Any bachelor degree in Arts, Science or Commerce with Hindi as one of the subjects or any bachelor degree in Arts, Science or Commerce without Hindi as one of the subjects, but with a diploma such as Sahitya Ratna, Bhasha Praveena or Vidwan or Equivalent to that.

A pass in higher secondary course (H.S.C.) 10+2 pattern or Intermediate examination or its equivalent / 10+3 years Diploma.

# Seats will be filled on all India basis.

**APPENDIX-II**

**SYLLABI FOR ENTRANCE TESTS IN SCIENCE, ARTS, COMMERCE & ENGINEERING**

**101 – LIFE SCIENCES**

Total Marks : 100


2. **Genetics**: Mendelian principles, Gene Interaction, Linkage and Crossing over, Sex determination, Sex linkage, Mutations – Genic and chromosomal (Structural and numerical); Chromosomal aberrations in humans. Recombination in prokaryotes transformation, conjugation, transduction, sexduction. Extra genomic inheritance.


4. **Biotechnology**: Plant and animal cell culture, cloning, Fermentors types and process, Biopesticides, biofertilizers, Bioremediation, Renewable and non – renewable energy resources, Non-conventional fuels.

5. **Biomolecules**: Carbohydrates, proteins, amino acids, lipids, vitamins and porphyrins. Enzymes – classification and mode of action, enzyme assay, enzyme units, enzyme inhibition, enzyme kinetics, Factors regulating enzyme action.

6. **Immunology**: Types of immunity, cells and organelles of immune system, Antigen – antibody reaction. Immunotechniques, Hypersensitivity, Vaccines.

7. **Techniques**: Microscopy – Light and Electron, Centrifugation, Chromatography, Electrophoresis, Calorimetric and Spectrophotometric techniques, Blotting techniques, PCR, DNA finger printing.


9. **Physiology**: Structure and function of liver, kidney and heart, composition of blood, blood types, blood coagulation, Digestion and absorption, Endocrinology, Muscle and Nervous system.

10. **Metabolism**: Metabolism of carbohydrates, lipids, proteins, aminoacids and nucleic acids. Biological oxidation and bioenergetics.

12. **Plant Science**: Classification of cryptogams and phanerogams. General characteristics of taxonomic groups at class and family level Water relations and mineral nutrition of plants, Plant growth regulators, Ethnobotany and medicinal plants, Biology of plant seed, Photosynthesis.


14. **Nutrition**: Biological value of proteins, protein malnutrition, disorders, Chemistry and physiological role of vitamins and minerals in living systems.

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**102 – PHYSICAL SCIENCES**

**Total Marks**: 100

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**Mechanics & Properties of Matter**

1. **Vector Analysis**
   - Scalar and vector fields, gradient of a scalar field and its physical significance. Divergence and curl of a vector field with derivations and physical interpretation. Vector integration (line, surface and volume), Statement and proof of Gauss and Stokes theorems.

2. **Mechanics of particles**
   - Laws of motion, motion of variable mass system, Equation of motion of a rocket. Conservation of energy and momentum, Collisions in two and three dimensions, Concept of impact parameter, scattering cross-section, Rutherford scattering-derivation.

3. **Mechanics of Rigid bodies**
   - Definition of rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum, Euler equations and its applications, precession of a top, Gyroscope, precession of the equinoxes.

4. **Mechanics of continuous media**
   - Elastic constants of isotropic solids and their relations, Poisson's ratio and expression for Poisson's ratio in terms of $y$, $n$, $k$. Classification of beams, types of bending, point load, distributed load, shearing force and bending moment, sign conventions.

5. **Central forces**
   - Central forces, definition and examples, characteristics of central forces, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force. Derivation of Kepler's laws. Motion of satellites, idea of Global Positioning System (GPS).

6. **Special theory of relativity**
   - Galilean relativity, absolute frames. Michelson-Morley experiment, negative result. Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four-vector formalism.

**Waves & Oscillations**

1. **Simple Harmonic oscillations**
   - Simple harmonic oscillator and solution of the differential equation - Physical characteristics of SHM, torsion pendulum-measurements of rigidity modulus, compound pendulum-measurement of ‘g’, Principle of superposition, beats, combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies. Lissajous figures.

2. **Damped and forced oscillations**
   - Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, comparison with un-damped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance and velocity resonance.

3. **Complex vibrations**
   - Fourier theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave, triangular wave, saw tooth wave, simple problems on evolution of Fourier coefficients.
4. Vibrating strings:
Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones and harmonics. Energy transport and transverse impedance.

5. Vibrations of bars:
Longitudinal vibrations in bars-wave equation and its general solution. Special cases (i) bar fixed at both ends (ii) bar fixed at the midpoint (iii) bar fixed at one end. Tuning fork.

6. Ultrasons:
Ultrasonics, properties of ultrasonic waves, production of ultrasonics by piezoelectric and magnetostrictive methods, detection of ultrasonics, determination of wavelength of ultrasonic waves. Applications of ultrasonic waves.

Wave Optics
1. Aberrations:
Introduction – monochromatic aberrations, spherical aberration, methods of minimizing spherical aberration, coma, astigmatism and curvature of field, distortion. Chromatic aberration-the achromatic doublet. Achromatism for two lenses (i) in contact and (ii) separated by a distance.

2. Interference

3. Diffraction
Introduction, distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction – Diffraction due to single slit-Fraunhofer diffraction due to double slit-Fraunhofer diffraction pattern with N slits (diffraction grating). Resolving power of grating, Determination of wavelength of light in normal incidence and minimum deviation methods using diffraction grating.
Fresnel’s half period zones-area of the half period zones-zone plate-comparison of zone plate with convex lens-difference between interference and diffraction.

4. Polarisation:
Polarized light: methods of polarization polarization by reflection, refraction, double refraction, scattering of light-Brewster’s law-Malus law-Nicol prism polarizer and analyzer-Quarter wave plate, Half wave plate-optical activity, determination of specific rotation by Laurent’s half shade polarimeter-Babinet’s compensator – idea of elliptical and circular polarization

5. Lasers and Holography

6. Fiber Optics
Introduction- different types of fibers, rays and modes in an optical fiber, fiber material, principles of fiber communication (qualitative treatment only), advantages of fiber optic communication.

Thermodynamics & Radiation Physics
1. Kinetic theory of gases

2. Thermodynamics

3. Thermodynamic potentials and Maxwell’s equations
Thermodynamic potentials-Derivation of Maxwell’s thermodynamic relations-Clausius-Clayperon’s equation-Derivation for ratio of specific heats-Derivation for difference of two specific heats for perfect gas. Joule Kelvin effect-expression for Joule Kelvin coefficient for perfect and vander Waal’s gas.
4. Low temperature Physics
Introduction - Joule Kelvin effect - Porous plug experiment - Joule expansion - Distinction between adiabatic and Joule Thomson expansion - Expression for Joule Thomson cooling - Liquefaction of helium, Kapitza’s method - Adiabatic demagnetization. Production of low temperatures - applications of substances at low temperatures - effects of chloro and fluoro carbons on ozone layer.

5. Quantum theory of radiation

Electricity, Magnetism & Electronics
1. Electric field intensity and potential:
Gauss’s law statement and its proof - Electric field intensity due to (1) Uniformly charged sphere and (2) an infinite conducting sheet of charge. Electrical potential – equipotential surfaces - potential due to i) a point charge, ii) charged spherical shell and uniformly charged sphere.

4. Dielectrics:
Electric dipole moment and molecular polarizability - Electric displacement D, electric polarization P – relation between D, E and P - Dielectric constant and susceptibility. Boundary conditions at the dielectric surface.

5. Electric and magnetic fields
Biot-Savart’s law, explanation and calculation of B due to long straight wire, a circular current loop and solenoid – Lorentz force – Hall effect – determination of Hall coefficient and applications.

4. Electromagnetic induction

5. Alternating currents and electromagnetic waves
Alternating current – Relation between current and voltage in LR and CR circuits, vector diagrams, LCR series and parallel resonant circuit, Q-factor, power in ac circuits.

6. Maxwell’s equations
Idea of displacement current – Maxwell’s equations (integral and differential forms) (no derivation), Maxwell’s wave equation (with derivation), Transverse nature of electromagnetic waves. Poynting theorem (statement and proof), production of electromagnetic waves (Hertz experiment).

7. Basic electronics:
PN 20 behavior diode, Zener diode, Tunnel diode, I-V characteristics, PNP and NPN transistors, CB, CE and CC configurations – Relation between, β and γ - transistor (CE) characteristics – Determination of hybrid parameters, Transistor as an amplifier.

8. Digital electronics
Number systems – Conversion of binary to decimal system and vice versa. Binary addition and subtraction (1’s and 2’s complement methods). Laws of Boolean algebra – De Morgan’s laws - statement and proof, Basic logic gates, NAND and NOR as universal gates, exclusive-OR gate, Half adder and Full adder, Parallel adder circuits.

Modern Physics
6. Atomic and molecular physics

2. Matter waves & Uncertainty Principle

7. Quantum (wave) mechanics
Basic postulates of quantum mechanics - Schrodinger time independent and time dependent wave equations - derivations. Physical interpretation of wave function. Eigen functions, Eigen values. Application of Schrodinger wave equation to particle in one dimensional infinite box.
4. General Properties of Nuclei
Basic ideas of nucleus—size, mass, charge density (matter energy), binding energy, angular momentum, parity, magnetic moment, electric moments. Liquid drop model and Shell model (qualitative aspects only) – Magic numbers.

5. Radioactivity decay:

6. Crystal Structure
Amorphous and crystalline materials, unit cell, Miller indices, reciprocal lattice, types of lattices, diffraction of X-rays by crystals, Bragg’s law, experimental techniques, Laue’s method and powder diffraction method.

7. Superconductivity:

103 – MATHEMATICAL SCIENCES
Total Marks : 100

DIFFERENTIAL EQUATIONS:
Differential Equations of first order and first degree: Linear differential equations; Differential equations reducible to linear Form; Exact differential equations; Integrating factors; Change of variables. Orthogonal trajectories.

Differential Equations of first order but not of the first degree: Equations solvable for p; Equations solvable for y; Equations solvable for x; Equations that do not contain x (or y); Equations of the first degree in x and y – Clairaut’s Equation.

Higher order linear differential equations-I: Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators.

General Solution of f(D)y=0
General Solution of f(D)y=Q when Q is a function of x.

\[ \frac{1}{f(D)} \] is Expressed as partial fractions.

P.I. of f(D)y = Q when Q= be^x
P.I. of f(D)y = Q when Q is b sin ax or b cos ax.

Higher order linear differential equations-II:
Solution of the non-homogeneous linear differential equations with constant coefficients.

P.I. of f(D)y = Q when Q= bx^k
P.I. of f(D)y = Q when Q= e^xV
P.I. of f(D)y = Q when Q= xV
P.I. of f(D)y = Q when Q= x^nV

Higher order linear differential equations-III: Method of variation of parameters; Linear differential Equations with non-constant coefficients; The Cauchy-Euler Equation.

SOLID GEOMETRY:
The Plane: Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.
The Line: Equation of a line; Angle between a line and a plane; The condition that a given line may lie in a given plane; The condition that two given lines are coplanar; Number of arbitrary constants in the equations of straight line; Sets of conditions which determine a line; The shortest distance between two lines; The length and equations of the line of shortest distance between two straight lines; Length of the perpendicular from a given point to a given line;
**Sphere:** Definition and equation of the sphere; Equation of the sphere through four given points; Plane sections of a sphere; Intersection of two spheres; Equation of a circle; Sphere through a given circle; Intersection of a sphere and a line; Power of a point; Tangent plane; Plane of contact; Polar plane; Pole of a Plane; Conjugate points; Conjugate planes;

**Sphere & Cones:** Angle of intersection of two spheres; Conditions for two spheres to be orthogonal; Radical plane; Coaxial system of spheres; Simplified from of the equation of two spheres. Definitions of a cone; vertex; guiding curve; generators; Equation of the cone with a given vertex and guiding curve; Enveloping cone of a sphere; Equations of cones with vertex at origin are homogenous; Condition that the general equation of the second degree should represent a cone; Condition that a cone may have three mutually perpendicular generators;

**Cones & Cylinders:** Intersection of a line and a quadric cone; Tangent lines and tangent plane at a point; Condition that a plane may touch a cone; Reciprocal cones; Intersection of two cones with a common vertex; Right circular cone; Equation of the right circular cone with a given vertex; axis and semi-vertical angle. Definition of a cylinder; Equation to the cylinder whose generators intersect a given conic and are parallel to a given line; Enveloping cylinder of a sphere; The right circular cylinder; Equation of the right circular cylinder with a given axis and radius.

**Abstract Algebra:**

**Groups:** Binary Operation – Algebraic structure – semi group-monoid – Group definition and elementary properties – Finite and Infinite groups – examples – order of a group. Composition tables with examples.

**Subgroups:** Complex Definition – Multiplication of two complexes Inverse of a complex-Subgroup definition – examples-criterion for a complex to be a subgroup. Criterion for the product of two subgroups to be a subgroup-union and intersection of subgroups. Cosets and Lagrange’s Theorem: Cosets Definition – properties of Cosets – index of a subgroups of a finite groups–Lagrange’s Theorem.

**Normal subgroups:** Definition of normal subgroup – proper and improper normal subgroup–Hamilton group – criterion for a subgroup to be a normal subgroup – intersection of two normal subgroups – Sub group of index 2 is a normal sub group – simple group – quotient group – criteria for the existence of a quotient group.

**Homomorphism:** Definition of homomorphism – Image of homomorphism elementary properties of homomorphism – Isomorphism – automorphism definitions and elementary properties–kernel of a homomorphism – fundamental theorem on Homomorphism and applications.

**Permutations and cyclic groups:** Definition of permutation – permutation multiplication – Inverse of a permutation – cyclic permutations – transposition – even and odd permutations – Cayley’s theorem. Cyclic Groups : Definition of cyclic group – elementary properties – classification of cyclic groups.

**REAL ANALYSIS:**

**Real numbers:** [The algebraic and order properties of R, Absolute value and Real line, Completeness property of R, Applications of supreme property; intervals. No. Question is to be set from this portion.]


**Infinite series:** series : Introduction to series, convergence of series. Cauchy’s general principle of convergence for series tests for convergence of series, Series of Non-Negative Terms.
1. P-test
2. Cauchy’s n\textsuperscript{th} root test or Root Test.
3. D-Alemberts’ Test or Ratio Test.

Absolute convergence and conditional convergence, semi convergence.

**Continuity:** limits : [Real valued Functions, Boundedness of a function, Limits of functions. Some extensions of the limit concept, Infinite Limits. Limits at infinity. No. Question is to be set from this portion.]
Continuous functions: Continuous functions, Combinations of continuous functions, Continuous Functions on intervals, uniform continuity.

**Differentiation and mean value theorems:** The derivability of a function, on an interval, at a point, Derivability and continuity of a function, Graphical meaning of the Derivative, Mean value Theorems; Role’s Theorem, Lagrange’s Theorem, Cauchy’s Mean value Theorem. **Riemann integration:** Riemann Integral, Riemann integral functions, Darboux theorem. Necessary and sufficient condition for R – integrability, Properties of integrable functions, Fundamental theorem of integral calculus, integral as the limit of a sum, Mean value Theorems.

**Ring Theory & Vector Calculus:**


**Vector differentiation:** Vector Differentiation, Ordinary derivatives of vectors, Differentiability, Gradient, Divergence, Curl operators, Formulae Involving these operators. **Vector integration:** Line Integral, Surface integral, Volume integral with examples.

**Vector integration applications:** Theorems of Gauss and Stokes, Green’s theorem in plane and applications of these theorems.

**LINEAR ALGEBRA**

**Vector Spaces-I:** Vector Spaces, General properties of vector spaces, n-dimensional Vectors, addition and scalar multiplication of Vectors, internal and external composition, Null space, Vector subspaces, Algebra of subspaces, Linear Sum of two subspaces, linear combination of Vectors, Linear span Linear independence and Linear dependence of Vectors.

**Vector Spaces-II:** Basis of Vector space, Finite dimensional Vector spaces, basis extension, co-ordinates, Dimension of a Vector space, Dimension of a subspace, Quotient space and Dimension of Quotient space.

**Linear Transformations:** Linear transformations, linear operators, Properties of L.T, sum and product of LTs, Algebra of Linear Operators, Range and null space of linear transformation, Rank and Nullity of linear transformations – Rank – Nullity Theorem.

**Matrix:** Matrices, Elementary Properties of Matrices, Inverse Matrices, Rank of Matrix, Linear Equations, Characteristic Roots, Characteristic Values & Vectors of square Matrix, Cayley – Hamilton Theorem.

**Inner product space:** Inner product spaces, Euclidean and unitary spaces, Norm or length of a Vector, Schwartz inequality, Triangle in Inequality, Parallelogram law, Orthogonality, Orthonormal set, complete orthonormal set, Gram – Schmidt orthogonalisation process. Bessel’s inequality and Parseval’s Identity.

**INORGANIC CHEMISTRY**

**p-block elements –I**

Group-13: Synthesis and structure of diborane and higher boranes (B_4H_{10} and B_5H_9), boron-nitrogen compounds (B_3N_2H_6 and BN)

Group – 14: Preparation and applications of silanes and silicones.


**p-block elements –II**

Group – 16: Classifications of oxides based on (i) Chemical behavior and (ii) Oxygen content.

Group-17: Inter halogen compounds and pseudo halogens.

**Organometallic Chemistry**

Definition – classification of Organometallic compounds – nomenclature, preparation, properties and applications of alkyls of Li and Mg.
Chemistry of d-block elements:
Characteristics of d-block elements with special reference to electronic configuration, variable valence, magnetic properties, catalytic properties and ability to form complexes. Stability of various oxidation states

Theories of bonding in metals:
Metallic properties and its limitations, Valence bond theory, Free electron theory, Explanation of thermal and electrical conductivity of metals, limitations, Band theory, formation of bands, explanation of conductors, semiconductors and insulators.

Metal carbonyls:
EAN rule, classification of metal carbonyls, structures and shapes of metal carbonyls of V, Cr, Mn, Fe, Co and Ni.

Chemistry of f-block elements:

Coordination Chemistry:
IUPAC nomenclature – bonding theories – Review of Werner’s theory and Sidgwick’s concept of coordination – Valence bond theory - geometries of coordination numbers 4-tetrahedral and square planar and 6-octahedral and its limitations, crystal filed theory - splitting of d-orbitals in octahedral, tetrahedral and square-planar complexes – low spin and high spin complexes – factors affecting crystal-field splitting energy, merits and demerits of crystal-field theory. Isomerism in coordination compounds – structural isomerism and stereo isomerism, stereochemistry of complexes with 4 and 6 coordination numbers.

Spectral and magnetic properties of metal complexes:
Types of magnetic behavior, spin-only formula, calculation of magnetic moments, experimental determination of magnetic susceptibility- Gouy method.

Stability of metal complexes:
Thermodynamic stability and kinetic stability, factors affecting the stability of metal complexes, chelate effect, determination of composition of complex by Job’s method and mole ratio method.

Reactivity of metal complexes:
Labile and inert complexes, ligand substitution reactions – \(\text{SN}_1\) and \(\text{SN}_2\); substitution reactions of square planar complexes – Trans effect and applications of trans effect.

Bioinorganic chemistry:
Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and Cl. Metalloporphyrins – Structure and functions of hemoglobin, Myoglobin and Chlorophyll.

Quantitative analysis:
Importance in various fields of science, steps involved in chemical analysis. Principles of volumetric analysis: Theories of acid-base, redox, complexometric, iodometric and precipitation titrations – choice of indicators for these titrations.

Principles of gravimetric analysis: precipitation, coagulation, peptization, coprecipitation, post precipitation, digestion, filtration and washing of precipitate, drying and ignition.

Treatment of analytical data:
Types of errors, significant figures and its importance, accuracy – methods of expressing accuracy, error analysis and minimization of errors, precision – methods of expressing precision, standard deviation and

SEPARATION TECHNIQUES IN CHEMICAL ANALYSIS:

SOLVENT EXTRACTION: Introduction, principle, techniques, factors affecting solvent extraction, Batch extraction, continuous extraction and counter current extraction. Synergism., Application – Determination of Iron (III)

ION EXCHANGE : Introduction, action of ion exchange resins, separation of inorganic mixtures, applications, Solvent extraction: Principle and process,

Chromatography: Classification of chromatography methods, principles of differential migration adsorption phenomenon, Nature of adsorbents, solvent systems, \(R_f\) values, factors effecting \(R_f\) values.
Paper Chromatography: Principles, R<sub>f</sub> values, experimental procedures, choice of paper and solvent systems, developments of chromatogram – ascending, descending and radial. Two dimensional chromatography, applications.


Column Chromatography: Principles, experimental procedures, Stationary and mobile Phases, Separation technique. Applications

HPLC: Basic principles and applications.

ORGANIC CHEMISTRY

Structural theory in Organic Chemistry

Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents including neutral molecules like H<sub>2</sub>O,NH<sub>3</sub>& AlCl<sub>3</sub>).

Bond polarization : Factors influencing the polarization of covalent bonds, electro negativity – inductive effect. Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance or Mesomeric effect, application to (a) acidity of phenol, and (b) acidity of carboxylic acids. Hyper conjugation and its application to stability of carbonium ions, Free radicals and alkenes, carbanions, carbenes and nitrenes.


Acyclic Hydrocarbons


Alkynes – Preparation by dehydrohalogenation of dihalides, dehalogenation of tetrahalides, Properties; Acidity of acetylenic hydrogen (formation of Metal acetylides). Preparation of higher acetylenes, Metal ammonia reductions, Physical properties. Chemical reactivity – electrophilic addition of X<sub>2</sub>, HX, H<sub>2</sub>O (Tautomerism), Oxidation with KmnO<sub>4</sub>, OsO<sub>4</sub>, reduction and Polymerisation reaction of acetylene.

Alicyclic hydrocarbons (Cycloalkanes)


Benzene and its reactivity

Concept of resonance, resonance energy. Heat of hydrogenation, heat of combustion of Benzene, mention of C-C bond lengths and orbital picture of Benzene. Concept of aromaticity – aromaticity (definition), Huckel’s rule – application to Benzenoid (Benzene, Naphthalene) and Non – Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylion cation)

Reactions – General mechanism of electrophilic substitution, mechanism of nitration, Friedel Craft’s alkylation and acylation. Orientation of aromatic substitution – Definition of ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO<sub>2</sub> and Phenolic). Orientation of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonie acid groups (iii) Halogens

(Explanation by taking minimum of one example from each type)

Halogen compounds

Nomenclature and classification of alkyl (into primary, secondary, tertiary), aryl, aryl alkyl, allyl, vinyl, benzyl halides. Nucleophilic aliphatic substitution reaction- classification intoSN<sub>1</sub> andSN<sub>2</sub> – reaction mechanism with examples – Ethyl chloride, t-butyl chloride and optically active alkyl halide 2-bromobutane.
Hydroxy compounds
Nomenclature and classification of behavior compounds.
Identification of alcohols by oxidation with KmnO₄, Ceric ammonium nitrate, Luca’s reagent and phenols by reaction with FeCl₃.
Chemical properties:
 a) Dehydration of alcohols.
 b) Oxidation of alcohols by CrO₃, KmnO₄.
 c) Special reaction of phenols: Bromination, Kolbe-Schmidt reaction, Riemer-Tiemann reaction, Fries rearrangement, azocoupling, Pinacol-Pinacolone rearrangement.

Carbonyl compounds
Nomenclature of aliphatic and aromatic carbonyl compounds, structure of the carbonyl group. Synthesis of aldehydes from acid chlorides, synthesis of aldehydes and ketones using 1,3-dithianes, synthesis of ketones from nitriles and from carboxylic acids. Physical properties: Reactivity of carbonyl group in aldehydes and ketones.
Nucleophilic addition reaction with a) NaHSO₃, b) HCN, c) RMgX, d) NH₂OH, e) PhNNH₂, f) 2,4 DNPH, g) Alcohols-formation of hemiacetal and acetal. Base catalysed reactions: a) Aldol, b) Cannizzaro’s reaction, c) Perkin reaction, d) Benzoin condensation, e) Haloform reaction, f) Knoevenagel reaction. Oxidation of aldehydes- Baeyer-Villiger oxidation of ketones.Reduction: Clemmensen reduction, Wolf-Kishner reduction, MPV reduction, reduction with LiAlH₄ and NaBH₄. Analysis of aldehydes and ketones with a) 2,4-DNPH test, b) Tollen’s test, c) Fehling test, d) Schiff’s test e) Haloform test (with equation)

Carboxylic acids and derivatives
Chemical properties: Reactions involving H, OH and COOH groups- salt formation, anhydride formation, acid chloride formation, amide formation and esterification (mechanism). Degradation of carboxylic acids by Huns-Diecker reaction, decarboxylation by Schimdt reaction, Arndt-Eistert synthesis, behavior ions by Hell- Volhard-Zelinsky reaction.

Active methylene compounds
Malonic ester: preparation from acetic acid. Synthetic applications: Preparation of a) monocarboxylic acids (propionic acid and n-butyric acid). B) Dicarboxylic acids (succinic acid and adipic acid) c) α,β-unsaturated carboxylic acids (crotonic acid). D) Reaction with urea.

Nitro hydrocarbons
Nomenclature and classification-nitro hydrocarbons, structure –Tautomerism of nitroalkanes leading to aci and keto form, Preparation of Nitroalkanes, reactivity –halogenation, reaction with HONO (Nitrous acid),Nef reaction and Mannich reaction leading to Micheal addition and reduction.

Nitrogen compounds
Amines (Aliphatic and Aromatic): Nomenclature, Classification into 1*, 2*, 3* Amines and Quaternary ammonium compounds. Preparative methods – 1. Ammonolysis of alkyl halides 2. Gabriel synthesis 3. Hoffman’s bromamide reaction (mechanism). Reduction of Amides and Schmidt reaction. Physical properties and basic character – Comparative basic strength of Ammonia, methyl amine, dimethyl amine, trimethyl amine and aniline – comparative basic strength of aniline, N-methylaniline and N,N-dimethyl aniline (in aqueous and non-aqueous medium), steric
effects and substituent effects. Chemical properties: a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation e) Reaction with Nitrous acid of 1°, 2°, 3° (Aliphatic and aromatic amines). Electrophillic substitution of Aromatic amines – Bromination and Nitration. Oxidation of aryl and Tertiary amines, Diazotization.

**Heterocyclic Compounds**

Introduction and definition: Simple five membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole – Aromatic character – Preparation from 1,4,- dicarboxyl compounds, Paul-Knorr synthesis.

Properties: Acidic character of pyrrole – electrophillic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions - Diels Alder reaction in furan.


**Carbohydrates**

Monosaccharides: (+) Glucose (aldo hexose) – Evidence for cyclic structure of glucose (some negative aldehydes tests and mutarotation) - Proof for the ring size (methylation, hydrolysis and oxidation reactions) – Pyranose structure (Haworth formula and chair conformational formula).

(-) Fructose (ketohexose) – Evidence of 2 – ketohexose structure (formation of pentaacetate, formation of 27ehavior27ion its hydrolysis and reduction by HI). Cyclic structure for fructose (Furanose structure and Haworth formula) – osazone formation from glucose and fructose – Definition of anomers with examples.

Interconversion of Monosaccharides: Aldopentose to Aldohexose (Arabinose to D- Glucose, D-Mannose) (Kiliani – Fischer method). Epimers, Epimerisation – Lobry de bruyn van Ekenstein rearrangement. Aldohexose to Aldopentose (D-Glucose to D- Arabinose) by Ruff degradation. Aldohexose to Ketohexose

[(+) Glucose to (-) Fructose] and Ketohexose to Aldohexose (Fructose to Glucose)

**Amino acids and proteins**


Physical properties: Zwitter ion structure – salt like character – solubility, melting points, amphoteric character, definition of isoelectric point.

Chemical properties: General reactions due to amino and carboxyl groups – lactams from gamma and delta amino acids by heating peptide bond (amide linkage). Structure and nomenclature of peptides and proteins.

Analysis of the following drugs and pharmaceuticals preparations:

(Knowledge of molecular formula, structure and analysis)

Analysis of anlgesics and antipyretics like aspirin and paracetamol
Analysis of antimalerials like chloroquine .
Anti tuberculous drug- isoniazid.
Analysis of the following drugs and pharmaceuticals preparations:

(Knowledge of molecular formula, structure and analysis)

Analysis of antihistamine drugs and sedatives like: allegra, zyrtec(citirizine), alprazolam, trazodone, lorazepem, ambien(zolpidem), diazepam,
Analysis of anti epileptic and anti convulsant drugs like phenobarbital and phenacemide.
Analysis of drugs used in case of cardiovascular drugs:atenolol, norvasc(amlodipine),
Analysis of lipitor(atorvastatin) a drug for the preventin of productin of cholesterol.
Analysis of diuretics like: furosemide (Lasix), triamterene
Analysis of prevacid(lansoprazole) a drug used for the prevention of production of acids in stomach.
Analysis of Milk and milk products: Acidity, total solids, fat, total nitrogen, proteins, lactose, phosphate activity, casein, chloride. Analysis of food materials- Preservatives: Sodium carbonate, sodium benzoate sorbic acid Coloring matters, - Brilliant blue FCF, fast green FCF, tertrazine, erythrosine, sunset yellow FCF.

Flavoring agents — Vanilla, diacetyl, isoamyl acetate, limonene, ethylpropionate, allyl hexanoate and Adulterants in rice and wheat, wheat flour, sago, coconut oil, coffee powder, tea powder, milk.

Clinical analysis of blood: Composition of blood, clinical analysis, trace elements in the body. Estimation of blood cholesterol, glucose, enzymes, RBC & WBC, Blood gas analyser.

**PHYSICAL CHEMISTRY**

**Solidstate**


**Gaseous state**


**Liquid state**

Structural differences between solids, liquids and gases. Liquid crystals, the mesomorphic state. Classification of liquid crystals into Smectic and Nematic. Differences between liquid crystal and solid/liquid. Application of liquid crystals as LCD devices.

**Solutions**


Nernst distribution law. Calculation of the partition coefficient. Applications of distribution law.

**SPECTROSCOPY**


2. Manganese in Manganous sulphate

**Electronic spectroscopy:**


**Infra red spectroscopy**

Different Regions in Infrared radiations. Modes of vibrations in diatomic and polyatomic molecules. Characteristic absorption bands of various functional groups. Interpretation of spectra-Alkanes, Aromatic, Alcohols, carbonyls, and amines with one example to each.

**Proton magnetic resonance spectroscopy (1H-NMR)**

Principles of nuclear magnetic resonance, equivalent and non-equivalent protons, position of signals. Chemical shift, NMR splitting of signals – spin-spin coupling, coupling constants. Applications of NMR with suitable examples – ethyl bromide, ethanol, acetaldehyde, 1,1,2-tribromo ethane, ethyl acetate, toluene and acetophenone.

**Dilute solutions**

Electrochemistry-I

Electrochemistry-II
Single electrode potential, sign convention, Reversible and irreversible cells Nernst Equation- Reference electrode, Standard Hydrogen electrode, calomel electrode, Indicator electrode, metal – metal ion electrode, Inert electrode, Determination of EMF of cell, Applications of EMF measurements – Potentiometric titrations.

Phase rule
Thermodynamics

Chemical kinetics
Rate of reaction – Definition of order and molecularity. Derivation of rate constants for first, second, third and zero order reactions and examples. Derivation for time half change. Methods to determine the order of reactions. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy.

Photochemistry
Difference between thermal and photochemical processes. Laws of photochemistry- Grothus-Draper’s law and Stark-Einstein’s law of photochemical equivalence. Quantum yield-Photochemical reaction mechanism- hydrogenchlorine, hydrogen- bromine reaction. Qualitative description of fluorescence, phosphorescence, Photosensitized reactions- energy transfer processes (simple example)

105 – GEOLOGY
Total Marks : 100

Palaeontology, Indian Geology and Economic Geology


Economic Geology : Definition of Economic Geology, Global tectonics and metallogeny – mineral resources and mineral deposits, Importance of economic minerals and rocks, ore minerals, gangue minerals (gangue). Ore, industrial minerals, tenor and grade; Syngenetic deposits, epigenetic deposits. Classification of mineral deposits – Bateman’s classification modified by Jenson. Processes of formation of mineral deposits; endogenetic and exogenetic processes. Study of ore deposits of gold, copper, lead, zinc, aluminium, iron, manganese, chromium, uranium and thorium with respect to their mineralogy, uses, mode of occurrence, origin and distribution in India. Distribution of industrial minerals in India for the following industries : abrasives, cement, ceramics, glass, fertilizers and chemicals, and insulators. Fossils fuels : Coal, it’s origin and types of coal – Coal deposits of India. Oil and Natural Gas : Origin, migration and entrapment and distribution in India, Use of micropaleontology in oil exploration,


Physical Geology, Crystallography and Mineralogy


**Crystallography**: **Definition of crystal** – amorphous and crystalline states – morphology of crystals – face, edge, solid angle and interfacial angle. **Forms**: simple, combination, closed and open forms. **Symmetry**: Plane, axis, centre, crystallographic axes, parameters, indices, crystallographic notation – Parameter system of Weiss, Index system of Miller. **Classification** of Crystals into ‘7’ systems. Morphological study of the following classes of symmetry: a) Cubic system – Normal (Galena) type, b) Tetragonal system – Zircon type, c) Hexagonal system – Beryl type, d) Trigonal system – Calcite type, e) Orthorhombic system – Barytes type, f) Monoclinic system – Gypsum type, and g) Triclinic system – Axinite type. **Twinning** in crystals – definition of twin, twin plane, twin axis and composition plane.


### 106 – STATISTICS


Properties, M.G.F., additive properties, Interrelation between Normal and Binomial, Normal and Poisson distribution, Cauchy Distribution.


Principal steps in a sample survey, Censes versus sample survey, sampling and Non-sampling errors. Types of sampling – subjective, probability and mixed sampling methods. Simple Random Sampling: Methods of random sample selection, estimation of population mean, variances in SRSWR and SRSWOR. Stratified random sampling: Proportional and optimum allocation of Sample sizes in stratification. Variance of estimators. Systematic sampling when N=nk, relative efficiencies of systematic sample estimates with simple and stratified random samples. Advantages and disadvantages of above methods of sampling. One way analysis of variance with equal and unequal classifications and ANOVA for two way classifications. Principles of experimentation in designs, analysis of completely randomized design, Randomized block design and Latin square design, including one missing observation. Efficiency of these designs. Concept of factorial experiments.

### 107 – 5-Year Integrated course in Geology & Applied Chemistry

**Total Marks : 100**

**Physics**

**Marks 50**

**PHYSICAL WORLD**


**UNITS AND MEASUREMENTS**


**MOTION IN A STRAIGHT LINE**

Position, path length and displacement, average velocity and average speed, instantaneous velocity and speed, acceleration, kinematic equations for uniformly accelerated motion, relative velocity.

**MOTION IN A PLANE**

 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.

**LAWS OF MOTION**
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, types of friction, static, kinetic and rolling frictions, Circular motion, Motion of a car on a level road, Motion of a car on a banked road, solving problems in mechanics.

**WORK, ENERGY AND POWER**

**SYSTEMS OF PARTICLES AND ROTATIONAL MOTION**
Rigid body motion, 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, 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, Dynamics of rotational motion about a fixed axis, Angular momentum in case of rotation about a fixed axis, Rolling motion, Kinetic Energy of Rolling Motion.

**OSCILLATIONS**
Periodic and oscillatory motions, Period and frequency, Displacement, Simple harmonic motion (S.H.M.), Simple harmonic motion and motion 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.

**GRAVITATION**
Kepler’s laws, Universal law of gravitation, central forces, 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, Orbital Speed, Earth satellites, Energy of an orbiting satellite, Geostationary and polar satellites, Weightlessness.

**MECHANICAL PROPERTIES OF SOLIDS**

**MECHANICAL PROPERTIES OF FLUIDS**
Pressure, Pascal’s Law, Variation of Pressure with Depth, Atmospheric Pressure and Gauge Pressure, Hydraulic Machines, Archimedes’ Principle, 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 and Surface Energy, Angle of Contact, Drops and Bubbles, Capillary Rise, Detergents and Surface Tension.

**THERMAL PROPERTIES OF MATTER**

**THERMODYNAMICS**
KINETIC THEORY

WAVES
Transverse and longitudinal waves, displacement relation in a progressive wave, amplitude and phase, wavelength and angular wave number, period, angular frequency and frequency, the speed of a travelling wave, speed of a 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: source moving and observer stationary, observer moving and source stationary, both source and observer moving.

RAY OPTICS AND OPTICAL INSTRUMENTS:
Reflection of light by spherical mirrors, sign convention, focal length of spherical mirrors, the 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, the eye, the simple and compound microscopes, refracting telescope and Cassegrain reflecting telescope.

WAVE OPTICS
Huygens principle, refraction and reflection of plane waves using Huygens principle, 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 diffraction, resolving power of optical instruments, the validity of ray optics, 34ehavior34ion, 34ehavior34ion by scattering, 34ehavior34ion by reflection.

ELECTRIC CHARGES AND FIELDS
Electric charge, conductors and insulators, charging by induction, basic properties of electric charges, additivity of charges, conservation of charge, quantization of 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 for points on the axial line and on the equatorial plane, physical significance of dipoles, dipole in a uniform external field, continuous charge distribution, Gauss’s law, applications of Gauss’s law, field due to an infinitely long straight uniformly charged wire, field due to a uniformly charged infinite plane sheet, field due to a uniformly charged thin spherical shell.

ELECTROSTATIC POTENTIAL AND CAPACITANCE
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, electrostatic shielding, dielectrics and 34ehavior34ion, electric displacement, capacitors and capacitance, the parallel plate capacitor, effect of dielectric on capacitance, combination of capacitors, capacitors in series, capacitors in parallel, energy stored in a capacitor, Van de Graaff generator.

CURRENT ELECTRICITY
Electric current, electric current in conductors, Ohm’s law, drift of electrons and the origin of resistivity, mobility, limitations of Ohm’s law, resistivity of various materials, colour code of resistors, 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 rules, Wheatstone Bridge, Meter Bridge, Potentiometer.

MOVING CHARGES AND MAGNETISM
Magnetic force, sources and fields, magnetic field, Lorentz force, magnetic force on a current carrying conductor, motion in a magnetic field, helical motion of charged particles, motion in combined electric and magnetic fields, velocity selector, Cyclotron, magnetic field due to a current element, Biot – Savart’s 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, magnetic dipole, torque on a rectangular current loop in a uniform magnetic field, circular current loop as a magnetic dipole, the magnetic dipole moment of a revolving electron, the Moving Coil Galvanometer; conversion into ammeter and voltmeter.

MAGNETISM AND MATTER
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, 35behavior35ions and magnetic intensity, susceptibility, magnetic properties of materials; Diamagnetism, Paramagnetism, Ferromagnetism, Hysteresis loop, permanent magnets and electromagnets.

**ELECTROMAGNETIC INDUCTION**
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.

**ALTERNATING CURRENT**
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.

**ELECTROMAGNETIC WAVES**
Displacement current, Maxwell’s equations, electromagnetic waves, sources of electromagnetic waves, nature of electromagnetic waves, electromagnetic spectrum: radio waves, microwaves, infrared waves, visible rays, ultraviolet rays, X-rays, gamma rays.

**DUAL NATURE OF RADIATION AND MATTER**
Electron emission, Photoelectric Effect, Hertz’s observations, Hallwachs and Lenard’s observations, experimental study of photoelectric effect, effect of intensity of light on photocurrent, effect of potential on photoelectric current, effect of frequency of incident radiation on stopping potential, 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, photocell, Davison and Germer experiment.

**ATOMS**
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, Franck – Hertz experiment, the line spectra of the hydrogen atom, de Broglie’s explanation of Bohr’s second postulate of quantization, LASER light.

**NUCLEI**

**SEMICONDUCTOR ELECTRONICS: MATERIALS, DEVICES AND SIMPLE CIRCUITS**
Classification of metals, conductors, and semiconductors on the basis of conductivity and energy bands, Band theory of solids, Intrinsic semiconductor, Extrinsic semiconductor, p-type semiconductor, n-type semiconductor, 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, Zener diode as voltage regulator, Optoelectronic junction devices, Photodiode, light emitting diode, solar cell. Junction transistor, structure and action, Basic transistor circuit configurations and transistor characteristics, transistor as a switch and as an amplifier (CE – Configuration), Feedback amplifier and transistor oscillator, Digital Electronics and Logic gates, NOT, OR, AND, NAND and NOR Gates, Integrated circuits.

**COMMUNICATION SYSTEMS**
Elements of a Communication system, basic terminology used in electronic communication systems, bandwidth of signals, bandwidth of transmission medium, propagation of electromagnetic waves, ground waves, sky waves, space wave, modulation and its necessity, size of the antenna or aerial, effective power radiated by an antenna, mixing up of signals from different transmitters, amplitude modulation, production of amplitude modulated wave, detection of amplitude modulated wave.

**CHEMISTRY**

**ATOMIC STRUCTURE**
Sub- atomic particles; Atomic models –Rutherford’s Nuclear model of atom; 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 35behavior 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.

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) Electro negativity; Periodic trends in chemical properties: (a) Valence or Oxidation states, (b) Anomalous properties of second period elements – diagonal relationship; Periodic trends and chemical reactivity.

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, General properties of ionic compounds; Bond Parameters – bond length, bond angle, and bond enthalpy, bond order, resonance-Polarity of bonds dipole moment-Fajan rules; Valence Shell Electron Pair Repulsion (VSEPR) theory; Predicting the geometry of simple molecules; Valence bond theory-Orbital overlap concept-Directional properties of bonds-overlapping of atomic orbitals-types of overlapping and nature of covalent bonds-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- H2, He2, Li2, B2, C2, N2 and O2; Hydrogen bonding-cause of formation of hydrogen bond – Types of hydrogen bonds- inter and intra molecular-General properties of hydrogen bonds.

STATES OF MATTER: GASES AND LIQUIDS

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 Behavior – 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).

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 Law, Examples; 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-limiting reagent; 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.

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 U and H: Calorimetry; Enthalpy change, ΔH 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 (ΔcH), (b) Enthalpy of atomization (ΔA H), phase transition, sublimation and ionization, (c) Bond Enthalpy (ΔbondH ), (d) Enthalpy of solution (ΔsolH ) and dilution-lattice enthalpy; 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.

CHEMICAL EQUILIBRIUM AND ACIDS-BASES
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 $K_p$ and $K_C$; 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- 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 $K_A$ and $K_B$-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 constant Common ion effect on
solubility of ionic salts.

HYDROGEN AND ITS COMPOUNDS
Position of hydrogen in the periodic table; Dihydrogen-Occurrence and Isotopes; Preparation of Dihydrogen;
Properties of Dihydrogen; Hydrides: Ionic, covalent, and non-stoichiometric 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.

THE 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.

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.

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 – carbonmonoxide, carbon dioxide,Silica, silicones, silicates and
zeolites.

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,
CO2). Global warming and Green house 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.
ORGANIC CHEMISTRY-SOME BASIC PRINCIPLES AND TECHNIQUES AND HYDROCARBONS

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 purification 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 38ehavi, 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, antiMarkovnikov’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-Craft’ alkylation and acylation; Directive influence of functional groups in mono substituted benzene, Carcinogenicity and toxicity.

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; Electricalproperties- conduction of electricity in metals, semiconductors and insulators- band theory of metals; Magnetic properties.

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 and determination of molar mass-relative lowering of vapour pressure-elevation of boiling point-depression of freezing point-osmotic pressure-reverse osmosis and water purification; Abnormal molar masses-van’t Hoff factor.

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: 38ehavior38i 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.
SURFACE CHEMISTRY


GENERAL PRINCIPLES OF METALLURGY

Occurrence of metals: Concentration of ores—levigation, magnetic separation, froth floatation, leaching; Thermodynamic principles of metallurgy—Ellingham diagram—applications—extraction of iron, copper and zinc from their ores; Electrochemical principles of metallurgy—Oxidation and reduction—Refining of crude metal—distillation, liquation, electrolytic refining, zone refining and vapour phase refining; Uses of aluminium, copper, zinc and iron.

p-BLOCK ELEMENTS:

GROUP-15 ELEMENTS: Occurrence—electronic configuration, atomic and ionic radii, 39ehavior39 enthalpy, electronegativity, physical and chemical properties; Dinitrogen—preparation, properties and uses; Compounds of nitrogen—preparation, properties and uses of ammonia; Oxides of nitrogen—Preparation and properties of nitric acid; Phosphorous—allotropic forms; Phosphine—preparation, properties and uses; Phosphorous halides; Oxoacids of phosphorous

GROUP-16 ELEMENTS: Occurrence—electronic configuration, atomic and ionic radii, 39ehavior39 enthalpy, electron gain enthalpy, electronegativity, physical and chemical properties; Dioxygen—preparation, properties and uses; Simple oxides; Ozone—preparation, properties, structure and uses; Sulphur dioxide—preparation, properties and uses; Oxoacids of sulphur; Sulphuric acid—manufacture, properties and uses.

GROUP-17 ELEMENTS: Occurrence, electronic configuration, atomic and ionic radii, 39ehavior39 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—preparation, properties and uses.

GROUP-18 ELEMENTS : Occurrence, electronic configuration, ionization enthalpy, atomic radii, electron gain enthalpy, physical and chemical properties(a) Xenon-fluorine compounds—XeF₂, XeF₄ and XeF₆—preparation, hydrolysis and formation of fluoro anions—structures of XeF₂, XeF₄ and XeF₆ (b) Xenon-oxygen compounds XeO₃ and XeOF₄—formation and structures—uses of noble gases.

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, 39ehavior39 enthalpies, oxidation states, trends in the M²⁺/M and M³⁺/M²⁺ standard electrode potentials, trends in stability of higher oxidation states, chemical reactivity and  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, properties and uses of potassium dichromate and potassium permanganate—structures of chromate, dichromate, manganate and permanganate ions; Inner transition elements—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, 40ehavior40i 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.

POLYMERS
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, 40ehavi and polyacrylonitrile-condensation polymerization or step growth polymerization-polyamides-preparation of Nylon 6,6 and nylon 6-poly esters-terylene-bakelite, melamine-formaldehyde 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 40ehavior – their monomers, structures and uses.

BIOMOLECULES
Carbohydrates - Classification of carbohydrates- Monosaccharides: preparation of glucose from sucrose and starch- Properties and structure of glucose- D,L configurations and (+), (-) notations of glucose-Structure of fructose; Disaccharides: Sucrose- preparation, structure; Invert sugar- Structures of maltose and lactose-Poly saccharides: Structures of starch, cellulose and glycogen- Importance of carbohydrates; Proteins-Aminoacids: Natural aminoacids-classification of aminoacids – structures and D and L forms-Zwitter ions; Proteins: Structures, classification, fibrous and globular- primary, secondary, tertiary and quartenary 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.

CHEMISTRY IN EVERYDAY LIFE
Drugs and their classification: (a) Classification of drugs on the basis of 40ehavior40ions40l 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- antifertility drugs; Chemicals in food-artificial sweetening agents, food preservatives, antioxidants in food; Cleansing agents-soaps and synthetic detergents – types and examples.

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 40ehavior40ions (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 reactions; 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

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 40ehavior and ether functional groups; Methods of preparation: Alcohols from alkenes and carbonyl compounds, from Grignard reagents; Phenols from haloarenes, benzene sulphonic acid, diazonium
salts, cumene; Physical properties of alcohols and phenols; Chemical reactions of alcohols and phenols (i) Reactions involving cleavage of O-H bond in alcohols-Acidity of alcohols and phenols, esterification (ii) Reactions involving cleavage of C-O bond- reactions with HX, PX₃, 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 (anisole).

ALDEHYDES AND KETONES
Nomenclature and structure of carbonyl group; Preparation of aldehydes and ketones-(1) by oxidation of alcohols (2) by dehydrogenation of 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 α- Hydrogen and other reactions (Cannizzaro reaction,electrophilic substitution reaction); Uses of aldehydes and ketones.

CARBOXYLIC ACIDS
Nomenclature and structure of carboxylgroup; 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 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 PCl₅, PCl₃, SOCl₂, esterification and reaction with ammonia (iii) Reactions involving-COOH group-reduction, decarb oxylation (iv) Substitution reactions in the hydrocarbon part - 41ehavior41ions and ring substitution; Uses of carboxylic acids.

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, carbly amine reaction, reaction with nitrous acid, reaction with aryl sulphonyl chloride, electrophilic substitution of aromatic amines (aniline)- 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) iodide 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.

201 – HUMANITIES & SOCIAL SCIENCES

REASONING

INDIAN CONSTITUION
Preamble, Fundamental Rights, Directive Principles of State, Local Self Governance.
Structure of Society : Social Groups, Indian Culture, Social Institutions, Individual and Society, Culture and Personality
Methods of Social Work, Group works, Principles, Community Development, Basics of Internet, World Wide Web, Digitalization
Unity and Diversity of Indian Society; Philosophical Foundations of Indian Culture; History and Culture of Andhra Pradesh.
GENERAL ENGLISH  (25 Marks)
Active/Passive Voice;  Parts of Speech; Time, Tense and Aspect;  Phrasal Verbs; Auxiliary verbs; Use of Shall, will, For, Since; Idioms and Phrases; Common Errors; Preposition; Synonyms and Antonyms; Precis Writing and Comprehension

CURRENT AFFAIRS  (25 Marks)
Current events of national and international importance. – History of India and Indian National Movement. – Indian and World Geography – Physical, Social, Economic Geography of India and the World. – Indian Policy and Governance – Constitution, Political System, Panchayati Raj, Public Policy. - Economic and Social Development Sustainable Development, Poverty, Inclusion, Demographics, Social Sector initiatives, etc. General issues on Environmental Ecology, Bio-diversity and Climate Change – that do not require subject specialization, General Science, Demonetization and Goods and Services Tax (GST).

202 – ENGLISH
Total Marks : 100
1. Literary terms, Genres, Literary Movements and Trends, Critical concepts.
2. Verb, verb patterns and structures, phrasal verbs concord, Active and Passive Voice, Prepositions, Question tags, Articles, synonyms and antonyms, one word substitutes, Note taking, confusables.

203 – TELUGU
Total Marks : 100
Fundamentals of Accounting


Cost Accounting


Management Accounting


Business Economics


Business Organization


https://www.freshersnow.com/

Total Marks : 100

Business Laws

Banking Theory & Practice

E-Commerce

Auditing & Corporate Taxation

Business Environment
1. Verbal Ability, Reading Comprehension and Writing Ability (10+10+10=30 Marks)

**Verbal Ability**
- Antonyms
- Analogies
- Odd word out
- Word substitute in a sentence
- Right usage of words in fill in the blank
- Right usage of word in match the following
- Fill in the Blanks – Homophones
- Idioms – Fill in the blank
- Idioms – Match the following
- Sentence Correction

**Reading Comprehension**
- Purpose of the passage
- Strengthen and Weaken
- Assumption and Supporting Statement
- Flaw and Discrepancy
- Inference and Conclusion Drawn
- Passage based questions
- Author’s Point of View
- Main idea of the Passage

**Writing Ability**
The applicant is to express their ideas on a given topic in 250 words.

2. Logical and Analytical Reasoning, Mental Ability (10+10=20 Marks)

**Logical and Analytical Reasoning**
- Number and letter Series
- Statement Conclusion / Assumption / Arguments
- Logical Connectivity
- Linear / Circular / Family Arrangement
- Venn Diagram
- Blood relations
- Coding and decoding
- Cause and effect

**Mental Ability**
- Averages
- Ratio & Proportion
- Partnership
- Problem on Ages Trains
- Time and Distance, Time and Work
- Boats and Streams
- Profit and Loss
- HCM and LCM

3. HRM Aptitude and General Awareness (30+10=40 Marks)

**HRM Aptitude**
- Business environment
A) Micro Economics – Consumer Behavior (16 Marks)

B) Micro Economics - Production and Price Theory (16 Marks)

C) Macro Economics - National Income, Employment and Money (16 Marks)

D) Banking and International Trade (16 Marks)
Trade Cycles - meaning and definition - Phases of a Trade Cycle -Inflation - definition - types of inflation - causes and effects of inflation measures to control inflation. Banking: Meaning and definition -Functions of Commercial

E) Economic Development and Indian Economy


F) Indian and Andhra Pradesh Economy


GENERAL INFORMATION:

1. For all Tests, the candidate has to answer 100 multiple choice questions in 90 minutes. Each question contains four alternative answers (a, b, c, d). The candidate must mark the answer on OMR Sheet and should not answer anywhere on the Test booklet.

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1. The Scattering cross section has dimension of  
   (a) Volume (b) Area (c) Density (d) Length  
2. In an irreversible process, the entropy of a system  
   (a) Remains constant (b) Decreases (c) Increases (d) Becomes infinite  
3. Table ‘A’ of Companies Act gives  
   (a) A model minute book (b) A model form of balance sheet (c) A model memorandum of association (d) A model articles of association

Note: For M.P.Ed. Students in addition to entrance examination another a minimum of 100 marks will be awarded for meritorious sports certificates at the time of counseling and merit order will be prepared.