
Section III
TG Science : (PCM / CBZ)

PCM : This section shall carry the questions from Physics, Chemistry and Mathematics subjects with equal proportion of marks:

PHYSICS SYLLABUS

Unit – 1 Motion

03 Marks

Newton's laws of motion, Kinematic Equations of motion with acceleration, Graphical representation of Kinematic Equations of motion, Relative velocity and relative acceleration, Work Energy and Power, Conservation of energy, Collision problem and Conservation of linear momentum, Forces of Nature, Frictional force.

Circular motion Rotational Kinematics, Conservation of Angular momentum, Moment of Inertia.

Motion under Gravity, projectile motion.

Simple harmonic motion and Kinematics of Simple Harmonic Motion, Simple Pendulum.

Unit – 2 Gravitation

02 Marks

Kepler's law of planetary motion, Newton's law of gravitation, Acceleration due to gravity. Gravitational field and potential, Escape velocity and Satellite motion, Geo-stationary Satellites.

Unit – 3 Properties of Matter

03 Marks

Inter-atomic and intermolecular force, Elasticity, Stress, Strain and Hook's law, Elastic module.

Kinetic theory of gases, concept of heat, pressure and temperature, specific heat, law of equi-partition of energy, Universal Gas laws, Measurement of pressure.

Surface tension, surface energy, angle of contact, excess pressure, capillarity, viscosity, Poiseuille's law, Stoke's Law, Bernoulli's Equation of fluid motion.

Hydrostatics, Buoyancy, Archimedes Principle, laws of flotation.

Unit – 4 Sound

02 Marks

Waves, progressive and stationary waves, mechanical waves, equation of a progressive wave, transverse vibration of a string, speed of sound waves, Newton's formula, Superposition of sound waves, Beats, Echo, Doppler effect, Musical sound and its characteristics.

Unit – 5 Optics

03 Marks

Laws of Reflection and Refraction in transparent medium, total internal reflection, Refraction through prism, Dispersion, Reflection and image formation in plane and spherical mirrors, equation for object and image distances for spherical mirrors, image formation in convex and concave lenses, lens equation for convex and concave lenses, power of single and combination of two lenses. Image formation in the eye and defects of vision, microscope and astronomical telescope.

Wave optics, Huygen's principle, Coherent sources and interference, Young's double slit, Bi-prism, Newton's ring experiments, Diffraction of light through single slit, and plane transmission grating.

Unit – 6 Electrostatics

02 Marks

Coulomb's law and unit of charge, force on a charge due to discrete and continuous charge distributions, lines of force and electric field, field due to a point charge and a dipole, electrostatic potential, potential due to a point charge and an electric dipole, electric potential energy of a group of point charges, electric flux, Gauss law and applications. Capacitor, capacitance of parallel plate and spherical capacitors, combination of capacitors in series and parallel.

Unit – 7 Current Electricity

03 Marks

Ohm's law, Current and Voltage measurements, Resistance and Resistivity, Combination of resistances in series and parallel, electromotive force, grouping of resistors and cells, Kirchhoff's laws and their applications.

Electric energy and power, heating effect of electric current, Faraday's law of electrolysis.

Magnetic field and magnetic induction, Biot-Savart law, magnetic field due to a straight conductor, a circular coil and a solenoid carrying current. Ampere's circuital law, Lorentz force on a charge particle in uniform electric and magnetic fields. Force between two parallel conductors carrying current.

Unit – 8 Electromagnetic Induction

02 Marks

Faraday's law of electromagnetic induction, Lenz's law, eddy current, self and mutual induction, emf induced in a rotating coil. Alternating current, average and RMS values of alternating currents, simple AC circuits (RC, RL and RLC), concept of admittance and impedance. Transformers and simple AC devices (motor, dynamo).

CHEMISTRY

Total marks : 20

1. Basic Concepts

02 Marks

Atomic, molecular and equivalent masses, mole concept, types of chemical reactions, calculations based on stoichiometry. Equivalent mass of acid, base, salt, oxidant and reductant.

2. States of Matter

1+1 Marks

Gas laws – Boyle's law, Charles's law, combined gas equation, ideal gas equation. Graham's law of diffusion / effusion, Dalton's law of partial pressure.

Characteristics of Liquids : Vapour pressure, viscosity and surface tension. Colligative properties of solutions (solute and solvent forming binary solution).

3. Structure of Atom

02 Marks

Bohr's model and its limitations, concept of shells and sub-shells, dual nature of matter and light. De Broglie's relationship, Heisenberg uncertainty principle, concept of orbitals, quantum numbers, shape of s, p and d orbitals, rules of filling electrons in orbitals - Aufbau principle and Hund's rule, electronic configuration of atoms, stability of half-filled and completely filled orbitals.

4. Classification and Elements and Periodicity in Properties

02 Marks

Modern periodic law and the present form of periodic table, periodic trends in properties of elements - atomic radii, ionic radii, ionization enthalpy, electron gain enthalpy, electronegativity, valency.

5. Chemical Bonding and Molecular Structure

02 Marks

Ionic bond, covalent bond, polar character of covalent bond, covalent character of ionic bond, concept of hybridization, VSEPR Theory and shapes of some simple molecules, hydrogen bond and metallic bond.

6. Chemical Reactions

02 Marks

Types of chemical reactions, redox reaction, oxidation number calculation, balancing of redox equations by oxidation number and ion-electron methods. Neutralization reactions and volumetric analysis.

7. Chemical Equilibria and Ionic Equilibria

**01+01
Marks**

- i) Equilibrium in physical and chemical processes, law of mass action, equilibrium constants (K_c , K_p and K_x), relation among them, the reaction quotient and its relation with equilibrium. Le-Chatelier's principle and its applications.
- ii) Theories of acids and bases, ionization of weak acids and bases, ionic product of water pH and other logarithmic terms, common ion effect, solubility product and its application in salt analysis.

8. General Principles of Extraction of Metals

02 Marks

Occurrence of metals, ores and minerals, concentration, calcinations, roasting, smelting, reduction methods (carbon reduction, aluminothermic process, electrolytic and self-reductions) and metal extraction, flux and slag,

refining of metals. Reactions Involved In the Blast Furnace for the extraction of iron.

9. Some Basic Principles In Organic Chemistry **02 Marks**

- i) Classification and IUPAC nomenclature of organic compounds
- ii) Electronic displacement in a covalent bond : inductive effect, electronic effect, resonance and hyper conjugation.
- iii) Homolytic and heterolytic fission of a covalent bond : free radicals, carbocations, carbanions, electrophiles and nucleophiles, types of organic reactions.

10. Hydrocarbons **01+01 Marks**

Classification of Hydrocarbons :

- i) Aliphatic Hydrocarbons : General methods of preparation, properties and uses of alkanes, alkenes and alkynes.
- ii) Aromatic Hydrocarbons : Benzene : resonance aromaticity, chemical properties, directive influence of functional group in monosubstituted benzene.

MATHEMATICS

20 questions are to be asked. Each question carries 01 mark

1. Set Theory and its Application **01 Mark**

- Union intersection, difference complement, power set, number of elements in union and intersection of finite sets.

2. Relations and Functions **02 Marks**

- Reflexive, Symmetric, transitive and equivalence relations, injective, surjective and bijective functions, inverse of a function.

3. Number System **01 Mark**

- Natural numbers, Integers, rational numbers, irrational number, real numbers, absolute values of numbers, triangle inequality.

4. Quadratic Equations **01 Mark**

- Fundamental theorem of Algebra, roots, discriminants, nature the roots, relation between the roots and coefficients.

5. Group **01 Mark**

- Group, semi-group, monoid, finite group, abelian group, sub-group, co-set, Lagrange's theorem, normal sub-groups.

6. Calculus of One Variable **02 Marks**

- Limit, continuity, derivative, tangent, normal, increasing and decreasing functions.

7. Sequence and Series **02 Marks**

- Arithmetic and Geometric progressions, monotonic sequence, exponential series, logarithmic series, Taylor's series, Maclaurin's series.

8. Coordinate Geometry **02 Marks**

- Distance formula, section formula, area of a triangle, locus and its equation, straight line, circle, conic section.

9. Analytical Solid Geometry **01 Mark**

- Plane, straight line, sphere

10. Probability **01 Mark**

- Trial, Sample Point, Sample Space, Event, Addition Theorem, Binomial Distribution.

11. Statistics **01 Mark**

- Mean, Mode, Median, Mean Deviation, Standard Deviation, Variance.

12. Trigonometry **02 Marks**

- Angles associated with 90° , 180° , 270° , 360° , compound angle formula, multiple angle formula, sub-multiple angle formula, Trigonometric Equations, Inverse trigonometric functions

13. Mensuration**02 Marks**

- Circumference of a circle, length of the arc of a circle, area of a circle, sector and segment, area of a circular annulus, area of a sectional region, area of a segment, surface area and volume of a prism, right circular cylinder, cone and sphere.

14. Determinant and Matrix**01 Mark**

- Determinant, minors, co-factors, Cramer's Rule, Matrix, Singular, Non-singular, Transpose, Ajoint Inverse, Solution of Equations by Matrix method.