PHYSICS (A)

General Physics

Units and dimensions, vector and scalar quantities, products (scalar and vector), gradient, divergence & curl, Gauss and Stoke theorems and applications

Newtonian Mechanics

Motion, force and Acceleration equations of motion, Kinetic and potential energy, Linear and angular momentum, conservation of energy and momentum ,conservative and non-conservative forces, Rotatory motion, centrifugal and centripetal forces, gravitational force, central force, Kepler's laws of planetary motion, geo stationary, satellites, acceleration due to gravity, escape velocity simple and compound pendulums. gravity, escape velocity.

Rotational Mechanics

Moment of inertia, Theorems of parallel and perpendicular axes, Moment of inertia of ring, circular disc, sphere and cylinder, Angular momentum and Torque.

Fluid Mechanics

Viscosity, Streamline and Turbulent motion, critical velocity. Stoke's and Poissollis's formula. Bernoulli theorem and uses.

Surface tension

Excess pressure inside curved surfaces, surface energy and full of liquid through capillary

Elasticity

Elastic Constants and their mutual relations Bending moment, cantilever.
Theory of relativity, variation of mass, length and time with velocity, mass energy equivalence.

Heat

Concept of heat and temperature, Various scales of temperature, absolute temperature, Thermal expansion of solids, gases and liquids, good and bad conductors, radiation of heat, blackbody radiation, Rayleigh- Jean's Law, Planck Law, Wien's law, Newtons law of cooling and Stefan's law, internal energy, Isothermal and Adiabatic changes, 1& II Law of thermodynamics, Carrot engine, Entropy, Maxwell's thermodynamic relations, Joule's Thomson effect, Clausius Clapeyron equations.

Waves and Oscillations:

Simple harmonic motion; progressive and stationary waves ,Phase and Group velocities ,Damped harmonic motion, forced oscillation and resonance, Sharpness of resonance, super position of waves ,Beats and Lissajous figures ,Doppler effect.

Optics:

Spherical mirrors and lenses, Reactive indices, Formulae for focal lengths, Coaxial lens system, Combination of thin lenses, Eye pieces: Ramsden and Huygen's eye piece, aberrations of lenses, Human eye, Hypermetropia and myopia. Basic concepts of Interference, Diffraction and polarization, Theory of Biprism, Newtons rings, Fresnel and Fraunhoffer diffraction, Zone plate, Gratings Double refraction, Plane, Circular and Elliptical Polarisation, quarter and half wave plates. Rayleigh criterion and resolving power of prism and grating Introduction of laser, Ruby and Helium Neonlaser.

Electricity and Magnetism:

Primary and Secondary cells, internal resistance, electromotive force, combinations of resistance and capacitances, current drift velocity and conductivity, galvanometer ,Ammeter and voltmeter ,Wheatstone's bridge and applications ,Biot-Savart law, Ampere's Circuital law, electro- magnetic induction, Faradays law & Lenz's law, self and mutual inductions, Alternating current, Series and parallel resonance (LCR)circuits ,para-dia and Ferromagnetism, Maxwell's electromagnetic field equations, Displacement current Electromagnetic waves.

Modern Physics:

Atomic-structure, vector atom model and Bohr model, Paull's Exclusion principle, optical and X-ray spectra, Photoelectric effect, Compton effect and Zeeman effect, Paschen Back effect, Raman effect, de Broglie waves uncertainty principle, Schrodinger equation and applications, Radioactivity, Metal. Semiconductor and insulaters. P N Junctions, Zener diode, Transistors: Construction and applications. Logic gates, Truth tables, Boolean Algebra.

.   **(B) CHEMISTRY**

General Organic Chemistry

Hyper conjugation, Inductive effect, Resonance, and Aromaticity and their applications. Electrophiles and nucleophiles. and reaction intermediates (carbocation, carbanion, free radical, carbine and benzyne)

Reaction mechanism

SN,, SN2, E,, and E2 reaction, electrophilic addition of alkenes, alkynes and free radical addition of alkenes. Nucleophilic addition of carbonyl compounds. Electrophilic aromatic substitution, ortho/para/meta directing groups and activating and deactivating groups in ArSE reaction .

Mechanism of name reaction:

Aldol reaction, Perkin reaction, Cannizzaro reaction, Benzo in condensation, Witting reaction, Reimer-Tiemann reaction ,Hoffmann Bromamide reaction, Knoevenagel reaction ,Michael addition

. Carbohydrates:

(only glucose and fructose) mutarotation formation of ozazone, oxidation and reduction.

Polymer:

Natural (starch, cellulose, rubber and silk) and synthetic polymers, Nylon, Terylene ,Polyethylene ,PVC ,and Teflon).

Isomerism:

Structural and stereoisomerism (enantiomerism , diast ereomerism R/S and E/Z nomenclature).

Absorption Spectroscopy UV:

Chromophore, auxochrome, bathochromic and hypsochromic shift, effect of conjugation and stability on λ_{max} Woodward- Fieser rule for calculation of max of polyenes. I R: Absorption frequency of Various functional groups and Factors on which Vmax depend.

Structure of Atom

Bohr's model, quantum numbers and Modern Atomic Theory.

Periodic properties

Atomic and ionic radii, ionization potential, electron affinity, electronegativity Lattice energy, hydration energy and their relation to solubility of ionic compounds.

Chemical bonding

Ionic, covalent, coordinate and hydrogen bonding. Shape of molecules.

Coordination Chemistry

3d block elements, nomenclature of complexes, ligands (monodentate, bidentate, polydentate), Werner theory and valence bond theory, Biologically active coordination compounds (haemoglobin, myoglobin, vitamin B12, chlorophyll)

Oxidation and Reduction

Oxidation number, redox reaction and standard electrode potential of half cell and its application in inorganic chemistry.

Radioactivity

Natural radioactivity, radioactive decay, properties of, and Rays,half life period, nuclear fission and nuclear fusion.

Chemical kinetics and catalysis

Molecularity, order of reaction, examples of zero, first and second order reaction, examples of catalytic and enzymatic reactions.

Thermodynamics

First and second law of thermodynamics, enthalpy of a system and capacity at constant volume and pressure, relation between C_p and C_v Extensive and intensive property.

Chemical equilibrium

Law of mass action, Le-Chatelier principle and its application, degree of dissociation, relation between Kp and Kc activity and activity coefficient.

Ionic equilibrium

Dissociation of weak acid (Ka) and weak base.(K), hydrolysis of salts of weak acid and Weak base, strong acid-weak base and weak acid- strong base. Solubility and solubility product. Dissociation constant of water (Kw), buffer solution and pH of the buffer solution.