

## PHYSICAL SCIENCE - SYLLABUS

### 10th CLASS

#### 1. Reflection of light at curved surface

- 1.1 Normal to the curved surface
- 1.2 Spherical mirrors, convex, concave mirrors
- 1.3 Pole, Focus, Centre of curvature, principle axis, Radius of curvature, Focal length
- 1.4 Images formed by spherical mirrors
- 1.5 Ray diagrams for spherical mirrors
  - 1.5.1 Rules for Ray diagrams by sign laws of reflection
- 1.6 Formula for spherical mirrors – sign convention
  - 1.6.1 Magnification
- 1.7 Application of reflection - Solar Cooker

#### 2. Chemical Equations and Reactions

- 2.1 Some daily life examples of chemical reactions.
- 2.2 Chemical equations – writing chemical equations, skeletal chemical equations, balancing chemical equations
- 2.3 Writing symbols of physical states, Heat changes, gas evolved and precipitate formed
- 2.4 Interpreting a balanced chemical equation
  - 2.4.1 Calculations based on mass, volume, number of molecules and moles

#### 3. Acids, Bases and Salts

- 3.1 Chemical properties of acids & bases

- 3.1.1 Acids & Bases in laboratory – Indicators
- 3.1.2 Reaction of Acids & Bases with Metals
- 3.1.3 Reaction of Acids & Bases with Metal Carbonates and Metal hydrogen carbonates
- 3.1.4 Reaction of Acids & Bases with each other (Neutralization)
- 3.1.5 Reaction of Acids with Metallic oxides
- 3.1.6 Reaction of Bases with Non-Metallic oxides
- 3.2 What do acids have in common? What do bases have in common?
- 3.3 Do Acids produce Ions only in Aqueous Solution ?
- 3.4 Reaction of Acid, Base with water
- 3.5 Strength of Acid or Base -  $p^H$  scale
- 3.6 Importance of  $p^H$  in everyday life
  - 3.6.1 Sensitivity of plants and animals to  $p^H$
  - 3.6.2  $p^H$  of soils,  $p^H$  in digestive system,  $p^H$  tooth decay
  - 3.6.3 Self defense by animals and plants through chemical warfare
- 3.7 Salts
  - 3.7.1 Family of salts
  - 3.7.2  $p^H$  of salts
- 3.8 Chemicals from common salt

- 3.8.1 Common salt – a raw material for other chemicals
- 3.8.2 Preparation of Sodium Hydroxide, Bleaching powder, Baking soda, Washing soda and uses
- 3.8.3 Removing of water of crystallization
- 3.8.4 Plaster of Paris

#### 4. Refraction of light at curved surface

- 4.1 Refraction of light at curved surface
  - 4.1.1 Image formation - Derivation of curved surface formula
- 4.2 Lenses
  - 4.2.1 Focal length of the lens
- 4.3 Rules for Ray diagram
- 4.4 Images formed by the lenses
- 4.5 Formula derived for thin lenses
- 4.6 Focal length of lens depends on surrounding medium
- 4.7 Lens maker formula

#### 5. Human eye and colourful world

- 5.1 Least distance of distinct vision, Angle of vision
- 5.2 Structure of human Eye - Focal length of human Eye lens, accommodation
- 5.3 Common accommodation defects of vision - Myopia, Hypermetropia, presbyopia
  - 5.3.1 Power of lens

- 5.4 Prism
  - 5.4.1 Rerective Index of Prism
  - 5.4.2 Derivation of formula for Rerective Index of Prism
- 5.5 Dispersion
  - 5.5.1 Rainbow
- 5.6 Scattering of light

#### 6. Structure of atom

- 6.1 Spectrum
  - 6.1.1 Wave nature of light
- 6.2 Electromagnetic Spectrum
  - 6.2.1 Planck's theory
- 6.3 Bohr's model of Hydrogen atom and its limitations
  - 6.3.1 Bohr - Sommerfeld model of an Atom
- 6.4 Quantum mechanical model of an Atom
  - 6.4.1 Quantum numbers
  - 6.4.2 Main shells, Sub-shells and orbitals in different sub-shells
  - 6.4.3 Shapes of s, p & d orbitals
- 6.5 Electronic Configuration of elements in their atoms
- 6.6  $n, l, m, s$  rule, Energies of electronic energy levels (n+l) rule ; Aufbau Principal, Paulis principal, Hund's Rule of maximum multiplicity, Stable configurations.

**7. Classification of Elements - The Periodic Table**

- 7.1 Need for arrangement of elements in an organized manner
  - 7.1.1 Historical background of classification of elements
- 7.2 Doberieners Triads - Limitations
- 7.3 Newland's law of Octaves
- 7.4 Mendeleev's Periodic Table (Periodic law, Achievements & Limitations)
- 7.5 Modern Periodic Table.
  - 7.5.1 Position of Elements in Modern Periodic Table
    - Groups
    - Periods
    - Metals and Non-metals
  - 7.5.2 Trends in Modern Periodic Table (Valency, Atomic size, Ionization Energy, Electron Affinity, Electro-negativity, Metallic & Non-metallic properties)

**8. Chemical Bonding**

- 8.1 Chemical bond definition (brief explanation)
  - 8.1.1 Lewis Symbols (or) Lewis Dot Structures
- 8.2 Electronic theory of Valence by Lewis and Kossel
  - 8.2.1 Octet Rule
- 8.3 Ionic and Covalent bonds: examples with Lewis Dot formulae
  - 8.3.1 The arrangement of Ions in Ionic compounds
  - 8.3.2 Factors affecting the formation of cation and anion

- 8.4 Shapes, bond lengths and bond energies in molecules
- 8.5 Valence shell electron pair repulsion theory
- 8.6 Valence bond theory – examples like  $H_2$ ,  $Cl_2$ ,  $H_2O$ ,  $BF_3$ ,  $CH_4$ ,  $NH_3$ ,  $C_2H_6$ ,  $C_2H_4$ ,  $C_2H_2$  etc
- 8.7 Hybridisation and explanation of  $H_2O$ ,  $BF_3$ ,  $CH_4$ ,  $NH_3$  etc., molecules
- 8.8 Properties of Ionic and Covalent Compounds

**9. Electric Current**

- 9.1 Electric current
  - 9.1.1  $I = \frac{Q}{t}$
  - 9.1.2  $I = nqAV_d$
- 9.2 Potential difference
- 9.3 How a battery or a cell works
  - 9.3.1 EMF
- 9.4 Ohm's law and its limitations, resistance, specific resistance, factors influencing resistance, electric shock
- 9.5 Electric Circuits
  - 9.5.1 Series and parallel connection of resistances
  - 9.5.2 Kirchhoff's Laws
- 9.6 Electric power
- 9.7 Safety fuses

## 10. Electromagnetism

- 10.1 Oersted Experiment
- 10.2 Magnetic field – field lines
  - 10.2.1 Magnetic Flux - Magnetic Flux density
- 10.3 Magnetic field due to currents
  - 10.3.1 Due to current carrying straight wire
  - 10.3.2 Due to circular loop
  - 10.3.3 Solenoid
- 10.4 Magnetic force on moving charge and current carrying wire
  - 10.4.1 Right hand rule
- 10.5 Electric motor
- 10.6 Electromagnetic induction – Faraday's law (including magnetic flux) – Lenz law
  - 10.6.1 Derivation of Faraday's law
  - 10.6.2 Applications of Faraday's law of electromagnetic induction
- 10.7 Generators and Alternating – Direct Currents

## 11. Principles of Metallurgy

- 11.1 Occurrence of Metals in nature
- 11.2 Extractions of metals from the Ores – activity series and related metallurgy, flow chart of steps involved in the extraction of metals from ore.

### 11.2.1 Enrichment of ores (Concentration or Dressing)

### 11.2.2 Extraction of Crude metal from the ore

- Extracting metals low in the activity series
- Extracting metal in the middle of the activity series
- Extracting metal in the top of the activity series

### 11.2.3 Refining metals (purification of the crude metal)

- Electrolytic refining
- Distillation
- Poling
- Liquation

### 11.3 Corrosion – Prevention of Corrosion

### 11.4 Important Processes used in metallurgy

- 11.4.1 Smelting
- 11.4.2 Roasting
- 11.4.3 Calcination

### 11.5 Flux

### 11.6 Furnace

## 12. Carbon and its compounds

- 12.1 Introduction of Carbon compounds
- 12.2 Promotion of an Electron – Bonding in Carbon including Hybridization

### 12.3 Allotropes of Carbon

- Amorphous Forms
- Crystalline Forms (Diamond, Graphite,  $C_{60}$  and Nano tubes)

### 12.4 Versatile nature of carbon

#### 12.4.1 Catenation and tetravalency

### 12.5 Hydrocarbons

#### 12.5.1 Open and Closed Chain Hydrocarbons

#### 12.5.2 Saturated and Unsturated Hydrocarbons

### 12.6 Bonding of carbon with other elements

#### 12.6.1 Functional groups in carbon compounds

### 12.7 Isomerism

### 12.8 Homologous series (Alkanes, Alkenes and Alkynes)

### 12.9 Nomenclature of Carbon compounds

### 12.10 Chemical properties of carbon compounds

#### 12.10.1 Combustion reactions

#### 12.10.2 Oxidation Reaction (Alcohol to Acids)

#### 12.10.3 Addition reactions

#### 12.10.4 Substitution reactions

### 12.11 Important carbon compounds

#### 12.11.1 Ethanol

#### 12.11.2 Properties of Ethanol – General properties, reaction of ethanol with sodium, reaction with hot concentrated sulphuric acid.

#### 12.11.3 Ethanoic acid

#### 12.11.4 Properties of Ethanoic acid – General properties, Reaction with a base, sodium hydroxide, sodium carbonate and sodium hydrogen carbonate

### 12.12 Esterification reactions

### 12.13 Soaps – Saponification, Micelles

#### 12.13.1 Cleansing action of Soap