



**UP TGT**

**Syllabus : Chemistry**

**1. Matter**

- Nature and Behaviour – Types of matter
- Elements and their classification (Metals & non metals)
- Compounds and their mixtures

**2. Laws of chemical combination**

- Law of constant composition
- Law of Refractive and inverse proportion
- Gay lussac's law of gaseous volumes
- Mitscherlich law of isomorphism

**3. Composition of Matter**

- Dalton's Atomic Theory
- Atoms, Molecules and their characteristics

**4. Atomic Structure –**

- Discovery of electron, proton and neutron
- Rutherford's Alpha scattering experiment and discovery of nucleus
- Rutherford, Bohr, sommerfeld's atomic model
- Quantum Numbers
- Modern Atomic Theory

**5. De broglie hypothesis, Heisenberg hypothesis –**

- Heisenberg uncertainty principle
- Electronic configuration of elements based on s, p, and d orbitals
- Electronic configuration according to pauli exclusion principle and hund's rule

**6. Radio Activity –**

- Discovery of Radioactivity
- Radioactive rays and their properties
- Average life time and Half life time
- Laws of Radioactive decay
- Nuclear fusion and Fission
- Artificial Radioactivity
- Isotopes, Isobars, Isotones

**7. Chemical Bonding –**

- Basic concept of connectivity
- Electronic principles
- Octet Rule
- Exceptions to the Octet rule
- Electrostatic
- Covalent and coordinate bond
- Characteristics of Ionic, covalent and coordinate compounds
- Fajan's rule of polarisation
- Inter pair effect
- Valence Bond theory of covalency (Hydrogen atoms)
- Hybridization
- Orbital shapes of  $Sp^2$ ,  $Sp^3$  hybridization

**8. Chemical Reactions –**

- Symbol, ion and formulas
- Chemical Reactions and chemical equation
- Physical and chemical change and their difference
- Types of chemical reactions – Displacement, combination, decomposition, double, slow and fast chemical reactions, endothermic and exothermic reaction, and catalyzed reactions

**9. Electrochemical Cells –**

- The working principle of voltaic cell
- Dry Cell
- Lead storage battery
- Reversible cell
- Electrode potential
- Nernst equation and its application

**10. Periodic classification of elements –**

- Mendeleev's Periodic classification and its basis.
- Advantages and disadvantages of Mendeleev's Periodic Table
- Variations and properties of periodic table
- Periodic properties of elements (atomic and ionic radius, ion potential, electron affinity, electronegativity)
- Variation of periodic properties in groups and periods
- Similarities between s and p block elements
- Electronic configuration of first-row transition elements (3d block elements)
- Oxidation state
- color- magnetism properties
- Formation of complex compounds

**11. Organic Chemistry–**

- Inductive effect, electrophoretic effect and mesomeric effects
- Hyperconjugation, resonance and their applications
- Electrophilic-and-nucleophilic-reagents
- free radical carbo-cation and carbo-anion
- hydrogen bonding and its effect
- Classification and nomenclature of organic compounds

**12. Isomerism –**

- Structural and stereoisomerism
- Concept of Mechanism of Organic Reactions
- Mechanism of simple substitution addition and elimination reaction

**13. Process of formation of organic compounds and their properties (given below)**

- Alkanes                      • Alkenes                      • Alkynes
- Alkyl halide                • Ketones
- Acids and derivative benzene its formulation, properties and composition

## **Syllabus : Physics**

### **1. General Physics (Mechanics)**

Unit & dimension, Accuracy, Precision, Error, Dimension analysis and its application, Motion in one and two dimension, Uniform and non-uniform motion, Relative-velocity, Circular motion, Projectile motion, Laws of motion, Friction and example of circular motion. Work, Energy, Power, Potential energy and K.E, Potentials energy of a spring, Conservative and non- conservative forces, Elastic and inelastic force in one dimension and two dimension, Centre of Mass application, Moments of forces, Torque of parallel and perpendicular axes, Universal law, variation of “g” due to altitude and depth, Gravitational potential energy, Escape velocity and orbital velocity, Geostationary satellite and polar satellite and their uses, Viscosity, Poiseuille equation, Bernoulli's theorem and its application. Stokes' law, Terminal velocity, Surface tension and its application, Excess pressure inside a liquid drop and bubble Capillary rise.

### **2. Heat**

Heat & Temperature – thermal expansion, Specific heats, Calorimeter, Latent heat, Modes of transmission of heats, Thermal conductivity, Newton's Law's of cooling. Kinetic theory of gases, Deduction of pressure, Maxwell law of Velocity distribution, Equipartition of energy, Specific heats of gases –  $C_p$  and  $C_v$ , Zeroth law, 1st Laws of Thermodynamics and 2nd law of Thermodynamic, Heat Engine and Refrigerator, Carnot cycle, Carnot theorem, Black body radiation, Kirchhoff law, Stefan's Boltzmann Law, Wien's displacement Law.

### **3. Wave & Oscillation**

SHM, Velocity, Acceleration and energy of SHM, Simple pendulum and its time period, Second pendulum, Forced Oscillation, Damped oscillation, Resonance, Transverse and Longitudinal wave, Speed of sound in elastic medium, Effects of temperature, Pressure, Wind, Moisture on speed of sound, Progressive and standing wave, Interference, Beats and standing wave in string and organ pipe, Doppler's effects.

### **4. Optics**

Reflection of light, Mirror equations, Reflection of light, Total internal reflection, Refraction through spherical surfaces, Lens maker's formula and thin lens formula, Refraction through prism, Dispersion of light and scattering of light, Microscope and telescope and its magnifying power and resolving power, Wave front, Huygens Principle, Law of reflection & refraction, Interference of light, Young's Double slits Experiment and Diffraction due to single Slit and width of central maxima, Polarization of light, Brewster's law, Nicol Prism.

### **5. Electricity & Magnetism**

Coulomb's law, Superposition principle, Electric field, Electric field due to point charge and dipole, Torque on electric dipole, Electric flux, Gauss's theorem and its application, Electric potential due to point charge and electric dipole, Equipotential surface, Capacitance in series and parallel combination, Capacitance in case of dielectric constant, Energy stored in parallel plate capacitor, Dielectric and polarization, Van De Graaff generator, Drift velocity, Relaxation time and its relation, Ohm's Law, Resistivity, Colour code of Carbon Resistors cell, Emf and potential differences, Kirchhoff's Law, Wheatstone Law and its application, Ampere's circuital Law and its application, Forces on a moving charge, Force between parallel current carrying conductors. Cyclotron, Moving coil galvanometer and conversion of Ammeter into voltmeter Magnetic field lines, Declination angle of dip, Diamagnetic & Paramagnetic substances.

### **6. Modern Physics**

Atomic Structure, Bohr's Theory of Hydrogen atom, Radius and energy of electron in orbit of hydrogen atom, Photo electric effects, Einstein's Photoelectric equation, Compton effect, Photo cell, Production of X-rays and its characteristics, Moseley's Law and its use, Wave nature of particle, De Broglie Law, Davisson and Germer experiment. Rutherford's Scattering experiment, Size of nucleus, Mass defect Binding energy, Magic number, Nuclear force and its properties, Radioactivity- Decay Law, Properties of  $\alpha$ ,  $\beta$  and  $\gamma$  rays, Half life, Mean life, Qvalue of nuclear reaction, Nuclear Fission, Amorphous and crystalline solid, Crystal lattice, Primitive cell, Types of Crystal Lattice, Potential energy of electron in metal, Energy bands in solids, Energy bands in solid, Semi-conductor, Intrinsic and extrinsic Semiconductors, P-types and N-types Semiconductor, Biasing of p-n junction, Diode as half wave and full rectifier, Zener Diode, Zener Diode as Voltage regulator, Photo diode, Solar Cell, LED, Transistor, Biasing of Transistor (PNP and NPN), Characteristic of NPN Transistor as amplifier, Common emitter amplifier, Current gain, voltage gain, Power gain, Transistor as oscillator, Logic gates, OR, AND, NOT, NAND and NOR Gates, Elements of communication system, Band width of signal, and width of transmission medium, Needs of modulation, Amplitude modulation, Phase modulation frequency modulation, Production & detection of modulated wave, Different modes of propagation of E.M wave.