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 Registivity, 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, Charle'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 uncertainity 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 logarithemic 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 or organic compounds
ii) Electronic displacement in a covalent bond : inductive effect, electronic effect, resonance and hyper conjugation.
iii) Homolytic and heterolytic fission of a covent 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 bezone.

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 inter-section of finite sets.

2. Relations and Functions **02 Marks**

- Reflexive, Summetric, 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 90^0, 180^0, 270^0, 360^0, 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.

CBZ : This section shall carry the questions from Chemistry, Botany and Zoology subjects with equal proportion of marks:

CHEMISTRY

As indicated in the PCM Syllabus

BOTANY

1. Plant Diversity and Conservation **04 Marks**

- Nomenclature and classification of plant kingdom, Plant divisions – Thallophyta, Bryophyta, Pteridophyta, Gymnosperms and Angiosperms, their habitat and complexity in their structural organization. Endangered plant species and their conservation measure.

2. Tissue System **03 Marks**

- Meristematic and permanent tissues: their types, organization and functions.
- Tissue System: Epidermal, ground and vascular tissue system, internal structure of dicot and monocot stems and roots, secondary growth in plants.

3. Photosynthesis **03 Marks**

- Structure and Photosynthetic pitments, Light reaction : light absorption, electron transport and photophosphorylation, Dark

reaction – CO_2 fixation by C_3, C_4 and CAM plants, photorespiration.

4. Growth Regulators in Plants **02 Marks**

- Auxins, Gibberellins, Cytokinins, Ethylene and Abscissic acid, their role in plant growth regulation.

5. Reproduction in Plants **04 Marks**

- Vegetative Reproduction : Fission, budding and cutting (grafting) and propagation in angiosperms.
- A Sexual Reproduction : Sporulation, Comidia formation and other special structure formation.
- Sexual Reproduction : Isogamy, anisogamy and oogamy, double fertilization and triple fusion in angiosperms.
- Parthenogenesis : Tissue culture and micropropagation

6. Mendelism **02 Marks**

- Mendelian factors, Monohybrid cross and principles of dominance and segregation.
- Dihybridcross : Laws of independent assortment.
- Deviations from Mendelian principles

7. Plant Diseases and Control Measures **02 Marks**

- Causal Organisms, symptoms, life cycle and control measures of following diseases : Late blight of potato, powdery mildew, Rust and Smut of Wheat, Leaf Sport and blast disease of rice.

ZOOLOGY

Full Marks : 20

1. Taxonomy **01 Mark**

- Five kingdom classification, Characteristics and Examples of each animal phylum (in case of phylum chordata up to classes) (01 question)

2. Cytology **02 Marks**

- Cell structure and cell division (mitosis and meiosis), DNA and RNA (02 questions)

3. Genetics **02 Marks**

- Linkage, Crossing over, Mutation, Chromosomal aberration and chromosomal mechanism of sex determination (02 questions)

4. Evolution **02 Marks**

- Darwinism, Modern Synthetic theory of evolution (variation, selection and isolation) (02 questions)

5. Ecology **02 Marks**

- Eco-system, Food Chain and Food web, Energy Flow, Ecological Pyramids, Renewable and Non-renewable energy resources, Bio-diversity (meaning and conservation), Causes, Effects and Control of Air Pollution (02 marks)

Life Processes:

6. Nutrition **01 Mark**

- Types of food and types of nutrition, names and functions of digestive enzymes (01 question)

7. Respiration **02 Marks**

- Types of respiration (aerobic and anaerobic) Glycolysis and Krebs cycle (02 questions)

8. Circulation **02 Marks**

- Blood (composition and function) in man, structure and working of human heart (02 questions)

9. Excretion **02 Marks**

- Human kidney (structural details), mechanism of urine formation (02 questions)

10. Control and Coordination **02 Marks**

- Structure of neuron, synaptic transmission, structure of human brain and function of its different parts, names of endocrine glands and secreted hormones with their specific functions (02 questions)

11. Reproduction and Development **Marks**

Structure of goruda (ovary and testes) and gamotes in man, Fertilization, Types of clearage (02 questions)