

IB: Øe (SYLLABUS)

(A) Physics

Unit and dimensions, dimensional analysis, S.I. Units, Motion in two dimensions Cases of uniform velocity and uniform acceleration, General relation between position and velocity, Uniform circular motion, Force and inertia. Newton's Laws of motion. Conservation of momentum and energy. Static and kinetic friction. Work energy and power collisions, potential energy, gravitational potential energy and its angular conversion to kinetic energy. Potential energy of a spring, Rigid body rotation and conservation of its momentum. Moment of inertia, theorems of parallel and perpendicular axis. (Moment of inertia of uniform ring, disc, thin rod and cylinder only).

Acceleration due to gravity and its variation, Universal law of gravitation, geostationary satellites, escape velocity.

Hooke's law, Young's modulus, shear and bulk modulus, surface energy and surface tension, kinetic theory of gases, gas laws, kinetic energy and temperature.

Specific heats at constant volume and constant pressure. mechanical equivalent of heat, isothermal and adiabatic processes.

Heat conduction in one dimension, convection and radiation, Stefan's Law and Newton's law of cooling Periodic motion, Simple harmonic motion, Oscillations due to spring, Wave motion principle of superposition; Progressive and stationary waves, Beats and Doppler effect.

Wave nature of light, Interference, Young's double slit experiment, Velocity of light and Doppler's effect in light.

Reflection, refraction, total internal reflection, curved mirrors, Lenses, mirror and lens formulae. Dispersion in prism, absorption and emission spectra.

The human eye, defects of vision, magnification and resolving power of telescope and microscope "e" and "e/m" for an electron, Einstein's photoelectric equation, photocells.

Bohr model of the atom, Hydrogen spectrum, Composition of nucleus, atomic masses and isotopes, radioactivity, laws of radio active decay, decay constant, half life and mean life, Mass-energy relation, fission. X-Ray: Properties and uses.

Elementary ideas of conductor, semi-conductor and insulator, intrinsic and extrinsic semi conductors, np Junction as a rectifier.

Bar magnet, lines of force, torque on a bar magnet due to magnetic field, earth's magnetic field, tangent galvanometer, vibration magnetometer.

Coulomb's law of electrostatic, dielectric constant, electric field and potential due to a point charge, dipole, dipole field, Gauss's law in a simple geometrics.

Electrostatic potential, capacitance, parallel plate and spherical capacitors capacitors in series and parallel, energy of a capacitor.

Electric current, Ohm's law, Kirchhoff's laws, resistances in series and parallel temperature dependence of resistance. Wheatstone bridge, potentiometer.

Measurement of voltages and currents.

Electric power, heating effects of currents, chemical effects and law of electrolysis, thermoelectricity. Biot Savart law. Magnetic fields due to a straight wire circular loop and solenoid.

Force on a moving charge in a magnetic field (Lorentz force), Magnetic moment of a current loop, effect of a uniform magnetic field of a current loop, forces between two currents, moving coil, galvanometer, ammeter and voltmeter.

Electromagnetic induction induced emf, Faraday's law, Lenz's law, self and mutual inductance alternating currents, impedance and reactance growth and decay of current in L-R circuit, elementary idea of dynamo and transformer.

(B) Chemistry

General and Physical Chemistry

Structure of Atom : Constitution of nucleus : Bohr's atom model : quantum numbers Aufbau principle, electronic configuration of elements (upto-Kr) : de-Broglie relation, shapes of orbitals.

Chemical Bond : Electrovalent, covalent and coordinate bonds, hybridization (sp) : hydrogen bond: shapes of molecules (VSEPR theory) : bond polarity, resonance, Elements of VBT MOT.

Solutions: Modes of expressing concentrations of solutions: Types of solutions, Raoult's law of colligative properties, non-ideal solution, abnormal molecular weights.

Solid State : Crystal lattices, unit cells, Structure of ionic compounds: close packed structure ionic radii, imperfections (Point defects): Properties of solids.

Nuclear Chemistry : Radio active radiations: half-life, radioactive decay, group displacement structure and properties of nucleus: Nuclear reaction, disintegration series, artificial transmutation: isotopes and their uses, Radio carbon dating.

Chemical Equilibrium : Chemical equilibrium, Law of mass action : KP and KC : Le Chatelier principle and its application.

Ionic Equilibria in solutions, Solubility product, common ion effect, theories of acids and base hydrolysis of salts : pH : buffers.

Thermochemistry and Thermodynamics : Energy changes during a chemical reaction: intrinsic energy enthalpy, first law of thermodynamics: Hess's law, Heats of reactions: Second law of thermodynamics: entropy: free energy; spontaneity of a chemical reaction; free energy change and chemical equilibrium; free energy as energy available for useful work.

Chemical kinetics, Rate of a reaction, factors affecting the rate, rate constant, rate expression, order of reaction, first order rate constant expression and characteristics, Arrhenous equation.

Electrochemistry: Oxidation, Oxidation number and ion-electron methods. Electrolytic conduction. Faraday's laws; voltaic cell, electrode potentials, electromotive force, Gibb's energy and cell potentials. Nernst equation, commercial cells, fuel cell, electrochemical theory of corrosion.

Surface chemistry, Colloids and Catalysis; Adsorption, Colloids (types preparation and properties), Emulsions, Micelles, Catalysis: Types and characteristics.

Inorganic Chemistry :

Principles of metallurgical-operations : Furnaces, ore concentration, extraction, purification metallurgies of Na, Al, Fe, Cu, Ag, Zn and Pb and their properties.

Chemical periodicity : s, p, d and f-block elements, periodic Table: periodicity : atomic and ionic radii valency, ionization energy, electron affinity electronegativity, metallic character.

Comparative study of elements: Comparative study of the following families of elements: (i) alkali metals (ii) Alkaline earth metals (iii) Nitrogen family (iv) Oxygen family (v) Halogens (vi) Noble gases.

Transition metals: Electronic configuration of 3d-metal ions, oxidation states, other general characteristic properties, Potassium permanganate, Potassium dichromate.

Co-ordination compounds : Simple nomenclature, bonding and stability, classification and bonding in organometallics.

Chemical analysis : Chemistry involved is simple inorganic qualitative analysis: calculations based on acid-base titrimetry.

Organic Chemistry :

Calculation of empirical and molecular formula of organic compounds, Nomenclature of organic compounds, common functional groups isomerism structure and shapes of alkanes, alkanes and benzene.

Preparation properties and uses of alkynes, alkyl, benzene, petroleum, cracking octane number, gasoline additives.

Nomenclature, Physical chemical properties, correlation of physical properties with structure properties and uses of haloalkanes, halobenzenes, alcohols and phenols: General ideas of some polyhalogen compounds viz., dichloroethanes, dichloroethers, chloroform, carbon tetrachloride D.D.T., benzene hexachloride.

Nomenclature, methods of preparation, Chemical properties correlations of physical properties with structures and uses of ethers, aldehydes, ketones, carboxylic acids and their derivatives, Brief account of the chemistry of Cyanides, isocyanides, amines and nitro compounds.

Polymers : Classification : Preparation and uses of common natural and synthetic polymers.

Biomolecules : Classification, Structures and biological importance of carbohydrates amino acids, peptides, proteins and enzymes, nucleic acids and lipids.

(C) Botany

Structural organization of cell, cell theory. Light and Electron Microscopic view of cell. Structure and functions of cell organelles : Nucleus Mitochondria, Chloroplast Endoplasmic reticulum, Golgi complex lysosome, microbodies microfilaments Ribosomes, Centrioles and Plasmids, Eukaryotic Chromosome (Morphology) cell and plasma membrane, Difference between plant and animal cell. Division, cell cycle significance of mitosis and meiosis.

Mendel's Laws of inheritance, Monohybrid and dihybrid cross; linkage and crossing over of genetic material DNA replication, genetic code transcription, transcription and gene regulation.

Difference between Prokaryote and Eukaryotes : Structure reproduction and economic importance of viruses Mycoplasma, Bacteriophage, Cyanobacteria (Nostoc) and Bacteria.

Five Kingdom classification, Binomial Nomenclature, External morphology and life cycle of Spirogyra mucr, Funaria Selaginella and pinus.

Elementary knowledge of microsporogenesis megasporogenesis. Fertilization endosperm and embryo development in Angiosperms.

Tissues and tissues systems, meristematic and permanent tissue, Mineral nutrition essential elements and their functions: uptake of minerals transport of water and solutes. Transpiration Photosynthesis and Respiration: Importance, mechanism and factors affecting this process: Photorespiration.

Enzymes and growth hormones with reference to their classification. Chemical nature, mode of action, importance. Elementary idea of photoperiodism and phytochrome.

Ecosystem - Structures and function, Major ecosystems i.e. lake and Forest; Food chain, Food web and energy flow, Ecological crisis- Role of man in polluting Environment - Air, Water and Soil.

Role of plants in human welfare: A general knowledge of plant products of economic value- Drugs, Fibers, Cereals.

Wheat and Rice, Pulse (gram), Oil seeds (Ground nut), Sugarcane, Coal and petroleum.

Food preservation-methods and importance.

Principle of plant breeding and its role in improvement of crops. Biotechnology; scope and importance in Agriculture and industrial manufacture of cheese. Yoghurt, Alcohol Antibiotics.

(D) Zoology

Multicellularity - Structure and Function of Animal Life :

Structure and function of Animal tissues Epithelial, Connective Muscular, Skeletal and Nerve.

Histology of mammalian organs - Stomach, Intestine, Liver, Kidney, Lung, Testes and Ovary.

Structure and Physiology of different organ systems of Human body. Skin, Digestive system, Respiratory system, Circulatory system.

Skeleton, Joints, Muscles on the basis of movement receptors.

Endocrine system with special reference to various Endocrine glands of man and hormonal co-ordination.

Vitamins & minerals (source and disorders due to deficiencies).

Developmental Biology and Genetics:

Female reproductive cycles in mammals. Gametogenesis alongwith structure of sperm and ovum. Types of eggs, Fertilization, cleavage types of cleavage and blastula. Development of mammals upto three germinal layers. Foetal membranestructure and functions.

Growth, repair and ageing, amniocentesis. - Chromosomes, Types of chromosome, Human karyotype and chromosomal abnormalities and syndromes, Hormonal, Chromosomal and Genic Balance theory of sex determination, Sex linkage and sex linked inheritance in Man. Blood Group and their significance, Blood Bank.

Tissue culture, Genetic Engineering (Brief idea). Mutation, gene mutation.

Human population, natality, Mortality, Sex ratio, Population explosion, dynamics of human life with respect to food supply, housing, health and standard of living, impact of population problems and their control.

Taxonomy Evolution and Economic Zoology:

Classification - Binomial and trinomial nomenclature, Basic features of classification, Classification of different animal phyla upto classes with characters and suitable examples.

Origin of life, Theories of organic evolution-Darwin Lamarck, Synthetic Evidence of organic evolution, Human Evolution.

Economic Zoology/Sericulture, Apiculture, Lac culture, Poultry, Fishery and Pearl industry.

Protozoan disease in relation to man. Insect carrying diseases in relation to man.

Cancer-types of cancer and cancer cell. Communicable diseases (Hepatitis, AIDS) STD, Immune Response, Vaccines and antisera allergies.

Smoking, alcoholism and drug addiction, symptoms and control.

Wild conservation.

Pesticides - Uses, advantages and hazards.