Syllabus for TG EAPCET 2025-E Stream (Engineering Stream)

The syllabus is in tune with the syllabus adapted by the Board of Intermediate Education, TG, for Intermediate course with effect from the academic year 2023-2024 (1st year) (100%) and 2024-2025 (2nd year) (100%) and is designed at the level of Intermediate Course and equivalent to (10+2) scheme of Examination conducted by Board of Intermediate Education, Telangana. The syllabus is designed to indicate the scope of subjects included for TG EAPCET-2025. The topics mentioned therein are not to be regarded as exhaustive. Questions may be asked in TG EAPCET-2025 to test the student's knowledge and intelligent understanding of the subject. The syllabus is applicable to students of both the current and previous batches of Intermediate Course, who desire to appear for TG EAPCET-2025.

MATHEMATICS

1) ALGEBRA

a) **Functions:** Ordered pairs, Types of functions - Definitions - Inverse functions and Theorems - Domain, Range, Inverse of real valued functions.

b) **Mathematical Induction:** Principle of Mathematical Induction & Theorems - Applications of Mathematical Induction - Problems on divisibility.

c) **Matrices:** Types of matrices - Scalar multiple of a matrix and multiplication of matrices - Transpose of a matrix - Determinants - Adjoint and Inverse of a matrix - Consistency and Inconsistency system of Simultaneous equations- Rank of a matrix - Solution of simultaneous linear equations.

d) **Complex Numbers:** Complex number as an ordered pair of real numbers- Fundamental operations - Representation of complex numbers in the form a+ib - Modulus and amplitude of complex numbers - Illustrations - Geometrical and Polar Representation of complex numbers in Argand plane- Argand diagram.

e) **De Moivre's Theorem:** De Moivre's theorem- Integral and Rational indices - n^{th} roots of unity- Geometrical Interpretations - Illustrations.

f) **Quadratic Expressions:** Quadratic expressions, equations in one variable - Sign of quadratic expressions - Change in signs - Maximum and minimum values - Quadratic inequations.

g) **Theory of Equations:** The relation between the roots and coefficients in an equation - Solving the equation when two or more of its roots are connected by certain relations - Equations with real coefficients, occurrence of complex roots in conjugate pairs and its consequences - Transformation of equations - Reciprocal Equations.

h) **Permutations and Combinations:** Fundamental Principle of counting - Linear and Circular permutations- Permutations of 'n' dissimilar things taken 'r' at a time - Permutations when repetitions are allowed - Circular permutations - Permutations with constraint repetitions - Combinations – Definitions and certain theorems.

i) **Binomial Theorem:** Binomial theorem for positive integral index - Binomial theorem for rational Index - Approximations using Binomial theorem.

j) **Partial fractions:** Rational fractions - Partial fractions of f(x)/g(x) when g(x) contains non – repeated linear factors - Partial fractions of f(x)/g(x) when g(x) contains repeated and/or non-repeated linear factors - Partial fractions of f(x)/g(x) when g(x) contains repeated and non-repeated irreducible factors.

2) TRIGONOMETRY:

    a) Trigonometric Ratios upto Transformations: Trigonometric ratios - variation - Graphs and Periodicity - Trigonometric ratios of Compound angles - Trigonometric ratios of multiple and sub-multiple angles - Sum and Product of transformations.

    b) Trigonometric Equations: General Solution of Trigonometric Equations - Simple Trigonometric Equations - Solutions.

    c) Inverse Trigonometric Functions: To reduce a Trigonometric Function into a bijective function - Graphs of Inverse Trigonometric Functions - Properties of Inverse Trigonometric Functions.

    d) Hyperbolic Functions: Definition of Hyperbolic Functions - Graphs - Definition of Inverse Hyperbolic Functions - Graphs - Addition formulae of Hyperbolic Functions.

    e) Properties of Triangles: Relation between the sides and angles of a Triangle - Sine, Cosine, Tangent and Projection rules - Half angle formulae and areas of a triangle - Incircle and Excircle of a Triangle.

3) VECTOR ALGEBRA:

    a) Addition of Vectors: Vectors as a triad of real numbers, some basic concepts - Classification (Types) of vectors - Addition of vectors - scalar multiplication of a vector - Angle between two non-zero vectors. Linear combination of vectors - Component of a vector in three dimensions - Vector equations of line and plane.

    b) Product of Vectors: Scalar or dot Product of two vectors - Geometrical Interpretations - Orthogonal projections - Properties of dot product - Expression for scalar (dot) product - Angle between two vectors - Geometrical Vector methods - Vector equations of plane in normal form - Angle between two planes-Vector product (cross product) of two vectors and properties - Vector product in (i, j, k) system - Vector Areas - scalar Triple Product-Vector equations of plane in different forms, skew lines, shortest distance-Plane condition for coplanarity etc., - Vector Triple Product - Results.

4) PROBABILITY:

    a) Measures of Dispersion - Range - Mean deviation - Variance and standard deviation of ungrouped/grouped data - Coefficient of variation and analysis of frequency distribution with equal means but different variances.

    b) Probability: Random experiments and events - Classical definition of probability, Axiomatic approach and addition theorem of probability.
Independent and dependent events - conditional probability- Multiplication theorem and Baye's theorem.

    c) Random Variables and Probability Distributions: Random Variables - Theoretical discrete distributions - Binomial and Poisson Distributions.

5) COORDINATE GEOMETRY:

    a) Locus: Definition of locus - Illustrations - Equations of locus - Problems connected to it.

    b) Transformation of Axes: Transformation of axes - Rules, Derivations and Illustrations - Rotation of axes - Derivations - Illustrations.

c) **The Straight Line:** Revision of fundamental results - Straight line - Normal form - Illustrations - Symmetric form - Reduction into various forms - Intersection of two Straight Lines - Family of straight lines - Concurrent lines - Condition for Concurrent lines - Angle between two lines - Length of perpendicular from a point to a Line - Distance between two parallel lines - Concurrent lines - properties related to a triangle.

d) **Pair of Straight lines:** Equations of pair of lines passing through the origin - angle between a pair of lines - Condition for perpendicular and coincident lines, bisectors of angles - Pair of bisectors of angles - Pair of lines - second degree general equation - Conditions for parallel lines - Distance between them, Point of intersection of pair of lines - Homogenizing a second degree equation with a first degree equation in x and y.

e) **Circle:** Equation of circle -standard form-centre and radius Position of a point in the plane of a circle - Definition of a tangent. Position of a straight line in the plane of a circle conditions for a line to be tangent - chord of contact and polar. Relative positions of two circles.

f) **System of circles:** Angle between two intersecting circles - Radical axis of two circles

g) **Parabola:** Conic sections - Equations of tangent and normal at a point on the parabola

h) **Ellipse:** Equation of ellipse in standard form- Parametric equations - Equation of tangent and normal at a point on the ellipse.

i) **Hyperbola:** Equation of hyperbola in standard form - Parametric equations - Equations of tangent and normal at a point on the Hyperbola.

j) **Three Dimensional Coordinates:** Coordinates - Section formulae.

k) **Direction Cosines and Direction Ratios:** Direction Cosines - Direction Ratios.

l) **Plane:** Cartesian equation of a Plane - Simple Illustrations.

6) CALCULUS:

a) **Limits and Continuity:** Intervals and neighbourhoods - Limits - Standard Limits - Continuity.

b) **Differentiation:** Derivative of a function - Elementary Properties - Trigonometric, Inverse Trigonometric, Hyperbolic, Inverse Hyperbolic Function.
Derivatives - Methods of Differentiation - Second Order Derivatives.

c) **Applications of Derivatives:** Errors and approximations - Geometrical Interpretation of the derivative - Equations of tangents and normals - Lengths of tangent, normal, sub tangent and sub normal. Angles between two curves and condition for orthogonality of curves - Derivative as Rate of change - Rolle's Theorem and Lagrange's Mean value theorem. Increasing and decreasing functions - Maxima and Minima.

d) **Integration:** Integration as the inverse process of differentiation- Standard forms - properties of integrals - Method of substitution - Integration of Algebraic, exponential, logarithmic, trigonometric and inverse trigonometric functions. Integration by parts, Integration by the method of substitution - Integration of algebraic and trigonometric functions, Integration by parts- Integration of exponential, logarithmic and inverse trigonometric functions, Integration-partial fractions method, reduction formulae.

e) **Definite Integrals:** Definite Integral as the limit of sum - Interpretation of Definite Integral as an area – The fundamental theorem of Integral Calculus - Properties - Reduction formulae. Application of Definite integral to areas.

f) **Differential Equations:** Formation of differential equation - Degree and order of an ordinary differential equation. Solving differential equation by Variables separable method, Homogeneous differential equation, non-homogeneous differential equation, Linear differential equations.

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PHYSICS

1) **PHYSICAL WORLD:**
   What is physics? Scope and excitement of Physics, Physics, technology and society, Fundamental forces in nature, Gravitational Force, Electromagnetic Force, Strong Nuclear Force, Weak Nuclear Force, Towards Unification of Forces, Nature of physical laws.

2) **UNITS AND MEASUREMENTS:**
   Introduction, The international system of units, Measurement of Length, Measurement of Large Distances, Estimation of Very Small Distances: Size of a Molecule, Range of Lengths, Measurement of Mass, Range of Masses, Measurement of time , Accuracy, precision of instruments and errors in measurement, Systematic errors, random errors, least count error, Absolute Error, Relative Error and Percentage Error, Combination of Errors, Significant figures, Rules for Arithmetic Operations with Significant Figures, Rounding off the Uncertain Digits, Rules for Determining the Uncertainty in the Results of Arithmetic Calculations, Dimensions of Physical Quantities, Dimensional Formulae and dimensional equations, Dimensional Analysis and its Applications, Checking the Dimensional Consistency of Equations, Deducing Relation among the Physical Quantities.

3) **MOTION IN A STRAIGHT LINE:**
   Introduction, Position, path length and displacement, Average velocity and average speed, Instantaneous velocity and speed, Acceleration, Kinematic equations for uniformly accelerated motion, Relative velocity.

4) **MOTION IN A PLANE:**
   Introduction, Scalars and vectors, Position and Displacement Vectors, Equality of Vectors, Multiplication of vectors by real numbers, Addition and subtraction of vectors - graphical method, Resolution of vectors, Vector addition - analytical method, Motion in a plane, Position Vector and Displacement, Velocity, Acceleration, Motion in a plane with constant acceleration, Relative velocity in two dimensions. Projectile motion, Equation of path of a projectile, Time of Maximum height, Maximum height of a projectile, Horizontal range of projectile, Uniform circular motion.

5) **LAWS OF MOTION:**
   Introduction, Aristotle's fallacy, The law of inertia, Newton's first law of motion, Newton's second law of motion, Momentum, Impulse, Newton's third law of motion, Conservation of momentum, Equilibrium of a particle, Common forces in mechanics, friction, rolling friction, Circular motion, Motion of a car on a level road, Motion of a car on a Banked road, Solving problems in mechanics.

6) **WORK, ENERGY AND POWER:**
Introduction, The Scalar Product, Notions of work and kinetic energy : The work-energy theorem, Work, Kinetic energy, Work done by a variable force, The work-energy theorem for a variable force, The concept of Potential Energy, The conservation of Mechanical Energy, The Potential Energy of a spring, Various forms of energy: the law of conservation of energy, Heat, Chemical Energy, Electrical Energy, The Equivalence of Mass and Energy, Nuclear Energy, The Principle of Conservation of Energy, Power, Collisions, Elastic and Inelastic Collisions, Collisions in one dimension, Coefficient of Restitution and its determination, Collisions in Two Dimensions.

7) **SYSTEMS OF PARTICLES AND ROTATIONAL MOTION:**
Introduction, What kind of motion can a rigid body have?, Centre of mass, Centre of Gravity, Motion of centre of mass, Linear momentum of a system of particles, Vector product of two vectors, Angular velocity and its relation with linear velocity, Angular acceleration, Kinematics of rotational motion about a fixed axis, Torque and angular momentum, Moment of force (Torque), Angular momentum of particle, Torque and angular momentum for a system of a particles, conservation of angular momentum, Equilibrium of a rigid body, Principle of moments, Moment of inertia, Theorems of perpendicular and parallel axes, Theorem of perpendicular axes, Theorem of parallel axes, Dynamics of rotational motion about a fixed axis, Angular momentum in case of rotations about a fixed axis, Conservation of Angular Momentum, Rolling motion, Kinetic Energy of Rolling Motion.

8) **OSCILLATIONS:**
Introduction, Periodic and oscillatory motions, Period and frequency, Displacement, Simple harmonic motion (S.H.M.), Simple harmonic motion and uniform circular motion, Velocity and acceleration in simple harmonic motion, Force law for Simple harmonic Motion, Energy in simple harmonic motion, Some systems executing Simple Harmonic Motion, Oscillations due to a spring, The Simple Pendulum, Damped simple harmonic motion, Forced oscillations and resonance.

9) **GRAVITATION:**
Introduction, Kepler's laws, Universal law of gravitation, The gravitational constant, Acceleration due to gravity of the earth, Acceleration due to gravity below and above the surface of earth, Gravitational potential energy, Escape speed, Earth satellite, Energy of an orbiting satellite, Geostationary and polar satellites, Weightlessness.

10) **MECHANICAL PROPERTIES OF SOLIDS:**
Introduction, Elastic behaviour of solids, Stress and strain, Hooke's law, Stress-strain curve, Elastic moduli, Young's Modulus, Determination of Young's Modulus of the Material of a Wire, Shear Modulus, Bulk Modulus, Poisson's Ratio, Elastic Potential Energy in a Stretched Wire, Applications of elastic behaviour of materials.

11) **MECHANICAL PROPERTIES OF FLUIDS:**

Introduction, Pressure, Pascal's Law, Variation of Pressure with Depth, Atmospheric Pressure and Gauge Pressure, Hydraulic Machines, Streamline flow, Bernoulli's principle, Speed of Efflux: Torricelli's Law, Venturi meter, Blood Flow and Heart Attack, Dynamic Lift, Viscosity, Variation of Viscosity of fluids with temperature, Stokes' Law, Reynolds number, critical velocity, Surface tension, Surface Energy, Surface Energy and Surface Tension, Angle of Contact, Drops and Bubbles, Capillary Rise, Detergents and Surface Tension.

12) **THERMAL PROPERTIES OF MATTER:**

Introduction, Temperature and heat, Measurement of temperature, Ideal-gas equation and absolute temperature, Thermal expansion, Specific heat capacity, Calorimetry, Change of state, Regelation, Latent Heat, Heat transfer, Conduction, thermal conductivity, Convection, Radiation, Black body Radiation, Greenhouse Effect, Newton's law of cooling.

13) **THERMODYNAMICS:**

Introduction, Thermal equilibrium, Zeroth law of thermodynamics, Heat, Internal Energy and work, First law of thermodynamics, Specific heat capacity, Specific heat capacity of water, Thermodynamic state variables and equation of State, Thermodynamic process, Quasistatic process, Isothermal Process, Adiabatic Process, Isochoric Process, Isobaric process, Cyclic process, Heat engines, Refrigerators and heat pumps, Second law of thermodynamics, Reversible and irreversible processes, Carnot engine, Carnot's theorem.

14) **KINETIC THEORY:**

Introduction, Molecular nature of matter, Behaviour of gases, Boyle's Law, Charles' Law, Kinetic theory of an ideal gas, Pressure of an Ideal Gas, Kinetic interpretation of temperature, Law of equipartition of energy, Specific heat capacity, Monatomic Gases, Diatomic Gases, Polyatomic Gases, Specific Heat Capacity of Solids, Specific Heat Capacity of Water, Mean free path.

15) **WAVES:**

Introduction, Transverse and longitudinal waves, Displacement relation in a progressive wave, amplitude and phase, wavelength and angular wave number, time period, angular frequency and frequency, The speed of a travelling wave, speed of transverse wave on stretched string, speed of a longitudinal wave (speed of sound), The principle of superposition of waves, Reflection of waves, standing waves and normal modes, Beats, Doppler effect.

16) **RAY OPTICS AND OPTICAL INSTRUMENTS:**

Introduction, Reflection of Light by Spherical Mirrors, sign convention, focal length of Spherical Mirrors, mirror equation, Refraction, Total Internal Reflection, Total Internal Reflection in nature and its technological applications, Refraction at Spherical

Surfaces and by Lenses, power of a lens, combination of thin lenses in contact, Refraction through a Prism, Dispersion by a Prism, Some Natural Phenomena due to Sunlight, the rainbow, scattering of light, Optical Instruments, eye, microscope, telescope.

17) **WAVE OPTICS:**

Introduction, Huygens Principle, Refraction and reflection of plane waves using Huygens Principle, refraction of a plane wave, refraction in a rarer medium (at the denser medium boundary), reflection of a plane wave by a plane surface, the Doppler effect, Coherent and Incoherent Addition of Waves, Interference of Light, Waves and Young's Experiment, Diffraction, the single slit, resolving power of optical instruments, the validity of ray optics, Polarisation, polarisation by scattering, polarisation of reflection.

18) **ELECTRIC CHARGES AND FIELDS:**

Introduction, Electric Charges, Conductors and Insulators, Charging by Induction, Basic Properties of Electric Charge, Coulomb's Law, Forces between Multiple Charges, Electric Field, Electric Field due to a system of charges, physical significance of Electric field, Electric Field Lines, Electric Flux, Electric Dipole, the field of an Electric Dipole, physical significance of dipoles, Dipole in a Uniform External Field, Continuous Charge Distribution, Gauss's Law, Application of Gauss's Law, field due to a an infinitely long straight uniformly charged wire, field due to a uniformly charged infinite plane sheet, field due to uniformly charged thin spherical shell.

19) **ELECTROSTATIC POTENTIAL AND CAPACITANCE:**

Introduction, Electrostatic Potential, Potential due to a Point Charge, Potential due to an Electric Dipole, Potential due to a System of Charges, Equipotential Surfaces, relation between field and potential, Potential Energy of a System of Charges, Potential Energy in an External Field, potential energy of a single charge, potential energy of a system of two charges in an external field, potential energy of a dipole in an external field, Electrostatics of Conductors, Dielectrics and Polarisation, Capacitors and Capacitance, The Parallel Plate Capacitor, Effect of Dielectric on Capacitance, Combination of Capacitors – series and parallel, Energy Stored in a Capacitor, Van de Graaff Generator.

20) **CURRENT ELECTRICITY:**

Introduction, Electric Current, Electric Currents in Conductors, Ohm's law, Drift of Electrons and the Origin of Resistivity, mobility, Limitations of Ohm's Law, Resistivity of various Materials, Temperature Dependence of Resistivity, Electrical Energy, Power, Combination of Resistors — Series and Parallel, Cells, emf, Internal Resistance, Cells in Series and in Parallel, Kirchhoff's Laws, Wheatstone Bridge, Meter Bridge, Potentiometer.

21) **MOVING CHARGES AND MAGNETISM:**
Introduction, Magnetic Force, sources and fields, magnetic field Lorentz force, Motion in a Magnetic Field, Motion in Combined Electric and Magnetic Fields, velocity selector, cyclotron, Magnetic Field due to a Current Element, Biot-Savart Law, Magnetic Field on the Axis of a Circular Current Loop, Ampere's Circuital Law, The Solenoid and the Toroid, Force between Two Parallel Current carrying conductors, the Ampere (unit), Torque on Current Loop (rectangular current loop), circular current loop as a Magnetic Dipole, the magnetic dipole moment of a revolving electron, The Moving Coil Galvanometer.

22) **MAGNETISM AND MATTER:**
Introduction, The Bar Magnet, the magnetic field lines, bar magnet as an equivalent solenoid, the dipole in a uniform magnetic field, the electrostatic, analog, Magnetism and Gauss's Law, The Earth's Magnetism, magnetic declination and dip, Magnetisation and Magnetic Intensity, Magnetic Properties of Materials (diamagnetism, para magnetism, ferromagnetism), Permanent Magnets and Electromagnets.

23) **ELECTROMAGNETIC INDUCTION:**
Introduction, The Experiments of Faraday and Henry, Magnetic Flux, Faraday's Law of Induction, Lenz's Law and Conservation of Energy, Motional Electromotive Force, Energy Consideration: A Quantitative Study, Eddy Currents, Inductance, mutual Inductance, self-Inductance, AC Generator.

24) **ALTERNATING CURRENT:**
Introduction, AC Voltage Applied to a Resistor, Representation of AC Current and Voltage by Rotating Vectors — Phasors, AC Voltage Applied to an Inductor, AC Voltage Applied to a Capacitor, AC Voltage Applied to a Series LCR Circuit, phasor – diagram solution, analytical solution, resonance, sharpness of resonance, Power in AC Circuit: The Power Factor, LC Oscillations, Transformers.

25) **ELECTROMAGNETIC WAVES:**
Introduction, Displacement Current, Electromagnetic Waves, sources of Electromagnetic Waves, nature of Electromagnetic Waves, Electromagnetic Spectrum.

26) **DUAL NATURE OF RADIATION AND MATTER:**
Introduction, Electron Emission, Photoelectric Effect, Hertz's observations, HallWachs and Lenard's observations, Experimental Study of Photoelectric Effect, Photoelectric Effect and Wave Theory of Light, Einstein's Photoelectric Equation: Energy Quantum of Radiation, Particle Nature of Light: The Photon, Wave Nature of Matter, Davisson and Germer Experiment.

27) **ATOMS:**
Introduction, Alpha-particle Scattering and Rutherford's Nuclear Model of Atom, alpha Particle trajectory, electron orbits, Atomic Spectra, spectral series, Bohr Model of the

Hydrogen Atom, energy levels, The Line Spectra of the Hydrogen Atom, De Broglie's Explanation of Bohr's Second Postulate of Quantisation.

28) **NUCLEI:**

Introduction, Atomic Masses and Composition of Nucleus, Size of the Nucleus, Mass-Energy and Nuclear Binding Energy, Nuclear Force, Radioactivity, law of radioactive decay, alpha decay, beta decay, gamma decay, Nuclear Energy, fission, nuclear reactor, nuclear fusion – energy generation in stars, controlled thermonuclear fusion.

29) **SEMICONDUCTOR ELECTRONICS: MATERIALS, DEVICES AND SIMPLE CIRCUITS:**

Introduction, Classification of Materials: Metals, Semiconductors and Insulators (on the basis of conductivity, on the basis of energy bands)   Intrinsic Semiconductor, Extrinsic Semiconductor, p-n Junction, p-n Junction formation, Semiconductor diode, p-n Junction diode under forward bias, p-n Junction diode under reverse bias, Application of Junction Diode as a Rectifier, Special Purpose p-n Junction Diodes, zener diode, optoelectronic junction devices (photo diode, light emitting diode, solar cell),   Junction Transistor, transistor: structure and action, basic transistor circuit configurations and Transistor characteristics (common emitter Transistor characteristics), Transistor as a device (switch, amplifier), Transistor as an amplifier (CE-configuration), feedback amplifier and Transistor oscillator,   Digital Electronics and Logic Gates, Logic Gates (NOT gate, OR gate, AND gate, NAND gate, NOR gate), Integrated Circuits.

30) **COMMUNICATION SYSTEMS:**

Introduction, Elements of a Communication System, Basic Terminology Used in Electronic Communication Systems, Bandwidth of Signals, Bandwidth of Transmission Medium, Propagation of Electromagnetic Waves (ground wave, sky waves, space waves), Modulation and its Necessity, Amplitude Modulation, Production of Amplitude Modulated Wave, Detection of Amplitude Modulated Wave.

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Syllabus for TG EAPCET 2025-E Stream (Engineering Stream)

CHEMISTRY

1) **ATOMIC STRUCTURE:**
   Introduction; Sub- atomic particles; Atomic models – Thomson's Model; Rutherford's Nuclear model of atom, Drawbacks; Developments to the Bohr's model of atom; Nature of electromagnetic radiation; Particle nature of electromagnetic radiation- Planck's quantum theory; Bohr's model for Hydrogen atom; Explanation of line spectrum of hydrogen; Limitations of Bohr's model; Quantum mechanical considerations of sub atomic particles; Dual behaviour of matter; Heisenberg's uncertainty principle; Quantum mechanical model of an atom. Important features of Quantum mechanical model of atom; Orbitals and quantum numbers; Shapes of atomic orbitals; Energies of orbitals; Filling of orbitals in atoms. Aufbau Principle, Pauli's exclusion Principle and Hund's rule of maximum multiplicity; Electronic configurations of atoms; Stability of half filled and completely filled orbitals.

2) **CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES:**
   Need to classify elements; Genesis of periodic classification; Modern periodic law and present form of the periodic table; Nomenclature of elements with atomic number greater than 100; Electronic configuration of elements and the periodic table; Electronic configuration and types of elements - s,p,d.and f blocks; Trends in physical properties:
   (a) Atomic radius, (b) Ionic radius (c)Variation of size in inner transition elements,
   (d) Ionization enthalpy, (e) Electron gain enthalpy, (f) Electronegativity;
   Periodic trends in chemical properties: (a) Valence or Oxidation states, (b) Anomalous properties of second period elements - diagonal relationship; Periodic trends and chemical reactivity.

3) **CHEMICAL BONDING AND MOLECULAR STRUCTURE:**
   Kossel - Lewis approach to chemical bonding, Octet rule, Representation of simple molecules, formal charges, limitations of octet rule; Ionic or electrovalent bond - Factors favourable for the formation of ionic compounds-Crystal structure of sodium chloride, Lattice enthalpy; General properties of ionic compounds; Bond Parameters - bond length, bond angle, and bond enthalpy, bond order, resonance-Polarity of bonds dipole moment; Valence Shell Electron Pair Repulsion (VSEPR) theories; Predicting the geometry of simple molecules; Valence bond theory-Orbital overlap concept-Directional properties of bonds-overlapping of atomic orbitals strength of **sigma** and **pi** bonds-Factors favouring the formation of covalent bonds; Hybridisation- different types of hybridization involving s, p and d orbitals- shapes of simple covalent molecules; Coordinate bond –definition with examples; Molecular orbital theory - Formation of molecular orbitals, Linear combination of atomic orbitals (LCAO)-conditions for combination of atomic orbitals - Energy level diagrams for molecular orbitals -Bonding in some homo nuclear diatomic molecules- H_2, He_2, Li_2, B_2, C_2, N_2 and O_2; Hydrogen bonding-cause of formation of hydrogen bond - Types of hydrogen bonds-inter and intra molecular-General properties of hydrogen bonds.

4) **STATES OF MATTER: GASES AND LIQUIDS:**

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Intermolecular forces; Thermal Energy; Intermolecular forces *vs* Thermal interactions; The Gaseous State; The Gas Laws; Ideal gas equation; Graham's law of diffusion - Dalton's Law of partial pressures; Kinetic molecular theory of gases; Kinetic gas equation of an ideal gas (no derivation) deduction of gas laws from Kinetic gas equation; Distribution of molecular speeds - rms, average and most probable speeds-Kinetic energy of gas molecules; Behaviour of real gases - Deviation from Ideal gas behaviour - Compressibility factor *vs* Pressure diagrams of real gases; Liquefaction of gases; Liquid State - Properties of Liquids in terms of Inter molecular interactions - Vapour pressure, Viscosity and Surface tension (Qualitative idea only. No mathematical derivation).

5) **STOICHIOMETRY:**
Some basic concepts - Properties of matter - uncertainty in measurement-significant figures, dimensional analysis; Laws of Chemical Combinations – Law of Conservation of Mass, Law of Definite Proportions, Law of Multiple Proportions, Gay Lussac's Law of Gaseous Volumes, Dalton's Atomic Theory, Avogadro's Law, Atomic and molecular masses- mole concept and molar mass. Concept of equivalent weight; Percentage composition of compounds and calculations of empirical and molecular formulae of compounds; Stoichiometry and stoichiometric calculations; Methods of expressing concentrations of solutions-mass percent, mole fraction, molarity, molality and normality; Redox reactions classical idea of redox reactions, oxidation and reduction reactions-redox reactions in terms of electron transfer; Oxidation number concept; Types of Redox reactions-combination, decomposition, displacement and disproportionation reactions; Balancing of redox reactions - oxidation number method, Half reaction (ion-electron) method; Redox reactions in Titrimetry.

6) **THERMODYNAMICS:**
Thermodynamic Terms; The system and the surroundings; Types of systems and surroundings; The state of the system; The Internal Energy as a State Function. (a) Work (b) Heat (c) The general case, the first law of Thermodynamics; Applications; Work; Enthalpy, H- a useful new state function; Extensive and intensive properties; Heat capacity; The relationship between Cp and Cv; Measurement of ΔU and ΔH: Calorimetry; Enthalpy change, $\Delta_r H$ of reactions - reaction Enthalpy (a) Standard enthalpy of reactions, (b) Enthalpy changes during transformations, (c) Standard enthalpy of formation, (d) Thermo chemical equations (e) Hess's law of constant heat summation; Enthalpies for different types of reactions. (a) Standard enthalpy of combustion ($\Delta_c H^\theta$), (b) Enthalpy of atomization ($\Delta_a H^\theta$), phase transition, sublimation and ionization, (c) Bond Enthalpy ($\Delta_{bond} H^\theta$), (d) Enthalpy of solution ($\Delta_{sol} H^\theta$) and dilution; Spontaneity. (a) Is decrease in enthalpy a criterion for spontaneity? (b) Entropy and spontaneity, the second law of thermodynamics, (c) Gibbs Energy and spontaneity; Gibbs Energy change and equilibrium; Absolute entropy and the third law of thermodynamics.

7) **CHEMICAL EQUILIBRIUM AND ACIDS-BASES:**

CHEMICAL EQUILIBRIUM: Equilibrium in Physical process; Equilibrium in chemical process - Dynamic Equilibrium; Law of chemical Equilibrium - Law of mass action and Equilibrium constant; Homogeneous; Equilibria, Equilibrium constant in gaseous systems. Relationship between KP and Kc; Heterogeneous Equilibria; Applications of Equilibrium constant; Relationship between Equilibrium constant K, reaction quotient Q and Gibbs energy G; Factors affecting Equilibria.-Le-chatlier principle application to industrial synthesis of Ammonia and Sulphur trioxide; Ionic Equilibrium in solutions

ACIDS,BASES AND SALTS: Acids, bases and salts- Arrhenius, Bronsted-Lowry and Lewis concepts of acids and bases; Ionisation of Acids and Bases -Ionisation constant of water and its ionic product- pH scale-ionisation constants of weak acids-ionisation of weak bases-relation between Ka and Kb-Di and poly basic acids and di and poly acidic Bases-Factors affecting acid strength-Common ion effect in the ionization of acids and bases-Hydrolysis of salts and pH of their solutions; Buffer solutions-designing of buffer solution-Preparation of Acidic buffer; Solubility Equilibria of sparingly soluble salts. Solubility product, Common ion effect on solubility of salts.

8) **HYDROGEN AND ITS COMPOUNDS:**

Position of hydrogen in the periodic table; Dihydrogen-Occurence and Isotopes; Preparation and properties of Dihydrogen; Hydrides: Ionic, covalent and non-stiochiometric hydrides; Water: Physical properties; structure of water, ice. Chemical properties of water; hard and soft water, Temporary and permanent hardness of water; Hydrogen peroxide: Preparation; Physical properties; structure and chemical properties; storage and uses; Heavy Water; Hydrogen as a fuel.

9) **s - BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS)**

Group 1 Elements : Alkali metals; Electronic configurations; Atomic and Ionic radii; Ionization enthalpy; Hydration enthalpy; Physical properties; Chemical properties; Uses; General characteristics of the compounds of the alkali metals: Oxides; Halides; Salts of oxo Acids; Anomalous properties of Lithium: Differences and similarities with other alkali metals, Diagonal relationship; similarities between Lithium and Magnesium; Some important compounds of Sodium: Sodium Carbonate; Sodium Chloride; Sodium Hydroxide; Sodium hydrogen carbonate; Biological importance of Sodium and Potassium.
Group 2 Elements: Alkaline earth elements; Electronic configuration; Ionization enthalpy; Hydration enthalpy; Physical properties, Chemical properties; Uses; General characteristics of compounds of the Alkaline Earth Metals: Oxides, hydroxides, halides, salts of oxoacids (Carbonates; Sulphates and Nitrates); Anomalous behavior of Beryllium; its diagonal relationship with Aluminium; Some important compounds of calcium: Preparation and uses of Calcium Oxide; Calcium Hydroxide; Calcium Carbonate; Plaster of Paris; Cement; Biological importance of Calcium and Magnesium.

10) **p- BLOCK ELEMENTS - GROUP 13 (BORON FAMILY):**
General introduction - Electronic configuration, Atomic radii, Ionization enthalpy, Electro negativity; Physical & Chemical properties; Important trends and anomalous properties of boron; Some important compounds of boron - Borax, Ortho boric acid, diborane; Uses of boron, aluminium and their compounds.

11) **p-BLOCK ELEMENTS - GROUP 14 (CARBON FAMILY):**
General introduction - Electronic configuration, Atomic radii, Ionization enthalpy, Electro negativity; Physical & Chemical properties; Important trends and anomalous properties of carbon; Allotropes of carbon; Uses of carbon; Some important compounds of carbon and silicon – carbon monoxide, carbon dioxide, Silica, silicones, silicates and zeolites.

12) **ENVIRONMENTAL CHEMISTRY:**
Definition of terms: Air, Water and Soil Pollutions; Environmental Pollution; Atmospheric pollution; Tropospheric Pollution; Gaseous Air Pollutants (Oxides of Sulphur; Oxides of Nitrogen; Hydrocarbons; Oxides of Carbon (CO, CO_2). Global warming and Greenhouse effect; Acid rain- Particulate Pollutants- Smog; Stratospheric Pollution: Formation and breakdown of Ozone- Ozone hole- effects of depletion of the Ozone Layer; Water Pollution: Causes of Water Pollution; International standards for drinking water; Soil Pollution: Pesticides, Industrial Wastes; Strategies to control environmental pollution- waste management- collection and disposal; Green Chemistry: Green chemistry in day-to-day life; Dry cleaning of clothes; Bleaching of paper; Synthesis of chemicals

13) **ORGANIC CHEMISTRY-SOME BASIC PRINCIPLES, TECHNIQUES AND HYDROCARBONS**
SOME BASIC PRINCIPLES AND TECHNIQUES

General introduction; Tetravalency of Carbon: shapes of organic compounds; Structural representations of organic compounds; Classification of organic compounds; Nomenclature of organic compounds; Isomerism; Fundamental concepts in organic reaction mechanisms; Fission of covalent bond; Nucleophiles and electrophiles; Electron movements in organic reactions; Electron displacement effects in covalent bonds: inductive effect, resonance, resonance effect, electromeric effect, hyperconjugation; Types of Organic reactions; Methods of purifcation of organic compounds; Qualitative elemental analysis of organic compounds; Quantitative elemental analysis of organic compounds.

HYDROCARBONS:
Classification of Hydrocarbons; **Alkanes** - Nomenclature, isomerism (structural and conformations of ethane only); Preparation of alkanes; Properties - Physical properties and chemical Reactivity, Substitution reactions - Halogenation (free radical mechanism), Combustion, Controlled Oxidation, Isomerisation, Aromatization, reaction with steam and Pyrolysis; **Alkenes-** Nomenclature, structure of ethene, Isomerism (structural and geometrical); Methods of preparation; Properties- Physical and chemical reactions:

Addition of Hydrogen, halogen, water, sulphuric acid, Hydrogen halides (Mechanism-ionic and peroxide effect, Markovnikov's, anti Markovnikov's or Kharasch effect). Oxidation, Ozonolysis and Polymerization; **Alkynes -** Nomenclature and isomerism, structure of acetylene. Methods of preparation of acetylene; Physical properties, Chemical reactions- acidic character of acetylene, addition reactions- of Hydrogen, Halogen, Hydrogen halides and Water. Polymerization.

AROMATIC HYDROCARBONS: Nomenclature and isomerism, Structure of benzene, Resonance and aromaticity; Preparation of benzene. Physical properties. Chemical properties: Mechanism of electrophilic substitution. Electrophilic substitution reactions-Nitration, Sulphonation, Halogenation, Friedel-Crafts alkylation and acylation; Directive influence of functional groups in mono substituted benzene, Carcinogenicity and toxicity.

14) **SOLID STATE:**
General characteristics of solid state; Amorphous and crystalline solids; Classification of crystalline solids based on different binding forces (molecular, ionic, metallic and covalent solids); Probing the structure of solids: X-ray crystallography; Crystal lattices and unit cells. Bravais lattices primitive and centred unit cells; Number of atoms in a unit cell (primitive, body centred and face centred cubic unit cell); Close packed structures: Close packing in one dimension, in two dimensions and in three dimensions- tetrahedral and octahedral voids formula of a compound and number of voids filled- locating tetrahedral and octahedral voids; Packing efficiency in simple cubic, bcc and in hcp, ccp lattice; Calculations involving unit cell dimensions-density of the unit cell; Imperfections in solids-types of point defects stoichiometric and non-stoichiometric defects; Electrical properties-conduction of electricity in metals, semiconductors and insulators- band theory of metals; Magnetic properties.

15) **SOLUTIONS:**
Types of solutions; Expressing concentration of solutions - mass percentage, volume percentage, mass by volume percentage, parts per million, mole fraction, molarity and molality; Solubility: Solubility of a solid in a liquid, solubility of a gas in a liquid, Henry's law; Vapour pressure of liquid solutions: vapour pressure of liquid- liquid solutions.
Raoult's law as a special case of Henry's law -vapour pressure of solutions of solids in liquids; Ideal and non-ideal solutions.
COLLIGATIVE PROPERTIES: Colligative properties and determination of molar mass relative lowering of vapour pressure-elevation of boiling point-depression of freezing point - osmosis and osmotic pressure-reverse osmosis and water purification; Abnormal molar masses - van't Hoff factor.

16) **ELECTROCHEMISTRY AND CHEMICAL KINETICS:**
ELECTROCHEMISTRY: Electrochemical cells; Galvanic cells: measurement of electrode potentials; Nernst equation-equilibrium constant from Nernst equation-electrochemical cell and Gibbs energy of the cell reaction; Conductance of electrolytic solutions- measurement of the conductivity of ionic solutions-variation of conductivity and

molar conductivity with concentration-strong electrolytes and weak electrolytes-applications of Kohlrausch's law; Electrolytic cells and electrolysis: Faraday's laws of electrolysis-products of electrolysis; Batteries: primary batteries and secondary batteries; Fuel cells; Corrosion of metals-Hydrogen economy.

CHEMICAL KINETICS: Rate of a chemical reaction; Factors influencing rate of a reaction: dependence of rate on concentration- rate expression and rate constant- order of a reaction, molecularity of a reaction; Integrated rate equations-zero order reactions-first order reactions- half-life of a reaction; Pseudo first order reaction; Temperature dependence of the rate of a reaction -effect of catalyst; Collision theory of chemical reaction rates.

17) **SURFACE CHEMISTRY:**
Adsorption and absorption: Distinction between adsorption and absorption-mechanism of adsorption-types of adsorption-characteristics of physisorption characteristics of chemisorptions-adsorption isotherms-adsorption from solution phase - applications of adsorption; Catalysis: Catalysts, promoters and poisons-auto catalysis - homogeneous and heterogeneous catalysis-adsorption theory of heterogeneous catalysis; important features of solid catalysts: (a)activity (b)selectivity-shape-selective catalysis by zeolites-enzyme catalysis-characteristics and mechanism- catalysts in industry; Colloids: Classification of colloids; Classification based on physical state of dispersed phase and dispersion medium-classification based on nature of interaction between dispersed phase and dispersion medium- classification based on type of particles of the dispersed phase- multi molecular, macromolecular and associated colloids- cleansing action of soaps-preparation of colloids-purification of colloidal solutions- properties of colloidal solutions: Tyndal effect, colour, Brownian movement-charge on colloidal particles, electrophoresis; Emulsions; Colloids around us- application of colloids.

18) **GENERAL PRINCIPLES OF METALLURGY:**
Occurrence of metals; Concentration of ores-levigation, magnetic separation, froth floatation, leaching; Extraction of crude metal from concentrated ore-conversion to oxide, reduction of oxide to the metal; Thermodynamic principles of metallurgy – Ellingham diagram-limitations-applications-extraction of aluminium, iron, copper and zinc from their oxides; Electrochemical principles of metallurgy; Oxidation and reduction; Refining of crude metal-distillation, liquation poling, electrolysis, zone refining and vapour phase refining; Uses of aluminium, copper, zinc and iron.

19) **p-BLOCK ELEMENTS:**
GROUP-15 ELEMENTS: Occurrence- electronic configuration, atomic and ionic radii, ionisation enthalpy, electronegativity, physical and chemical properties; Dinitrogen preparation, properties and uses; Compounds of nitrogen-preparation and properties of ammonia; Oxides of nitrogen; Preparation and properties of nitric acid; Phosphorous-allotropic forms; Phosphine-preparation and properties; Phosphorous halides; Oxoacids of phosphorous

GROUP-16 ELEMENTS: Occurrence- electronic configuration, atomic and ionic radii, ionisation enthalpy, electron gain enthalpy, electronegativity, physical and chemical properties; Dioxygen-preparation, properties and uses; Simple oxides; Ozone-preparation, properties, structure and uses; Sulphur-allotropic forms; Sulphur dioxide-preparation, properties and uses; Oxoacids of sulphur; Sulphuric acid-industrial process of manufacture, properties and uses.

GROUP-17 ELEMENTS: Occurrence, electronic configuration, atomic and ionic radii, ionisation enthalpy, electron gain enthalpy, electronegativity, physical and chemical properties; Chlorine- preparation, properties and uses; Hydrogen chloride- preparation, properties and uses; Oxoacids of halogens; Interhalogen compounds.

GROUP-18 ELEMENTS: Occurrence, electronic configuration, ionization enthalpy, atomic radii, electron gain enthalpy, physical and chemical properties(a) Xenon-fluorine compounds- XeF_2, XeF_4 and XeF_6 -preparation, hydrolysis and formation of fluoro anions structures of XeF_2, XeF_4 and XeF_6 (b) Xenon-oxygen compounds: XeO_3 and $XeOF_4$ – their formation and structures.

20) **d AND f BLOCK ELEMENTS & COORDINATION COMPOUNDS:**
d AND f BLOCK ELEMENTS: Position in the periodic table; Electronic configuration of the d block elements; General properties of the transition elements (d-block) -physical properties, variation in atomic and ionic sizes of transition series, ionisation enthalpies, oxidation states, trends in the M^2+/M and M^3+/M^2+ standard electrode potentials, trends in stability of higher oxidation states, chemical reactivity and E^θ values, magnetic properties, formation of coloured ions, formation of complex compounds, catalytic properties, formation of interstitial compounds, alloy formation; Some important compounds of transition elements oxides and oxoanions of metals-preparation and properties of potassium dichromate and potassium permanganate-structures of chromate, dichromate, manganate and permanganate ions; Inner transition elements (f-block)-lanthanoids- electronic configuration-atomic and ionic sizes oxidation states- general characteristics; actinoids-electronic configuration atomic and ionic sizes, oxidation states, general characteristics and comparison with lanthanoids; Some applications of d and f block elements.
COORDINATION COMPOUNDS: Werner's theory of coordination compounds; Definitions of some terms used in coordination compounds; Nomenclature of coordination compounds-IUPAC nomenclature; Isomerism in coordination compounds-
(a) Stereo isomerism-Geometrical and optical isomerism (b) Structural isomerism-linkage, coordination, ionisation and hydrate isomerism; Bonding in coordination compounds.
(a) Valence bond theory - magnetic properties of coordination compounds-limitations of valence bond theory (b) Crystal field theory (i) Crystal field splitting in octahedral and tetrahedral coordination entities (ii) Colour in coordination compounds-limitations of crystal field theory; Bonding in metal carbonyls; Stability of coordination compounds; Importance and applications of coordination compounds.

21) **POLYMERS:**

Introduction; Classification of Polymers -Classification based on source, structure, mode of polymerization, molecular forces and growth polymerization; Types of polymerization reactions-addition polymerization or chain growth polymerization-ionic polymerization, free radical mechanism-preparation of addition polymers-polythene, Teflon and polyacrylonitrile-condensation polymerization or step growth polymerization polyamides-preparation of Nylon 6,6 and Nylon 6, -poly esters-terylene, bakelite, melamineformaldehyde polymers; copolymerization, Rubber-natural rubber-vulcanisation of rubber-Synthetic rubbers-preparation of neoprene and buna-N; Molecular mass of polymers-number average and weight average molecular masses- poly dispersity index (PDI); Biodegradable polymers-PHBV, Nylon 2 Nylon 6; Polymers of commercial importance - polypropene, polystyrene, polyvinylchloride (PVC), urea-formaldehyde resin, Glyptal and Bakelite – their monomers, structures and uses.

22) **BIOMOLECULES:**

Carbohydrates –
Classification of carbohydrates- Monosaccharides: preparation of glucose from sucrose and starch- Properties and structure of glucose- D,L and (+), (-) configurations of glucose-Structure of fructose; Disaccharides: Sucrose- preparation, structure; Invert sugar-Structures of maltose and lactose- Polysaccharides: Structures of starch, cellulose, glycogen- Importance of carbohydrates; **Aminoacids:** Natural aminoacids-classification of aminoacids - structures and D and L forms-Zwitter ions; **Proteins:** Structures, classification, fibrous and globular- primary, secondary, tertiary and quarternary structures of proteins- Denaturation of proteins; **Enzymes:** Enzymes, mechanism of enzyme action; **Vitamins:** Explanation, names, classification of vitamins - sources of vitamins-deficiency diseases of different types of vitamins; **Nucleic acids:** chemical composition of nucleic acids, structures of nucleic acids, DNA finger printing, biological functions of nucleic acids; **Hormones:** Definition, different types of hormones, their production, biological activity, diseases due to their abnormal activities.

23) **CHEMISTRY IN EVERYDAY LIFE:**

Drugs and their classification: (a) Classification of drugs on the basis of pharmocological effect (b) Classification of drugs on the basis of drug action (c) Classification of drugs on the basis of chemical structure (d) Classification of drugs on the basis of molecular targets; Drug-Target interaction-Enzymes as drug targets (a) Catalytic action of enzymes (b) Drug-enzyme interaction,receptors as drug targets; Therapeutic action of different classes of drugs: antacids, antihistamines, neurologically active drugs: tranquilizers, analgesics-non-narcotic, narcotic analgesics, antimicrobials-antibiotics, antiseptics and disinfectants- anti fertility drugs; Chemicals in food-artificial sweetening agents, food preservatives, antioxidants in food; Cleansing agents-soaps and synthetic detergents – types and examples.

24) **HALOALKANES AND HALOARENES:**

Classification and nomenclature; Nature of C-X bond; Methods of preparation: Alkyl halides and aryl halides-from alcohols, from hydrocarbons (a) by free radical halogenation (b) by electrophilic substitution (c) by replacement of diazonium group (Sandmeyer reaction) (d) by the addition of hydrogen halides and halogens to alkenes - by halogen exchange (Finkelstein reaction); Physical properties-melting and boiling points, density and solubility; Chemical reactions: Reactions of haloalkanes (i) Nucleophilic substitution reactions (a) SN2 mechanism (b) SN1 mechanism (c) stereochemical aspects of nucleophilic substitution reactions-optical activity (ii) Elimination reactions (iii) Reaction with metals-Reactions of haloarenes: (i) Nucleophilic substitution (ii) Electrophilic substitution and (iii) Reaction with metals; Polyhalogen compounds: Uses and environmental effects of dichloro methane, trichloromethane, triiodomethane, tetrachloro methane, freons and DDT.

25) **ORGANIC COMPOUNDS CONTAINING C, H AND O (Alcohols, Phenols, Ethers, Aldehydes, Ketones and Carboxylic acids):**

ALCOHOLS, PHENOLS AND ETHERS: Alcohols, phenols and ethers -classification; Nomenclature: (a)Alcohols, (b)phenols and (c) ethers; Structures of hydroxy and ether functional groups; Methods of preparation: **Alcohols** from alkenes and carbonyl compounds (reduction and reaction with Grignard reagents); **Phenols** from haloarenes, benzene sulphonic acid, diazonium salts, cumene; Physical propertics of alcohols and phenols; Chemical reactions of alcohols and phenols (i) Reactions involving cleavage of O-H bond-Acidity of alcohols and phenols, esterification (ii) Reactions involving cleavage of C-O bond- reactions with HX, PX_3, dehydration and oxidation (iii) Reactions of phenols- electrophilic aromatic substitution, Kolbe's reaction, Reimer - Tiemann reaction, reaction with zinc dust, oxidation; Commercially important alcohols (methanol,ethanol).

ETHERS-Methods of preparation: By dehydration of alcohols, Williamson synthesis-Physical properties-Chemical reactions: Cleavage of C-O bond and electrophilic substitution of aromatic ethers.

ALDEHYDES AND KETONES: Nomenclature and structure of carbonyl group; Preparation of aldehydes and ketones-(1) by oxidation of alcohols (2) by dehydrogenation of alcohols (3) from hydrocarbons - Preparation of aldehydes: (1) from acyl chlorides (2) from nitriles and esters (3) from hydrocarbons-Preparation of ketones: (1) from acyl chlorides

(2) from nitriles (3) from benzene or substituted benzenes; Physical properties of aldehydes and ketones; Chemical reactions of aldehydes and ketones-nucleophilic addition, reduction, oxidation, reactions due to alpha hydrogen (aldol condensation) and other reactions (Cannizzaro reaction, electrophilic substitution reaction); Uses of aldehydes and ketones.

CARBOXYLIC ACIDS: Nomenclature and structure of carboxyl group; Methods of preparation of carboxylic acids (1) from primary alcohols and aldehydes (2) from alkylbenzenes (3) from nitriles and amides (4) from Grignard reagents (5) from acyl

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halides and anhydrides (6) from esters; Physical properties; Chemical reactions: (i) Reactions involving cleavage of O-H bond-acidity, reactions with metals and alkalies (ii) Reactions involving cleavage of C-OH bond-formation of anhydride, reactions with PCl_5, PCl_3, $SOCl_2$, esterification and reaction with ammonia (iii) Reactions involving-COOH group-reduction, decarboxylation (iv) Substitution reactions in the hydrocarbon part - halogenation and ring substitution; Uses of carboxylic acids.

26) **ORGANIC COMPOUNDS CONTAINING NITROGEN:**

AMINES: Structure of amines; Classification; Nomenclature; Preparation of amines: reduction of nitro compounds, ammonolysis of alkyl halides, reduction of nitriles, reduction of amides, Gabriel phthalimide synthesis and Hoffmann bromamide degradation reaction; Physical properties; Chemical reactions: basic character of amines, alkylation, acylation, carbyl amine reaction, reaction with nitrous acid, reaction with aryl sulphonyl chloride, electrophilic substitution of aromatic amines-bromination, nitration and sulphonation.

DIAZONIUM SALTS: Methods of preparation of diazonium salts (by diazotization) Physical properties; Chemical reactions: Reactions involving displacement of Nitrogen; Sandmeyer reaction, Gatterman reaction, replacement by i) iodiode and fluoride ions ii) hydrogen, hydroxyl and Nitro groups; reactions involving retention of diazo group; coupling reactions; Importance of diazonium salts in synthesis of aromatic compounds.

CYANIDES AND ISOCYANIDES: Structure and nomenclature of cyanides and isocyanides; Preparation, physical properties and chemical reactions of cyanides and isocyanides.

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MODEL QUESTIONS – MATHEMATICS

1) I) The coefficient of x^5 in $(1 - x - x^2 + x^3)^6$ is 20.
   II) If p and q are the coefficients of x^4 in $(1 + x)^{2n}$ and $(1 + x)^{2n-1}$ respectively then 2p=q.
   Which of the above statements is (are) true.

   1) only I   2) Only II   3) Both I and II   4) Neither I nor II

2). Assertion (A): If A+B=45° then (1+TanA)(1+TanB)=2.
   Reason(R):   Tan 22 ½ ° = $\sqrt{2} - 1$.

   1) Both   A & R are True and R is the correct explanation of A.
   2) Both A & R are True and R is not correct explanation of A.
   3) A is True but R is False.
   4) R is True but A is False.

3) Arrange the following statements in ascending order of their results

   A) The order of $\left(\frac{d^4y}{dx^4} + \frac{d^2y}{dx^2} \right)^{3/2} = a\left(\frac{d^3y}{dx^3} \right)$

   B) The degree of $\left(\frac{dy}{dx} + \frac{d^2y}{dx^2} \right)^{5/4} = a\left(\frac{d^3y}{dx^3} \right)^{2/3}$

   C) The degree of $y = \left(1 + \left(\frac{dy}{dx} \right)^2 \right)^{3/2} \left(\frac{d^2y}{dx^2} \right)$

   D) The order of $x^3 + \left(\frac{d^3y}{dx^3} \right)^2 + 2x^2 \left(\frac{d^2y}{dx^2} \right) - 3y = x^2$

   1) D,C,B,A   2) D,C,A,B   3) C,D,B,A   4) C,D,A,B

4) A and B are two independent events of a sample space such that P(A)=0.2, P(B)=0.5.

List I	List II
A) P(B/A)	I) 0.2
B) P(A/B)	II) 0.1
C) P(A ∩ B)	III) 0.3
D) P(A ∪ B)	IV) 0.6
	V) 0.5

   The correct match is
   1) A-IV, B-V, C-III, D-I
   2) A-V, B-I, C-II, D-IV
   3) A-III, B-I, C-II, D- IV
   4) A-II, B-I, C-IV, D-V

5) The line $ax + by + c = 0$ is a normal to the circle $x^2 + y^2 + 4x + 6y + 8 = 0$ if and only if

   (1) $2a + 3b = c$ (2) $3a + 2b = c$ (3) $2a + 3b + c = 0$ (4) $3a + 2b + c = 0$

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6) $\begin{vmatrix} al & bm & cn \\ l^2 & m^2 & n^2 \\ 1 & 1 & 1 \end{vmatrix} = \Delta_1$ and $\begin{vmatrix} a & b & c \\ l & m & n \\ mn & ln & lm \end{vmatrix} = \Delta_2$ then

(1) $\Delta_1 = \Delta_2$ (2) $\Delta_1 = 2\Delta_2$ (3) $2\Delta_1 = \Delta_2$ (4) $\Delta_1 + \Delta_2 = 0$

7) If $\bar{a}$ is a non-zero vector and $\bar{b}$, $\bar{c}$ are two vectors such that $\bar{a} \times \bar{b} = \bar{a} \times \bar{c}$ and $\bar{a} \cdot \bar{b} = \bar{a} \cdot \bar{c}$ then

1) $\bar{b} - \bar{c}$ is collinear with $\bar{a}$ 2) $\bar{b} - \bar{c}$ is perpendicular with $\bar{a}$

3) $\bar{b} = \bar{c}$ 4) $\bar{b} \neq \bar{c}$

8) If $L_1 : 2x + 3y - 20 = 0$, $L_2 : 2x + 3y - 14 = 0$,
then the straight line represented by $a(2x + 3y - 20) + b(2x + 3y - 14) = 0$ is

1) Parallel to $L_1 = 0$ and $L_2 = 0$.
2) Perpendicular to $L_1 = 0$ and parallel to $L_2 = 0$
3) Perpendicular to $L_1 = 0$ and $L_2 = 0$
4) Parallel to $L_1 = 0$ and Perpendicular to $L_2 = 0$

9) If $f(x) = \log\left(\frac{1+2x}{1-2x}\right)$, then $x =$

1) $\frac{e^{f(x)} - 1}{2(e^{f(x)} + 1)}$ 2) $\frac{2(e^{f(x)} - 1)}{(e^{f(x)} + 1)}$ 3) $\frac{e^{f(x)} - 1}{(e^{f(x)} + 1)}$ 4) $\frac{e^{f(2x)} - 1}{(e^{f(2x)} + 1)}$

10) If $\tan\theta = \frac{b}{a}$ then $a\cos2\theta - b\sin2\theta =$

1) a 2) b 3) $2a$ 4) $2b$

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Syllabus for TG EAPCET 2025-E Stream (Engineering Stream)

MODEL QUESTIONS – PHYSICS

1. A particle performs simple harmonic motion with amplitude **A** and time period **T**. The mean velocity of the particle over the time interval during which it travels a distance of **A/2** starting from extreme position.

   1) A/T   2) 2A/T   3) 3A/T   4) A/2T

2. When a battery connected across a resistor of 16 Ω, the voltage across the resistor is 12V.When same battery is connected across a resistor of 10 Ω voltage across it is 11V.The internal resistance of the battery

   1) 10/7Ω   2) 20/7Ω   3) 25/7Ω   4) 30/7Ω

3. **Assertion (A):** A rocket works on the principle of conservation of linear momentum.
   Reason (R): Whenever there is change in momentum of one body, the same change occurs in the momentum of the second body of the same system but in the opposite direction.

   1) A is true & R is true and correct explanation
   2) A is true & R is true and not correct explanation
   3) A is true & R is false
   4) A is false & R is true

4. **Statement(A):** A particle can have zero displacement and non zero average velocity.

   Statement (B): A particle can have zero acceleration and non zero velocity

   Statement (C): A particle can have zero velocity and non-zero acceleration.

   1) A,B,C True   2) A, B True, C False   3) B,C True, A False   4) A,B,C False.

5. Match the following
   In the experimental study of photoelectric effect:

Column-I	Column-II
A. Intensity of incident light changes	**I.** Maximum K.E of photoelectrons changes
B. Frequency of incident light changes	**II**. Stopping potential changes
C. Target material changes	**III**. Saturation current changes.

   1. A-III   B-I,II   C-I,II
   2. A-II   B-I,III   C-I,II
   3. A-III   B-III,II   C-I,II
   4. A-I   B-I,II   C-I,II

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Syllabus for TG EAPCET 2025-E Stream (Engineering Stream)

MODEL QUESTIONS – CHEMISTRY

1. Half life of a first order reaction is 15min. The time required for completion of 87.5% of the reaction is
   (1) 15 min   (2) 30 min   (3) 60 min   (4) 45 min

2. Arrange the following in increasing order of their basic strength.
   I) $C_2H_5NH_2$ II) $C_6H_5NH_2$ III) $C_6H_5CH_2NH_2$ IV) $(C_2H_5)_2NH$
   (1) I < II < IV < III   (2) II < III < I < IV
   (3) I < IV < III < II   (4) IV < I < III < II

3. Which of the following has least electron gain enthalpy?
   (1) Sulphur   (2) Chlorine   (3) Flourine   (4) Oxygen

4. Assertion (A): H_2O is liquid and H_2S is gas at room temperature
   Reason (R)   : Molecules of H_2O are highly associated through hydrogen bonding
   The correct answer is:
   (1) Both (A) and (R) are true and (R) is the correct explanation of (A)
   (2) Both (A) and (R) are true and (R) is not the correct explanation of (A)
   (3) (A) is true but (R) is not true
   (4) (A) is not true but (R) is true

5. Match the following:

LIST I (Crystal System)	LIST II (Axial Angle)
(A) Cubic	(I) $\alpha = \beta = 90°; \gamma = 120°$
(B) Hexagonal	(II) $\alpha \neq \beta \neq \gamma \neq 90°$
(C) Monoclinic	(III) $\alpha = \beta = \gamma \neq 90°$
(D) Triclinic	(IV) $\alpha = \gamma = 90°; \beta \neq 90°$
	(V) $\alpha = \beta = \gamma = 90°$

   The correct match is:
   (1) A-V, B-I, C-III, D-IV
   (2) A-IV, B-II, C-V, D-I
   (3) A-V, B-I, C-IV, D-II
   (4) A-IV, B-II, C-V, D-III

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