

Paper -2
(Total 60 Marks)

TGT Science: (PCM)

(This section shall carry equal marks from Physics, Chemistry and Mathematics subjects with equal proportion of marks)

Section I

PHYSICS

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

Unit-1 Motion

Newton's laws of motion, Kinematic Equations of motions with acceleration, Graphical representation of Kinematics 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, friction force.

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

Motion under Gravity, project motion, Simple harmonic motion, and Kinematics of simple harmonic motion, simple pendulum.

Unit-2 Gravitation

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

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, Stokes's Law, Bernoulli's Equation of fluid motion.
Hydrostatics, Buoyancy, Archimedes Principle, Laws of flotation.

Unit-4 Sound

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

Unit-5 Optics

Laws of reflection and refraction in transparent medium, total internal reflection, refraction through prisms, Dispersion, Reflection and image formation plan 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, Huygens'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

Coulomb's law and unit of charge, force on 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, combinations of capacitors in series and parallel.

Unit-7 Current Electricity

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

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).

Section-II

CHEMISTRY

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

Unit-1 Basic Concepts

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

Unit-2 States of Matter

Gas laws- Boyle's law, Charles' 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).

Unit-3 Structure of Atom

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

Unit-4 Classification and elements and periodicity in properties

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, electro negativity, valency.

Unit-5 Chemical bonding and molecular Structure

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.

Unit-6 Chemical reactions

Types of chemical reactions, redox reaction, Oxidation number calculations, balancing of redox equations by oxidation number and ion electron methods, neutralization reactions and volumetric analysis.

Unit-7 Chemical Equilibria and Ionic Equilibria

Equilibrium in physical and chemical processes, law of mass action, equilibrium constants (K_c , K_p , K_x) relation among them, the reaction quotient and its relation with equilibrium. Le-Chateliers principle and its applications.

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.

Unit- 8. General Principles of extraction of metals

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 metal. Reactions involved in the Blast furnace for extraction of iron.

Unit-9 Some basic principles of organic chemistry

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

Unit-10 Hydrocarbons

Classification of Hydrocarbons.

- a. Aliphatic Hydrocarbons: general methods of preparation, properties and uses of alkanes, alkenes and alkynes.
- b. Aromatic Hydrocarbons: benzene, resonance aromaticity, chemical properties, directive influence of functional group in mono-substituted benzene.

Section-III

MATHEMATICS

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

1. Set Theory and its Application

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

2. Relations and Functions

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

3. Number System

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

4. Quadratic & Linear Equations

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

5. Calculus of One Variable

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

6. Sequence and Series

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

7. Coordinate geometry

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

8. Analytical Solid Geometry

- Plane, straight line, Sphere

9. Probability

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

10. Statistics

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

11. Trigonometry

- Angles associated with 90, 180, 270, 360 compounded angle formula, sub-multiple angle formula, Trigonometry Equations, Inverse trigonometric functions, Height and Distance.

12. Mensuration

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