iii) Focusing devices
    - (iv) Ocean Thermal energy conversion power plant
- **EARTH**
  - Geothermal energy
  - Nuclear energy
- **NUCLEUS OF ATOM**
  - Nuclear energy
    - (i) Electric generators
    - (ii) Steam turbines
    - (iii) Nuclear Power plant
Chapter - 15 : Our Environment

Flowchart

ENVIRONMENT

ABBIOTIC FACTORS

1. Temperature
2. Pressure
3. Humidity
4. Rainfall
5. Sunlight
6. Wind

BIOTIC FACTORS

1. Plants
2. Animals
3. Human beings

TROPHIC LEVELS

PRODUCERS

Plants

CONSUMERS

Herbivores
Carnivores
Decomposers