

## अध्याय - 3

### पाठ्यक्रम (SYLLABUS)

#### 1- विज्ञान (Science) : (Comprising Physics and Chemistry)

##### (A) PHYSICS

Unit and dimensions, dimensional analysis, S.I. Units, Motion in two dimensions Cases of uniform velocity and uniform acceleration, General relation among 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 Elastic 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, p-n 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, Kirchhoffs laws, resistances in series and parallel temperature dependence of resistance. Wheatstone bridge, potentiometer.

Measurement of voltages as 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, Faradays 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**

1. 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.
2. Chemical Bond: Electrovalent, covalent and coordinate bonds, hybridisation (sp): hydrogen bond: shapes of molecules (VSEPR theory) : bond polarity, resonance, Elements of VBT a MOT.
3. Solutions: Modes of expressing concentrations of solutions: Types of solutions, Raoult's law of colligative properties, non-ideal solution, abnormal molecular weights.
4. Solid State: Crystal lattices, unit cells, Structure of ionic compounds: close packed structure ionic radii, imperfections (Point defects): Properties of solids.
5. Nuclear chemistry Radio active radiations: half-life, radioactive decay, group displacement Law structure and properties of nucleus: Nuclear reaction, disintegration series artificial transmutation: isotopes and their uses : Radiocarbon dating.
6. Chemical Equilibrium: Chemical equilibrium, Law of mass action :  $K_p$  and  $K_c$  : Le Chatelier principle and its applications.
7. Ionic Equilibria in solutions, Solubility product, common ion effect, theories of acids and base hydrolysis of salts: pH : buffers.
8. 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.
9. Chemical Kinetic: Rate of a reaction, factors affecting the rate, rate constant rate expression, order of reaction, first order rate constant expression and characteristics, Arrhenius equation.
10. Electrochemistry: Oxidation, Oxidation number and ion-electron methods. Electrolytic conduction. Faraday's laws; voltaic cell, electrode potentials, electromotive force, Gibbs's