PHYSICS

Section-1 (Class 11th Syllabus)

BASIC MATHEMATICS USED IN PHYSICS

ALGEBRA : Quadratic Equation (Roots of quadratic equation, Solution by Factorization and by Shridharacharya Formula, Properties of roots (real, equal, imaginary etc), Application of Quadratic equation in physics), Binomial Theorem and binomial approximation, Logarithm and Exponents (Laws of logarithms and exponents with applications / examples), Series (Arithmetic Progression and its general term and Sum, Sum of first n Natural numbers, Geometrical Progression and its general term and Sum, Sum of infinite GP), Componendo & Dividendo rule.

TRIGONOMETRY : Angle & its measurement (Sexagesimal and Circular system) , Trigonometric-ratios, Trigonometric identities , Four Quadrants & ASTC rule, T-ratios for general angles , Addition/ subtraction Formulae , Small angle Approximation, Ranges of T-functions.

CO-ORDINATE GEOMETRY : Define Origin, Axis or Axes, Co-ordinates of a point in a plane or space (2D or 3D), Distance Formula, Slope of a line and its interpretation, Graphs of commonly used functions(Straight line, Parabola, Circle, Ellipse , Hyperbola including rectangular hyperbola , Sinusoidal functions (sine and cosine functions), Exponential functions.

CALCULUS : Differential calculus (Average rate of change and Instantaneous rate of change, Differentiation of commonly used functions, Rules of differentiation including Product and Quotient rules, Application of derivatives: Increasing and Decreasing nature, Maxima and Minima with geometrical / graphical explanation), Integral calculus (Integration is the reverse process of differentiation, Indefinite and Definite Integration, Integration of commonly used functions, Rules of Integration, Application of Integral calculus: Area under a curve and Average value of a continuous function in an interval).

VECTORS

Definition of scalar and vector quantities, Graphical representation of vectors, Notation of Vectors, Angle between two vectors , Types of Vectors (Unit vector, Null vector, Equal vectors and equality of vectors, opposite and Negative of a vector, Parallel and anti-parallel vectors, Co-planar vectors, axial vectors) , Position and displacement vectors , Addition/subtraction of two vectors (Triangle law, Parallelogram law), Addition of many vectors (Polygon law),Unit vectors and their significance (Representation of vector in terms of unit vector in plane and in space) , Resolution of a Vector into components i.e. Cartesian Components in two and three dimensions and Direction Cosines , Multiplication or Division of a Vector by a Scalar (i.e. Real number) ,Scalar (Dot) product of two Vectors and component of a vector in the direction of another vector , Vector (Cross) product of two Vectors with its geometrical interpretation and Right hand rule for direction.

UNIT, DIMENSIONS AND MEASUREMENTS

Classification of Physical Quantities according to their dependency i.e. Fundamental (or Base) and Derived quantities , Need for measurement (Units of measurement) , Systems of units (FPS, CGS, MKS, SI system of units and Supplementary units, fundamental and derived units , Some idea about Practical and Improper units) , Standards of Length, mass and time measurements, Dimensions of physical quantities, Dimensional Formulae of important physical quantities, Dimensional analysis and its applications & its limitations, SI prefixes and general guidelines for using Symbols of SI units , Errors in measurement (Systematic, Random and Least count Errors) , Accuracy and precision of measuring instruments ; Absolute Error, Relative Error, Percentage Error and Combination of Errors , Significant figures and its rules for Arithmetic operations (i.e. addition, subtraction, multiplication and division) ,Rounding off the uncertain digits.

KINEMATICS

(Motion along a straight line and Motion in a Plane)

Motion and Rest with introduction of frame of reference , Variables of Translatory Motion (Position/ Displacement / Path length(Distance) , Velocity/ Speed / Average Velocity / Average Speed , Acceleration / Average Acceleration) , Relation among various variables of motion and their applications to variable acceleration , Equations of Motion with constant acceleration (scalar and vector forms), Motion along a straight line, velocity-time and position-time graphs for uniformly accelerated motion (graphical treatment) , Motion under gravity, Free-fall , Motion in a plane with constant acceleration , Projectile Motion – Ground to Ground projection, Projection from a height (Horizontal projection) , Relative Motion in one-dimensions , Relative Velocity in two dimensions (Rain-Man problem, River-Boat Problem & wind based questions)

LAWS OF MOTION AND FRICTION

Intuitive concept of force, Basic or Fundamental forces in nature, The law of Inertia, Newton's first law of motion ,Momentum and Newton's second law of motion; impulse , Newton's third law of motion , Common forces in mechanics-Weight, Normal reaction, Friction, Contact force, Tension in string , Free Body diagram, Equilibrium of concurrent forces-Lami's theorem, Motion of bodies in contact or connected by

strings, Pulley systems , Frame of Reference-Inertial and Non Inertial Frames. Pseudo Force and its applications , Cause of Friction, Static and Kinetic friction , Laws of friction, Limiting Static and Kinetic friction coefficients, Angle of Friction, Angle of Repose , Rolling friction, Lubrication.

WORK, ENERGY, POWER

Work done by a constant force (use of dot product) and variable force(use of definite integration i.e. area under the curve) , Kinetic energy , Work-energy theorem for a Constant and a Variable force , Concept of potential energy, conservative forces and non-conservative forces. Gravitational Potential Energy , Potential energy versus position graph and stable, unstable & neutral equilibrium , Spring force and Elastic Potential energy of a spring , Conservation of mechanical energy (kinetic and potential energies) , Power (Instantaneous and Average power).

CIRCULAR MOTION

Kinematics of circular motion (Variables of motion (Angular Displacement, Angular Velocity, Angular acceleration), Relations among Angular Variables for constant angular acceleration , General relation among angular variables) , Dynamics of uniform circular motion. Centripetal force, examples of circular motion (vehicle on level circular road, vehicle on banked road) , Dynamics of non-uniform circular motion(Motion in a vertical circle)

COLLISIONS AND CENTRE OF MASS

Impulse of a force and Impulse-Momentum theorem, Idea about Impulsive forces,

Law of conservation of linear momentum and its applications, Elastic and inelastic collisions in one and two dimensions (Head-on and Oblique collisions), Coefficient of restitution and line of impact, Expression of loss in Kinetic energy in inelastic collision,

Centre of mass of discrete system: two-particle system and n-particle system, Centre of mass of continuous system: General formula, Centre of mass of symmetrical rigid bodies; centre of mass of uniform rod , Centre of mass of composite and truncated bodies , Motion of centre of mass: Velocity, Acceleration and linear momentum vector of centre of mass of the system , Momentum conservation and centre of mass motion.

ROTATIONAL MOTION

Kinematics of Rotational Motion about a fixed axis: Comparison of linear and rotational motions, Moment of inertia, radius of gyration and its significance. Values of M.I. for simple geometrical objects (Ring, Rod and Disc with derivation and others with no derivation).Statement of parallel and perpendicular axes theorems and their applications, Moment of a force-torque, Equilibrium of rigid bodies, Angular momentum, Relation between torque and Angular momentum, Conservation of angular momentum with some examples , Pure Rolling or rolling motion on a smooth/rough horizontal surface. Expression for Rotational Kinetic Energy, Rolling motion on an inclined plane, Expression for acceleration and minimum friction coefficient.

GRAVITATION

The universal law of gravitation(Newton's law of Gravitation), Gravitational Field and its Intensity, Brief idea about Inertial and Gravitational mass, Acceleration due to gravity and its variation with altitude and depth. Idea about variation in g due to Shape and Rotation of earth, Gravitational potential energy and gravitational potential, Kepler's laws of planetary motion (The law of orbits, Areas and Periods), Motion of Planets and Satellites in Circular orbits ,Orbital velocity of a satellite, Total Energy and Binding Energy of a satellite, Escape velocity and escape energy, Geostationary satellites, Idea about of polar satellites, Weightlessness.

PROPERTIES OF MATTER AND FLUID MECHANICS

Elastic behavior, Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear, modulus of rigidity, Poisson's ratio; elastic energy. Pressure, Pascal's law, Archimedes' Principle and Buoyancy. Floatation and Translatory equilibrium, Variation of Pressure with Depth, Atmospheric pressure and Gauge Pressure, Hydraulic Machines, Streamline and turbulent flow, Critical velocity and Reynolds's number, Principle of Continuity, Bernoulli's theorem and its applications. Speed of Efflux: Torricelli's law, Venturi-meter, Dynamic lift, Viscosity, Newton's law of viscous force, Stokes' law, terminal velocity,Surface energy and surface tension, angle of contact, excess of pressure, application of surface tension ideas to drops, bubbles and capillary rise. Detergent and surface tension

THERMAL PHYSICS

(Thermal Expansion, Calorimetry, Heat Transfer, KTG & Thermodynamics)

Temperature and Thermal Expansion (Temperature, Temperature scales, Brief idea about thermometers, Thermal expansion; thermal expansion of solids, liquids, and gases. Anomalous expansion)

Calorimetry (Heat, Heat capacity, Specific heat capacity, Molar heat capacity, Water Equivalent, Heat of transformation – latent heat, Principle of Calorimetry, Heating curve, Phase diagram)

Heat transfer Conduction: (Process, Steady State, Law of Conduction, Thermal conductivity, Thermal resistance, Series
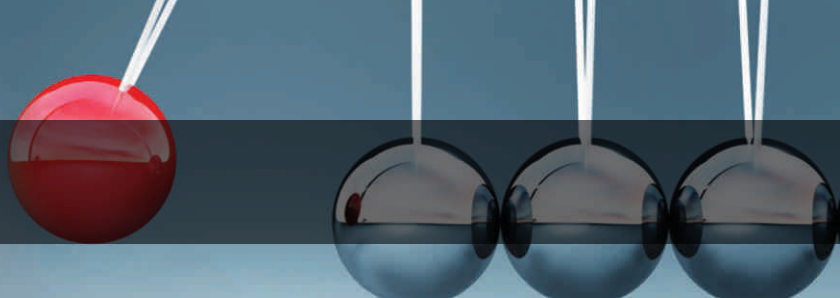
and Parallel combinations of rods, Growth of ice on ponds) , Convection: Process, Idea about Natural and Forced Convection, Radiation: Qualitative ideas of Black Body Radiation, Ideal Black Body, Absorptive Power, Emissive Power, Spectral Emissive Power, Kirchhoff's Law and its applications, Stefan's Law, Newton's law of cooling, Wien's displacement law and Green House effect, Solar constant.

Thermodynamics: Thermal equilibrium and definition of temperature (Zeroth law of Thermodynamics). Heat, work and internal energy. First law of thermodynamics. Cyclic, Isochoric, Isobaric, Isothermal and Adiabatic processes, Second law of the thermodynamics: Reversible and irreversible processes. Heat engines and refrigerators.

Kinetic theory of gases : Gas Laws, Equation of state of a perfect gas, Brief idea of van der Waals' equation and Critical temperature, Assumptions, Concept of pressure. Different types of speeds of gas molecules, Maxwell's velocity distribution curve, Kinetic energy and temperature; Degrees of freedom, Law of equipartition of energy (statement only) and application to specific heat capacities of gases; Concept of mean free path.

OSCILLATIONS

(SHM, damped and forced oscillations & Resonance)

Periodic (harmonic) motion and Oscillatory motion, Periodic motion-period, frequency, displacement as a function of time, Periodic functions, Simple harmonic motion (SHM) and its equation; Velocity, Acceleration and Phase, Oscillations of a spring-restoring force and force constant. Equivalent spring constant of Series and parallel combinations, Energy in SHM –Kinetic and Potential energies, Simple pendulum-derivation of expression for its time period, Superposition of two SHMs of Same Frequency in the same direction, Free, forced and damped oscillations (qualitative ideas only), resonance.

WAVE MOTION AND DOPPLER'S EFFECT

Wave motion, Mechanical Waves, Longitudinal and transverse waves, Equation of Plane Progressive waves, Velocity of Transverse mechanical waves, Intensity of waves , Sound waves: Audible, Infrasonic and Ultrasonic waves , Speed of sound waves: Newton's formula and Laplace correction, Effect of temperature, Pressure and Humidity on speed of Sound waves , Some idea about description of sound waves as Displacement and Pressure waves, Characteristics of sound waves: Pitch, Loudness and Quality, Reflection and transmission of waves & Echo , Principle of superposition of waves, Interference and Beats, Stationary waves, Standing waves in strings and organ pipes, fundamental mode and harmonics. Resonance tube , Doppler Effect in Sound waves and Light Waves.

Section-2 (Class 12th Syllabus)

ELECTROSTATICS

Electric charges and their basic properties, Conductors and Insulators, Method of charging: Charging by Friction, Charging by Induction and Charging by Conduction, Gold-leaf Electroscope, Coulomb's law-force between two point charges, force, between multiple charges and Superposition principle, Equilibrium of charge systems and SHM,Electric field Intensity, electric field due to a point charge and a system of charges. Electric field due to an arc, Electric field on an axial point of Ring, Electric field lines and their properties, Electric flux, statement of Gauss's theorem and its applications to find field due to(Infinitely long straight wire, Uniformly charged infinite plane sheet ,Uniformly charged thin spherical shell (field inside and outside) ,Electric potential, Potential difference, Electric potential due to(A point charge,A system of charges,Ring(on an axial point),Conducting and non conducting sphere),Electrical potential energy of a system of two/more than two point charges,Equipotential surfaces, Relation between Field and Potential,Motion of charged particle in Electric Field,Electric dipole and dipole moment(Electric Potential due to a dipole,Electric field due to a dipole,Torque on a dipole in a uniform electric field,Electrical potential energy of electric diploes in an electrostatic field,Work done in rotating a dipole)

CURRENT ELECTRICITY AND HEATING EFFECTS OF CURRENT

Electric current, flow of electric charges in a metallic conductor, drift velocity and mobility, relaxation time and their relation with electric current and current density,Ohm's law, electrical resistance, V-I characteristics (liner and non-linear),Electrical resistivity and conductivity,Carbon resistors, colour code for carbon resistors,Series and parallel combinations of resistors,Temperature dependence of resistance,Internal resistance of a cell, potential difference and emf of a cell, combination of cells in series and in parallel,Kirchhoff's laws (KCL and KVL) and simple applications,Wheatstone bridge, Meter Bridge,Potentiometer-principle and applications to, Measure potential difference, For comparing emf of two cells, Measurement of internal resistance of a cell, Moving coil galvanometer and its,Current sensitivity and voltage sensitivity,Conversion to ammeter and voltmeter, Electrical energy and power. Applications to Electric Bulbs and Heaters.

CAPACITORS

Concept of Capacity, Capacitors and capacitance, Capacity of an Isolated Spherical Capacitor, Sharing of Charges, Capacitance of a parallel plate capacitor with and without

dielectric medium between the plates, Conductors and insulators, free charges and bound charges inside a conductor. Dielectrics and electric polarization, Combination of capacitors in series and in parallel, Work done by Battery in charging of a capacitor. Energy stored in a capacitor, Charging and discharging of a Capacitor, Van de Graaff generator.

MAGNETIC EFFECT OF CURRENT AND MAGNETISM

Concept of magnetic field, Oersted's experiment, Biot-Savart law and its application to current carrying circular loop and straight wire, Ampere's law and its applications to (Infinitely long straight wire, Straight and toroidal solenoids),Circular motion of a moving charged particle in uniform magnetic field, Force on a moving charge in uniform magnetic and electric fields (Lorentz force)(Velocity Selector, Cyclotron], Force on a current-carrying conductor in a uniform magnetic field, Force between two parallel current-carrying conductors-definition of ampere, Torque experienced by a current loop in a magnetic field, Current loop as a magnetic dipole and its magnetic dipole moment. Magnetic dipole moment of a revolving electron, Bar Magnet(Magnetic field intensity due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis, Torque on a magnetic dipole (bar magnet) in a uniform magnetic field, Bar magnet as an equivalent solenoid, Magnetic field lines),Earth's magnetic field and magnetic elements, Magnetic properties of Materials(Diamagnetism with examples, Para magnetism with examples, Ferromagnetism with examples and brief analysis of magnetic Hysteresis, Electromagnets and factors affecting their strengths, Permanent magnets)

ELECTROMAGNETIC INDUCTION

Magnetic Flux, Electromagnetic induction(Faraday's Experiments),Faraday's law, Induced emf, induced, current and induced charge, Lenz's Law and its applications, Static, Dynamic and Rotational Emf, Induced Electric Field and its properties, Eddy currents, Self Induction(Coefficient of self induction (L),Growth and Decay of Current in L-R circuits),Mutual Induction(Coefficient of Mutual induction (M), Coefficient of Coupling (K)],AC generator, Transformer.

ALTERNATING CURRENT

Alternating current and Voltage, Measurement of AC, Comparison between AC and DC, Peak, Average and RMS value of alternating current/ voltage, Circuit elements in ac circuits(Resistive Circuit, Capacitive Circuit, Inductive Circuit),RC, RL circuits and their Reactance & impedance in series and parallel combination, LC oscillations (qualitative treatment only),LCR series circuit, Resonance, Quality Factor, Power in AC circuits,Wattles Current, Power Factor.

ELECTROMAGNETIC WAVES

Need for displacement current, Electromagnetic waves and their characteristics (qualitative ideas only),Transverse nature of electromagnetic waves, Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, x-rays, gamma rays) including elementary facts about their uses.

RAY OPTICS AND OPTICAL INSTRUMENTS

Reflection of light(Laws of Reflection, Reflection at Plane Surface (Plane Mirror): Formation of Image, Deviation, Rotation of mirror, Number of images, velocity of image, Minimum length of mirror to see full image of a man, Field of view, Reflection at Spherical Surface(Curved Mirror: Rules of image tracing, Image formation in concave and convex mirrors, Focal length of spherical mirrors, Relation between u,v and f (i.e. Mirror Equation for Para-axial rays), Sign convention, Magnification),Refraction of light at Plane Surface(Snell's law, Total internal reflection and its applications (Mirage, Looming, Diamond, prism and optical fibers),Optical Path, Lateral and normal shift],Refraction at spherical surfaces(single and double surface),Lenses(Thin lens formula, Lens-maker's formula, Magnification, Power of a lens, Combination of thin lenses in contact, Combination of a lens and a mirror, Silvering of Lenses, Chromatic and Spherical Aberrations.), Refraction and dispersion of light through a prism, combinations of prisms, Some Natural Phenomena due to Sunlight(Rainbow-dispersion of sun light and TIR, Scattering of light- blue colour of the sky and reddish appearance of the sun at sunrise and sunset),Optical instruments(Human eye, image formation and accommodation, correction of eye defects (myopia, hypermetropia and astigmatism) using lenses, Microscopes and telescopes (reflecting and refracting) and their magnifying powers)

WAVE OPTICS

(Nature of light, Interference, Diffraction & Polarization)

Wave front and Huygens' Principle, reflection and refraction of plane wave at a plane surface using wave fronts. Proof of laws of reflection and refraction using Huygens' Principle, Coherent and incoherent sources, LASER(only qualitative idea),Superposition of Light Waves: Interference, Young's double slit experiment and expression for fringe width, coherent sources and sustained interference of light,Diffraction due to a single slit, width of central maximum, Resolving power of microscopes and astronomical telescopes, Eye and Rayleigh Criterion, Polarisation, Polarisation by Scattering and Reflection, plane polarized light, Brewster's law, uses of plane polarized light and Polaroid's.

MODERN PHYSICS

Photoelectric effect(Hertz observation, Hallwach's and Lenard's observations,Einstein's photoelectric equation-particle nature of light (photon),Matter waves(Wave nature of particles, de Broglie relation, Davisson-Germer experiment (experimental details should be omitted; only conclusion should be explained),Atoms(Alpha- particle scattering experiments; Rutherford's model of atom,Bohr model, energy levels, hydrogen spectrum),X-rays and their elementary idea, Nuclei(Composition and size of nucleus,Atomic masses, Isotopes, isobars, isotones and isodiapheres, Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number, Nuclear fission and fusion, Nuclear reactor, Nuclear Force and its properties, Radioactivity (Law of Radioactive decay, Alpha decay, Beta decay, Gamma decay)

SEMICONDUCTOR AND DIGITAL ELECTRONICS

Classification of Metals, Conductors and Semi-conductors on the basis of(Conductivity,Energy bands in solids (qualitative ideas only),Intrinsic Semi-conductor,Extrinsic Semi-conductor (n-type and p-type),p-n Junction: p-n junction formation, Barrier potential, Semiconductor diode: I-V characteristics in forward and reverse bias, Application of Junction Diode as a Rectifier and Filter(only qualitative idea),Special purpose p-n junction diodes and their I-V characteristics (LED, Photodiode, Solar cell, Zener diode),Junction Breakdown: Zener and Avalanche breakdown, Zener diode as a voltage regulator, Junction Transistor(n-p-n and p-n-p Transistor structure and action, Characteristics of a transistor, Transistor as an amplifier (common emitter configuration),Transistor as a switch(i.e. ON and OFF),Transistor as a oscillator with feedback effects),Digital Electronics and Logic gates(Law of Boolean algebra and De Morgan's Theorem, Basic Logic gates(OR gate, AND gate, NOT gate)(Combination of gates(NAND gate, NOR gate) Brief Idea about ICs)

CHEMISTRY

Section-1 (Class 11th Syllabus)

STRUCTURE OF ATOM : Subatomic particles, Atomic models. Atomic number, isotopes and isobars. Concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle, Bohr's Model concept of orbital, quantum numbers, shapes of s,p and d orbitals, rules for filling electrons in orbitals- Aufbau principle, Pauli's exclusion principles and Hund's rule, electronic configuration of atoms, stability of half filled and completely filled orbitals.

CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES : Why do we need to classify elements, Genesis of periodic classification. Modern periodic law and long form of periodic table, IUPAC Nomenclature of elements with atomic number >100, Electronic configuration of elements and types of elements. periodic trends in properties of elements- atomic radii, ionic radii, ionization enthalpy, electron gain enthalpy, electronegativity, valency.

CHEMICAL BONDING AND MOLECULAR STRUCTURE : Kossel Lewis Approach to Chemical Bonding, Valence electrons, ionic bond, covalent bond, bond parameters, Lewis structure, polar character of covalent bond, valence bond theory, resonance, geometry of molecules, VSEPR theory, concept of hybridization involving s, p and d orbitals and shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only). Hydrogen bond, Dipole Moment.

EQUILIBRIUM : Equilibrium in physical and chemical processes, dynamic nature of equilibrium, law of chemical equilibrium, equilibrium constant, factors affecting equilibrium-Le Chatelier's principle, Relationship between equilibrium constant K and reaction Quotient Q.

Ionic equilibrium- ionization of acids and bases, strong and weak electrolytes, degree of ionization, ionization of polybasic acids, acid strength, concept of pH., Hydrolysis of salts (elementary idea)., buffer solutions, Henderson equation, solubility product, common ion effect (with illustrative examples).

SOME BASIC CONCEPTS OF CHEMISTRY : General Introduction: Important and scope of chemistry. Laws of chemical combination, Dalton's atomic theory: concept of elements, atoms and molecules.

Atomic and molecular masses. Mole concept and molar mass; percentage composition and empirical and molecular formula; chemical reactions, stoichiometry and calculations based on stoichiometry.

THERMODYNAMICS : First law of thermodynamics, internal energy and enthalpy, heat capacity and specific heat, measurement of $\triangle U$ and $\triangle H$, Hess's law of constant heat summation, enthalpy of : bond dissociation, combustion,

formation, atomization, sublimation, phase transition, ionization, solution and dilution. Introduction of entropy as state function, Second law of thermodynamics, Gibb's energy change for spontaneous and non-spontaneous process, criteria for equilibrium and spontaneity. Third law of thermodynamics-Brief introduction.

REDOX REACTIONS : Concept of oxidation and oxidation and reduction, redox reactions oxidation number, balancing redox reactions in terms of loss and gain of electron and change in oxidation numbers, application of oxidation number, equivalent concept of oxidising and reducing agent.

HYDROGEN : Position of Hydrogen in Periodic Table, Dihydrogen (H_2), Hydrides, Occurrence, isotopes, preparation, properties and uses of hydrogen; hydrides ionic, covalent and interstitial; physical and chemical properties of water, heavy water; hydrogen peroxide-preparation, reactions, uses and structure. Dihydrogen as a fuel.

ORGANIC CHEMISTRY–SOME BASIC PRINCIPLES AND TECHNIQUES : General introduction, Tetra valence of carbon, Shapes of organic compounds, structural representation of organic compounds, methods of purification, qualitative and quantitative analysis, classification and IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond: inductive effect, electromeric effect, resonance and hyperconjugation. Homolytic and heterolytic fission of a covalent bond, free radicals, carbocations, carbanions; electrophiles and nucleophiles, types of organic reactions (Reaction Mechanism).

HYDROCARBONS:

Alkanes- Nomenclature, isomerism, conformations (ethane only), physical properties, chemical reactions including free radical mechanism of halogenation, combustion and pyrolysis.

Alkenes - Nomenclature, structure of double bond (ethene), geometrical isomerism, physical properties, methods of preparation, chemical reactions: addition of hydrogen, halogen, water, hydrogen halides (Markovnikov's addition and peroxide effect), ozonolysis, oxidation, mechanism of electrophilic addition.

Alkynes - Nomenclature, structure of triple bond (ethyne), physical properties, methods of preparation, chemical reactions: acidic character of alkynes, addition reaction of hydrogen, halogens, hydrogen halides and water.

Aromatic Hydrocarbons - Introduction, IUPAC nomenclature, Benzene, resonance, aromaticity, chemical properties: mechanism of electrophilic substitution- Nitration, sulphonation, halogenation, Friedel Craft's alkylation and acylation; directive influence of functional group in mono substituted benzene, carcinogenicity and toxicity.

s–BLOCK ELEMENTS (Alkali and Alkaline Earth Metals) : Group I and group II elements: General introduction, electronic configuration, occurrence, anomalous properties of the first element of each group, diagonal relationship, trends in the variation of properties (such as ionization enthalpy, atomic and ionic radii), trends in chemical reactivity with oxygen, water, hydrogen and halogens; uses. Preparation and Properties of Some important Compounds: Sodium carbonate, sodium chloride, sodium hydroxide and sodium hydrogencarbonate, biological importance of sodium and potassium. Anomalous behaviour of Be. Industrial use of lime and limestone, biological importance of Mg and Ca. Some Important Compound of Calcium.

ENVIRONMENTAL CHEMISTRY : Environmental pollution: Air, water and soil pollution, chemical reactions in atmosphere, smogs, major atmospheric pollutants, acid rain, ozone and its reactions, effects of depletion of ozone layer, greenhouse effect and global warming-pollution due to industrial wastes; green chemistry as an alternative tool for reducing pollution, strategy for control of environmental pollution.

STATES OF MATTER : Gases and Liquids : Three states of matter, intermolecular interactions, types of bonding, melting and boiling points, role of gas laws of elucidating the concept of the molecule, Boyle's law, Charle's law, Gay Lussac's law, Avogadro's law, ideal behaviour of gases, empirical derivation of gas equation. Avogadro number, ideal gas equation. Kinetic energy and molecular speeds (elementary idea), deviation from ideal behaviour, liquefaction of gases, critical temperature.

LIQUID STATE : Vapour pressure, viscosity and surface tension (qualitative idea only, no mathematical derivations).

p-BLOCK ELEMENTS : General Introduction of p-Block Elements.

Group 13 elements : General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of first element of the group; Boron, some important compounds: borax, boric acid, boron hydrides. Aluminium: uses, reactions with acids and alkalies.

Group 14 elements : General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first element. Carbon, allotropic forms, physical and chemical properties: uses of some important compounds : (Carbon & Silicon) oxides, Important compounds of silicon and a few uses: silicon tetrachloride, silicones, silicates and zeolites & their uses.

Section-2 (Class 12th Syllabus)

SOLID STATE : Classification of solids based on different binding forces; molecular, ionic covalent and metallic solids, amorphous and crystalline solids (elementary idea), unit cell in two dimensional and three dimensional lattices, calculation of density of unit cell, packing in solids, packing efficiency, voids, number of atoms per unit cell in a cubic unit cell, point defects,

electrical and magnetic properties, Band theory of metals, conductors, semiconductors and insulators.

SOLUTIONS : Types of solutions, expression of concentration of solutions of solids in liquids, solubility of gases in liquids, solid solutions, colligative properties- relative lowering of vapour pressure, Raoult's law, elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, abnormal molecular mass. Vant and Hoff factor.

ELECTROCHEMISTRY : Redox reactions, conductance in electrolytic solutions, specific and molar conductivity variation of conductivity with concentration, kohlrausch's Law, electrolysis and Laws of electrolysis (elementary idea), dry cell-electrolytic cells and Galvanic cells; lead accumulator, EMF of a cell, standard electrode potential, Relation between Gibbs energy change and EMF of a cell, fuel cells; corrosion.

CHEMICAL KINETICS : Rate of a reaction (average and instantaneous), factors affecting rates of reaction; concentration, temperature, catalyst; order and molecularity of a reaction; rate law and specific rate constant, integrated rate equations and half life (only for zero and first order reactions); concept of collision theory (elementary idea, no mathematical treatment). Activation energy, Arrhenious equation.

SURFACE CHEMISTRY : Adsorption-physisorption and chemisorption; factors affecting adsorption of gases on solids, catalysis homogeneous and heterogeneous, activity and selectivity: enzyme catalysis; colloidal state: distinction between true solutions, colloids and suspensions; lyophillic, lyophobic, multimolecular and macromolecular colloids; properties of colloids; Tyndall effect, Brownian movement, electrophoresis, coagulation; emulsions- types of emulsions.

p-BLOCK ELEMENTS : General Introduction of p-Block Elements.

Group 13 elements : General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous properties of first element of the group; Boron, some important compounds: borax, boric acid, boron hydrides. Aluminium: uses, reactions with acids and alkalies.

Group 14 elements : General introduction, electronic configuration, occurrence, variation of properties, oxidation states, trends in chemical reactivity, anomalous behaviour of first element. Carbon, allotropic forms, physical and chemical properties: uses of some important compounds : (Carbon & Silicon) oxides, Important compounds of silicon and a few uses: silicon tetrachloride, silicones, silicates and zeolites & their uses.

Group 15 elements : General introduction, electronic configuration, occurrence, oxidation states, trends in physical and chemical properties; preparation and properties of ammonia and nitric acid, oxides of nitrogen (structure only); Phosphorous- allotropic forms; compounds of phosphorous: preparation and properties of phosphine, halides (PCl_3, PCl_5) and oxoacids (elementary idea only).

Group 16 elements : General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; dioxygen: preparation, properties and uses; classification of oxides; ozone. Sulphur – allotropic forms; compounds of sulphur: preparation, properties and uses of sulphur dioxide H_2S; sulphuric acid: industrial process of manufacture, properties and uses, oxoacids of sulphur (structures only).

Group 17 elements: General introduction, electronic configuration, oxidation states, occurrence, trends in physical and chemical properties; compounds of halogens: preparation, properties and uses of chlorine and hydrochloric acid, interhalogen compounds, oxoacids of halogens (structures only).

Group 18 elements: General introduction, electronic configuration, occurrence, trends in physical and chemical properties, uses.

General Principles and Processes of Isolation of Elements : Principles and methods of extraction- concentration, oxidation, reduction electrolytic method and refining; occurrence and principles of extraction of aluminium, copper, zinc and iron.

Haloalkanes and Haloarenes : Haloalkanes : Nomenclature, nature of C–X bond, physical and chemical properties, mechanism of substitution reactions and elimination reactions Optical activity.

Haloarenes: Nature of C-X bond, substitution reactions (directive influence of halogen for monosubstituted compounds only).

Uses and environment effects of – dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons, DDT.

COORDINATION COMPOUNDS : Coordination compounds: Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds, isomerism (structural and stereo) bonding in coordination compound, Werner's theory, VBT, CFT; importance and applications of coordination compounds (in qualitative analysis, biological systems).

d and f Block Elements : General introduction, electronic configuration, characteristics of transition metals, general trends in properties of the first row transition metals- metallic character, melting point ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, interstitial compounds, alloy formation. Preparation and properties of $K_2Cr_2O_7$ and $KMnO_4$.

Lanthanoids - electronic configuration, oxidation states, chemical reactivity, and lanthanoid contraction and its consequences.

Actinoids: Electronic configuration, oxidation states and comparison with lanthanoids. Some application of d & f block elements.

ALCOHOL, PHENOL AND ETHER : Alcohol: Nomenclature, methods of preparation, physical and chemical properties (of

primary alcohols only); identification of primary, secondary and tertiary alcohol; mechanism of dehydration, uses with special reference to methanol and ethanol. Some commercially important alcohols.

Phenol : Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophillic substitution reactions, uses of phenols.

Ether : Nomenclature, methods of preparation, physical and chemical properties & uses.

ALDEHYDES, KETONES AND CARBOXYLIC ACIDS : Aldehydes and Ketones : Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties; and mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes; uses.

Carboxylic Acids : Nomenclature, acidic nature, methods of preparation, physical and chemical properties, uses.

ORGANIC COMPOUNDS CONTAINING NITROGEN:
Amines : Nomenclature, classification, structure, methods of preparation, physical and chemical properties, uses, identification of primary, secondary and tertiary amines.

Cyanides and Isocyanides - will be mentioned at relevant places.

Diazonium salts: Preparation, chemical reactions and importance in synthetic organic chemistry.

Polymers : Classification - Natural and synthetic, Molecular mass of polymers, methods of polymerization (addition and condensation), co-polymerization. Some important polymers: natural and synthetic like polyesters, bakelite, rubber, Biodegradable and non-biodegradable polymers. Polymers of commercial importance.

Biomolecules : Carbohydrates - Classification (aldoses and ketoses), monosaccharide (glucose and fructose), DL configuration, oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen) and their importance.

Proteins - Elementary idea of amino acids, peptide bond, polypeptides, proteins, primary structure, secondary structure, tertiary structure and quaternary structure (qualitative idea only), denaturation of proteins; enzymes.

Hormones - Elementary idea (excluding structure).

Vitamins - Classification and function.

Nucleic Acids : DNA and RNA

Chemistry in Everyday Life : Chemicals in medicines (Drugs) - analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines.

Chemicals in food- preservatives, artificial sweetening agents, elementary idea of antioxidants.

Cleansing agents- soaps and detergents, cleansing action.

Methods of purification qualitative and quantitative analysis.

BIOLOGY

Section-1 (Class 11th Syllabus)

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.

Biological Classification : Five kingdom classification; salient features and classification of Monera; Protista and Fungi into major groups; Lichens; Viruses and Viroids. Prokaryotic Cell (Bacteria)

Plant Kingdom : Salient features and classification of plants into major groups-Algae, Bryophytes, Pteridophytes, Gymnosperms and Angiosperms; Angiosperms- classification up to class, characteristic features and examples).

ANIMAL KINGDOM : 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).

Structural Organisation in Plants : Morphology and modifications, functions of different parts of flowering plants: Root, Stem, Leaf, inflorescence, flower, fruit and seed and families [Cruciferae, Malvaceae, Solanaceae, Fabaceae, Liliaceae, Compositae, Poaceae, Cucurbitaceae]

Anatomy: Tissues, Tissue system, Internal structure of root, stem, leaf, secondary growth.

Structural Organization in Animals : Animal tissues; Morphology, anatomy and functions of different systems (digestive, circulatory, respiratory, nervous and reproductive) of an insect (cockroach), Frog, Earthworm (Brief account only).

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 (ultra structure and function); Nucleus-nuclear membrane, chromatin, nucleolus.

Biomolecules- Structure and function of proteins, carbohydrates, lipids, nucleic acids.

Cell Division: Cell cycle, mitosis, meiosis and their significance.

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 andtranslocation 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 C_3 and C_4 pathways; Factors affecting photosynthesis.

Respiration: Exchange of gases; Cellular respiration-glycolysis, fermentation (anaerobic), TCA cycle and electron transport system (aerobic); The respiratory balance sheet, 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.

Enzyme - Types, Properties & enzyme action, Factors affecting enzyme action.

Human Physiology-I 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, diarrhea, Vitamins.

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 Corpuscles, Blood Groups, Blood clotting, RH factor. Human circulatory system- Double circulation; Structure of human heart and blood vessels; Cardiac cycle, cardiac output, ECG, 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, kidney transplantation.

Human Physiology-II : Locomotion and Movement: Types of movement- ciliary, flagellar, 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 Integration: Endocrine glands andhormones; 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, exopthalmic goiter, diabetes, Addison's disease).

Section-2 (Class 12th Syllabus)

REPRODUCTION : 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; 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).

GENETICS-I & II :

Principles of Inheritance 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, Mutation (Hardy-weinberg's principle), population genetics.

Biology in Human Welfare : Microbes in human welfare: In household food processing, industrial production, sewage treatment, energy generation and as biocontrol agents and biofertilizers, Antibiotic production and judicious use..

Biotechnology : Principles and process of Biotechnology: Genetic engineering (Recombinant DNA technology).

Biotechnology and Its Applications : Application of Biotechnology in health and agriculture: Human insulin and vaccine production, gene therapy; Genetically modified organisms-Bt crops; Transgenic Animals; Biosafety issues-Biopiracy and patents.

Molecular basis of Inheritance: Structure and function of protein, carbohydrate lipid and Nucleic acid (Protoplasm) 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 finger printing.

Biology and Human Welfare (Domestication of Plants) : Improvement in food production, Plant breeding, out breeding devices, tissue culture, single cell protein, Biofortification.

ORIGIN AND EVOLUTION : Evolution: Origin of life; Biological evolution and evidences for organic evolution from Paleontology, comparative anatomy, embryology and molecular evidence; Darwin's contribution, Neodarwinism (Gene flow genetic drift), Modern synthetic theory of organic evolution, Genetic basis of adaptation.

Machanism of evolution - Variation and natural selection, types of natural selection, species, speciation, human evolution.

Biology and Human Welfare : Health and Disease; Pathogens; parasites causing human diseases (Malaria, Filariasis, Ascariasis. Typhoid, Pneumonia, common cold, amoebiasis, ring worm); Sexually transmitted disease, Basic concepts of immunology-vaccines; Cancer, HIV and AIDS; Adolescence, drug and alcohol abuse, electrocardiogram(ECG).

Apiculture and Animal husbandry **(Domestication of Animals).**

Ecology and environment & Demography : Organisms and environment: Habitat and niche; Population and ecological adaptations; Population interactions-mutualism, competition, predation, parasitism; Population attributes-growth, birth rate and death rate, age distribution **(Demography).**

Ecosystem: Patterns, components; productivity and decomposition; Energy flow; Pyramids of number, biomass, energy; Nutrient cycling (carbon and phosphorous); Ecological succession; Ecological Services, carbon fixation, pollination and oxygen release (in brief).

Biodiversity and its Conservation: Concept of Biodiversity; Patterns of Biodiversity; Importance of Biodiversity; Loss of Biodiversity; Biodiversity conservation; Hotspots, endangered organisms, extinction, Red Data Book, biosphere reserves, National parks and sanctuaries, Ramsar sites.

Environmental Issues: Air pollution and its control; Water pollution and its control; Agrochemicals and their effects; Solid waste management; Radioactive waste management; Greenhouse effect and global warming; Ozone depletion; Deforestation; Case studies as success stories addressing environmental issues.