

Physics

CALCULUS :Variables, Functions,Basic formula and graphical understanding of differential and integral calculus

VECTORS:Scalars and Vectors, Vector. Addition and subtraction, zero vector, scalar and vector products, Unit Vector, Resolution of a Vector.

KINEMATICS :The frame of reference, motion in a straight line, Position- time graph, speed and velocity; Uniform and non-uniform motion, average speed and instantaneous velocity, uniformly accelerated motion, velocity-time, position-time graph, relations for uniformly accelerated motion, Application of calculus in Kinematics,Application of vectors in Kinematics

2D MOTION :Relative Velocity, Motion in a plane, Projectile Motion, River Man, Rain Man

LAWS OF MOTION :Force and inertia, Types of fundamental forces and their nature, Newton's First law of motion; Newton's Second Law of motion, Newton's Third Law of motion. Equilibrium of concurrent forces. Application of Newton's Laws of Motion, Force Body Diagram,Pseudo force,String constraints, Normal Constraints. Inertial and noninertial frame.

FRICTION:Static and Kinetic friction, laws of friction,rolling friction.

CIRCULAR MOTION.:Uniform Circular Motion Kinematics and Dynamics, Non Uniform Circular Motion Kinematics and Dynamics, Banking of roads, Conical Pendulum, Centrifugal force

WORK AND ENERGY:Work done by a constant force and a variable force; kinetic and potential energies, work-energy theorem, power. The potential energy of spring conservation of mechanical energy,conservative and non conservative forces;

CENTRE OF MASS :Centre of the mass of a two-particle system, Centre of the mass of a rigid body,Motion of Centre of mass,Momentum,Law of conservation of linear momentum and its applications. Impulses Elastic and inelastic collisions in one and two dimensions. Coefficient of restitution and its equation

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ROTATIONAL MOTION: Basic concepts of rotational motion; a moment of a force; torque, angular momentum, conservation of angular momentum and its applications the moment of inertia, the radius of gyration. Values of moments of inertia for simple geometrical objects, parallel and perpendicular axes theorems and their applications. Rigid body rotation, equations of rotational motion. Rolling and slipping kinematics and dynamics

MECHANICAL PROPERTIES OF SOLIDS: Elastic behaviour, Stress-strain relationship, Hooke's Law. Young's modulus, bulk modulus, modulus of rigidity E . Young's modulus of elasticity of the material of a metallic wire.

FLUIDS: Pressure, Pressure variation in a fluid Pascal's law and its applications. Archimede' Principle, Buoyancy and Buoyant force.

Viscosity, Stokes' law. terminal velocity, streamline and turbulent flow. Reynolds number. Bernoulli's principle and its applications. Surface energy and surface tension, angle of contact, application of surface tension -drops, bubbles and capillary rise

E6. Surface tension of water by capillary rise and effect of detergents,

E7. Co-efficient of Viscosity of a given viscous liquid by measuring terminal velocity of a given spherical body,

CALORIMETRY AND HEAT TRANSFER: Heat, temperature, thermal expansion; specific heat capacity, calorimetry; change of state, latent heat. Heat transfer- conduction,

convection and radiation. Newton's law of cooling.

E8. Plotting a cooling curve for the relationship between the temperature of a hot body and time.

E10. Specific heat capacity of a given (i) solid and (ii) liquid by method of mixtures.

THERMODYNAMICS: Thermal equilibrium, zeroth law of thermodynamics, the concept of temperature. Heat, work and internal energy. The first law of thermodynamics. The second law of thermodynamics: reversible and irreversible processes. Carnot engine and its efficiency.

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KINETIC THEORY OF GASES AND SPECIFIC HEAT CAPACITIES:Equation of state of a perfect gas, work done on compressing a gas, Kinetic theory of gases - assumptions, the concept of pressure. Kinetic energy and temperature: RMS speed of gas molecules: Degrees of freedom. Law of equipartition of energy, applications to specific heat capacities of gases. Mean free path. Avogadro's number.

SIMPLE HARMONIC MOTION:Periodic motion - period, frequency, displacement as a function of time. Periodic functions. Simple harmonic motion linear and angular and its equation; phase: oscillations of a spring - restoring force and force constant: energy in S.H.M. - Kinetic and potential energies. Simple pendulum - derivation of expression for its time period:Free, forced and damped oscillations, resonance

WAVES ON STRING:Wave motion. Longitudinal and transverse waves, speed of a wave. Displacement relation for a progressive wave. Principle of superposition of waves, a reflection of waves. Standing waves in strings

SOUND WAVES:Properties of Sound waves, Speed of sound wave in mediums, Newton's Formula and Laplace Correction, Standing waves in organ pipe,fundamental mode and harmonics. Beats. Doppler Effect in sound E9. Speed of sound in air at room temperature using a resonance tube

WAVE OPTICS:Wavefront and Huygens' principle. Laws of reflection and refraction using Huygens principle. 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.Polarization, plane-polarized light:Brewster's law, uses of plane-polarized light and Polaroid.

RAY OPTICS:Reflection and refraction of light at plane and spherical surfaces, mirror formula.Total internal reflection and its application. Deviation and Dispersion of light by a; prism; Lens Formula.Magnification. Power of a Lens.Combination of thin lenses in contact

Physics

E15. The focal length of;

(i) Convex mirror

(ii) Concave mirror, and

(ii) Convex lens,

using the parallax method.

E16. The plot of the angle of deviation vs angle of incidence for a triangular prism.

E17. Refractive index of a glass slab using a travelling microscope.

OPTICAL INSTRUMENTS: Microscope and Astronomical Telescope (reflecting and refracting) and their magnifying powers.

ELECTRIC CHARGES AND COULOMB'S LAW: Electric charges: Conservation of charge, Charging of a body Coulomb's law-forces between two point charges, forces between multiple charges:superposition principle.

ELECTRIC FIELD AND ELECTRIC POTENTIAL: Electric field: Electric field due to a point charge, Electric field lines. Electric dipole, Electric field due to a dipole. Torque on a dipole in a uniform electric field. Electric potential and its calculation for a point charge, electric dipole and system of charges; Equipotential surfaces, Electrical potential energy of a system of two point charges in an electrostatic field.

GAUSS LAW: Types of surface and Area a Vector, Electric flux. Gauss's law and its applications to find field due to infinitely long uniformly charged straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell.

CAPACITORS: Conductors and insulators. Dielectrics and electric polarization, capacitor, the combination of capacitors in series and parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates. Energy stored in a capacitor

CURRENT ELECTRICITY: Electric current. Drift velocity. Ohm's law. Electrical resistance. Resistances of different materials. V-I characteristics of Ohmic and non-ohmic conductors. Electrical energy and power. Electrical resistivity.

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Colour code for resistors; Series and parallel combinations of resistors; Temperature dependence of resistance. Electric Cell and its Internal resistance, potential difference and emf of a cell, a combination of cells in series and parallel. Kirchhoff's laws and their applications. Wheatstone bridge.

Metre Bridge. Potentiometer - principle and its applications.

E11. The resistivity of the material of a given wire using metre bridge.

E12. The resistance of a given wire using Ohm's law.

E13. Potentiometer

i. Comparison of emf of two primary cells.

ii. Determination of internal resistance of a cell.

BIOT-SAVART LAW: Biot - Savart law and its application to current carrying circular loop. Ampere's law and its applications to infinitely long current carrying straight wire and solenoid.

MAGNETIC FORCE: Force on a current-carrying conductor in a uniform magnetic field. The force between two parallel current carrying conductors definition of ampere. Torque experienced by a current loop in a uniform magnetic field: Moving coil galvanometer, its current sensitivity and conversion to ammeter and voltmeter. Force on a moving charge in uniform magnetic and electric fields.

Cyclotron.

E14. Resistance and figure of merit of a galvanometer by half deflection method.

MAGNETISM AND MATTER: Bar magnet as an equivalent solenoid, magnetic field lines; Earth's magnetic field and magnetic elements. Para-, dia- and ferromagnetic substances. Magnetic susceptibility and permeability. Hysteresis. Electromagnets and permanent magnets.

ELECTRO MAGNETIC INDUCTION : Electromagnetic induction: Faraday's law. Induced emf and current: Lenz's Law, Motional EMF and EMF due to time varying magnetic field Eddy currents. Self and mutual inductance.

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ALTERNATING CURRENT: Alternating currents, peak and RMS value of alternating current/ voltage: reactance and impedance: LCR series circuit, resonance: Quality factor, power in AC circuits, wattless current. AC generator and transformer.

EM WAVES: Electromagnetic waves and their characteristics, Transverse nature of electromagnetic waves, Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet. X-rays. Gamma rays), Applications of e.m. waves.

DUAL NATURE AND PHOTO ELECTRIC EFFECT: Dual nature of radiation. Photoelectric effect. Hertz and Lenard's observations; Einstein's photoelectric equation: particle nature of light. Matter waves-wave nature of particle, de Broglie relation. Davisson Germer experiment.

ATOM: Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum.

NUCLIE: Composition and size of nucleus, atomic masses, isotopes, isobars: isotones. Radioactivity- alpha. beta and gamma particles/rays and their properties; radioactive decay law. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number, nuclear fission and fusion.

ELECTRONIC DEVICES: Semiconductors; semiconductor diode: I-V characteristics in forward and reverse bias; diode as a rectifier; I-V characteristics of LED. the photodiode, solar cell and Zener diode; Zener diode as a voltage regulator.

Junction transistor, transistor action, characteristics of a transistor: transistor as an amplifier

(common emitter configuration) and oscillator.

Logic gates

(OR. AND. NOT. NAND and NOR).

Transistor as a switch.

E18. Characteristic curves of a p-n junction diode in forward and reverse bias.

E19. Characteristic curves of a Zener diode and finding reverse break down

Physics

voltage.

E20. Characteristic curves of a transistor and finding current gain and voltage gain.

E21. Identification of Diode, LED, Transistor, IC, Resistor, A capacitor from a mixed collection of such items.

E22. Using a multimeter to:

(i) Identify the base of a transistor

(ii) Distinguish between NPN and PNP type transistor

(iii) See the unidirectional of current in case of a diode and an LED.

(iv) Check the correctness or otherwise of a given electronic component (diode, transistor or IC)

COMMUNICATION SYSTEMS: Propagation of electromagnetic waves in the atmosphere; Sky and space wave propagation. Need for modulation.

Amplitude and Frequency Modulation, Bandwidth of signals. the bandwidth of Transmission medium, Basic Elements of a Communication System (Block Diagram only).

PHYSICS AND MEASUREMENT : Physics, technology and society, S I Units, fundamental and derived units, least count, accuracy and precision of measuring instruments, Errors in measurement, Dimensions of Physics quantities, dimensional analysis and its applications.

E1. Vernier callipers-its use to measure the internal and external diameter and depth of a vessel.

E2. Screw gauge-its use to determine thickness/ diameter of thin sheet/wire.

E3. Simple Pendulum-dissipation of energy by plotting a graph between the square of amplitude and time.

E4. Metre Scale - the mass of a given object by principle of moments.

GRAVITATION : The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth. Kepler's law of planetary motion. Gravitational potential energy; gravitational potential. Escape velocity, Orbital velocity of a satellite. Geo stationary satellites.

Chemistry

ATOMIC STRUCTURE: Thomson and Rutherford atomic models and their limitations; Nature of electromagnetic radiation, photoelectric effect; Spectrum of the hydrogen atom. Bohr model of a hydrogen atom - its postulates, derivation of the relations for the energy of the electron and radii of the different orbits, limitations of Bohr's model; Dual nature of matter, de Broglie's relationship. Heisenberg uncertainty principle. Elementary ideas of quantum mechanics, quantum mechanics, the quantum mechanical model of the atom, its important features. Concept of atomic orbitals as one-electron wave functions: Variation of ψ and ψ^2 with r for 1s and 2s orbitals; various quantum numbers (principal, angular momentum and magnetic quantum numbers) and their significance; shapes of s, p and d - orbitals, electron spin and spin quantum number: Rules for filling electrons in orbitals - Aufbau principle. Pauli's exclusion principle and Hund's rule, electronic configuration of elements, extra stability of half-filled and completely filled orbitals.

REDOX REACTIONS: Electronic concepts of oxidation and reduction, redox reactions, oxidation number, rules for assigning oxidation number, balancing of redox reactions.

CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES: Modern periodic law and present form of the periodic table, s, p, d and f block elements, periodic trends in properties of elements atomic and ionic radii, ionization enthalpy, electron gain enthalpy, valence, oxidation states and chemical reactivity.

CHEMICAL BONDING AND MOLECULAR STRUCTURE: Kossel - Lewis approach to chemical bond formation, the concept of ionic and covalent bonds. Ionic Bonding: Formation of ionic bonds, factors affecting the formation of ionic bonds; calculation of lattice enthalpy. Covalent Bonding: Concept of electronegativity. Fajan's rule, dipole moment: Valence Shell Electron Pair Repulsion (VSEPR) theory and shapes of simple molecules. Quantum mechanical approach to covalent bonding: Valence bond theory - its important features, the concept of hybridization involving s, p and d orbitals; Resonance. Molecular Orbital Theory - Its important features. LCAOs, types of molecular orbitals (bonding, antibonding), sigma and pi-bonds, molecular orbital electronic configurations of homonuclear diatomic molecules, the concept of bond order, bond length and bond energy. Elementary idea of metallic bonding. Hydrogen bonding and its applications

Chemistry

SOME BASIC CONCEPTS IN CHEMISTRY: Matter and its nature, Dalton's atomic theory: Concept of atom, molecule, element and compound: Physical quantities and their measurements in Chemistry, precision and accuracy, significant figures. S.I.Units, dimensional analysis: Laws of chemical combination; Atomic and molecular masses, mole concept, molar mass, percentage composition, empirical and molecular formulae: Chemical equations and stoichiometry

Gaseous State: Measurable properties of gases: Gas laws - Boyle's law, Charle's law. Graham's law of diffusion. Avogadro's law, Dalton's law of partial pressure; Concept of Absolute scale of temperature; Ideal gas equation; Kinetic theory of gases (only postulates); Concept of average, root mean square and most probable velocities; Real gases, deviation from Ideal behaviour, compressibility factor and van der Waals equation.

CHEMICAL EQUILIBRIUM: Meaning of equilibrium, the concept of dynamic equilibrium. Equilibria involving physical processes: Solid-liquid, liquid - gas and solid-gas equilibria, Henry's law. General characteristics of equilibrium involving physical processes. Equilibrium involving chemical processes: Law of chemical equilibrium, equilibrium constants (K_p and K_c) and their significance, the significance of ΔG and ΔG° in chemical equilibrium, factors affecting equilibrium concentration, pressure, temperature, the effect of catalyst; Le Chatelier's principle.

HYDROGEN: Position of hydrogen in periodic table, isotopes, preparation, properties and uses of hydrogen; Physical and chemical properties of water and heavy water; Structure, preparation, reactions and uses of hydrogen peroxide; Classification of hydrides - ionic, covalent and interstitial; Hydrogen as a fuel.

IONIC EQUILIBRIUM: Ionic equilibrium: Weak and strong electrolytes, ionization of electrolytes, various concepts of acids and bases (Arrhenius. Bronsted - Lowry and Lewis) and their ionization, acid-base equilibria (including multistage ionization) and ionization constants, ionization of water. pH scale, common ion effect, hydrolysis of salts and pH of their solutions, the solubility of sparingly soluble salts and solubility products, buffer solutions.

Chemistry

S -BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS): Group -1 and 2 Elements General introduction, electronic configuration and general trends in physical and chemical properties of elements, anomalous properties of the first element of each group, diagonal relationships. Preparation and properties of some important compounds - sodium carbonate and sodium hydroxide and sodium hydrogen carbonate; Industrial uses of lime, limestone. Plaster of Paris and cement: Biological significance of Na, K, Mg and Ca.

CHEMICAL THERMODYNAMICS: Fundamentals of thermodynamics: System and surroundings, extensive and intensive properties, state functions, types of processes. The first law of thermodynamics - Concept of work, heat internal energy and enthalpy, heat capacity, molar heat capacity; Hess's law of constant heat summation; Enthalpies of bond dissociation, combustion, formation, atomization, sublimation, phase transition, hydration, ionization and solution. The second law of thermodynamics - Spontaneity of processes; ΔS of the universe and ΔG of the system as criteria for spontaneity. ΔG° (Standard Gibbs energy change) and equilibrium constant.

THERMOCHEMISTRY: Heat of reaction, Heat of formation, heat of combustion, Heat of neutralization, Heat of atomization, Latent heat, Hess' law, Kirchoff's law, bond energies, resonance energy calculation

NOMENCLATURE OF ORGANIC COMPOUNDS: Hydrocarbons, Alkyl halides, Alcohols, Ethers, Epoxides, Aldehydes, Ketones, Carboxylic acids, Esters, Amines, Amides, Aromatic compounds

PURIFICATION AND CHARACTERISATION OF ORGANIC COMPOUNDS: Purification - Crystallization, sublimation, distillation, differential extraction and chromatography - principles and their applications. Qualitative analysis - Detection of nitrogen, sulphur, phosphorus and halogens. Quantitative analysis (basic principles only) - Estimation of carbon, hydrogen, nitrogen, halogens, sulphur, phosphorus. Calculations of empirical formulae and molecular formulae: Numerical problems in organic quantitative analysis,

ISOMERISM: Structural (excluding tautomerism) and Stereo isomerism

Chemistry

P- BLOCK ELEMENTS: Group -13 to Group 14 Elements General Introduction: Electronic configuration and general trends in physical and chemical properties of elements across the periods and down the groups; unique behaviour of the first element in each group. Groupwise study of the p - block elements Group -13 Preparation, properties and uses of boron and aluminium; Structure, properties and uses of borax, boric acid, diborane, boron trifluoride, aluminium chloride and alums. Group -14 The tendency for catenation; Structure, properties and uses of Allotropes and oxides of carbon, silicon tetrachloride, silicates, zeolites and silicones.

SOME BASIC PRINCIPLES OF ORGANIC CHEMISTRY: Covalent bond fission - Homolytic and heterolytic: free radicals, carbocations and carbanions; stability of carbocations and free radicals, electrophiles and nucleophiles. Electronic displacement in a covalent bond - Inductive effect, electromeric effect, resonance and hyperconjugation. Common types of organic reactions: Substitution, addition, elimination and rearrangement.

SOLID STATE: Classification of solids: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea); Bragg's Law and its applications: Unit cell and lattices, packing in solids (fcc, bcc and hcp lattices), voids, calculations involving unit cell parameters, an imperfection in solids; Electrical and magnetic properties.

HYDROCARBONS: Classification, isomerism, IUPAC nomenclature, general methods of preparation, properties and reactions. Alkanes - Conformations: Sawhorse and Newman projections (of ethane): Mechanism of halogenation of alkanes. Alkenes - Geometrical isomerism: Mechanism of electrophilic addition: addition of hydrogen, halogens, water, hydrogen halides (Markownikoffs and peroxide effect): Ozonolysis and polymerization.

ENVIRONMENTAL CHEMISTRY: Environmental pollution - Atmospheric, water and soil. Atmospheric pollution - Tropospheric and Stratospheric Tropospheric pollutants - Gaseous pollutants: Oxides of carbon, nitrogen and sulphur, hydrocarbons; their sources, harmful effects and prevention; Greenhouse effect and Global warming: Acid rain; Particulate pollutants: Smoke, dust, smog, fumes, mist; their sources, harmful effects and prevention. Stratospheric pollution- Formation and breakdown of ozone, depletion of the ozone layer - its mechanism and effects.

Chemistry

Water Pollution - Major pollutants such as. pathogens, organic wastes and chemical pollutants; their harmful effects and prevention. Soil pollution - Major pollutants such as; Pesticides (insecticides. herbicides and fungicides), their harmful effects and prevention. Strategies to control environmental pollution.

CHEMICAL KINETICS:Rate of a chemical reaction, factors affecting the rate of reactions: concentration, temperature, pressure and catalyst; elementary and complex reactions, order and molecularity of reactions, rate law, rate constant and its units, differential and integral forms of zero and first-order reactions, their characteristics and half-lives, the effect of temperature on the rate of reactions, Arrhenius theory, activation energy and its calculation, collision theory of bimolecular gaseous reactions (no derivation).

HYDROCARBONS:Alkynes - Acidic character: Addition of hydrogen, halogens, water and hydrogen halides: Polymerization.

AROMATIC HYDROCARBONS:benzene - structure and aromaticity: Mechanism of electrophilic substitution: halogenation, nitration. Friedel - Craft's alkylation and acylation, directive influence of the functional group in mono-substituted benzene.

SOLUTIONS:Different methods for expressing the concentration of solution - molality, molarity, mole fraction, percentage (by volume and mass both), the vapour pressure of solutions and Raoult's Law - Ideal and non-ideal solutions, vapour pressure - composition, plots for ideal and non-ideal solutions; Colligative properties of dilute solutions - a relative lowering of vapour pressure, depression of freezing point, the elevation of boiling point and osmotic pressure; Determination of molecular mass using colligative properties; Abnormal value of molar mass, van't Hoff factor and its significance.

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Chemistry

Formation and breakdown of ozone, depletion of the ozone layer - its mechanism and effects. Water Pollution - Major pollutants such as. pathogens, organic wastes and chemical pollutants; their harmful effects and prevention. Soil pollution - Major pollutants such as; Pesticides (insecticides. herbicides and fungicides), their harmful effects and prevention. Strategies to control environmental pollution.

ORGANIC COMPOUNDS CONTAINING HALOGENS:General methods of preparation, properties and reactions; Nature of C-X bond; Mechanisms of substitution and elimination reactions. Uses; Environmental effects of chloroform, iodoform freons and DDT.

P- BLOCK ELEMENTS:Group -15 Properties and uses of nitrogen and phosphorus; Allotropic forms of phosphorus; Preparation, properties, structure and uses of ammonia, nitric acid, phosphine and phosphorus halides, (PCl₃. PCl₅); Structures of oxides and oxoacids of nitrogen and phosphorus. Group -16 Preparation, properties, structures and uses of ozone: Allotropic forms of sulphur; Preparation, properties, structures and uses of sulphuric acid (including its industrial preparation); Structures of oxoacids of sulphur.

ALCOHOLS, PHENOLS & ETHERS:Alcohols: Identification of primary, secondary and tertiary alcohols: mechanism of dehydration. Phenols: Acidic nature, electrophilic substitution reactions: halogenation. nitration and sulphonation. Reimer - Tiemann reaction. Ethers: Structure, Williamson Ether synthesis, reaction with acids

P- BLOCK ELEMENTS:Group-17 Preparation, properties and uses of hydrochloric acid; Trends in the acidic nature of hydrogen halides; Structures of Interhalogen compounds and oxides and oxoacids of halogens. Group-18 Occurrence and uses of noble gases; Structures of fluorides and oxides of xenon.

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CARBONYL COMPOUNDS - ALDEHYDES, KETONES AND CARBOXYLIC ACIDS: Reducing and oxidizing agents, Nucleophilic Addn reactions, Tests for aldehydes and ketones, tautomerism, enols and enolates, Rearrangement reactions

POLYMERS: General introduction and classification of polymers, general methods of polymerization, - Addition and condensation, copolymerization. Natural and synthetic, rubber and vulcanization, some important polymers with emphasis on their monomers and uses - polythene, nylon, polyester and bakelite.

CO-ORDINATION COMPOUNDS: Introduction to co-ordination compounds. Werner's theory; ligands, co-ordination number, denticity. chelation; IUPAC nomenclature of mononuclear co-ordination compounds, isomerism; Bonding-Valence bond approach and basic ideas of Crystal field theory, colour and magnetic properties; Importance of co-ordination compounds (in qualitative analysis, extraction of metals and in biological systems).

d - and f- BLOCK ELEMENTS: Transition Elements General introduction, electronic configuration, occurrence and characteristics, general trends in properties of the first-row transition elements - physical properties, ionization enthalpy, oxidation states, atomic radii, colour, catalytic behaviour, magnetic properties, complex formation, interstitial compounds, alloy formation; Preparation, properties and uses of $K_2Cr_2O_7$, and $KMnO_4$. Inner Transition Elements Lanthanoids - Electronic configuration, oxidation states and lanthanoid contraction. Actinoids - Electronic configuration and oxidation states.

ORGANIC COMPOUNDS CONTAINING NITROGEN: General methods of preparation. Properties, reactions and uses. Amines: Nomenclature, classification structure, basic character and identification of primary, secondary and tertiary amines and their basic character. Diazonium Salts: Importance in synthetic organic chemistry.

Chemistry



ELECTROCHEMISTRY: Electrolytic and metallic conduction, conductance in electrolytic solutions, molar conductivities and their variation with concentration: Kohlrausch's law and its applications. Electrochemical cells - Electrolytic and Galvanic cells, different types of electrodes, electrode potentials including standard electrode potential, half - cell and cell reactions, emf of a Galvanic cell and its measurement: Nernst equation and its applications; Relationship between cell potential and Gibbs' energy change: Dry cell and lead accumulator; Fuel cells.

SURFACE CHEMISTRY: Adsorption- Physisorption and chemisorption and their characteristics, factors affecting adsorption of gases on solids - Freundlich and Langmuir adsorption isotherms, adsorption from solutions. Catalysis - Homogeneous and heterogeneous, activity and selectivity of solid catalysts, enzyme catalysis and its mechanism. Colloidal state- distinction among true solutions, colloids and suspensions, classification of colloids - lyophilic. lyophobic; multimolecular. macromolecular and associated colloids (micelles), preparation and properties of colloids - Tyndall effect. Brownian movement, electrophoresis, dialysis, coagulation and flocculation: Emulsions and their characteristics

GENERAL PRINCIPLES AND PROCESSES OF ISOLATION OF METALS: Modes of occurrence of elements in nature, minerals, ores; Steps involved in the extraction of metals - concentration, reduction (chemical and electrolytic methods) and refining with special reference to the extraction of Al. Cu, Zn and Fe; Thermodynamic and electrochemical principles involved in the extraction of metals.

BIOMOLECULES: General introduction and importance of biomolecules. CARBOHYDRATES - Classification; aldoses and ketoses: monosaccharides (glucose and fructose) and constituent monosaccharides of oligosaccharides (sucrose, lactose and maltose). PROTEINS - Elementary Idea of alpha-amino acids, peptide bond, polypeptides. Proteins: primary, secondary, tertiary and quaternary structure (qualitative idea only), denaturation of proteins, enzymes. VITAMINS - Classification and functions. NUCLEIC ACIDS - Chemical constitution of DNA and RNA. Biological functions of nucleic acids.

CHEMISTRY IN EVERYDAY LIFE: Chemicals in Medicines - Analgesics, tranquillizers, antiseptics, disinfectants, antimicrobials, anti-fertility drugs, antibiotics, antacids. Anti-histamines - their meaning and common examples. Chemicals in food - Preservatives, artificial sweetening agents - common examples. Cleansing Agents - Soaps and detergents, cleansing action

Chemistry

PRINCIPLES RELATED TO PRACTICAL CHEMISTRY: Detection of extra elements (Nitrogen, Sulphur, halogens) in organic compounds; Detection of the following functional groups; hydroxyl (alcoholic and phenolic), carbonyl (aldehyde and ketones) carboxyl and amino groups in organic compounds. ☒ The chemistry involved in the preparation of the following: Inorganic compounds; Mohr's salt, potash alum. Organic compounds: Acetanilide, p-nitro acetanilide, aniline yellow, iodoform. ☒ The chemistry involved in the titrimetric exercises - Acids, bases and the use of indicators, oxalic-acid vs KMnO_4 , Mohr's salt vs KMnO_4 ☒ Chemical principles involved in the qualitative salt analysts: Cations - Pb^{2+} , Cu^{2+} , Al^{3+} , Fe^{3+} , Zn^{2+} , Ni^{2+} , Ca^{2+} , Ba^{2+} , Mg^{2+} , NH_4 Anions- CO_3^{2-} , S^{2-} , SO_4^{2-} , NO_3^- , NO_2^- , Cl^- , Br^- , I^- (Insoluble salts excluded). Chemical principles involved in the following experiments: 1. Enthalpy of solution of CuSO_4 2. Enthalpy of neutralization of strong acid and strong base. 3. Preparation of lyophilic and lyophobic sols. 4. Kinetic study of the reaction of iodide ion with hydrogen peroxide at room temperature.

Maths

QUADRATIC EQUATION AND EXPRESSIONS : Equations Reducible To Quadratic

Reminder And Factor Theorems

Quadratic Equation and Quadratic Function

Common Root

Relation Between Coefficient And Roots Of N - Degree Equations

Repeated Roots

Location Of Roots

PROGRESSION AND SERIES : Arithmetic Progression A.P

Geometric Progression G.P.

Harmonic Progression H.P.

Miscellaneous Series

TRIGONOMETRIC RATIOS AND IDENTITIES : Measurement Of Angles

Trigonometric Functions

Problems Based On Trigonometric Identities

Trigonometric Ratios For Complementary And Supplementary Angles

Trigonometric Ratios For Compound Angles

Trigonometric Formulae

Trigonometric Ratios Of Multiples And Sub - Multiple Angles

Values Of Trigonometric Ratios Of Standard Angles

Sum Of Sines Or Cosines Of N Angles In A.P.

Conditional Identities

INEQUALITIES INVOLVING MEANS : Inequalities Involving Simple Mean

Inequalities Involving Arithmetic Mean Of M Power

Inequalities Involving Weighted Means

TRIGONOMETRIC EQUATIONS : Trigonometric Equations

General Solution Of Some Standard Equations

Problems Based On Extreme Values Of Functions

Inequalities

Maths

FUNCTIONS : Number System And Inequalities

Function

Different Types Of Functions

Different Types Of Mappings

Even And Odd Functions

Periodic Function

Composite Function

Inverse Functions

Identical Function

Functional Function

LIMITS : Concept Of Limits

Algebra Of Limits

Use Of Expansions In Evaluating Limits

Evaluation Of Algebraic Limits

Evaluation Of Trigonometric Limits

Limits Of Different Form

STRAIGHT LINES : Different Forms On Line

Distance Form Of A Line

Distance Of A Point From A Line

Position Of Points Relative To A Line

Concurrency Of Three Lines

Equations Of Bisectors Of The Angles Between The Lines

Family Of Straight Lines

PAIR OF STRIGHT LINES : Pair Of Straight Lines

General Equation Of Second Degree

Combined Equation Of Pair Of Lines Joining

CIRCLE : Equation Of Circle With Center And Radius

Equation Of Circle Passing Through

Equation Of Circle With Typical Conditions

Position Of A Point With Respect To A Circle

Intersection Of A Line And A Circle

Maths

Tangent To A Circle At A Given Point
Normal To A Circle At A Given Point
Chord Of Contact
Equation Of The Chord Bisected At A Given Point
Different Cases Of Two Circles
Radical Axis
Common Chord Of Two Circles
Family Of Circles

PARABOLA : Standard Equation Of Parabola
General Equation Of A Parabola
Equation Of Tangent And Properties
Equation Of Normal And Their Properties

ELLIPSE : Ellipse Introduction
Difference Between Circle And Ellipse
Auxiliary Circle And Eccentric Angle
Intersection Of A Line And An Ellipse
Equation Of Tangent
Chord Of Contact
Equation Of Chord Joining Points
Point Of Intersection Of Tangents At Points
Equation Of The Chord Of The Ellipse Whose Midpoint
Concyclic Points On Ellipse

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