

# Physics

**Vectors:** Definition, Properties, Graphical Methods of Vector Addition, Trigonometric ratios and basic identity, Analytical Methods of Vector addition.

**Kinematics:** Position, Frame of reference, Displacement, Distance, Speed, Velocity, Acceleration, Uniform and Non Uniform Motion. Application of Vectors in Kinematics Equations of motion, Uniformly accelerated motion, Motion under gravity

**Graphs :** Reading and drawing Position-time, Displacement-time, Distance-time, Velocity-time, Acceleration-time, Velocity-Position, Speed-Position, Acceleration-Position graphs. Emphasis on straight line and parabolic graphs. Relating graphs and equations.

**Dynamics :** Force, Type of Fundamental Forces, Gravitational Force, Universal law of gravitation,  $G$  and  $g$ , Contact Force, Normal, Friction, Tension, Spring Force Properties of fundamental forces. Newton's Laws of Motion, Application of Newton's Laws of Motion, Linear Momentum, Conservation of Linear Momentum, Application of conservation of linear momentum. Application of vectors in dynamics.

**Work & Energy :** Work done by a constant force, Kinetic Energy of a particle, Work Energy Theorem for particle, gravitational potential Energy, Elastic potential energy, Law of Conservation of Mechanical Energy, Power. Related Graphs.

# Chemistry

**Basics of Chemistry: Energy change in a chemical process - exothermic and endothermic nature of a process, Exo and Endo in terms of bond breaking and formation; Exo and endo in terms of attractions and repulsions; Exo and endo in terms of stability of reaction species; Intermolecular forces (IMF) and phases of matter, Heating effect on phases of matter, phase transition and boiling point and melting point and their relation with IMF, Latent heat and its applications, Units of heat and energy, concept of thermal equilibrium, concept of conservation of energy, specific heat capacity and application in phase transition - application in numericals (learning problem solving approach)**

**Mole Concept:** Dalton's atomic theory, Elements, molecules and compounds, Relative atomic weights, definition of amu/u, Isotopes, isobars, isotones, Avogadro's number and definition of mole, Gram atomic mass and gram molecular mass, Relation of mole with number of particles, mass and volume at STP, Numerical application based on mole concept (learning problem solving approach)

**Atomic Structure:** Cathode ray experiment (observations and conclusions), Anode ray experiment (observations and conclusions), Plum pudding model, Rutherford's alpha particle scattering experiment (observations and conclusions), Bohr atomic model and introduction to quantization, Electronic configuration based on Bohr model, Concept of valence shell, valence electrons, valency and covalency, arranging first 20 elements on basis of configuration, Noble gases and octet/duplet rule,

**Bonding:** Dot/cross notation of valence electrons, electronic configuration of cations and anions, Common ions formed, methods of bonding, Ionic bond and its formation, identifying charges on cation and anion in an ionic compound, writing formula unit of an ionic compound when the ions are known, Types of ions - monoatomic, polyatomic; based on charges - univalent, divalent, etc; Names of common cations and anions, Names of compounds from their molecular formula; Covalent bond, representation of a covalent bond, formation of homonuclear diatomic molecules,

# Chemistry

concept of bonding electrons, non-bonding electrons and lone pairs, formation of heteronuclear diatomic molecules, formation of polyatomic molecules, concept of single bond, double bond and triple bond, forming compounds using valency, concept of bond strength, bond length and bond order and its applications

**Periodic Properties:** Dobreiner's triads, Newlands laws of octaves, Lothar Meyer curve, Mendeleev's periodic table - advantages and disadvantages, Modern periodic table - short form and long form, its basic properties; remembering periodic table group wise; Representative elements, transition and inner transition elements (only definition), Effective nuclear charge (ENC) - trend across a period and down the group, Slater's rules for calculating ENC. Properties to be studied - Atomic size (covalent radius, metallic radius, van der waals radius) and its trends; Ionization energy (IE) - revising energy change in a process and endo/exo nature of a process, trends in IE; Electron affinity (EA) and its trends; Electronegativity (EN) and its trends, Pauling scale - applications of EN (metallic and non-metallic nature, diagonal relationship, nature of oxides - acidic, basic, amphoteric and neutral)

**Oxidation state (OS):** OS in ionic compounds, OS in covalent compounds using structure, Rules for finding OS, formula for finding OS when structure is not known; Oxidation and reduction on the basis of OS; oxidizing agent (OA) and reducing agent (RA) on the basis of OS; Balancing redox reactions (half reaction method) - balancing in acidic medium and basic medium, Nomenclature of common oxyacids (using OS as reference) of Cl, S, N, P; Nomenclature of anions from oxyacids, Pyro and meta acids; Electrochemical series and its applications to oxidation and reduction; Redox properties of halogens

**Acids and Bases:** Arrhenius theory; Lowry bronsted theory, Lewis theory, General representation of an acid and base, Polyprotic acids, Amphiprotic species, Acid-conjugate base pair, pH scale, Writing neutralisation reactions (monoacidic+monobasic species, diacidic+monobasic species etc), Classification of acids and bases as weak or strong, Nature of salt formed in an acid-base reaction,

# Maths

**Rational numbers** : Properties of rational numbers, Representation of rational numbers on the number line .

**Linear equations in one Variable** : Solving equations which have linear expressions on one side and numbers on the other side, some applications, reducing equations to simpler form

**Understanding Quadrilaterals** : Polygons, sum of the measure of the exterior, kinds of quadrilaterals,

**Practical Geometry** : Constructing a quadrilateral, some special cases

**Squares and Square roots** : Properties of square numbers, finding the square of a number, square roots of decimals,

**Cubes & cube roots** : Cube, cube roots

**Comparing Quantities** : Finding the increase or decrease per cent, finding discounts, sales tax/value added tax, compound interest, deducing a formula for compound interest

**Algebraic Expressions and identities** : Terms, factors and coefficients, monomials, binomials, and polynomials, addition and subtraction of algebraic expression, multiplying a monomial by a polynomial

**Visualizing solid shapes** : Cube, Cuboid, cylinder their geometrical interpretation and formula of finding volume and surface area

**Exponents and powers:** Laws of exponents and proof of anything power zero

**Factorization** : Definition of polynomial, classification of polynomial based on their degree and number of terms, roots and zeroes of polynomial, algebra of polynomials

**Introduction to Graphs:** Use of graph in corporate life, different types of graph and reading data

# Maths

**Playing with numbers:** Categorisation of number system based on ancient life, prime factorization of numbers, Vedic mathematics



# LOGIC

Number Analogy  
Word Analogy  
Letter Analogy  
Number Classification  
Word Classification  
Letter Classification

Number Series  
Letter Series  
Alphanumeric Series

Number Coding  
Letter Coding  
Word Coding  
Letter Arrangement  
Problems Involving Sequence

Logical Sequence of Time  
Blood Relation  
Seating Arrangement  
Logical Games  
Direction Sense  
Venn Diagram  
Number Puzzle  
Letter Puzzle

