❖ Physics:

1. Physical-world and measurement

Physics, technology and society, S I units, Fundamental and derived unitsLeast count, accuracy and precision of measuring instruments,Errors in measurement,Dimensions of Physical quantities, dimensional analysis and its applications

2. Kinematics

Frame of reference, Motion in a straight line: Position-time graph, speed and velocity, Uniform and non-uniform motion, average speed and instantaneous velocity, Uniformly accelerated motion, velocity-time, position-time graphs, relations for uniformly accelerated motion.

Scalars and Vectors, Vector addition and Subtraction, Zero Vector, Scalar and Vector products, Unit Vector, Resolution of a Vector Relative Velocity, Motion in a plane, Projectile Motion, Uniform Circular Motion

3. Laws of Motion

Force and Inertia,Newton's First Law of motion; Momentum, Newton's Second Law of motion; Impulse; Newton's Third Law of motion. Law of conservation of linear momentum and its applications, Equilibrium of concurrent forces. Static and Kinetic friction,laws of friction, rolling friction Dynamics of uniform circular motion: Centripetal force and its applications

4. Work, Energy and Power

Work done by a constant force and a variable force kinetic and potential energies,work energy theorem power, Potential energy of a spring conservation of mechanical energy, conservative and non-conservative forces Elastic and inelastic collisions in one and two dimensions

5. Motion of System of Particles and Rigid Body

Centre of mass of a two-particle system, Centre of mass of a rigid body
Basic concepts of rotational motion moment of a force, Torque, angular momentum, conservation of angular momentum and its applications, moment of inertia, radius of gyration Values of moments of inertia for simple geometrical objects,parallel and perpendicular axes theorems and their applications. Rigid body rotation, equations of rotational motion.

6. Gravitation

The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth. Kepler's laws of planetary motion. Gravitational potential energy; gravitational potential. Escape velocity. Orbital velocity of a satellite. Geo-stationary satellites.

7. Properties of Solids and Liquids

Elastic behaviour, Stress-strain relationship, Hooke's Law, Young's modulus, bulk modulus, modulus of rigidity.

Pressure due to a fluid column; Pascal's law and its applications.Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, Reynolds number. Bernoulli's principle and its applications. Surface energy and surface tension, angle of contact, application of surface tension – drops, bubbles and capillary rise.

Heat, temperature, thermal expansion; specific heat capacity, calorimetry; change of state, latent heat. Heat transfer-conduction, convection and radiation, Newton's law of cooling.

8. Thermodynamics

Thermal equilibrium, zeroth law of thermodynamics, concept of temperature. Heat, work and internal energy. First law of thermodynamics. Second law of thermodynamics: reversible and irreversible processes. Carnot engine and its efficiency.

9. Kinetic Theory of Gases

Equation of state of a perfect gas, work done on compressing a gas. Kinetic theory of gases – assumptions, concept of pressure. Kinetic energy

and temperature: rms speed of gas molecules; Degrees of freedom, Law of equipartition of energy, applications to specific heat capacities of gases; Mean free path, Avogadro's number.

10. Oscillations and Waves

Periodic motion period, frequency, displacement as a function of time Periodic functions. Simple harmonic motion (S.H.M.) and its equation; phase; oscillations of a spring -restoring force and force constant; energy in S.H.M. – kinetic and potential energies; Simple pendulum – derivation of expression for its time period; Free, forced and damped oscillations, resonance

12. Current Electricity

Electric current, Drift velocity, Ohm's law, Electrical resistance, Resistances of different materials, V-I characteristics of Ohmic and non ohmic conductors, Electrical energy and power, Electrical resistivity, Colour code for resistors; Series and parallel combinations of resistors; Temperature dependence of resistance. Electric Cell and its Internal resistance, potential difference and emf of a cell, combination of cells in series and in parallel.Kirchhoff's laws and their applications.Wheatstone bridge, Metre bridge.

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16. Optics

Reflection and refraction of light at plane and spherical surfaces, mirror formula, Total internal reflection and its applications, Deviation and Dispersion of light by a prism, Lens Formula, Magnification, Power of a Lens, Combination of thin lenses in contact, Microscope and Astronomical Telescope (reflecting and refracting) and their magnifying powers.

❖ Chemistry

1. Some Basic Concepts In Chemistry

Matter and its nature, Dalton's atomic theory, Concept of atom, molecule, element and compound, Physical quantities and their measurements in Chemistry, precision and accuracy, significant figures, S.I. Units, dimensional analysis, Laws of chemical combination, Atomic and molecular masses, mole concept, molar mass, percentage composition, empirical and molecular formulae, Chemical equations and stoichiometry

2. States Of Matter

Classification of matter into solid, liquid and gaseous states, Gaseous State: Measurable properties of gases, Gas laws – Boyle's law, Charle's law, Graham's law of diffusion, Avogadro's law, Dalton's law of partial pressure, Concept of Absolute scale of temperature; Ideal gas equation, Kinetic theory of gases (only postulates), Concept of average, root mean square and most probable velocities, Real gases, deviation from Ideal behaviour, compressibility factor and vander Waals equation, Solid State: Classification of solids: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea), Bragg's Law and its applications ,Unit cell and lattices, packing in solids (fcc, bcc and hcp lattices), voids, calculations involving unit cell parameters, imperfection in solids, Electrical, magnetic and dielectric properties

3. Atomic Structure

- Thomson and Rutherford atomic models and their limitations
- Nature of electromagnetic radiation, photoelectric effect
- Spectrum of hydrogen atom, Bohr model of hydrogen atom – its postulates, derivation of the relations for energy of the electron and radii of the different orbits, limitations of Bohr's model
- Dual nature of matter, de-Broglie's relationship, Heisenberg uncertainty principle.
- Elementary ideas of quantum mechanics, quantum mechanical model of atom, its important features, concept of atomic orbitals as one electron wave functions
- various quantum numbers (principal, angular momentum and magnetic quantum numbers) and their significance
- shapes of s, p and d – orbitals, electron spin and spin quantum number
- Rules for filling electrons in orbitals – aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of elements, extra stability of half-filled and completely filled orbitals.

4. Chemical Bonding and Molecular Structure

- Kossel – Lewis approach to chemical bond formation, concept of ionic and covalent bonds.
- Ionic Bonding: Formation of ionic bonds, factors affecting the formation of ionic bonds; calculation of lattice enthalpy.
- Covalent Bonding: Concept of electronegativity, Fajan's rule, dipole moment
- Valence Shell Electron Pair Repulsion (VSEPR) theory and shapes of simple molecules
- Quantum mechanical approach to covalent bonding: Valence bond theory – Its important features, concept of hybridization involving s, p and d orbitals
- Resonance
- Molecular Orbital Theory – Its important features, LCAOs, types of molecular orbitals (bonding, antibonding), sigma and pi-bonds, molecular orbital electronic configurations of homonuclear diatomic molecules, concept of bond order, bond length and bond energy.

5. Chemical Thermodynamics

- First law of thermodynamics – Concept of work, heat internal energy and enthalpy, heat capacity, molar heat capacity
- Hess's law of constant heat summation

- Enthalpies of bond dissociation, combustion, formation, atomization, sublimation, phase transition, hydration, ionization and solution
- Second law of thermodynamics
- Spontaneity of processes
- DS of the universe and DG of the system as criteria for spontaneity, Dgo (Standard Gibbs energy change) and equilibrium constant

6. Solutions

- Different methods for expressing concentration of solution – molality, molarity, mole fraction, percentage (by volume and mass both), vapour pressure of solutions and Raoult's Law – Ideal and non-ideal solutions, vapour pressure – composition, plots for ideal and non-ideal solutions
- Colligative properties of dilute solutions – relative lowering of vapour pressure, depression of freezing point, elevation of boiling point and osmotic pressure
- Determination of molecular mass using colligative properties; Abnormal value of molar mass, van't Hoff factor and its significance

7. Equilibrium

- Meaning of equilibrium, concept of dynamic equilibrium.
- Equilibria involving physical processes: Solid - liquid, liquid – gas and solid – gas equilibria, Henry's law, general characterics of equilibrium involving physical processes.
- Equilibria involving chemical processes: Law of chemical equilibrium, equilibrium constants (Kp and Kc) and their significance, significance of DG and DGo in chemical equilibria, factors affecting equilibrium concentration, pressure, temperature, effect of catalyst; Le Chatelier's principle.
- Ionic equilibrium: Weak and strong electrolytes, ionization of electrolytes, various concepts of acids and bases (Arrhenius, Bronsted – Lowry and Lewis) and their ionization, acid-base equilibria (including multi stage ionization) and ionization constants, ionization of water, pH scale, common ion effect, hydrolysis of salts and pH of their solutions, solubility of sparingly soluble salts and solubility products, buffer solutions.

8. Redox Reactions and Electrochemistry

- Electrolytic and metallic conduction,
- conductance in electrolytic solutions,
- specific and molar conductivities and their variation with concentration
- Kohlrausch's law and its applications.
- Electrochemical cells – Electrolytic and Galvanic cells, different types of electrodes, electrode potentials including standard electrode potential, half – cell and cell reactions, emf of a Galvanic cell and its measurement
- Nernst equation and its applications; Relationship between cell potential and Gibbs' energy change
- Dry cell and lead accumulator; Fuel cells.

9. Classification Of Elements and Periodicity In Properties

- Modem periodic law and present form of the periodic table,
- s, p, d and f block elements,
- periodic trends in properties of elements atomic and ionic radii, ionization enthalpy, electron gain enthalpy, valence, oxidation states and chemical reactivity.

10. S- Block Elements (Alkali and Alkaline Earth Metals)

- Group – 1 and 2 Elements: General introduction,
- electronic configuration and general trends in physical and chemical properties of elements,
- anomalous properties of the first element of each group, diagonal relationships.
- Preparation and properties of some important compounds – sodium carbonate and sodium hydroxide;
- Industrial uses of lime,limestone, Plaster of Paris and cement;
- Biological significance of Na, K, Mg and Ca.

11. P-Block Elements

- Group – 13 to Group 18 Elements
- General Introduction: Electronic configuration and general trends in physical and chemical properties of elements across the periods and down the groups; unique behaviour of the first element in each group.
- Groupwise study of the p – block elements
- Group – 13: Preparation, properties and uses of boron and aluminium; properties of boric acid, diborane, boron trifluoride, aluminium chloride and alums.
- Group – 14: Allotropes of carbon, tendency for catenation; Structure & properties of silicates, and zeolites.
- Group – 15: Properties and uses of nitrogen and phosphorus; Allotropic forms of phosphorus; Preparation, properties, structure and uses of ammonia, nitric acid, phosphine and phosphorus halides, (PCl3, PCl5); Structures of oxides and oxoacids of phosphorus.
- Group – 16: Preparation, properties, structures and uses of ozone; Allotropic forms of sulphur; Preparation, properties, structures and uses of sulphuric acid (including its industrial preparation); Structures of oxoacids of sulphur.
- Group – 17: Preparation, properties and uses of hydrochloric acid; Trends in the acidic nature of hydrogen halides; Structures of Interhalogen compounds and oxides and oxoacids of halogens.
- Group –18: Occurrence and uses of noble gases; Structures of fluorides and oxides of xenon.

12. Environmental Chemistry

- Environmental pollution – Atmospheric, water and soil.
- Atmospheric pollution – Tropospheric and Stratospheric
- Tropospheric pollution – Gaseous pollutants: Oxides of carbon, nitrogen and sulphur, hydrocarbons; their sources, harmful effects and prevention; Greenhouse effect and Global warming; Acid rain;
- Particulate pollutants: Smoke, dust, smog, fumes, mist; their sources, harmful effects and prevention.
- Stratospheric pollution- Formation and breakdown of ozone, depletion of ozone layer – its mechanism and effects.
- Water Pollution – Major pollutants such as, pathogens, organic wastes and chemical pollutants; their harmful effects and prevention.
- Soil pollution – Major pollutants such as: Pesticides (insecticides,. herbicides and fungicides), their harmful effects and prevention. Strategies to control environmental pollution.

13. Organic Compounds

- General methods of preparation, properties, reactions and uses.
- Amines: Nomenclature, classification, structure, basic character and identification of primary, secondary and tertiary amines and their basic character.
- Diazonium Salts: Importance in synthetic organic chemistry.

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❖ Mathematics

1. Sets, relations and functions

- Sets and their representation
- Union, intersection and complement of sets and their algebraic properties
- Power set; Relation, Types of relations, equivalence relations, functions; One-one, into and onto functions, the composition of functions.

2. Complex numbers and quadratic equations

- Complex numbers as ordered pairs of reals,
- Representation of complex numbers in the form a+ib and their representation in a plane,
- Argand diagram,
- algebra of complex numbers,
- modulus and argument (or amplitude) of a complex number,
- square root of a complex number,
- triangle inequality,
- Quadratic equations in real and complex number systems and their solutions.
- Relation between roots and coefficients, nature of roots, formation of quadratic equations with given roots

3. Matrices and determinants

- Matrices,
- algebra of matrices,
- types of matrices,
- determinants and matrices of order two and three.
- Properties of determinants,
- evaluation of determinants,
- area of triangles using determinants
- Adjoint and evaluation of inverse of a square matrix using determinants and elementary transformations,
- Test of consistency and solution of simultaneous linear equations in two or three variables using determinants and matrices.

4. Permutations and combinations

- Fundamental principle of counting,
- permutation as an arrangement and
- combination as selection,
- Meaning of P (n,r) and C (n,r),
- simple applications.

4. Binomial theorem and its simple applications

- Binomial theorem for a positive integral index,
- general term and middle term,
- properties of Binomial coefficients
- simple applications

5. Sequences and series

- Arithmetic and Geometric progressions,
- insertion of arithmetic,
- geometric means between two given numbers
- relation between A.M. and G.M. sum upto n terms of special series
- Arithmetic – Geometric progression

6. Limit, continuity and differentiability

- Real valued functions
- algebra of functions
- polynomials
- rational
- trigonometric
- logarithmic and exponential functions
- inverse functions
- Graphs of simple functions
- Limits, continuity and differentiability
- Differentiation of the sum, difference, product and quotient of two functions
- Differentiation of trigonometric
- inverse trigonometric
- logarithmic
- exponentia,
- composite and implicit functions
- derivatives of order upto two
- Rolle's and Lagrange's Mean Value Theorems
- Applications of derivatives: Rate of change of quantities, monotonic – increasing and decreasing functions
- Maxima and minima of functions of one variable
- tangents and normals

7. Integral calculus

- Integral as an anti – derivative.
- Fundamental integrals involving algebraic, trigonometric, exponential and logarithmic functions.
- Integration by substitution, by parts and by partial fractions. Integration using trigonometric identities.
- Evaluation of simple integrals of the type Integral as limit of a sum
- Fundamental Theorem of Calculus
- Properties of definite integrals
- Evaluation of definite integrals, determining areas of the regions bounded by simple curves in standard form

8. Differential equations

- Ordinary differential equations, their order and degree.
- Formation of differential equations.
- Solution of differential equations by the method of separation of variables, solution of homogeneous and linear differential equations of the type: $dy/dx+p(x)y=q(x)$

9. Coordinate geometry

- distance formula
- section formula
- locus and its equation
- translation of axes
- slope of a line
- parallel and perpendicular lines
- intercepts of a line on the coordinate axes
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Straight lines:

- Various forms of equations of a line
- intersection of lines
- angles between two lines
- conditions for concurrence of three lines
- distance of a point from a line
- equations of internal and external bisectors of angles between two lines
- coordinates of centroid
- orthocentre and circumcentre of a triangle
- equation of family of lines passing through the point of intersection of two lines

Circles, conic sections:

- Standard form of equation of a circle
- General form of the equation of a circle, its radius and centre
- equation of a circle when the endpoints of a diameter are given points of intersection of a line and a circle with the centre at the origin and condition for a line to be tangent to a circle
- equation of the tangent. Sections of cones, equations of conic sections (parabola, ellipse and hyperbola) in standard forms, condition for $y = mx + c$ to be a tangent and point (s) of tangency.

❖ Biology

1. Diversity in Living World

• What is living? ; Biodiversity; Need for classification; Three domains of life; Taxonomy & Systematics; Concept of species and taxonomical hierarchy; Binomial nomenclature; Tools for study of Taxonomy — Museums, Zoos, Herbaria, Botanical gardens.

• Five kingdom classification; salient features and classification of Monera; Protista and Fungi into major groups; Lichens; Viruses and Viroids.

• Salient features and classification of plants into major groups-Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms (three to five salient and distinguishing features and at least two examples of each category); Angiosperms-classification up to class, characteristic features and examples).

• Salient features and classification of animals-nonchordate up to phyla level and chordate up to classes level (three to five salient features and at least two examples).

2. Structural Organisation in Animals and Plants

Morphology and modifications; Tissues; Anatomy and functions of different parts of flowering plants: Root, stem, leaf, inflorescence- cymose and racemose, flower, fruit and seed (To be dealt along with the relevant practical of the Practical Syllabus).

• Animal tissues; Morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of an insect (cockroach). (Brief account only)

3. Cell Structure and Function

Cell theory and cell as the basic unit of life; Structure of prokaryotic and eukaryotic cell; Plant cell and animal cell; Cell envelope, cell membrane, cell wall; Cell organelles-structure and function; Endomembrane system-endoplasmic reticulum, golgi bodies, lysosomes, vacuoles; mitochondria, ribosomes, plastids, micro bodies; Cytoskeleton, cilia, flagella, centrioles (ultrastructure and function); Nucleus-nuclear membrane, chromatin, nucleolus.

• Chemical constituents of living cells: Biomolecules-structure and function of proteins, carbohydrates, lipids, nucleic acids; Enzymes-types, properties, enzyme action.

• B Cell division: Cell cycle, mitosis, meiosis and their significance.

4. Plant Physiology

Transport in plants: Movement of water, gases and nutrients; Cell to cell transport-Diffusion, facilitated diffusion, active transport; Plant — water relations — imbibition, water potential, osmosis, plasmolysis; Long distance transport of water— Absorption, apoplast, symplast, transpiration pull, root pressure and guttation; Transpiration-Opening and closing of stomata; Uptake and translocation of mineral nutrients-Transport of food, phloem transport, Mass flow hypothesis; Diffusion of gases (brief mention).

• Mineral nutrition: Essential minerals, macro and micronutrients and their role; Deficiency symptoms; Mineral toxicity; Elementary idea of Hydroponics as a method to study mineral nutrition; Nitrogen metabolism-Nitrogen cycle, biological nitrogen fixation.

• Photosynthesis: Photosynthesis as a means of Autotrophic nutrition; Site of photosynthesis take place; pigments involved in Photosynthesis (Elementary idea); Photochemical and biosynthetic phases of photosynthesis; Cyclic and non-cyclic and photophosphorylation; Chemiosmotic hypothesis; Photorespiration C3 and C4 pathways; Factors affecting photosynthesis.

• Respiration: Exchange gases; Cellular respiration-glycolysis, fermentation(anaerobic), TCA cycle and electron transport system

(aerobic); Energy relations-Number of ATP molecules generated; Amphibolic pathways; Respiratory quotient.

• Plant growth and development: Seed germination; Phases of Plant growth and plant growth rate; Conditions of growth; Differentiation, dedifferentiation and Redifferentiation; Sequence of developmental process in a plant cell; Growth Regulators-auxin, gibberellin, cytokinin, ethylene, ABA; Seed dormancy; Vernalisation; Photoperiodism.

5. Human Physiology

Digestion and absorption; Alimentary canal and digestive glands; Role of digestive enzymes and gastrointestinal hormones; Peristalsis, digestion, absorption and assimilation of proteins, carbohydrates and fats; Caloric value of proteins, carbohydrates and fats; Egestion; Nutritional and digestive disorders — PEM, indigestion, constipation, vomiting, jaundice, diarrhoea.

• Breathing and Respiration: Respiratory organs in animals (recall only); Respiratory system in humans; Mechanism of breathing and its regulation in humans-Exchange of gases, transport of gases and regulation of respiration Respiratory volumes; Disorders related to respiration-Asthma, Emphysema, Occupational respiratory disorders.

• Body fluids and circulation: Composition of blood, blood groups, coagulation of blood; Composition of lymph and its function; Human circulatory system-Structure of human heart and blood vessels; Cardiac cycle, cardiac output, ECG, Double circulation; Regulation of cardiac activity; Disorders of circulatory system- Hypertension, Coronary artery disease, Angina pectoris, Heart failure.

• Excretory products and their elimination: Modes of excretion- Ammonotelism, ureotelism, uricotelism; Human excretory system-structure and function; Urine formation, Osmoregulation; Regulation of kidney function-Renin-angiotensin, Atrial Natriuretic Factor, ADH and Diabetes insipidus; Role of other organs in excretion; Disorders; Uraemia, Renal failure, renal calculi, Nephritis; Dialysis and artificial kidney.

• Locomotion and Movement: Types of movement- ciliary, flagella, muscular; Skeletal muscle- contractile proteins and muscle contraction; Skeletal system and its functions (To be dealt with the relevant practical of Practical syllabus); Joints; Disorders of muscular and skeletal system-Myasthenia Gravis, Tetany, Muscular dystrophy, Arthritis, Osteoporosis, Gout
• Neural control and coordination: Neuron and nerves; Nervous system in humans- central nervous system, peripheral nervous system and visceral nervous system;
Generation and conduction of nerve impulse; Reflex action; Sense organs; Elementary structure and function of eye and ear.
• Chemical coordination and regulation: Endocrine glands and hormones; Human endocrine system-Hypothalamus, Pituitary, Pineal, Thyroid, Parathyroid, Adrenal, Pancreas, Gonads; Mechanism of hormone action (Elementary Idea); Role of hormones as messengers and regulators. Hypo-and hyperactivity and related disorders (Common disorders e.g. Dwarfism, Acromegaly, Cretinism, goiter, exophthalmic goiter, diabetes, Addison's disease).
(Imp: Diseases and disorders mentioned above to be dealt in brief.)

6. Reproduction

• Reproduction in organisms: Reproduction, a characteristic feature of all organisms for continuation of species; Modes of reproduction — Asexual and sexual; Asexual reproduction; Modes-Binary fission, sporulation, budding, gemmule, fragmentation; vegetative propagation in plants.

• Sexual reproduction in flowering plants: Flower structure; Development of male and female gametophytes; Pollination-types, agencies and examples; Outbreeding devices; Pollen-Pistil interaction; Double fertilization; Post fertilization events-Development of endosperm and embryo, Development of seed and formation of fruit; Special modes-apomixis, parthenocarpy,

polyembryony; Significance of seed and fruit formation.

• Human Reproduction: Male and female reproductive systems; Microscopic anatomy of testis and ovary; Gametogenesis-spermatogenesis & oogenesis; Menstrual cycle; Fertilisation, embryo development upto blastocyst formation, implantation; Pregnancy and placenta formation (Elementary idea); Parturition (Elementary idea); Lactation (Elementary idea).

• Reproductive health: Need for reproductive health and prevention of sexually transmitted diseases (STD); Birth control-Need and Methods, Contraception and Medical Termination of Pregnancy (MTP); Amniocentesis; Infertility and assisted reproductive technologies — IVF, ZIFT, GIFT (Elementary idea for general awareness).

7. Genetics and Evolution

• Heredity and variation: Mendelian Inheritance; Deviations from Mendelism- Incomplete dominance, Co-dominance, Multiple alleles and Inheritance of blood groups, Pleiotropy; Elementary idea of polygenic inheritance; Chromosome theory of inheritance; Chromosomes and genes; Sex determination-In humans, birds, honey bee; Linkage and crossing over; Sex-linked inheritance-Haemophilia, Colour blindness; Mendelian disorders in humans-Thalassemia; Chromosomal disorders in humans; Down's syndrome, Turner's and Klinefelter's syndromes.

•Molecular basis of Inheritance: Search for genetic material and DNA as genetic material; Structure of DNA and RNA; DNA packaging; DNA replication; Central dogma; Transcription, genetic code, translation; Gene expression and regulation-Lac Operon; Genome and human genome project; DNA fingerprinting.

•Evolution: Origin of life; Biological evolution and evidences for biological evolution from Paleontology, comparative anatomy, embryology and molecular evidence); Darwin's contribution, Modern Synthetic Theory of Evolution; Mechanism of evolution-Variation (Mutation and Recombination) and Natural Selection with examples, types of natural selection; Gene flow and genetic drift; Hardy-Weinberg's principle; Adaptive Radiation; Human evolution.

8. Biology and Human Welfare

• Health and Disease; Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis. Typhoid, Pneumonia, common cold, amoebiasis, ring worm); Basic concepts of immunology-vaccines; Cancer, HIV and AIDS; Adolescence, drug and alcohol abuse.

• Improvement in food production; Plant breeding, tissue culture, single cell protein, Biofortification; Apiculture and Animal husbandry.

• Microbes in human welfare: In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers.