

## SCIENCE and TECHNOLOGY

### (THEORY)

### CLASS - X

#### UNIT I PHYSICS

(Total Marks = 26)

- 1. Reflection Of Light** - Laws of reflection; convergence and divergence of light; images formed by a concave mirror, convex mirror; related concepts; centre of curvature, principal axis, optical centre, focus, focal length, mirror formula, magnification (with sign convention) numerical to be taken.
- 2. Refraction Of Light** - Laws of refraction, refractive index of the medium, absolute refractive index, refractive index and speed of light in a medium, images formed by a convex and concave lenses, lens formula with sign convention, magnification produced by lenses, power of a lens (with numerical).
- 3. The Human Eye And The Colourful World** - Human eye - power of accommodation - far point, near point of the eye, problems of vision and remedies, twinkling of stars, dispersion of light, atmospheric refraction, scattering of light.
- 4. Electricity** - Electric current, electric potential, potential difference, electric circuit, Ohm's law, electrical resistance, electric resistivity, conductors, resistors and insulators, combination or grouping of resistors: series, parallel (formula only no derivation) and numericals to be taken. Heating effect of electric current, application of a heating effect of current, electric fuse and bulb, electric power, inter-relation between P, V, I and R (numericals to be taken), calculation of the cost of electrical energy.
- 5. Magnetic Effects Of Electric Current** - Magnet, compass, magnetic field lines, field due to a current carrying wire, field due to current carrying coil or solenoid, force on current carrying conductor, Fleming's left hand rule, electric motor (principle, working and construction), electromagnetic induction induced potential differences, induced current, electric generator, construction, principle and working of AC generator, Direct current, Alternating current, Advantages of AC over DC, Domestic electric circuits.

**UNIT II CHEMISTRY****(Total Marks = 26)**

- 1. Chemical Reactions** – Chemical equations, types of chemical reactions, combination, decomposition, double displacement (precipitation and neutralization), oxidation and reduction in terms of gain and loss of oxygen and hydrogen atom (definition with first three examples), corrosion and rancidity.

Recapitulate writing chemical formulas studied in earlier classes. Rules for writing word equation.

Writing a skeletal chemical equation using the chemical formula of the reactants and the products.

Writing balanced chemical equations.

**Types of Chemical Reactions****1. Combination reactions**

- Combination of two elements to form a compound
- Combination of an element and a compound to form new compound
- Combination of two compounds to form a new compound

**2. Decomposition reactions**

- Thermal decomposition reactions
- Electrolytic decomposition reactions

**3. Displacement reactions**

Demonstration of a displacement reaction

Uses of the activity series

**4. Double Displacement reactions**

- Precipitation Reaction
- Neutralization Reaction
- Irreversible Reaction

**Oxidation****a. Addition of oxygen**

- Burning of carbon
- Burning of sulphur
- Burning of phosphorous
- Burning of magnesium
- Rusting of iron

**b. Removal of hydrogen**

- Oxidation of hydrogen sulphide by bromine
- Oxidation of hydrochloric acid by magnesium (IV) oxide
- Removal of hydrogen from HCl

**Reduction**

- a. Removal of oxygen
  - Reduction of copper (II) oxide with hydrogen
  - Reduction of iron (III) oxide
  - Reduction of manganese (IV) oxide with aluminium
  - Burning of magnesium
  - Rusting of iron

**Oxidizing and reducing Agents**

- Oxidizing agent
- Reducing agent
- Relation between oxidation and reduction
- Difference between oxidation and reduction

**Effects of Oxidation Reactions in everyday life****Corrosion - Only Definition**

- Conditions necessary for the occurrence of corrosion
- Prevention of corrosion – (Any three)

**Rusting of Iron - Only Definition**

- Conditions necessary for rusting
- Prevention of rusting – (Any three)

**Rancidity -Only Definition**

**Chapter 2 - Acids, Bases and Salts****Arrhenius Concept of Acid and Bases**

Limitations of Arrhenius concept

**Bronsted - Lowry's Proton Concept of Acids and Bases**

Limitations of Bronsted – Lowry's concept

**General Properties of Acids**

- Physical properties of acids
- Chemical properties of acids
  1. Action of Litmus
  2. Reaction with carbonates and hydrogen carbonates
  3. Reaction with bases (Neutralisation)
  4. Reaction with metals

**Classification of Acids**

1. Classification on the Basis of Strength
  - a. Strong acids
  - b. Weak acids
2. Classification on the Basis of their Basicity
  - a. Monobasic acids
  - b. Dibasic acids
  - c. Tribasic acids

Storing of curd and other sour substances in metal vessels.

Storing and transporting acids on a small and large scale.

Acids in the living world.

Handling of acids in the laboratory.

Uses of acids.

Soda - acid fire extinguisher.

**p<sup>H</sup> Scale and Universal Indicator**

Relationship between the concentration of H<sup>+</sup>(aq) ions and PH of solution

p<sup>H</sup> sensitivity of animals and plants.

p<sup>H</sup> in daily life

1. PH in digestive system
2. PH dependent tooth decay
3. Acids in joints and fatigued muscles
4. Self protection of plants and animals through chemical warfare
5. Role of PH in blood
6. Functions of enzymes at definite PH
7. Function of Kidney against wide variety of PH
8. Acids in regaining of tarnished copper utensils

**Alkalis****Classification of Bases**

1. Classification on the Basis of Strength
  - a. Strong base
  - b. Weak base
2. Classification on the Basis of their Acidity
  - a. Monoacidic base
  - b. Diacidic base
  - c. Triacidic base

**General Properties of Acids**

- Physical properties of bases
- Chemical properties of bases
  1. Action of Litmus and indicators
  2. Action with Ammonium salts
  3. Amphoteric behaviour of some bases
  4. Action with acids (neutralization)
  5. Application of neutralization reactions
  6. Action with metals

Use of the term 'concentrated' and 'strong' in acids and bases

**Uses of Acids and Bases****Basicity of Acids****Salts****Types of Salts**

1. Acid Salts
2. Normal Salts
3. Basic Salts
4. Double Salts
5. Common Salt

Bleaching Powder

Uses of bleaching powder

**Preparation of Salts****General properties of salts**

1. Solubility
2. Electrical conductivity
3. Crystalline nature – Water of crystallization with common examples
4. Deliquescence
5. Hygroscopic Substances
6. Efflorescence
7. Hydrolysis

Uses of some common salts

**Chapter 3 – Metals, Non – Metals and Metallurgy****Metals****Properties of Metals****• Physical properties**

1. Physical state
2. Hardness
3. Tensile strength
4. Density
5. Metallic lusture
6. Malleability and ductility
7. Melting point and boiling point
8. Thermal and electrical conductivity
9. Elasticity
10. Electron emission
11. Sonority
12. Formation of alloys

**• Chemical properties of metals**

- Electropositive character
- Activity series of metals
- Chemical Reactions of Metals
  1. Reaction with oxygen (amphoteric oxides)
  2. Reaction with water
  3. Reaction with salt solutions (Displacement reactions)
  4. Reaction with strong alkalis

**Non – Metals****General characteristics of Non – metals****• Physical properties**

- a. Hardness
- b. Density
- c. Malleability and ductility
- d. Lusture
- e. Melting point and boiling point
- f. Thermal and electrical conductivity
- g. Sonority
- h. Allotropy

- **Chemical properties**
- Electronegative character
  - a. Reaction with oxygen
  - b. Reaction with water
- Comparison of properties of Metals and Non - Metals
- How do metals react with non - metals
  - Octet rule,
  - Ionic compound
  - Examples of Ionic compounds
- Properties of Ionic compounds
  1. Physical Nature
  2. Melting and boiling points
  3. Solubility
  4. Electrical conductivity
  5. Aggregates
- Occurrence of Metals
- Minerals and ores
- Minerals found in India
- Activity series and Metallurgical Processes

#### **Extraction of Metals from their Ores (Metallurgy)**

1. Concentration of ore – **(only names of concentration process, details not required)**
  - a. Gravity separation method (Lavigation)
  - b. Froth Flootation Process
  - c. Chemical separation (Leaching)
2. Conversion of concentrated ore into metal oxide - **only definition and distinction of the following**
  - a. Calcination
  - b. Roasting
3. Extraction of the metal by reduction of metal oxide
  - a. Reduction by heat alone (Self – reduction) **(Hg, Cu)**
  - b. Chemical Reduction **(Zn & Fe)**
    - Advantages of Carbon reduction process
    - Disadvantages of Carbon reduction process
    - Aluminothermic reduction
  - c. Electrolytic reduction **(only Al)**

4. Refining of impure metals (*only names of different processes and details of only Electrorefining*)
  - a. Distillation
  - b. Liquidation
  - c. Oxidation
  - d. Electrorefining
  - e. Vapour phase refining
  - f. Van Arkel Method
  - g. Zone refining



**Chapter 4 - Classification of Elements****Newlands' Law of Octaves****Mendeleev's Periodic Law****1. Merits of Mendeleev's Periodic Table**

- a. Systematic classification of elements
- b. Prediction of undiscovered elements
- c. Electronic configuration of elements

**2. Defects of Mendeleev's Periodic Table**

- a. Discrepancy in periodicity
- b. Position of hydrogen
- c. Violation of one position for one element rule

**Modern Periodic Law**

1. Explanation for the positions of some elements
2. Positions for elements having identical properties in different groups
3. Justification of placing dissimilar elements together
4. One position for one element

**Description of Modern Periodic Law**

- Electronic configuration of elements
- Periodic trends in atomic properties
  1. Electropositive or metallic character
  2. Ionisation energy
  3. Electron affinity
  4. Electronegativity

**Chapter 5 – Carbon and its Compounds****A. Bonding of Carbon Compounds – The Covalent Bond**

- Hydrogen Molecule
- Hydrogen Chloride
- Oxygen Molecule
- Nitrogen Molecule

**B. Allotropes of Carbon****C. Properties of Covalent Compounds****D. Hydrocarbons, Homologous Series, Characteristics of a Homologous Series, Paraffin Series****E. Classification of Hydrocarbons**

1. Saturated hydrocarbons
  - a) Straight Chain
  - b) Branch Chain
  - c) Ring Chain

2. Unsaturated hydrocarbons

**F. Nomenclature of Organic Compounds and Functional Group****G. Alkanes**General Properties of Alkanes

1. Physical States
2. Solubility

Chemical Properties of Alkanes

1. Combustion
  - a) In excess of air or oxygen
  - b) In limited supply of air or oxygen
  - c) In very less supply of air or oxygen

2. Halogenation

3. Cracking:

- i) Thermal Cracking
- ii) Catalytic Cracking

**H. Natural Gas**

Uses of Natural Gas

**I. Methane**Properties of Methane:

1. Physical Properties (all included)
2. Chemical Properties (all included)

**Uses of Methane**

Methane and Greenhouse effect

**Ethane**Properties of Ethane:

1. Physical Properties (all included)

2. Chemical Properties (all included)

#### Uses of Ethane

### J. Alcohols

Naming of Alcohols, Structural and Electron – Dot formulae of some alcohols.

#### Methanol

Properties of Methanol

1. Physical Properties (all included)
2. Chemical Properties (all included)

#### Uses of Methanol

#### Ethanol

Properties of Ethanol

1. Physical Properties (all included)
2. Chemical Properties (all included)

#### Uses of Ethanol

Harmful effect of drinking Alcohols

Methylated or denaturated spirit

### K. Carboxylic Acids

#### L. Ethanoic Acid (Acetic Acid) Properties of Ethanoic Acid

1. Physical Properties of Ethanoic Acid (all included)
2. Chemical Properties of Ethanoic Acid (all included)

Tests for Carboxylic Acid

Uses of Ethanoic Acid

### M. Soaps

Soap Molecule

#### Types of Soaps

1. Hard Soaps
2. Soft Soaps
3. Transparent Soaps

#### Manufacture of Soaps

Raw materials needed for manufacture of soap

Processes for Manufacture of Soap

1. Hot process
2. Ittner and Twitchell process Cleansing

Action of Soap

Limitations of Soap

**UNIT III BIOLOGY****(Total Marks = 28)****1. Life Processes**

- (a) Nutrition** - Modes of nutrition, Nutrition in amoeba, Photosynthesis - significance, raw materials, factors affecting photosynthesis, Nutrition in Human - alimentary canal and associated digestive glands, physiology of digestion with steps of digestion.
- (b) Respiration** - Respiration in plants, gaseous exchange in animals, body surface/skin, airtubes/trachea, gills, lungs. Type of respiration - aerobic and anaerobic. Respiration in human - parts (description), breathing mechanism (distinction between breathing and respiration), gaseous exchange in lungs and tissues.
- (c) Transportation** - Transport of materials in plants (water and minerals), Root hairs, conducting tissues, xylem. Transpiration (definition), working of stomata. Translocation - phloem vessels. Transportation of materials and fluids in human beings - composition of blood and functions of each component, blood vessels, diagram of external and internal structure of human heart, cardiac cycle, ECG, blood pressure, Lymphatic system.
- (d) Excretion** - Excretion in animals, human beings. Osmoregulation and artificial kidney. Diagram of urinary system and nephron (urine formation).

**2. Control And Coordination** - Coordination in plants and plant hormones, nervous system in lower animals, vertebrates and human being. Reflex action, peripheral nervous system; autonomic nervous system and chemical coordination in animals (diagram of neuron); animal hormones.

**3. Reproduction In Plants And Animals** - Reproduction - Types of reproduction, types of asexual reproduction. Vegetative reproduction by natural and artificial methods and advantages of asexual reproduction in plants. Sexual reproduction in plants. Reproductive system in human beings (male and female) (fertilization, pregnancy and development of the embryo excluded). Birth control, sexually transmitted diseases.

**4. Heredity And Evolution** - Definition of heredity; genetics, chromosome, variation, gene, genotype and phenotype, Mendel's Law of inheritance. Evolution - definition. Morphological and anatomical evidences of evolution, origin of life on the earth - Oparin and Haldane theory.

**(PRACTICAL)****(Total Marks = 20)**

Every student will perform atleast fifteen experiments (atleast five experiments from each unit) during the academic year.

**PHYSICS**

1. To verify the laws of reflection of light by using plane mirror.
2. To determine the focal length of a concave mirror by obtaining image of distant object.
3. To trace the path of a ray of light passing through a rectangular glass slab and measure the angle in incidence and angle of emergence.
4. To determine the focal length of a convex lens by focusing a distant object.
5. To trace the path of a ray of light passing through a glass prism and measure the angle of deviation.
6. To study the dependence of current on the potential difference across a resistor and determine its resistance.
7. To find out the equivalent resistance of two resistors connected in (i) series and (ii) parallel.

**BIOLOGY**

1. To study land food chain from the given chart.
2. Construction of food web using models.
3. To study the different parts of a Hibiscus flower.
4. To study germination of grams/ pea seeds.
5. To test the presence of starch in a given food sample.
6. To study various things around and classify them into living and non-living.
7. To study various waste materials and classify them into bio-degradable and non-biodegradable wastes.
8. Collection of news paper reports on HIV/ AIDS.

**CHEMISTRY**

1. To measure the change in temperature during chemical reactions (at least four) and conclude whether the reaction is exothermic or not.
2. To identify bleaching powder from the given samples of chemicals (four samples).
3. To identify washing soda or baking soda from the given samples of chemicals (four samples).
4. To study on precipitation reaction and isolation of the precipitate:
  - (i) NaCl with  $\text{AgNO}_3$ ,
  - (ii)  $\text{Na}_2\text{SO}_4$  with  $\text{BaCl}_2$
5. To prepare Sulphur dioxide gas and study its two physical and two chemical properties.
6. To carry out the reactions for an acid (HCl) with (i) Litmus solution (blue and red), (ii) Zinc metal, (iii) Sodium carbonate and (iv) Sodium hydroxide.
7. To prepare ammonia gas and study its two physical and two chemical properties.
8. To study any two physical and two chemical properties of acetic acid.
9. To identify whether a given solution is acidic or basic performing following tests:
  - (i) Litmus test,

- (ii) Reaction with  $\text{NaHCO}_3$  /  $\text{Na}_2\text{CO}_3$ ,
  - (iii) Reaction with  $\text{NH}_4\text{OH}$  /  $(\text{NH}_4)_2\text{CO}_3$
  - (iv) Reaction with little excess of volumes of  $\text{HCl}$  or  $\text{NaOH}$  (as a case may be) and performing the litmus test with the resulting solution (strength of unknown solution supplied and acid/ base solution given for experiment 4 must be the same)
10. To study the decomposition of  $\text{CaCO}_3$  and prove that  $\text{CO}_2$  is evolved during the reaction (lime water test)
11. To perform the reaction of 1: 1 molar acetic acid and carboxylic acid and observe the changes in terms of:
- (i) Colour
  - (ii) Litmus test (acidic/ alkaline)
12. To examine the heating effect on sugar and common salt, observe the change and hence to comment on the nature of bonding in the two compounds.
13. To determine the pH values of equimolar concentration of four acids and arrange them in order of their increasing acidity.

**PRESCRIBED TEXTBOOKS:****1. Science & Technology Class 10**

Ratna Sagar Pvt. Ltd., 60, Dr. Sundari Mohan Avenue, Kolkata - 700014.

**2. Tushar's Laboratory Manual**

Tushar Publications Pvt. Ltd., C-21, Jhandewalan F. F. Complex, Rani Jhansi Road, New Delhi - 110055.

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