SIKSHA O ANUSANDHAN

SYLLABUS FOR SAAT 2025

SOADU
01/12/2024

Contents

SYLLABUS FOR (B.TECH.)

A. PHYSICS

UNIT 1: Units and Measurements
Units of measurements, System of units, SI Units, fundamental and derived units, least count, significant figures, Errors in measurements. Dimensions of Physics quantities, dimensional analysis and its applications.

UNIT 2: Kinematics
The frame of reference, motion in a straight line, speed and velocity, uniform and non-uniform motion, average speed and instantaneous velocity, uniformly accelerated motion, velocity-time, position-time graph, relations for uniformly accelerated motion, relative velocity. Motion in a plane, projectile motion, uniform circular motion.

UNIT 3: Laws of Motion
Force and inertia, Newton's first law of motion, momentum, Newton's second Law of motion, impulse, Newton's third Law of motion. Law of conservation of linear momentum and its applications, equilibrium of concurrent forces.
Static and Kinetic friction, laws of friction, rolling friction.
Dynamics of uniform circular motion, centripetal force and its applications: vehicle on a level circular road, vehicle on a banked road.

UNIT 4: Work, Energy and Power
Work done by a constant force and a variable force, kinetic and potential energies, work-energy theorem, power.
The potential energy of a spring, conservation of mechanical energy, conservative and non- conservative forces, motion in a vertical circle. Elastic and inelastic collisions in one and two dimensions.

UNIT 5: Rotational Motion
Centre of mass of a two-particle system, centre of mass of a rigid body. Basic concepts of rotational motion, moment of a force, torque, angular momentum, conservation of angular momentum and its applications.
The moment of inertia, the radius of gyration, values of moments of inertia for simple geometrical objects, parallel and perpendicular axes theorems and their applications. Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions.

UNIT 6: Gravitation
The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth. Kepler's law of planetary motion. Gravitational potential energy, gravitational potential. Escape velocity, motion of a satellite, orbital velocity, time period and energy of satellite.

UNIT 7: Properties of Solids and Liquids
Elastic behaviour, stress-strain relationship, Hooke's Law, Young's modulus, bulk modulus and modulus of rigidity.
Pressure due to a fluid column, Pascal's law and its applications, effect of gravity on fluid pressure, viscosity, Stoke's law, terminal velocity, streamline and turbulent flow, critical velocity, Bernoulli's principle and its applications.
Surface energy and surface tension, angle of contact, excess of pressure across a curved surface, application of surface tension: drops, bubbles and capillary rise.
Heat, temperature, thermal expansion, specific heat capacity, calorimetry, change of state, latent heat. Heat transfer: conduction, convection and radiation.

UNIT 8: Thermodynamics
Thermal equilibrium and the concept of temperature, zeroth law of thermodynamics, heat, work and internal energy. The first law of thermodynamics, isothermal and adiabatic processes. The second law of thermodynamics: reversible and irreversible processes.

UNIT 9: Kinetic Theory of Gases
Equation of state of a perfect gas, work done on compressing a gas, kinetic theory of gases: assumptions, the

concept of pressure, kinetic interpretation of temperature, RMS speed of gas molecules, degrees of freedom, law of equipartition of energy and applications to specific heat capacities of gases, mean free path, Avogadro's number.

UNIT 10: Oscillations and Waves

Oscillations and periodic motion: time period, frequency, displacement as a function of time, periodic functions. Simple harmonic motion (S.H.M.) and its equation, phase, oscillations of a spring: restoring force and force constant, energy in S.H.M.: kinetic and potential energies, simple pendulum: derivation of expression for its time period.

Wave motion, longitudinal and transverse waves, speed of the travelling wave, displacement relation for a progressive wave, principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, beats.

UNIT 11: Electrostatics

Electric charges: conservation of charge, Coulomb's law forces between two point charges, forces between multiple charges, superposition principle and continuous charge distribution.

Electric field: electric field due to a point charge, electric field lines, electric dipole, electric field due to a dipole, torque on a dipole in a uniform electric field.

Electric flux, Gauss's law and its applications to find field due to infinitely long uniformly charged straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell.

Electric potential and its calculation for a point charge, electric dipole and system of charges, potential difference, equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field.

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

UNIT 12: Current Electricity

Electric current: drift velocity, mobility and their relation with electric current, Ohm's law, electrical resistance, I-V characteristics of Ohmic and non-ohmic conductors, electrical energy and power, electrical resistivity and conductivity, series and parallel combinations of resistors, temperature dependence of resistance.

Internal resistance, potential difference and emf of a cell, a combination of cells in series and parallel.

Kirchhoff's laws and their applications, Wheatstone bridge, Metre Bridge.

UNIT 13: Magnetic Effects of Current and Magnetism

Biot - Savart law and its application to the current carrying circular loop, Ampere's law and its applications to infinitely long current carrying straight wire and solenoid.

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

Current loop as a magnetic dipole and its magnetic dipole moment, bar magnet as an equivalent solenoid, magnetic field lines, magnetic field due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis, torque on a magnetic dipole in a uniform magnetic field, para-, dia- and ferromagnetic substances with examples, the effect of temperature on magnetic properties.

UNIT 14: Electromagnetic Induction and Alternating Currents

Electromagnetic induction: Faraday's law, induced emf and current, Lenz's law, eddy currents, self and mutual inductance.

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

UNIT 15: Electromagnetic Waves

Displacement current, electromagnetic waves and their characteristics, transverse nature of electromagnetic waves, electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, Gamma rays), applications of electromagnetic waves.

UNIT 16: Optics

Reflection of light, spherical mirrors, mirror formula. Refraction of light at plane and spherical surfaces, thin lens formula and lens maker formula, total internal reflection and its applications, magnification, power of a lens, combination of thin lenses in contact, refraction of light through a prism, microscope and astronomical telescope (reflecting and refracting) and their magnifying powers.

Wave optics: wavefront and Huygens 'Principle, laws of reflection and refraction using Huygens principle. Interference: Young's double-slit experiment and expression for fringe width, coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maximum. Polarization: plane-polarized light, Brewster's law, uses of plane- polarized light and Polaroid.

UNIT 17: Dual Nature of Matter and Radiation

Dual nature of radiation, Photoelectric effect, Hertz and Lenard's observations, Einstein's photoelectric equation, particle nature of light. Matter waves: wave nature of particle, de- Broglie relation.

UNIT 18: Atoms and Nuclei

Alpha-particle scattering experiment, Rutherford's model of atom, Bohr model, energy levels, hydrogen spectrum. Composition and size of nucleus, atomic masses, mass-energy relation, mass defect, binding energy per nucleon and its variation with mass number, nuclear fission and fusion.

UNIT 19: Electronic Devices

Semiconductors, semiconductor diode: I-V characteristics in forward and reverse bias, diode as a rectifier; I-V characteristics of LED, the photodiode, solar cell, Zener diode, Zener diode as a voltage regulator.
Logic gates (OR. AND. NOT. NAND and NOR).

UNIT 20: Experimental Skills

1. Familiarity with the basic approach and observations of the experiments and activities:
2. Vernier calipers -its use to measure the internal and external diameter and depth of a vessel.
3. Screw gauge-its use to determine the thickness/ diameter of thin sheet/wire.
4. Simple pendulum-dissipation of energy by plotting a graph between the square of amplitude and time.
5. Metre scale - the mass of a given object by the principle of moments.
6. Young's modulus of elasticity of the material of a metallic wire.
7. Surface tension of water by capillary rise and effect of detergents,
8. Co-efficient of viscosity of a given viscous liquid by measuring the terminal velocity of a given spherical body.
9. Speed of sound in air at room temperature using a resonance tube,
10. Specific heat capacity of a given (i) solid and (ii) liquid by method of mixtures.
11. The resistivity of the material of a given wire using a metre bridge.
12. The resistance of a given wire using Ohm's law.
13. Resistance and figure of merit of a galvanometer by half deflection method.
14. The focal length of
    a. Convex mirror
    b. Concave mirror and
    c. Convex lens, using the parallax method.
15. The plot of the angle of deviation vs angle of incidence for a triangular prism.
16. The refractive index of a glass slab using a travelling microscope.
17. Characteristic curves of a p-n junction diode in forward and reverse bias.
18. Characteristic curves of a Zener diode and finding reverse breakdown voltage.
19. Identification of diode, LED, resistor, a capacitor from a mixed collection of such items

B. CHEMISTRY

PHYSICAL CHEMISTRY

UNIT I: SOME BASIC CONCEPTS IN CHEMISTRY
Matter and its nature, Dalton's atomic theory, Concept of atom, molecule, element and compound, Laws of chemical combination, Atomic and molecular masses, mole concept, molar mass, percentage composition, empirical and molecular formulae, Chemical equations and stoichiometry.

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

UNIT 3: CHEMICAL BONDING AND MOLECULAR STRUCTURE
Kossel-Lewis approach to chemical bond formation, the concept of ionic and covalent bonds.
Ionic Bonding: Formation of ionic bonds, factors affecting the formation of ionic bonds; calculation of lattice enthalpy.
Covalent Bonding: Concept of electronegativity, Fajan's rule, dipole moment, Valence Shell Electron Pair Repulsion (VSEPR) theory and shapes of simple molecules.
Quantum mechanical approach to covalent bonding: Valence bond theory - its important features, the concept of hybridization involving s, p and d orbitals, resonance.
Molecular Orbital Theory - Its important features, LCAOs, types of molecular orbitals (bonding, antibonding), sigma and pi-bonds, molecular orbital electronic configurations of homonuclear diatomic molecules, the concept of bond order, bond length and bond energy.
Elementary idea of metallic bonding, hydrogen bonding and its applications.

UNIT 4: CHEMICAL THERMODYNAMICS
Fundamentals of thermodynamics: System and surroundings, extensive and intensive properties, state functions, entropy, types of processes.
The first law of thermodynamics - Concept of work, heat, internal energy and enthalpy, heat capacity, molar heat capacity, Hess's law of constant heat summation, Enthalpies of bond dissociation, combustion, formation, atomization, sublimation, phase transition, hydration, ionization and solution.
The second law of thermodynamics - Spontaneity of processes, ΔS of the universe and ΔG of the system as criteria for spontaneity. ΔG°(Standard Gibbs energy change) and equilibrium constant.

UNIT 5: SOLUTIONS
Different methods for expressing the concentration of solution - molality, molarity, mole fraction, percentage (by volume and mass both), the vapour pressure of solutions and Raoult's Law - Ideal and non- ideal solutions, vapour pressure - composition, plots for ideal and non- ideal solutions, Colligative properties of dilute solutions - a relative lowering of vapour pressure, depression of freezing point, the elevation of boiling point and osmotic pressure, determination of molecular mass using colligative properties, abnormal value of molar mass, van't Hoff factor and its significance.

UNIT 6: EQUILIBRIUM
Meaning of equilibrium is the concept of dynamic equilibrium.
Equilibria involving physical processes: Solid-liquid, liquid-gas, gas-gas and solid-gas equilibria, Henry's law. General characteristics of equilibrium involving physical processes.
Equilibrium involving chemical processes: Law of chemical equilibrium, equilibrium constants (K_p and K_c) and their significance, the significance of ΔG and ΔG° in chemical equilibrium, factors affecting equilibrium

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

UNIT 7: REDOX REACTIONS AND ELECTROCHEMISTRY
Electronic concepts of oxidation and reduction, redox reactions, oxidation number, rules for assigning oxidation number and balancing of redox reactions.
Electrolytic and metallic conduction, conductance in electrolytic solutions, molar conductivities and their variation with concentration, Kohlrausch's law and its applications.
Electrochemical cells - Electrolytic and Galvanic cells, different types of electrodes, electrode potentials including standard electrode potential, half-cell and cell reactions, emf of a Galvanic cell and its measurement, Nernst equation and its applications, relationship between cell potential and Gibbs' energy change, dry cell and lead accumulator, fuel cells.

UNIT 8: CHEMICAL KINETICS
Rate of a chemical reaction, factors affecting the rate of reactions: concentration, temperature, pressure and catalyst, elementary and complex reactions, order and molecularity of reactions, rate law, rate constant and its units, differential and integral forms of zero and first-order reactions, their characteristics and half-lives, the effect of temperature on the rate of reactions, Arrhenius theory, activation energy and its calculation, collision theory of bi-molecular gaseous reactions (no derivation).

INORGANIC CHEMISTRY

UNIT 9: CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES
Modern periodic law and present form of the periodic table, s, p. d and f block elements, periodic trends in properties of elements atomic and ionic radii, ionization enthalpy, electron gain enthalpy, valence, oxidation states and chemical reactivity.

UNIT 10: p- BLOCK ELEMENTS
Group -13 to Group 18 Elements
General Introduction: Electronic configuration and general trends in physical and chemical properties of elements across the periods and down the groups, unique behaviour of the first element in each group.

UNIT 11: d - and f- BLOCK ELEMENTS
Transition Elements - General introduction, electronic configuration, occurrence and characteristics, general trends in properties of the first-row transition elements - physical properties, ionization enthalpy, oxidation states, atomic radii, colour, catalytic behaviour, magnetic properties, complex formation, interstitial compounds, alloy formation, preparation, properties and uses of $K_2Cr_2O_7$ and $KMnO_4$.
Inner Transition Elements
Lanthanoids - Electronic configuration, oxidation states and Lanthanoid contraction.

Actinoids - Electronic configuration and oxidation states.

UNIT 12: COORDINATION COMPOUNDS
Introduction to coordination compounds. Werner's theory, ligands, coordination number, denticity, chelation, IUPAC nomenclature of mononuclear co-ordination compounds, isomerism, Bonding: Valence bond approach and basic ideas of Crystal field theory, colour and magnetic properties, importance of coordination compounds (in qualitative analysis, extraction of metals and in biological systems).

ORGANIC CHEMISTRY
UNIT 13: PURIFICATION AND CHARACTERISATION OF ORGANIC COMPOUNDS
Purification - Crystallization, sublimation, distillation, differential extraction and chromatography - principles and their applications.
Qualitative analysis - Detection of nitrogen, sulphur, phosphorus and halogens.

Quantitative analysis (basic principles only) - Estimation of carbon, hydrogen, nitrogen, halogens, sulphur and phosphorus.
Calculations of empirical formulae and molecular formulae, numerical problems in organic quantitative analysis,

UNIT 14: SOME BASIC PRINCIPLES OF ORGANIC CHEMISTRY
Tetravalency of carbon, shapes of simple molecules - hybridization (s and p): classification of organic compounds based on functional groups and those containing halogens, oxygen, nitrogen and sulphur, homologous series: Isomerism - structural and stereoisomerism.
Nomenclature (Trivial and IUPAC)
Covalent bond fission - Homolytic and heterolytic, free radicals, carbocations and carbanions, stability of carbocations and free radicals, electrophiles and nucleophiles.
Electronic displacement in a covalent bond
- Inductive effect, electromeric effect, resonance and hyperconjugation.
Common types of organic reactions- Substitution, addition, elimination and rearrangement.

UNITS 15: HYDROCARBONS
Classification, isomerism, IUPAC nomenclature, general methods of preparation, properties and reactions.
Alkanes - Conformations: Sawhorse and Newman projections (of ethane), mechanism of halogenation of alkanes.
Alkenes - Geometrical isomerism, mechanism of electrophilic addition, addition of hydrogen, halogens, water, hydrogen halides (Markownikoffs and peroxide effect), Ozonolysis and polymerization.
Alkynes - Acidic character, addition of hydrogen, halogens, water and hydrogen halides, polymerization.
Aromatic hydrocarbons - Nomenclature, benzene - structure and aromaticity, mechanism of electrophilic substitution, halogenation, nitration.

Friedel-Craft's alkylation and acylation, directive influence of the functional group in mono- substituted benzene.
UNIT 16: ORGANIC COMPOUNDS CONTAINING HALOGENS
General methods of preparation, properties and reactions, nature of C-X bond, mechanisms of substitution reactions.
Uses, environmental effects of chloroform, iodoform, freons and DDT.

UNIT 17: ORGANIC COMPOUNDS CONTAINING OXYGEN
General methods of preparation, properties, reactions and uses.

ALCOHOLS, PHENOLS AND ETHERS
Alcohols: Identification of primary, secondary and tertiary alcohols, mechanism of dehydration.
Phenols: Acidic nature, electrophilic substitution reactions, halogenation, nitration and sulphonation, Reimer - Tiemann reaction.
Ethers: Structure.
Aldehyde and Ketones: Nature of carbonyl group, nucleophilic addition to >C=O group, relative reactivities of aldehydes and ketones, important reactions such as - Nucleophilic addition reactions (addition of HCN, NH_3 and its derivatives), Grignard reagent, oxidation, reduction (Wolf Kishner and Clemmensen), the acidity of -hydrogen. Aldol condensation, Cannizzaro reaction, Haloform reaction, chemical tests to distinguish between aldehydes and ketones.
Carboxylic Acids: Acidic strength and factors affecting it.

UNIT 18: ORGANIC COMPOUNDS CONTAINING NITROGEN
General methods of preparation, properties, reactions and uses.
Amines: Nomenclature, classification, structure, basic character and identification of primary, secondary and tertiary amines and their basic character.
Diazonium Salts: Importance in synthetic organic chemistry.

UNIT 19: BIOMOLECULES
General introduction and importance of biomolecules.
CARBOHYDRATES – Classification, aldoses and ketoses, monosaccharides (glucose and fructose) and constituent monosaccharides of oligosaccharides (sucrose, lactose and maltose).

PROTEINS - Elementary idea of -amino acids, peptide bond, polypeptides, proteins: primary, secondary, tertiary and quaternary structure (qualitative idea only), denaturation of proteins, enzymes.
VITAMINS – Classification and functions.
NUCLEIC ACIDS – Chemical constitution of DNA and RNA, biological functions of nucleic acids.
Hormones (General introduction)

UNIT 20: PRINCIPLES RELATED TO PRACTICAL CHEMISTRY
Detection of extra elements (Nitrogen, sulphur, halogens) in organic compounds, detection of the following functional groups, hydroxyl (alcoholic and phenolic), carbonyl (aldehyde and ketones) carboxyl and amino groups in organic compounds.
The chemistry involved in the preparation of the following:

- Inorganic compounds, Mohr's salt, potash alum.
- Organic compounds: Acetanilide, p-nitro acetanilide, aniline yellow, iodoform.
- The chemistry involved in the titrimetric exercises – acids, bases and the use of indicators, oxalic-acid vs $KMnO_4$, Mohr's salt vs $KMnO_4$
- Chemical principles involved in the qualitative salt analysis: Cations – Pb^{2+}, Cu^{2+}, Al^{3+}, Fe^{3+}, Zn^{2+}, Ni^{2+}, Ca^{2+}, Ba^{2+}, Mg^{2+}, NH_4^+
- Anions- CO_3^{2-}, S^{2-}, SO_4^{2-}, NO_3^-, NO_2^-, Cl^-, Br^-, I^- (Insoluble salts excluded).

Chemical principles involved in the following experiments:

- Enthalpy of solution of $CuSO_4$
- Enthalpy of neutralization of strong acid and strong base.
- Preparation of lyophilic and lyophobic sols.

Kinetic study of the reaction of iodide ions with hydrogen peroxide at room temperature

C. MATHEMATICS

UNIT 1: SETS, RELATIONS AND FUNCTIONS:
Sets and their representation; Union, intersection and complement of sets and their algebraic properties; Power set; Relations, type of relations, equivalence relations, functions; one-one, into and onto functions, the composition of functions.

UNIT 2: COMPLEX NUMBERS AND QUADRATIC EQUATIONS:
Complex numbers as ordered pairs of reals, Representation of complex numbers in the form $a + ib$ and their representation in a plane, Argand diagram, algebra of complex numbers, modulus and argument (or amplitude) of a complex number, Quadratic equations in real and complex number systems and their solutions; Relations between roots and coefficients, nature of roots, the formation of quadratic equations with given roots.

UNIT 3: MATRICES AND DETERMINANTS:
Matrices, algebra of matrices, type of matrices, determinants and matrices of order two and three, evaluation of determinants, area of triangles using determinants; Adjoint and inverse of a square matrix; Test of consistency and solution of simultaneous linear equations in two or three variables using matrices.

UNIT 4: PERMUTATIONS AND COMBINATIONS:
The fundamental principle of counting, permutations and combinations; Meaning of $P(n, r)$ and $C(n, r)$. Simple applications.

UNIT 5: BINOMIAL THEOREM AND ITS SIMPLE APPLICATIONS:
Binomial theorem for a positive integral index, general term and middle term and simple applications.

UNIT 6: SEQUENCE AND SERIES:
Arithmetic and Geometric progressions, insertion of arithmetic, geometric means between two given numbers, Relation between A.M and G.M.

UNIT 7: LIMIT, CONTINUITY AND DIFFERENTIABILITY:
Real–valued functions, algebra of functions; polynomial, rational, trigonometric, logarithmic and exponential functions; inverse functions. Graphs of simple functions. Limits, continuity and differentiability. Differentiation of the sum, difference, product and quotient of two functions. Differentiation of trigonometric, inverse trigonometric, logarithmic, exponential, composite and implicit functions; derivatives of order upto two, Applications of derivatives: Rate of change of quantities, monotonic-Increasing and decreasing functions, Maxima and minima of functions of one variable.

UNIT 8: INTEGRAL CALCULAS:
Integral as an anti-derivative, Fundamental integrals involving algebraic, trigonometric, exponential and logarithmic functions. Integration by substitution, by parts and by partial fractions. Integration using trigonometric identities. Evaluation of simple integrals of the type

$$\int \frac{dx}{x^2+a^2}, \quad \int \frac{dx}{\sqrt{x^2 \pm a^2}}, \int \frac{dx}{a^2-x^2}, \int \frac{dx}{\sqrt{a^2-x^2}}, \int \frac{dx}{ax^2+bx+c}, \int \frac{dx}{\sqrt{ax^2+bx+c}}, \int \frac{(px+q)dx}{ax^2+bx+c},$$

$$\int \frac{(px+q)dx}{\sqrt{ax^2+bx+c}} \quad \int \sqrt{a^2 \pm x^2}\, dx, \int \sqrt{x^2-a^2}\, dx$$

The fundamental theorem of calculus, properties of definite integrals. Evaluation of definite integrals, determining areas of the regions bounded by simple curves by simple curves in standard forms.

UNIT 9: DIFFRENTIAL EQUATIONS:
Ordinary differential equations, their order and degree, the solution of differential equation by the method of separation of variables, solution of a homogeneous and linear differential equation of the type $\frac{dy}{dx} + p(x)y = q(x)$

UNIT 10: CO-ORDINATE GEOMETRY:
Cartesian system of rectangular coordinates in a plane, distance formula, sections formula, locus and its equation,

the slope of a line, parallel and perpendicular lines, intercepts of a line on the co-ordinate axis.
Straight line: Various forms of equations of a line, intersection of lines, angles between two lines, conditions for concurrence of three lines, the distance of a point form a line, co-ordinate of the centroid, orthocentre and circumcentre of a triangle.
Circle, conic sections: A standard form of equations of a circle, the general form of the equation of a circle, its radius and centre, equation of a circle when the endpoints of a diameter are given, points of intersection of a line and a circle with the centre at the origin and sections of conics, equations of conic sections (parabola, ellipse and hyperbola) in standard forms**.**
UNIT 11: THREE DIMENSIONAL GEOMETRY:
Coordinates of a point in space, the distance between two points, section formula, direction ratios and direction cosines and the angle between two intersecting lines. Equation of a line; Skew lines, the shortest distance between them and its equation.

UNIT 12: VECTOR ALGEBRA:
Vectors and scalars, the addition of vectors, components of a vector in two dimensions and three-dimensional spaces, scalar and vector products.
UNIT 13: STATISTICS AND PROBABILITY:

Measures of dispersion; calculation of mean, median, mode of grouped and ungrouped data, calculation of standard deviation, variance and mean deviation for grouped and ungrouped data. Probability: Probability of an event, addition and multiplication theorems of probability, Baye's theorem, probability distribution of a random variable.
UNIT 14: TRIGONOMETRY:
Trigonometrical identities and trigonometrical functions, inverse trigonometrical functions their properties.

Section	No. of Questions
Physics	20
Mathematics	20
Chemistry	20

SYLLABUS FOR (B.PHARM./B.Sc. AGRICULTURE)

A. PHYSICS

UNIT 1: Units and Measurements
Units of measurements, System of units, SI Units, fundamental and derived units, least count, significant figures, Errors in measurements. Dimensions of Physics quantities, dimensional analysis and its applications.

UNIT 2: Kinematics
The frame of reference, motion in a straight line, speed and velocity, uniform and non-uniform motion, average speed and instantaneous velocity, uniformly accelerated motion, velocity-time, position-time graph, relations for uniformly accelerated motion, relative velocity. Motion in a plane, projectile motion, uniform circular motion.

UNIT 3: Laws of Motion
Force and inertia, Newton's first law of motion, momentum, Newton's second Law of motion, impulse, Newton's third Law of motion. Law of conservation of linear momentum and its applications, equilibrium of concurrent forces. Static and Kinetic friction, laws of friction, rolling friction.
Dynamics of uniform circular motion, centripetal force and its applications: vehicle on a level circular road, vehicle on a banked road.

UNIT 4: Work, Energy and Power
Work done by a constant force and a variable force, kinetic and potential energies, work-energy theorem, power.
The potential energy of a spring, conservation of mechanical energy, conservative and non- conservative forces, motion in a vertical circle. Elastic and inelastic collisions in one and two dimensions.

UNIT 5: Rotational Motion
Centre of mass of a two-particle system, centre of mass of a rigid body. Basic concepts of rotational motion, moment of a force, torque, angular momentum, conservation of angular momentum and its applications.
The moment of inertia, the radius of gyration, values of moments of inertia for simple geometrical objects, parallel and perpendicular axes theorems and their applications. Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions.

UNIT 6: Gravitation
The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth. Kepler's law of planetary motion. Gravitational potential energy, gravitational potential. Escape velocity, motion of a satellite, orbital velocity, time period and energy of satellite.

UNIT 7: Properties of Solids and Liquids
Elastic behaviour, stress-strain relationship, Hooke's Law, Young's modulus, bulk modulus and modulus of rigidity. Pressure due to a fluid column, Pascal's law and its applications, effect of gravity on fluid pressure, viscosity, Stoke's law, terminal velocity, streamline and turbulent flow, critical velocity, Bernoulli's principle and its applications. Surface energy and surface tension, angle of contact, excess of pressure across a curved surface, application of surface tension: drops, bubbles and capillary rise.
Heat, temperature, thermal expansion, specific heat capacity, calorimetry, change of state, latent heat. Heat transfer: conduction, convection and radiation.

UNIT 8: Thermodynamics
Thermal equilibrium and the concept of temperature, zeroth law of thermodynamics, heat, work and internal energy. The first law of thermodynamics, isothermal and adiabatic processes. The second law of thermodynamics: reversible and irreversible processes.

UNIT 9: Kinetic Theory of Gases
Equation of state of a perfect gas, work done on compressing a gas, kinetic theory of gases: assumptions, the concept of pressure, kinetic interpretation of temperature, RMS speed of gas molecules, degrees of freedom, law of equipartition of energy and applications to specific heat capacities of gases, mean free path, Avogadro's number.

UNIT 10: Oscillations and Waves

Oscillations and periodic motion: time period, frequency, displacement as a function of time, periodic functions. Simple harmonic motion (S.H.M.) and its equation, phase, oscillations of a spring: restoring force and force constant, energy in S.H.M.: kinetic and potential energies, simple pendulum: derivation of expression for its time period. Wave motion, longitudinal and transverse waves, speed of the travelling wave, displacement relation for a progressive wave, principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, beats.

UNIT 11: Electrostatics

Electric charges: conservation of charge, Coulomb's law forces between two point charges, forces between multiple charges, superposition principle and continuous charge distribution.
Electric field: electric field due to a point charge, electric field lines, electric dipole, electric field due to a dipole, torque on a dipole in a uniform electric field.
Electric flux, Gauss's law and its applications to find field due to infinitely long uniformly charged straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell.
Electric potential and its calculation for a point charge, electric dipole and system of charges, potential difference, equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field.
Conductors and insulators, dielectrics and electric polarization, capacitors and capacitance, the combination of capacitors in series and parallel and capacitance of a parallel plate capacitor with and without dielectric medium between the plates, energy stored in a capacitor.

UNIT 12: Current Electricity

Electric current: drift velocity, mobility and their relation with electric current, Ohm's law, electrical resistance, I-V characteristics of Ohmic and non-ohmic conductors, electrical energy and power, electrical resistivity and conductivity, series and parallel combinations of resistors, temperature dependence of resistance.
Internal resistance, potential difference and emf of a cell, a combination of cells in series and parallel.
Kirchhoff's laws and their applications, Wheatstone bridge, Metre Bridge.

UNIT 13: Magnetic Effects of Current and Magnetism

Biot - Savart law and its application to the current carrying circular loop, Ampere's law and its applications to infinitely long current carrying straight wire and solenoid.
Force on a moving charge in uniform magnetic and electric fields, force on a current-carrying conductor in a uniform magnetic field, the force between two parallel currents carrying conductors-definition of ampere, torque experienced by a current loop in a uniform magnetic field: Moving coil galvanometer, its sensitivity and conversion to ammeter and voltmeter.
Current loop as a magnetic dipole and its magnetic dipole moment, bar magnet as an equivalent solenoid, magnetic field lines, magnetic field due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis, torque on a magnetic dipole in a uniform magnetic field, para-, dia- and ferromagnetic substances with examples, the effect of temperature on magnetic properties.

UNIT 14: Electromagnetic Induction and Alternating Currents

Electromagnetic induction: Faraday's law, induced emf and current, Lenz's law, eddy currents, self and mutual inductance.
Alternating currents, peak and RMS value of alternating current/voltage, reactance and impedance, LCR series circuit, resonance, power in AC circuits, wattless current, AC generator and transformer.

UNIT 15: Electromagnetic Waves

Displacement current, electromagnetic waves and their characteristics, transverse nature of electromagnetic waves, electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, Gamma rays), applications of electromagnetic waves.

UNIT 16: Optics

Reflection of light, spherical mirrors, mirror formula. Refraction of light at plane and spherical surfaces, thin lens formula and lens maker formula, total internal reflection and its applications, magnification, power of a lens,

combination of thin lenses in contact, refraction of light through a prism, microscope and astronomical telescope (reflecting and refracting) and their magnifying powers.
Wave optics: wavefront and Huygens 'Principle, laws of reflection and refraction using Huygens principle. Interference: Young's double-slit experiment and expression for fringe width, coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maximum. Polarization: plane-polarized light, Brewster's law, uses of plane- polarized light and Polaroid.
UNIT 17: Dual Nature of Matter and Radiation
Dual nature of radiation, Photoelectric effect, Hertz and Lenard's observations, Einstein's photoelectric equation, particle nature of light. Matter waves: wave nature of particle, de- Broglie relation.

UNIT 18: Atoms and Nuclei
Alpha-particle scattering experiment, Rutherford's model of atom, Bohr model, energy levels, hydrogen spectrum. Composition and size of nucleus, atomic masses, mass-energy relation, mass defect, binding energy per nucleon and its variation with mass number, nuclear fission and fusion.

UNIT 19: Electronic Devices
Semiconductors, semiconductor diode: I-V characteristics in forward and reverse bias, diode as a rectifier; I-V characteristics of LED, the photodiode, solar cell, Zener diode, Zener diode as a voltage regulator.
Logic gates (OR. AND. NOT. NAND and NOR).

UNIT 20: Experimental Skills
Familiarity with the basic approach and observations of the experiments and activities:

1. Vernier calipers -its use to measure the internal and external diameter and depth of a vessel.
2. Screw gauge-its use to determine the thickness/ diameter of thin sheet/wire.
3. Simple pendulum-dissipation of energy by plotting a graph between the square of amplitude and time.
4. Metre scale - the mass of a given object by the principle of moments.
5. Young's modulus of elasticity of the material of a metallic wire.
6. Surface tension of water by capillary rise and effect of detergents,
7. Co-efficient of viscosity of a given viscous liquid by measuring the terminal velocity of a given spherical body.
8. Speed of sound in air at room temperature using a resonance tube,
9. Specific heat capacity of a given (i) solid and (ii) liquid by method of mixtures.
10. The resistivity of the material of a given wire using a metre bridge.
11. The resistance of a given wire using Ohm's law.
12. Resistance and figure of merit of a galvanometer by half deflection method.
13. The focal length of
    (i) Convex mirror
    (ii) Concave mirror and
    (iii) Convex lens, using the parallax method.
14. The plot of the angle of deviation vs angle of incidence for a triangular prism.
15. The refractive index of a glass slab using a travelling microscope.
16. Characteristic curves of a p-n junction diode in forward and reverse bias.
17. Characteristic curves of a Zener diode and finding reverse breakdown voltage.
18. Identification of diode, LED, resistor, a capacitor from a mixed collection of such items

B. CHEMISTRY

PHYSICAL CHEMISTRY

UNIT I: SOME BASIC CONCEPTS IN CHEMISTRY
Matter and its nature, Dalton's atomic theory, Concept of atom, molecule, element and compound, Laws of chemical combination, Atomic and molecular masses, mole concept, molar mass, percentage composition, empirical and molecular formulae, Chemical equations and stoichiometry.

UNIT 2: ATOMIC STRUCTURE
Nature of electromagnetic radiation, photoelectric effect, spectrum of the hydrogen atom, Bohr model of a hydrogen

atom - its postulates, derivation of the relations for the energy of the electron and radii of the different orbits, limitations of Bohr's model, dual nature of matter, de Broglie's relationship, Heisenberg uncertainty principle, elementary ideas of quantum mechanics, the quantum mechanical model of the atom and its important features, concept of atomic orbitals as one-electron wave functions, variation of and ^{2} with r for 1s and 2s orbitals, various quantum numbers (principal, angular momentum and magnetic quantum numbers) and their significance, shapes of s, p and d - orbitals, electron spin and spin quantum number, rules for filling electrons in orbitals – Aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of elements and extra stability of half-filled and completely filled orbitals.

UNIT 3: CHEMICAL BONDING AND MOLECULAR STRUCTURE

Kossel-Lewis approach to chemical bond formation, the concept of ionic and covalent bonds.

Ionic Bonding: Formation of ionic bonds, factors affecting the formation of ionic bonds; calculation of lattice enthalpy.

Covalent Bonding: Concept of electronegativity, Fajan's rule, dipole moment, Valence Shell Electron Pair Repulsion (VSEPR) theory and shapes of simple molecules.

Quantum mechanical approach to covalent bonding: Valence bond theory - its important features, the concept of hybridization involving s, p and d orbitals, resonance.

Molecular Orbital Theory - Its important features, LCAOs, types of molecular orbitals (bonding, antibonding), sigma and pi-bonds, molecular orbital electronic configurations of homonuclear diatomic molecules, the concept of bond order, bond length and bond energy.

Elementary idea of metallic bonding, hydrogen bonding and its applications.

UNIT 4: CHEMICAL THERMODYNAMICS

Fundamentals of thermodynamics: System and surroundings, extensive and intensive properties, state functions, entropy, types of processes.

The first law of thermodynamics - Concept of work, heat, internal energy and enthalpy, heat capacity, molar heat capacity, Hess's law of constant heat summation, Enthalpies of bond dissociation, combustion, formation, atomization, sublimation, phase transition, hydration, ionization and solution.

The second law of thermodynamics - Spontaneity of processes, ΔS of the universe and ΔG of the system as criteria for spontaneity. $\Delta G°$(Standard Gibbs energy change) and equilibrium constant.

UNIT 5: SOLUTIONS

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

UNIT 6: EQUILIBRIUM

Meaning of equilibrium is the concept of dynamic equilibrium.

Equilibria involving physical processes: Solid-liquid, liquid-gas, gas-gas and solid-gas equilibria, Henry's law. General characteristics of equilibrium involving physical processes.

Equilibrium involving chemical processes: Law of chemical equilibrium, equilibrium constants (K_p and K_c) and their significance, the significance of ΔG and $\Delta G°$ in chemical equilibrium, factors affecting equilibrium concentration, pressure, temperature, the effect of catalyst, Le Chatelier's principle.

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

UNIT 7: REDOX REACTIONS AND ELECTROCHEMISTRY

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

Electrolytic and metallic conduction, conductance in electrolytic solutions, molar conductivities and their variation with concentration, Kohlrausch's law and its applications.

Electrochemical cells - Electrolytic and Galvanic cells, different types of electrodes, electrode potentials including standard electrode potential, half-cell and cell reactions, emf of a Galvanic cell and its measurement, Nernst equation and its applications, relationship between cell potential and Gibbs' energy change, dry cell and lead accumulator, fuel cells.

UNIT 8: CHEMICAL KINETICS
Rate of a chemical reaction, factors affecting the rate of reactions: concentration, temperature, pressure and catalyst, elementary and complex reactions, order and molecularity of reactions, rate law, rate constant and its units, differential and integral forms of zero and first-order reactions, their characteristics and half-lives, the effect of temperature on the rate of reactions, Arrhenius theory, activation energy and its calculation, collision theory of bi-molecular gaseous reactions (no derivation).

INORGANIC CHEMISTRY

UNIT 9: CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES
Modern periodic law and present form of the periodic table, s, p. d and f block elements, periodic trends in properties of elements atomic and ionic radii, ionization enthalpy, electron gain enthalpy, valence, oxidation states and chemical reactivity.

UNIT 10: p- BLOCK ELEMENTS
Group -13 to Group 18 Elements
General Introduction: Electronic configuration and general trends in physical and chemical properties of elements across the periods and down the groups, unique behaviour of the first element in each group.

UNIT 11: d - and f- BLOCK ELEMENTS
Transition Elements - General introduction, electronic configuration, occurrence and characteristics, general trends in properties of the first-row transition elements - physical properties, ionization enthalpy, oxidation states, atomic radii, colour, catalytic behaviour, magnetic properties, complex formation, interstitial compounds, alloy formation, preparation, properties and uses of $K_2Cr_2O_7$ and $KMnO_4$.
Inner Transition Elements
Lanthanoids - Electronic configuration, oxidation states and Lanthanoid contraction.

Actinoids - Electronic configuration and oxidation states.

UNIT 12: COORDINATION COMPOUNDS
Introduction to coordination compounds. Werner's theory, ligands, coordination number, denticity, chelation, IUPAC nomenclature of mononuclear co-ordination compounds, isomerism, Bonding: Valence bond approach and basic ideas of Crystal field theory, colour and magnetic properties, importance of coordination compounds (in qualitative analysis, extraction of metals and in biological systems).

ORGANIC CHEMISTRY

UNIT 13: PURIFICATION AND CHARACTERISATION OF ORGANIC COMPOUNDS
Purification - Crystallization, sublimation, distillation, differential extraction and chromatography - principles and their applications.
Qualitative analysis - Detection of nitrogen, sulphur, phosphorus and halogens.
Quantitative analysis (basic principles only) - Estimation of carbon, hydrogen, nitrogen, halogens, sulphur and phosphorus.
Calculations of empirical formulae and molecular formulae, numerical problems in organic quantitative analysis,

UNIT 14: SOME BASIC PRINCIPLES OF ORGANIC CHEMISTRY
Tetravalency of carbon, shapes of simple molecules - hybridization (s and p): classification of organic compounds based on functional groups and those containing halogens, oxygen, nitrogen and sulphur, homologous series: Isomerism - structural and stereoisomerism.
Nomenclature (Trivial and IUPAC)
Covalent bond fission - Homolytic and heterolytic, free radicals, carbocations and carbanions, stability of

carbocations and free radicals, electrophiles and nucleophiles.
Electronic displacement in a covalent bond
- Inductive effect, electromeric effect, resonance and hyperconjugation.
Common types of organic reactions- Substitution, addition, elimination and rearrangement.

UNIT 15: HYDROCARBONS
Classification, isomerism, IUPAC nomenclature, general methods of preparation, properties and reactions.
Alkanes - Conformations: Sawhorse and Newman projections (of ethane), mechanism of halogenation of alkanes.
Alkenes - Geometrical isomerism, mechanism of electrophilic addition, addition of hydrogen, halogens, water, hydrogen halides (Markownikoffs and peroxide effect), Ozonolysis and polymerization.
Alkynes - Acidic character, addition of hydrogen, halogens, water and hydrogen halides, polymerization.
Aromatic hydrocarbons - Nomenclature, benzene - structure and aromaticity, mechanism of electrophilic substitution, halogenation, nitration.

Friedel-Craft's alkylation and acylation, directive influence of the functional group in mono- substituted benzene.
UNIT 16: ORGANIC COMPOUNDS CONTAINING HALOGENS
General methods of preparation, properties and reactions, nature of C-X bond, mechanisms of substitution reactions.
Uses, environmental effects of chloroform, iodoform, freons and DDT.

UNIT 17: ORGANIC COMPOUNDS CONTAINING OXYGEN
General methods of preparation, properties, reactions and uses.

ALCOHOLS, PHENOLS AND ETHERS
Alcohols: Identification of primary, secondary and tertiary alcohols, mechanism of dehydration.
Phenols: Acidic nature, electrophilic substitution reactions, halogenation, nitration and sulphonation, Reimer - Tiemann reaction.
Ethers: Structure.
Aldehyde and Ketones: Nature of carbonyl group, nucleophilic addition to >C=O group, relative reactivities of aldehydes and ketones, important reactions such as - Nucleophilic addition reactions (addition of HCN, NH_3 and its derivatives), Grignard reagent, oxidation, reduction (Wolf Kishner and Clemmensen), the acidity of -hydrogen. Aldol condensation, Cannizzaro reaction, Haloform reaction, chemical tests to distinguish between aldehydes and ketones.
Carboxylic Acids: Acidic strength and factors affecting it.

UNIT 18: ORGANIC COMPOUNDS CONTAINING NITROGEN
General methods of preparation, properties, reactions and uses.
Amines: Nomenclature, classification, structure, basic character and identification of primary, secondary and tertiary amines and their basic character.
Diazonium Salts: Importance in synthetic organic chemistry.

UNIT 19: BIOMOLECULES
General introduction and importance of biomolecules.
CARBOHYDRATES – Classification, aldoses and ketoses, monosaccharides (glucose and fructose) and constituent monosaccharides of oligosaccharides (sucrose, lactose and maltose).
PROTEINS - Elementary idea of -amino acids, peptide bond, polypeptides, proteins: primary, secondary, tertiary and quaternary structure (qualitative idea only), denaturation of proteins, enzymes.
VITAMINS – Classification and functions.
NUCLEIC ACIDS – Chemical constitution of DNA and RNA, biological functions of nucleic acids.
Hormones (General introduction)

UNIT 20: PRINCIPLES RELATED TO PRACTICAL CHEMISTRY
Detection of extra elements (Nitrogen, sulphur, halogens) in organic compounds, detection of the following functional groups, hydroxyl (alcoholic and phenolic), carbonyl (aldehyde and ketones) carboxyl and amino groups in organic compounds.

- The chemistry involved in the preparation of the following:

- Inorganic compounds, Mohr's salt, potash alum.
- Organic compounds: Acetanilide, p-nitro acetanilide, aniline yellow, iodoform.
- The chemistry involved in the titrimetric exercises – acids, bases and the use of indicators, oxalic-acid vs $KMnO_4$, Mohr's salt vs $KMnO_4$
- Chemical principles involved in the qualitative salt analysis: Cations –

  Pb^{2+}, Cu^{2+}, Al^{3+}, Fe^{3+}, Zn^{2+}, Ni^{2+}, Ca^{2+}, Ba^{2+}, Mg^{2+}, NH_4^+

- Anions- CO_3^{2-}, S^{2-}, SO_4^{2-}, NO_3^-, NO_2^-, Cl^-, Br^-, I^- (Insoluble salts excluded).

Chemical principles involved in the following experiments:

- Enthalpy of solution of $CuSO_4$
- Enthalpy of neutralization of strong acid and strong base.
- Preparation of lyophilic and lyophobic sols.

Kinetic study of the reaction of iodide ions with hydrogen peroxide at room temperature

C. MATHEMATICS

UNIT 1: SETS, RELATIONS AND FUNCTIONS:
Sets and their representation; Union, intersection and complement of sets and their algebraic properties; Power set; Relations, type of relations, equivalence relations, functions; one-one, into and onto functions, the composition of functions.

UNIT 2: COMPLEX NUMBERS AND QUADRATIC EQUATIONS:
Complex numbers as ordered pairs of reals, Representation of complex numbers in the form $a + ib$ and their representation in a plane, Argand diagram, algebra of complex numbers, modulus and argument (or amplitude) of a complex number, Quadratic equations in real and complex number systems and their solutions; Relations between roots and coefficients, nature of roots, the formation of quadratic equations with given roots.

UNIT3: MATRICES AND DETERMINANTS:
Matrices, algebra of matrices, type of matrices, determinants and matrices of order two and three, evaluation of determinants, area of triangles using determinants; Adjoint and inverse of a square matrix; Test of consistency and solution of simultaneous linear equations in two or three variables using matrices.

UNIT 4: PERMUTATIONS AND COMBINATIONS:
The fundamental principle of counting, permutations and combinations; Meaning of $P(n, r)$ and $C(n, r)$. Simple applications.
UNIT 5: BINOMIAL THEOREM AND ITS SIMPLE APPLICATIONS:
Binomial theorem for a positive integral index, general term and middle term and simple applications.

UNIT 6: SEQUENCE AND SERIES:
Arithmetic and Geometric progressions, insertion of arithmetic, geometric means between two given numbers, Relation between A.M and G.M.

UNIT 7: LIMIT, CONTINUITY AND DIFFERENTIABILITY:
Real–valued functions, algebra of functions; polynomial, rational, trigonometric, logarithmic and exponential functions; inverse functions. Graphs of simple functions. Limits, continuity and differentiability. Differentiation of the sum, difference, product and quotient of two functions. Differentiation of trigonometric, inverse trigonometric, logarithmic, exponential, composite and implicit functions; derivatives of order upto two, Applications of derivatives: Rate of change of quantities, monotonic-Increasing and decreasing functions, Maxima and minima of functions of one variable.

UNIT 8: INTEGRAL CALCULAS:
Integral as an anti-derivative, Fundamental integrals involving algebraic, trigonometric, exponential and logarithmic functions. Integration by substitution, by parts and by partial fractions. Integration using trigonometric identities. Evaluation of simple integrals of the type

$\int \frac{dx}{x^2+a^2}$, $\int \frac{dx}{\sqrt{x^2 \pm a^2}}$, $\int \frac{dx}{a^2-x^2}$, $\int \frac{dx}{\sqrt{a^2-x^2}}$, $\int \frac{dx}{ax^2+bx+c}$, $\int \frac{dx}{\sqrt{ax^2+bx+c}}$, $\int \frac{(px+q)dx}{ax^2+bx+c}$,

$\int \frac{(px+q)dx}{\sqrt{ax^2+bx+c}}$ $\int \sqrt{a^2 \pm x^2}\, dx$, $\int \sqrt{x^2-a^2}\, dx$

The fundamental theorem of calculus, properties of definite integrals. Evaluation of definite integrals, determining areas of the regions bounded by simple curves by simple curves in standard forms.

UNIT 9: DIFFRENTIAL EQUATIONS:
Ordinary differential equations, their order and degree, the solution of differential equation by the method of separation of variables, solution of a homogeneous and linear differential equation of the type $\frac{dy}{dx} + p(x)y = q(x)$

UNIT 10: CO-ORDINATE GEOMETRY:
Cartesian system of rectangular coordinates in a plane, distance formula, sections formula, locus and its equation, the slope of a line, parallel and perpendicular lines, intercepts of a line on the co-ordinate axis.
Straight line: Various forms of equations of a line, intersection of lines, angles between two lines, conditions for concurrence of three lines, the distance of a point form a line, co-ordinate of the centroid, orthocentre and circumcentre of a triangle.
Circle, conic sections: A standard form of equations of a circle, the general form of the equation of a circle, its radius and centre, equation of a circle when the endpoints of a diameter are given, points of intersection of a line and a circle with the centre at the origin and sections of conics, equations of conic sections (parabola, ellipse and hyperbola) in standard forms**.**

UNIT 11: THREE DIMENSIONAL GEOMETRY:
Coordinates of a point in space, the distance between two points, section formula, direction ratios and direction cosines and the angle between two intersecting lines. Equation of a line; Skew lines, the shortest distance between them and its equation.

UNIT 12: VECTOR ALGEBRA:
Vectors and scalars, the addition of vectors, components of a vector in two dimensions and three-dimensional spaces, scalar and vector products.

UNIT 13: STATISTICS AND PROBABILITY:
Measures of dispersion; calculation of mean, median, mode of grouped and ungrouped data, calculation of standard deviation, variance and mean deviation for grouped and ungrouped data. Probability: Probability of an event, addition and multiplication theorems of probability, Baye's theorem, probability distribution of a random variable.

UNIT 14: TRIGONOMETRY:
Trigonometrical identities and trigonometrical functions, inverse trigonometrical functions their properties.

D. BIOLOGY

I. BOTANY

UNIT–I: HISTORY
History, botanical studies, branches of botany, brief classification of plant kingdom. Scope of Botany, cell Biology, cell theory.

UNIT–II: PLANT CELL
Structure of typical plant cell, cell wall and cell membrane, protoplasm - physical and chemical nature, cell organelle -

structure and functions, nucleus, Iysosomes, golgi bodies, plastids, ribosomes, mitochondria, chromosomes, spherosomes, Important compounds of cell, water, amino acids, carbohydrates, fats, nucleotides, nucleic acids. Cell inclusions, physical and chemical nature and functions of enzymes, vitamins and hormones, mode of enzyme action, cell cycle, Mitosis; Meiosis.

UNIT–III: COMPLEXITIES OF PLANT LIFE
Meristematic tissues, permanent, simple and complex tissues, Internal structure of dicot and monocot systems and roots, Internal structure of Isobilateral and Dorsiventral with functions of different tissues, Normal, secondary growth in dicot stems.

UNIT–IV: MORPHOLOGY OF ANGIOSPERMS
Normal and Modified stems, roots and leaves, Inflorescence, Flower and its parts, floral diagram and floral formula, pollination, fertilization, fruits.

UNIT–V: TAXONOMY OF FLOWERING PLANTS
Principle and units of classification (species, genus, family), knowledge of important families and their economic importance.

UNIT–VI: CONTINUITY OF PLANT LIFE
Genetics (elementary knowledge), mitosis and meiosis and their significance, principle of Mendel's law of inheritance, monohybrid and dihybrid ratio, concept of gene, elementary idea of gene action, evolution, evidence, theories and mechanism of evolution, variation and mutation, role of mutation in agriculture, origin of species.

UNIT–VII: MICROORGANISMS AND DIVERSITIES OF PLANT LIFE
Elementary idea and economic importance of virus, bacteria, fungi, algae and lichen, elementary idea of gryophytes, pterodophytes and gymnosperms.

UNIT–VIII: PROCESSES IN PLANTS
Absorption and transport of water and minerals, transpiration, stomatal mechanism, life energy and ATP, respiration and fermentation, photosynthesis, elementary idea of protein synthesis, growth, reproduction, movements (with special reference to geotrposim and phototropism).

UNIT–IX: ENVIRONMENTAL BIOLOGY
Man and his environment, biotic community, ecological adaptations (hydrophytes and xerophytes).

UNIT–X: BOTANY AND HUMAN WELFARE
Agricultural crops - Brief description and economic importance of crop plants like rice, gram (green gram) Jute, groundnut, sugarcane, and potato.

UNIT–XI: COMMON PLANT DISEASES
control of blight in rice, rot of sugarcane, forestry, genetic conservation and crop improvement.

UNIT–XII: GENETIC ENGINEERING AND BIOTECHNOLOGY
Recombinant DNA, gene library, transgenic plants, fermentation, bakery, antibiotics, monochloral antibodies.

II. ZOOLOGY

UNIT–I: ANIMAL WORLD
Definition, scope and branch of zoology. Species concept, bionomical nomenclature, classification, scientific name of some common animals: Fishes-rohu, bhakura, mrigal, Amphibians-frog, toad, Reptiles-houselizard, garden lizard, crocodile, turtle, snakes-cobra, krait, birds-fowl. peacock, pigeon, mammals-tiger, lion, elephant, cat, dog, cow, rabbit & man.

UNIT–II: DIVERSITY OF LIFE: KINGDOM-PROTASIA
General characters of the phylum, protozoa, Classification - amoeba, entamoeba, paramoecium, euglena, trypanosoma, plasmodium.

Kingdom-animalia: Concept of body plan, symmetry, coelom, germ layershomeothermic and poikilothermic animals.
General characters of Non-chordata like - porifera, coelenterata, platy helminthes, nematahelminthes, annelida, arthopoda, mollusca, echinodermata & hemichrhordata.

UNIT–III: MULTI CELLULARITY IN ANIMALS
Animal tissues - Types- epithelial, connective (details about blood and lymph), muscular & nervous- organs & organ systems.

UNIT–IV: LOCOMOTION
Locomotory organelles in protozoans, hydra, annelid, brief account of joints and muscles in movement of man, modes of nutrition - Nutrition in amoeba.
Digestive system of man - Structure and function of alimentary canal associated glands, physiology of digestion and absorption.

UNIT–V: TYPES OF RESPIRATION
Structure and function of respiratory system in man: Respiratory organs, mechanics of pulmonary resipiration, plunomary exchange of gas, transport of gases, glycolysis & Kreb's cycle, respiratory quotient.
Unit–VI: Digestive System Organs, Digestion & absorption.

UNIT–VII: TYPES OF CIRCULATION
Open circulation, closed circulatory system in man: Structure of Heart, cardiac cycle, arteries, veins, capillaries, portal system, coronary circulation, blood pressure, respiratory pigments, group and coagulation.

UNIT–VIII: EXCRETORY REPRODUCTION IN MAN
Structure and function of kidney.

UNIT–IX: CONTROL AND COORDINATION IN MAN
Nervous system-central, peripheral and autonomic sense organs, endocrine system, Mechanism of Hormone action.

UNIT–X: TYPES OF REPRODUCTION
Asexual, binary & multiple fission, budding, cellular growth, re-generation, ageing. **Sexual reproduction in man -** male & female reproductive system, menstrual cycle.

UNIT–XI: GENETICS
Chromosomes and heredity: heredity and viriation, mendelian principle, laws of heredity, chromosomes, Interaction of genes, chromosomal variation.

UNIT–XII: EVOLUTION
Origin of life Anatomical, embryological biochemical, palaentological, and biogeographical evidences of evolutions, Darwin's theory of natural selection, modern synthetic theory.

UNIT–XIII: ENVIRONMENTAL BIOLOGY
Meaning of ecology environment, habitat and niche, biosphere and ecosystem, ecological adaptations, biodiversity.
Environmental Pollution - Source, effects and control of air, water and sound pollution, deforestation, global warming, climate change.

UNIT–XIV: COMMON HUMAN DISEASE
Non communicable diseases - Diabetes & cardiac diseases. Communicable diseases like, amoebiasis, filariasis, malaria (Mode of inflection- pathogens, prevention and treatment).

UNIT – XV: DEFENCE MECHANISM OF BODY
Cells, Immune system and their function, immune deficiency in AIDS.

UNIT – XVI: WILDLIFE CONSERVATION

Importance of wildlife, Causes of extinction, threatened species - endangered, vulnerable and rare species, conservation of wild life.

Section	No. of Questions
Physics	20
Chemistry	20
Biology / Mathematics	20

SYLLABUS FOR (B.SC. NURSING)

A. PHYSICS

UNIT 1: Units and Measurements
Units of measurements, System of units, SI Units, fundamental and derived units, least count, significant figures, Errors in measurements. Dimensions of Physics quantities, dimensional analysis and its applications.

UNIT 2: Kinematics
The frame of reference, motion in a straight line, speed and velocity, uniform and non-uniform motion, average speed and instantaneous velocity, uniformly accelerated motion, velocity-time, position-time graph, relations for uniformly accelerated motion, relative velocity. Motion in a plane, projectile motion, uniform circular motion.

UNIT 3: Laws of Motion
Force and inertia, Newton's first law of motion, momentum, Newton's second Law of motion, impulse, Newton's third Law of motion. Law of conservation of linear momentum and its applications, equilibrium of concurrent forces. Static and Kinetic friction, laws of friction, rolling friction.
Dynamics of uniform circular motion, centripetal force and its applications: vehicle on a level circular road, vehicle on a banked road.

UNIT 4: Work, Energy and Power
Work done by a constant force and a variable force, kinetic and potential energies, work-energy theorem, power.
The potential energy of a spring, conservation of mechanical energy, conservative and non- conservative forces, motion in a vertical circle. Elastic and inelastic collisions in one and two dimensions.

UNIT 5: Rotational Motion
Centre of mass of a two-particle system, centre of mass of a rigid body. Basic concepts of rotational motion, moment of a force, torque, angular momentum, conservation of angular momentum and its applications.
The moment of inertia, the radius of gyration, values of moments of inertia for simple geometrical objects, parallel and perpendicular axes theorems and their applications. Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions.

UNIT 6: Gravitation
The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth. Kepler's law of planetary motion. Gravitational potential energy, gravitational potential. Escape velocity, motion of a satellite, orbital velocity, time period and energy of satellite.

UNIT 7: Properties of Solids and Liquids
Elastic behaviour, stress-strain relationship, Hooke's Law, Young's modulus, bulk modulus and modulus of rigidity. Pressure due to a fluid column, Pascal's law and its applications, effect of gravity on fluid pressure, viscosity, Stoke's law, terminal velocity, streamline and turbulent flow, critical velocity, Bernoulli's principle and its applications. Surface energy and surface tension, angle of contact, excess of pressure across a curved surface, application of surface tension: drops, bubbles and capillary rise.
Heat, temperature, thermal expansion, specific heat capacity, calorimetry, change of state, latent heat. Heat transfer: conduction, convection and radiation.

UNIT 8: Thermodynamics
Thermal equilibrium and the concept of temperature, zeroth law of thermodynamics, heat, work and internal energy. The first law of thermodynamics, isothermal and adiabatic processes. The second law of thermodynamics: reversible and irreversible processes.

UNIT 9: Kinetic Theory of Gases
Equation of state of a perfect gas, work done on compressing a gas, kinetic theory of gases: assumptions, the concept of pressure, kinetic interpretation of temperature, RMS speed of gas molecules, degrees of freedom, law of equipartition of energy and applications to specific heat capacities of gases, mean free path, Avogadro's number.

UNIT 10: Oscillations and Waves

Oscillations and periodic motion: time period, frequency, displacement as a function of time, periodic functions. Simple harmonic motion (S.H.M.) and its equation, phase, oscillations of a spring: restoring force and force constant, energy in S.H.M.: kinetic and potential energies, simple pendulum: derivation of expression for its time period. Wave motion, longitudinal and transverse waves, speed of the travelling wave, displacement relation for a progressive wave, principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, beats.

UNIT 11: Electrostatics

Electric charges: conservation of charge, Coulomb's law forces between two point charges, forces between multiple charges, superposition principle and continuous charge distribution.

Electric field: electric field due to a point charge, electric field lines, electric dipole, electric field due to a dipole, torque on a dipole in a uniform electric field.

Electric flux, Gauss's law and its applications to find field due to infinitely long uniformly charged straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell.

Electric potential and its calculation for a point charge, electric dipole and system of charges, potential difference, equipotential surfaces, electrical potential energy of a system of two point charges and of electric dipole in an electrostatic field.

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

UNIT 12: Current Electricity

Electric current: drift velocity, mobility and their relation with electric current, Ohm's law, electrical resistance, I-V characteristics of Ohmic and non-ohmic conductors, electrical energy and power, electrical resistivity and conductivity, series and parallel combinations of resistors, temperature dependence of resistance.

Internal resistance, potential difference and emf of a cell, a combination of cells in series and parallel.

Kirchhoff's laws and their applications, Wheatstone bridge, Metre Bridge.

UNIT 13: Magnetic Effects of Current and Magnetism

Biot - Savart law and its application to the current carrying circular loop, Ampere's law and its applications to infinitely long current carrying straight wire and solenoid.

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

Current loop as a magnetic dipole and its magnetic dipole moment, bar magnet as an equivalent solenoid, magnetic field lines, magnetic field due to a magnetic dipole (bar magnet) along its axis and perpendicular to its axis, torque on a magnetic dipole in a uniform magnetic field, para-, dia- and ferromagnetic substances with examples, the effect of temperature on magnetic properties.

UNIT 14: Electromagnetic Induction and Alternating Currents

Electromagnetic induction: Faraday's law, induced emf and current, Lenz's law, eddy currents, self and mutual inductance.

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

UNIT 15: Electromagnetic Waves

Displacement current, electromagnetic waves and their characteristics, transverse nature of electromagnetic waves, electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, X-rays, Gamma rays), applications of electromagnetic waves.

UNIT 16: Optics

Reflection of light, spherical mirrors, mirror formula. Refraction of light at plane and spherical surfaces, thin lens formula and lens maker formula, total internal reflection and its applications, magnification, power of a lens, combination of thin lenses in contact, refraction of light through a prism, microscope and astronomical telescope

(reflecting and refracting) and their magnifying powers.
Wave optics: wavefront and Huygens 'Principle, laws of reflection and refraction using Huygens principle. Interference: Young's double-slit experiment and expression for fringe width, coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maximum. Polarization: plane-polarized light, Brewster's law, uses of plane- polarized light and Polaroid.

UNIT 17: Dual Nature of Matter and Radiation

Dual nature of radiation, Photoelectric effect, Hertz and Lenard's observations, Einstein's photoelectric equation, particle nature of light. Matter waves: wave nature of particle, de- Broglie relation.

UNIT 18: Atoms and Nuclei

Alpha-particle scattering experiment, Rutherford's model of atom, Bohr model, energy levels, hydrogen spectrum. Composition and size of nucleus, atomic masses, mass-energy relation, mass defect, binding energy per nucleon and its variation with mass number, nuclear fission and fusion.

UNIT 19: Electronic Devices

Semiconductors, semiconductor diode: I-V characteristics in forward and reverse bias, diode as a rectifier; I-V characteristics of LED, the photodiode, solar cell, Zener diode, Zener diode as a voltage regulator.
Logic gates (OR. AND. NOT. NAND and NOR).

UNIT 20: Experimental Skills

Familiarity with the basic approach and observations of the experiments and activities:

19. Vernier calipers -its use to measure the internal and external diameter and depth of a vessel.
20. Screw gauge-its use to determine the thickness/ diameter of thin sheet/wire.
21. Simple pendulum-dissipation of energy by plotting a graph between the square of amplitude and time.
22. Metre scale - the mass of a given object by the principle of moments.
23. Young's modulus of elasticity of the material of a metallic wire.
24. Surface tension of water by capillary rise and effect of detergents,
25. Co-efficient of viscosity of a given viscous liquid by measuring the terminal velocity of a given spherical body.
26. Speed of sound in air at room temperature using a resonance tube,
27. Specific heat capacity of a given (i) solid and (ii) liquid by method of mixtures.
28. The resistivity of the material of a given wire using a metre bridge.
29. The resistance of a given wire using Ohm's law.
30. Resistance and figure of merit of a galvanometer by half deflection method.
31. The focal length of
    (i) Convex mirror
    (ii) Concave mirror and
    (iii) Convex lens, using the parallax method.
32. The plot of the angle of deviation vs angle of incidence for a triangular prism.
33. The refractive index of a glass slab using a travelling microscope.
34. Characteristic curves of a p-n junction diode in forward and reverse bias.
35. Characteristic curves of a Zener diode and finding reverse breakdown voltage.
36. Identification of diode, LED, resistor, a capacitor from a mixed collection of such items

B. CHEMISTRY

PHYSICAL CHEMISTRY

UNIT I: SOME BASIC CONCEPTS IN CHEMISTRY

Matter and its nature, Dalton's atomic theory, Concept of atom, molecule, element and compound, Laws of chemical combination, Atomic and molecular masses, mole concept, molar mass, percentage composition, empirical and molecular formulae, Chemical equations and stoichiometry.

UNIT 2: ATOMIC STRUCTURE

Nature of electromagnetic radiation, photoelectric effect, spectrum of the hydrogen atom, Bohr model of a hydrogen atom - its postulates, derivation of the relations for the energy of the electron and radii of the different orbits,

limitations of Bohr's model, dual nature of matter, de Broglie's relationship, Heisenberg uncertainty principle, elementary ideas of quantum mechanics, the quantum mechanical model of the atom and its important features, concept of atomic orbitals as one-electron wave functions, variation of and ^{2} with r for 1s and 2s orbitals, various quantum numbers (principal, angular momentum and magnetic quantum numbers) and their significance, shapes of s, p and d - orbitals, electron spin and spin quantum number, rules for filling electrons in orbitals – Aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of elements and extra stability of half-filled and completely filled orbitals.

UNIT 3: CHEMICAL BONDING AND MOLECULAR STRUCTURE

Kossel-Lewis approach to chemical bond formation, the concept of ionic and covalent bonds.

Ionic Bonding: Formation of ionic bonds, factors affecting the formation of ionic bonds; calculation of lattice enthalpy.

Covalent Bonding: Concept of electronegativity, Fajan's rule, dipole moment, Valence Shell Electron Pair Repulsion (VSEPR) theory and shapes of simple molecules.

Quantum mechanical approach to covalent bonding: Valence bond theory - its important features, the concept of hybridization involving s, p and d orbitals, resonance.

Molecular Orbital Theory - Its important features, LCAOs, types of molecular orbitals (bonding, antibonding), sigma and pi-bonds, molecular orbital electronic configurations of homonuclear diatomic molecules, the concept of bond order, bond length and bond energy.

Elementary idea of metallic bonding, hydrogen bonding and its applications.

UNIT 4: CHEMICAL THERMODYNAMICS

Fundamentals of thermodynamics: System and surroundings, extensive and intensive properties, state functions, entropy, types of processes.

The first law of thermodynamics - Concept of work, heat, internal energy and enthalpy, heat capacity, molar heat capacity, Hess's law of constant heat summation, Enthalpies of bond dissociation, combustion, formation, atomization, sublimation, phase transition, hydration, ionization and solution.

The second law of thermodynamics - Spontaneity of processes, ΔS of the universe and ΔG of the system as criteria for spontaneity. ΔG°(Standard Gibbs energy change) and equilibrium constant.

UNIT 5: SOLUTIONS

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

UNIT 6: EQUILIBRIUM

Meaning of equilibrium is the concept of dynamic equilibrium.

Equilibria involving physical processes: Solid-liquid, liquid-gas, gas-gas and solid-gas equilibria, Henry's law. General characteristics of equilibrium involving physical processes.

Equilibrium involving chemical processes: Law of chemical equilibrium, equilibrium constants (K_p and K_c) and their significance, the significance of ΔG and ΔG° in chemical equilibrium, factors affecting equilibrium concentration, pressure, temperature, the effect of catalyst, Le Chatelier's principle.

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

UNIT 7: REDOX REACTIONS AND ELECTROCHEMISTRY

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

Electrolytic and metallic conduction, conductance in electrolytic solutions, molar conductivities and their variation with concentration, Kohlrausch's law and its applications.

Electrochemical cells - Electrolytic and Galvanic cells, different types of electrodes, electrode potentials including

standard electrode potential, half-cell and cell reactions, emf of a Galvanic cell and its measurement, Nernst equation and its applications, relationship between cell potential and Gibbs' energy change, dry cell and lead accumulator, fuel cells.

UNIT 8: CHEMICAL KINETICS
Rate of a chemical reaction, factors affecting the rate of reactions: concentration, temperature, pressure and catalyst, elementary and complex reactions, order and molecularity of reactions, rate law, rate constant and its units, differential and integral forms of zero and first-order reactions, their characteristics and half-lives, the effect of temperature on the rate of reactions, Arrhenius theory, activation energy and its calculation, collision theory of bi-molecular gaseous reactions (no derivation).

INORGANIC CHEMISTRY

UNIT 9: CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES
Modern periodic law and present form of the periodic table, s, p. d and f block elements, periodic trends in properties of elements atomic and ionic radii, ionization enthalpy, electron gain enthalpy, valence, oxidation states and chemical reactivity.

UNIT 10: p- BLOCK ELEMENTS
Group -13 to Group 18 Elements
General Introduction: Electronic configuration and general trends in physical and chemical properties of elements across the periods and down the groups, unique behaviour of the first element in each group.

UNIT 11: d - and f- BLOCK ELEMENTS
Transition Elements - General introduction, electronic configuration, occurrence and characteristics, general trends in properties of the first-row transition elements - physical properties, ionization enthalpy, oxidation states, atomic radii, colour, catalytic behaviour, magnetic properties, complex formation, interstitial compounds, alloy formation, preparation, properties and uses of $K_2Cr_2O_7$ and $KMnO_4$.
Inner Transition Elements
Lanthanoids - Electronic configuration, oxidation states and Lanthanoid contraction.

Actinoids - Electronic configuration and oxidation states.

UNIT 12: COORDINATION COMPOUNDS
Introduction to coordination compounds. Werner's theory, ligands, coordination number, denticity, chelation, IUPAC nomenclature of mononuclear co-ordination compounds, isomerism, Bonding: Valence bond approach and basic ideas of Crystal field theory, colour and magnetic properties, importance of coordination compounds (in qualitative analysis, extraction of metals and in biological systems).

ORGANIC CHEMISTRY

UNIT 13: PURIFICATION AND CHARACTERISATION OF ORGANIC COMPOUNDS
Purification - Crystallization, sublimation, distillation, differential extraction and chromatography - principles and their applications.
Qualitative analysis - Detection of nitrogen, sulphur, phosphorus and halogens.
Quantitative analysis (basic principles only) - Estimation of carbon, hydrogen, nitrogen, halogens, sulphur and phosphorus.
Calculations of empirical formulae and molecular formulae, numerical problems in organic quantitative analysis,

UNIT 14: SOME BASIC PRINCIPLES OF ORGANIC CHEMISTRY
Tetravalency of carbon, shapes of simple molecules - hybridization (s and p): classification of organic compounds based on functional groups and those containing halogens, oxygen, nitrogen and sulphur, homologous series: Isomerism - structural and stereoisomerism.
Nomenclature (Trivial and IUPAC)
Covalent bond fission - Homolytic and heterolytic, free radicals, carbocations and carbanions, stability of carbocations and free radicals, electrophiles and nucleophiles.

Electronic displacement in a covalent bond
- Inductive effect, electromeric effect, resonance and hyperconjugation.
Common types of organic reactions- Substitution, addition, elimination and rearrangement.

UNIT 15: HYDROCARBONS
Classification, isomerism, IUPAC nomenclature, general methods of preparation, properties and reactions.
Alkanes - Conformations: Sawhorse and Newman projections (of ethane), mechanism of halogenation of alkanes.
Alkenes - Geometrical isomerism, mechanism of electrophilic addition, addition of hydrogen, halogens, water, hydrogen halides (Markownikoffs and peroxide effect), Ozonolysis and polymerization.
Alkynes - Acidic character, addition of hydrogen, halogens, water and hydrogen halides, polymerization.
Aromatic hydrocarbons - Nomenclature, benzene - structure and aromaticity, mechanism of electrophilic substitution, halogenation, nitration.

Friedel-Craft's alkylation and acylation, directive influence of the functional group in mono- substituted benzene.
UNIT 16: ORGANIC COMPOUNDS CONTAINING HALOGENS
General methods of preparation, properties and reactions, nature of C-X bond, mechanisms of substitution reactions.
Uses, environmental effects of chloroform, iodoform, freons and DDT.

UNIT 17: ORGANIC COMPOUNDS CONTAINING OXYGEN
General methods of preparation, properties, reactions and uses.

ALCOHOLS, PHENOLS AND ETHERS
Alcohols: Identification of primary, secondary and tertiary alcohols, mechanism of dehydration.
Phenols: Acidic nature, electrophilic substitution reactions, halogenation, nitration and sulphonation, Reimer - Tiemann reaction.
Ethers: Structure.
Aldehyde and Ketones: Nature of carbonyl group, nucleophilic addition to >C=O group, relative reactivities of aldehydes and ketones, important reactions such as - Nucleophilic addition reactions (addition of HCN, NH_3 and its derivatives), Grignard reagent, oxidation, reduction (Wolf Kishner and Clemmensen), the acidity of -hydrogen. Aldol condensation, Cannizzaro reaction, Haloform reaction, chemical tests to distinguish between aldehydes and ketones.
Carboxylic Acids: Acidic strength and factors affecting it.

UNIT 18: ORGANIC COMPOUNDS CONTAINING NITROGEN
General methods of preparation, properties, reactions and uses.
Amines: Nomenclature, classification, structure, basic character and identification of primary, secondary and tertiary amines and their basic character.
Diazonium Salts: Importance in synthetic organic chemistry.

UNIT 19: BIOMOLECULES
General introduction and importance of biomolecules.
CARBOHYDRATES – Classification, aldoses and ketoses, monosaccharides (glucose and fructose) and constituent monosaccharides of oligosaccharides (sucrose, lactose and maltose).
PROTEINS - Elementary idea of -amino acids, peptide bond, polypeptides, proteins: primary, secondary, tertiary and quaternary structure (qualitative idea only), denaturation of proteins, enzymes.
VITAMINS – Classification and functions.
NUCLEIC ACIDS – Chemical constitution of DNA and RNA, biological functions of nucleic acids.
Hormones (General introduction)

UNIT 20: PRINCIPLES RELATED TO PRACTICAL CHEMISTRY
Detection of extra elements (Nitrogen, sulphur, halogens) in organic compounds, detection of the following functional groups, hydroxyl (alcoholic and phenolic), carbonyl (aldehyde and ketones) carboxyl and amino groups in organic compounds.

- The chemistry involved in the preparation of the following:

- Inorganic compounds, Mohr's salt, potash alum.
- Organic compounds: Acetanilide, p-nitro acetanilide, aniline yellow, iodoform.
- The chemistry involved in the titrimetric exercises – acids, bases and the use of indicators, oxalic-acid vs $KMnO_4$, Mohr's salt vs $KMnO_4$
- Chemical principles involved in the qualitative salt analysis: Cations –

  Pb^{2+}, Cu^{2+}, Al^{3+}, Fe^{3+}, Zn^{2+}, Ni^{2+}, Ca^{2+}, Ba^{2+}, Mg^{2+}, NH_4^+

- Anions- CO_3^{2-}, S^{2-}, SO_4^{2-}, NO_3^-, NO_2^-, Cl^-, Br^-, I^- (Insoluble salts excluded).

Chemical principles involved in the following experiments:

- Enthalpy of solution of $CuSO_4$
- Enthalpy of neutralization of strong acid and strong base.
- Preparation of lyophilic and lyophobic sols.

Kinetic study of the reaction of iodide ions with hydrogen peroxide at room temperature

C. BIOLOGY

III. BOTANY

UNIT–I: HISTORY
History, botanical studies, branches of botany, brief classification of plant kingdom. Scope of Botany, cell Biology, cell theory.

UNIT–II: PLANT CELL
Structure of typical plant cell, cell wall and cell membrane, protoplasm - physical and chemical nature, cell organelle - structure and functions, nucleus, Iysosomes, golgi bodies, plastids, ribosomes, mitochondria, chromosomes, spherosomes, Important compounds of cell, water, amino acids, carbohydrates, fats, nucleotides, nucleic acids. Cell inclusions, physical and chemical nature and functions of enzymes, vitamins and hormones, mode of enzyme action, cell cycle, Mitosis; Meiosis.

UNIT–III: COMPLEXITIES OF PLANT LIFE
Meristematic tissues, permanent, simple and complex tissues, Internal structure of dicot and monocot systems and roots, Internal structure of Isobilateral and Dorsiventral with functions of different tissues, Normal, secondary growth in dicot stems.

UNIT–IV: MORPHOLOGY OF ANGIOSPERMS
Normal and Modified stems, roots and leaves, Inflorescence, Flower and its parts, floral diagram and floral formula, pollination, fertilization, fruits.

UNIT–V: TAXONOMY OF FLOWERING PLANTS
Principle and units of classification (species, genus, family), knowledge of important families and their economic importance.

UNIT–VI: CONTINUITY OF PLANT LIFE
Genetics (elementary knowledge), mitosis and meiosis and their significance, principle of Mendel's law of inheritance, monohybrid and dihybrid ratio, concept of gene, elementary idea of gene action, evolution, evidence, theories and mechanism of evolution, variation and mutation, role of mutation in agriculture, origin of species.

UNIT–VII: MICROORGANISMS AND DIVERSITIES OF PLANT LIFE
Elementary idea and economic importance of virus, bacteria, fungi, algae and lichen, elementary idea of gryophytes,

pterodophytes and gymnosperms.

UNIT–VIII: PROCESSES IN PLANTS
Absorption and transport of water and minerals, transpiration, stomatal mechanism, life energy and ATP, respiration and fermentation, photosynthesis, elementary idea of protein synthesis, growth, reproduction, movements (with special reference to geotrposim and phototropism).

UNIT–IX: ENVIRONMENTAL BIOLOGY
Man and his environment, biotic community, ecological adaptations (hydrophytes and xerophytes).

UNIT–X: BOTANY AND HUMAN WELFARE
Agricultural crops - Brief description and economic importance of crop plants like rice, gram (green gram) Jute, groundnut, sugarcane, and potato.

UNIT–XI: COMMON PLANT DISEASES
control of blight in rice, rot of sugarcane, forestry, genetic conservation and crop improvement.

UNIT–XII: GENETIC ENGINEERING AND BIOTECHNOLOGY
Recombinant DNA, gene library, transgenic plants, fermentation, bakery, antibiotics, monochloral antibodies.

IV. ZOOLOGY

UNIT–I: ANIMAL WORLD
Definition, scope and branch of zoology. Species concept, bionomical nomenclature, classification, scientific name of some common animals: Fishes-rohu, bhakura, mrigal, Amphibians-frog, toad, Reptiles-houselizard, garden lizard, crocodile, turtle, snakes-cobra, krait, birds-fowl. peacock, pigeon, mammals-tiger, lion, elephant, cat, dog, cow, rabbit & man.

UNIT–II: DIVERSITY OF LIFE: KINGDOM-PROTASIA
General characters of the phylum, protozoa, Classification - amoeba, entamoeba, paramoecium, euglena, trypanosoma, plasmodium.

Kingdom-animalia: Concept of body plan, symmetry, coelom, germ layershomeothermic and poikilothermic animals.
General characters of Non-chordata like - porifera, coelenterata, platy helminthes, nematahelminthes, annelida, arthopoda, mollusca, echinodermata & hemichrhordata.

UNIT–III: MULTI CELLULARITY IN ANIMALS
Animal tissues - Types- epithelial, connective (details about blood and lymph), muscular & nervous- organs & organ systems.

UNIT–IV: LOCOMOTION
Locomotory organelles in protozoans, hydra, annelid, brief account of joints and muscles in movement of man, modes of nutrition - Nutrition in amoeba.
Digestive system of man - Structure and function of alimentary canal associated glands, physiology of digestion and absorption.

UNIT–V: TYPES OF RESPIRATION
Structure and function of respiratory system in man: Respiratory organs, mechanics of pulmonary resipiration, plunomary exchange of gas, transport of gases, glycolysis & Kreb's cycle, respiratory quotient.
Unit–VI: Digestive System Organs, Digestion & absorption.

UNIT–VII: TYPES OF CIRCULATION
Open circulation, closed circulatory system in man: Structure of Heart, cardiac cycle, arteries, veins, capillaries, portal system, coronary circulation, blood pressure, respiratory pigments, group and coagulation.

UNIT–VIII: EXCRETORY REPRODUCTION IN MAN
Structure and function of kidney.

UNIT–IX: CONTROL AND COORDINATION IN MAN
Nervous system-central, peripheral and autonomic sense organs, endocrine system, Mechanism of Hormone action.

UNIT–X: TYPES OF REPRODUCTION
Asexual, binary & multiple fission, budding, cellular growth, re-generation, ageing. **Sexual reproduction in man -** male & female reproductive system, menstrual cycle.

UNIT–XI: GENETICS
Chromosomes and heredity: heredity and viriation, mendelian principle, laws of heredity, chromosomes, Interaction of genes, chromosomal variation.

UNIT–XII: EVOLUTION
Origin of life Anatomical, embryological biochemical, palaentological, and biogeographical evidences of evolutions, Darwin's theory of natural selection, modern synthetic theory.

UNIT–XIII: ENVIRONMENTAL BIOLOGY
Meaning of ecology environment, habitat and niche, biosphere and ecosystem, ecological adaptations, biodiversity. **Environmental Pollution -** Source, effects and control of air, water and sound pollution, deforestation, global warming, climate change.

UNIT–XIV: COMMON HUMAN DISEASE
Non communicable diseases - Diabetes & cardiac diseases. Communicable diseases like, amoebiasis, filariasis, malaria (Mode of inflection- pathogens, prevention and treatment).

UNIT – XV: DEFENCE MECHANISM OF BODY
Cells, Immune system and their function, immune deficiency in AIDS.

UNIT – XVI: WILDLIFE CONSERVATION
Importance of wildlife, Causes of extinction, threatened species - endangered, vulnerable and rare species, conservation of wild life.

Section	No. of Questions
Aptitude for Nursing	12
Physics	12
Chemistry	12
Biology	12
English	12

SYLLABUS FOR BACHELOR OF VETERINARY SCIENCE AND ANIMAL HUSBANDRY (B.V.SC. & A.H.) ENTRANCE EXAM

A. PHYSICS

UNIT 1: PHYSICS AND MEASUREMENT
Physics, technology, and society, S I units, Fundamental and derived units. Least count, accuracy and precision of measuring instruments, Errors in measurement, Dimensions of Physical quantities, dimensional analysis, and its applications.

UNIT 2: KINEMATICS
Frame of reference. Motion in a straight line: Position-time graph, speed and velocity. Uniform and nonuniform motion, average speed and instantaneous velocity Uniformly accelerated motion, velocity-time, position-time graphs, relations for uniformly accelerated motion. Scalars and Vectors, Vector addition and Subtraction, Zero Vector, Scalar and Vector products, Unit Vector, Resolution of a Vector. Relative Velocity, Motion in a plane, Projectile Motion, Uniform Circular Motion.

UNIT 3: LAWS OF MOTION
Force and Inertia, Newton's First Law of motion; Momentum, Newton's Second Law of motion; Impulse; Newton's Third Law of motion. Law of conservation of linear momentum and its applications, Equilibrium of concurrent forces. Static and Kinetic friction, laws of friction, rolling friction. Dynamics of uniform circular motion: Centripetal force and its applications.

UNIT 4: WORK, ENERGY AND POWER
Work done by a constant force and a variable force; kinetic and potential energies, work energy theorem, power. Potential energy of a spring, conservation of mechanical energy, conservative and nonconservative forces; Elastic and inelastic collisions in one and two dimensions.

UNIT 5: ROTATIONAL MOTION
Centre of mass of a two-particle system, Centre of mass of a rigid body; Basic concepts of rotational motion; moment of a force, torque, angular momentum, conservation of angular momentum and its applications; moment of inertia, radius of gyration. Values of moments of inertia for simple geometrical objects, parallel and perpendicular axes theorems and their applications. Rigid body rotation, equations of rotational motion.

UNIT 6: GRAVITATION
The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth. Kepler's laws of planetary motion. Gravitational potential energy; gravitational potential. Escape velocity. Orbital velocity of a satellite. Geo-stationary satellites.

UNIT 7: PROPERTIES OF SOLIDS AND LIQUIDS
Elastic behavior, Stress-strain relationship, Hooke's Law, Young's modulus, bulk modulus, modulus of rigidity. Pressure due to a fluid column; Pascal's law and its applications. Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, Reynolds number. Bernoulli's principle and its applications. Surface energy and surface tension, angle of contact, application of surface tension - drops, bubbles and capillary rise. Heat, temperature, thermal expansion; specific heat capacity, calorimetry; change of state, latent heat. Heat transfer conduction, convection and radiation, Newton's law of cooling.

UNIT 8: THERMODYNAMICS
Thermal equilibrium, zeroth law of thermodynamics, concept of temperature. Heat, work and internal energy. First law of thermodynamics. Second law of thermodynamics: reversible and irreversible processes. Carnot engine and its efficiency.

UNIT 9: KINETIC THEORY OF GASES
Equation of state of a perfect gas, work done on compressing a gas. Kinetic theory of gases - assumptions, concept of

pressure. Kinetic energy and temperature: rms speed of gas molecules; Degrees of freedom, Law of equi partition of energy, applications to specific heat capacities of gases; Mean free path, Avogadro's number.

UNIT 10: OSCILLATIONS AND WAVES

Periodic motion - period, frequency, displacement as a function of time. Periodic functions. Simple harmonic motion (S.H.M.) and its equation; phase; oscillations of a spring -restoring force and force constant; energy in S.H.M. - kinetic and potential energies; Simple pendulum - derivation of expression for its time period; Free, forced and damped oscillations, resonance. Wave motion. Longitudinal and transverse waves, speed of a wave. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves, Standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect in sound.

UNIT 11: ELECTROSTATICS

Electric charges: Conservation of charge, Coulomb's law-forces between two-point charges, forces between multiple charges; superposition principle and continuous charge distribution. Electric field: Electric field due to a point charge, Electric field lines, Electric dipole, Electric field due to a dipole, Torque on a dipole in a uniform electric field. Electric flux, Gauss's law and its applications to find field due to infinitely long uniformly charged straight wire, uniformly charged infinite plane sheet and uniformly charged thin spherical shell. Electric potential and its calculation for a point charge, electric dipole and system of charges; Equipotential surfaces, Electrical potential energy of a system of two-point charges in an electrostatic field. Conductors and insulators, Dielectrics and electric polarization, capacitor, combination of capacitors in series and in parallel, capacitance of a parallel plate capacitor with and without dielectric medium between the plates, Energy stored in a capacitor.

UNIT 12: CURRRENT ELECTRICITY

Electric current, Drift velocity, Ohm's law, Electrical resistance, Resistances of different materials, V-I characteristics of Ohmic and nonohmic conductors, Electrical energy and power, Electrical resistivity, Colour code for resistors; Series and parallel combinations of resistors; Temperature dependence of resistance. Electric Cell and its Internal resistance, potential difference and emf of a cell, combination of cells in series and in parallel. Kirchhoff's laws and their applications. Wheatstone bridge, Metre bridge. Potentiometer - principle and its applications.

UNIT 13: MAGNETIC EFFECTS OF CURRENT AND MAGNETISM

Biot - Savart law and its application to current carrying circular loop. Ampere's law and its applications to infinitely long current carrying straight wire and solenoid. Force on a moving charge in uniform magnetic and electric fields. Cyclotron. Force on a current-carrying conductor in a uniform magnetic field. Force between two parallel current-carrying conductors-definition of ampere. Torque experienced by a current loop in uniform magnetic field; Moving coil galvanometer, its current sensitivity and conversion to ammeter and voltmeter. Current loop as a magnetic dipole and its magnetic dipole moment. Bar magnet as an equivalent solenoid, magnetic field lines; Earth's magnetic field and magnetic elements. Para-, dia- and ferro- magnetic substances. Magnetic susceptibility and permeability, Hysteresis, Electromagnets and permanent magnets.

UNIT 14: ELECTROMAGNETIC INDUCTION AND ALTERNATING CURRENTS

Electromagnetic induction; Faraday's law, induced emf and current; Lenz's Law, Eddy currents. Self and mutual inductance. Alternating currents, peak and rms value of alternating current/ voltage; reactance and impedance; LCR series circuit, resonance; Quality factor, power in AC circuits, wattless current. AC generator and transformer.

UNIT 15: ELECTROMAGNETIC WAVES

Electromagnetic waves and their characteristics. Transverse nature of electromagnetic waves. Electromagnetic spectrum (radio waves, microwaves, infrared, visible, ultraviolet, Xrays, gamma rays). Applications of e.m. waves.

UNIT 16: OPTICS

Reflection and refraction of light at plane and spherical surfaces, mirror formula, Total internal reflection and its applications, Deviation and Dispersion of light by a prism, Lens Formula, Magnification, Power of a Lens, Combination of thin lenses in contact, Microscope and Astronomical Telescope (reflecting and refracting) and their magnifying powers. Wave optics: wavefront and Huygens' principle, Laws of reflection and refraction using Huygen's principle. Interference, Young's double slit experiment and expression for fringe width. Diffraction due to a single slit, width of central maximum. Resolving power of microscopes and astronomical telescopes, Polarisation, plane polarized light; Brewster's law, uses of plane polarized light and Polaroids.

UNIT 17: DUAL NATURE OF MATTER ANDRADIATION
Dual nature of radiation. Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation; particle nature of light. Matter waves-wave nature of particle, de Broglie relation. Davisson Germer experiment.

UNIT 18: ATOMS AND NUCLEI
Alpha-particle scattering experiment; Rutherford's model of atom; Bohr model, energy levels, hydrogen spectrum. Composition and size of nucleus, atomic masses, isotopes, isobars; isotones. Radioactivity-alpha, beta and gamma particles/rays and their properties; radioactive decay law. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number, nuclear fission and fusion.

UNIT 19: ELECTRONIC DEVICES
Semiconductors; semiconductor diode: I-V characteristics in forward and reverse bias; diode as a rectifier; I-V characteristics of LED, photodiode, solar cell and Zener diode; Zener diode as a voltage regulator. Junction transistor, transistor action, characteristics of a transistor; transistor as an amplifier (common emitter configuration) and oscillator. Logic gates (OR, AND, NOT, NAND and NOR). Transistor as a switch.

UNIT 20: COMMUNICATION SYSTEMS
Propagation of electromagnetic waves in the atmosphere; Sky and space wave propagation, Need for modulation, Amplitude and Frequency Modulation, Bandwidth of signals, Bandwidth of Transmission medium, Basic Elements of a Communication System (Block Diagram only).

B. CHEMISTRY

PHYSICAL CHEMISTRY

UNIT 1: SOME BASIC CONCEPTS IN CHEMISTRY
Matter and its nature, Dalton's atomic theory; Concept of atom, molecule, element and compound; Physical quantities and their measurements in Chemistry, precision and accuracy, significant figures, S.I. Units, dimensional analysis; Laws of chemical combination; Atomic and molecular masses, mole concept, molar mass, percentage composition, empirical and molecular formulae; Chemical equations and stoichiometry.

UNIT 2: STATES OF MATTER
Classification of matter into solid, liquid and gaseous states. Gaseous State: Measurable properties of gases; Gas laws - Boyle's law, Charle's law, Graham's law of diffusion, Avogadro's law, Dalton's law of partial pressure; Concept of Absolute scale of temperature; Ideal gas equation; Kinetic theory of gases (only postulates); Concept of average, root mean square and most probable velocities; Real gases, deviation from Ideal behaviour, compressibility factor and van der Waals equation. Liquid State: Properties of liquids - vapour pressure, viscosity and surface tension and effect of temperature on them (qualitative treatment only). Solid State: Classification of solids: molecular, ionic, covalent and metallic solids, amorphous and crystalline solids (elementary idea); Bragg's Law and its applications; Unit cell and lattices, packing in solids (fcc, bcc and hcp lattices), voids, calculations involving unit cell parameters, imperfection in solids; Electrical, magnetic and dielectric properties.

UNIT 3: ATOMIC STRUCTURE
Thomson and Rutherford atomic models and their limitations; Nature of electromagnetic radiation, photoelectric effect; Spectrum of hydrogen atom, Bohr model of hydrogen atom - its postulates, derivation of the relations for energy of the electron and radii of the different orbits, limitations of Bohr's model; Dual nature of matter, de-Broglie's relationship, Heisenberg uncertainty principle. Elementary ideas of quantum mechanics, quantum mechanical model of atom, its important features, concept of atomic orbitals as one electron wave functions; Variation of Ψ and Ψ^2, with r for 1s and 2s orbitals; various quantum numbers (principal, angular momentum and magnetic quantum numbers) and their significance; shapes of s, p and d - orbitals, electron spin and spin quantum number; Rules for filling electrons in orbitals - aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of elements, extra stability of half-filled and completely filled orbitals.

UNIT 4: CHEMICAL BONDING AND MOLECULAR STRUCURE
Kossel - Lewis approach to chemical bond formation, concept of ionic and covalent bonds. Ionic Bonding: Formation of ionic bonds, factors affecting the formation of ionic bonds; calculation of lattice enthalpy. Covalent Bonding:

Concept of electronegativity, Fajan's rule, dipole moment; Valence Shell Electron Pair Repulsion (VSEPR) theory and shapes of simple molecules. Quantum mechanical approach to covalent bonding: Valence bond theory - Its important features, concept of hybridization involving s, p and d orbitals; Resonance. Molecular Orbital Theory - Its important features, LCAOs, types of molecular orbitals (bonding, antibonding), sigma and pi-bonds, molecular orbital electronic configurations of homonuclear diatomic molecules, concept of bond order, bond length and bond energy. Elementary idea of metallic bonding. Hydrogen bonding and its applications.

UNIT 5: CHEMICAL THERMODYNAMICS

Fundamentals of thermodynamics: System and surroundings, extensive and intensive properties, state functions, types of processes. First law of thermodynamics- Concept of work, heat internal energy and enthalpy, heat capacity, molar heat capacity; Hess's law of constant heat summation; Enthalpies of bond dissociation, combustion, formation, atomization, sublimation, phase transition, hydration, ionization and solution. Second law of thermodynamics; Spontaneity of processes; S of the universe and G of the system as criteria for spontaneity, G0 (Standard Gibbs energy change) and equilibrium constant.

UNIT 6: SOLUTIONS

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

UNIT 7: EQUILIBRIUM

Meaning of equilibrium, concept of dynamic equilibrium. Equilibria involving physical processes: Solid -liquid, liquid - gas and solid - gas equilibria, Henry's law, general characterics of equilibrium involving physical processes. Equilibria involving chemical processes:

Law of chemical equilibrium, equilibrium constants (Kp and Kc) and their significance, significance of G and Go in chemical equilibria, factors affecting equilibrium concentration, pressure, temperature, effect of catalyst; Le Chatelier's principle. Ionic equilibrium: Weak and strong electrolytes, ionization of electrolytes, various concepts of acids and bases (Arrhenius, Brnsted - Lowry and Lewis) and their ionization, acid - base equilibria (including multistage ionization) and ionization constants, ionization of water, pH scale, common ion effect, hydrolysis of salts and pH of their solutions, solubility of sparingly soluble salts and solubility products, buffer solutions.

UNIT 8: REDOX REACTIONS AND ELECTROCHEMISTRY

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

UNIT 9 : CHEMICAL KINETICS

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

UNIT-10: SURFACE CHEMISTRY

Adsorption- Physisorption and chemisorption and their characteristics, factors affecting adsorption of gases on solids - Freundlich and Langmuir adsorption isotherms, adsorption from solutions. Colloidal state -distinction among true solutions, colloids and suspensions, classification of colloids - lyophilic, lyophobic; multi molecular, macromolecular and associated colloids (micelles), preparation and properties of colloids - Tyndall effect, Brownian movement, electrophoresis, dialysis, coagulation and flocculation; Emulsions and their characteristics.

INORGANIC CHEMISTRY

UNIT 11: CLASSIFICATON OF ELEMENTS AND PERIODICITY IN PROPERTIES
Modem periodic law and present form of the periodic table, s, p, d and f block elements, periodic trends in properties of elements atomic and ionic radii, ionization enthalpy, electron gain enthalpy, valence, oxidation states and chemical reactivity.

UNIT 12: GENERAL PRINCIPLES AND PROCESSES OF ISOLATION OF METALS
Modes of occurrence of elements in nature, minerals, ores; Steps involved in the extraction of metals - concentration, reduction (chemical and electrolytic methods) and refining with special reference to the extraction of Al, Cu, Zn and Fe; Thermodynamic and electrochemical principles involved in the extraction of metals.

UNIT 13: HYDROGEN
Position of hydrogen in periodic table, isotopes, preparation, properties and uses of hydrogen; Physical and chemical properties of water and heavy water; Structure, preparation, reactions and uses of hydrogen peroxide; Hydrogen as a fuel.

UNIT 14: S - BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS)
Group - 1 and 2 Elements General introduction, electronic configuration and general trends in physical and chemical properties of elements, anomalous properties of the first element of each group, diagonal relationships. Preparation and properties of some important compounds - sodium carbonate and sodium hydroxide; Industrial uses of lime, limestone, Plaster of Paris and cement; Biological significance of Na, K, Mg and Ca.

UNIT 15: P - BLOCK ELEMENTS
Group - 13 to Group 18 Elements General Introduction: Electronic configuration and general trends in physical and chemical properties of elements across the periods and down the groups; unique behaviour of the first element in each group. Groupwise study of the p - block elements
Group - 13 Preparation, properties and uses of boron and aluminium; properties of boric acid, diborane, boron trifluoride, aluminium chloride and alums.
Group – 14 Allotropes of carbon, tendency for catenation; Structure & properties of silicates, and zeolites.
Group - 15 Properties and uses of nitrogen and phosphorus; All otrophic forms of phosphorus; Preparation, properties, structure and uses of ammonia, nitric acid, phosphine and phosphorus halides, (PCl3, PCl5); Structures of oxides and oxoacids of phosphorus.
Group - 16 Preparation, properties, structures and uses of ozone; Allotropic forms of sulphur; Preparation, properties, structures and uses of sulphuric acid (including its industrial preparation); Structures of oxoacids of sulphur.
Group - 17 Preparation, properties and uses of hydrochloric acid; Trends in the acidic nature of hydrogen halides; Structures of Interhalogen compounds and oxides and oxoacids of halogens. Group -18 Occurrence and uses of noble gases; Structures of fluorides and oxides of xenon.

UNIT 16: d - and f - BLOCK ELEMENTS
Transition Elements General introduction, electronic configuration, occurrence and characteristics, general trends in properties of the first row transition elements - physical properties, ionization enthalpy, oxidation states, atomic radii, colour, catalytic behaviour, magnetic properties, complex formation, interstitial compounds, alloy formation; Preparation, properties and uses of $K_2Cr_2O_7$ and $KMnO_4$ Inner Transition Elements Lanthanoids - Electronic configuration, oxidation states and lanthanoid contraction. Actinoids -Electronic configuration and oxidation states.

UNIT 17: CO-ORDINATION COMPOUNDS
Introduction to co-ordination compounds, Werner's theory; ligands, co-ordination number, denticity, chelation; IUPAC nomenclature of mononuclear co-ordination compounds, isomerism; Bonding-Valence bond approach and basic ideas of Crystal field theory, colour and magnetic properties; Importance of co-ordination compounds (in qualitative analysis, extraction of metals and in biological systems).

UNIT 18: ENVIRONMENTAL CHEMISTRY
Environmental pollution - Atmospheric, water and soil. Atmospheric pollution- Tropospheric and Stratospheric

Tropospheric pollutants - Gaseous pollutants: Oxides of carbon, nitrogen and sulphur, hydrocarbons; their sources, harmful effects and prevention; Greenhouse effect and Global warming; Acid rain; Particulate pollutants: Smoke, dust, smog, fumes, mist; their sources, harmful effects and prevention. Stratospheric pollution-Formation and breakdown of ozone, depletion of ozone layer - its mechanism and effects. Water Pollution -Major pollutants such as, pathogens, organic wastes and chemical pollutants; their harmful effects and prevention. Soil pollution - Major pollutants such as: Pesticides (insecticides, herbicides and fungicides), their harmful effects and prevention. Strategies to control environmental pollution.

ORGANIC CHEMISTRY

UNIT 19: PURIFICATION AND CHARACTERISATION OF ORGANIC COMPOUNDS
Purification - Crystallization, sublimation, distillation, differential extraction and chromatography - principles and their applications. Qualitative analysis - Detection of nitrogen, sulphur, phosphorus and halogens. Quantitative analysis (basic principles only) - Estimation of carbon, hydrogen, nitrogen, halogens, sulphur, phosphorus. Calculations of empirical formulae and molecular formulae; Numerical problems in organic quantitative analysis.

UNIT 20: SOME BASIC PRINCIPLES OF ORGANIC CHEMISTRY
Tetravalency of carbon; Shapes of simple molecules - hybridization (s and p); Classification of organic compounds based on functional groups: - C = C -, - C h C - and those containing halogens, oxygen, nitrogen and sulphur; Homologous series; Isomerism structural and stereoisomerism. Nomenclature (Trivial and IUPAC) Covalent bond fission - Homolytic and heterolytic: free radicals, carbocations and carbanions; stability of carbocations and free radicals, electrophiles and nucleophiles. Electronic displacement in a covalent bond -Inductive effect, electromeric effect, resonance and hyperconjugation. Common types of organic reactions: substitution, addition, elimination and rearrangement.

UNIT 21: HYDROCARBONS
Classification, isomerism, IUPAC nomenclature, general methods of preparation, properties and reactions. Alkanes - Conformations: Sawhorse and Newman projections (ofethane); Mechanism of halogenation of alkanes. Alkenes - Geometrical isomerism; Mechanism of electrophilic addition: addition of hydrogen, halogens, water, hydrogen halides (Markownikoff's and peroxide effect); Ozonolysis and polymerization. Alkynes - Acidic character; Addition of hydrogen, halogens, water and hydrogen halides; Polymerization. Aromatic hydrocarbons - Nomenclature, benzene - structure and aromaticity; Mechanism of electrophilic substitution: halogenation, nitration, Friedel - Craft's alkylation and acylation, directive influence of functional group in mono-substituted benzene.

UNIT 22: ORGANIC COMPOUNDS CONTAINING HALOGENS
General methods of preparation, properties and reactions; Nature of C-X bond; Mechanisms of substitution reactions.Uses; Environmental effects of chloroform & iodoform.

UNIT 23: ORGANIC COMPOUNDS CONTAINING OXYGEN
General methods of preparation, properties, reactions and uses. ALCOHOLS, PHENOLS AND ETHERS Alcohols: Identification of primary, secondary and tertiary alcohols; mechanism of dehydration. Phenols: Acidic nature, electrophilic substitution reaction s: halogenation, nitration and sulphonation, Reimer - Tiemann reaction. Ethers: Structure. Aldehyde and Ketones: Nature of carbonyl group;Nucleophilic addition to >C=O group, relative reactivities of aldehydes and ketones; Important reactions such as - Nucleophilic addition reactions (addition of HCN, NH3 and its derivatives), Grignard reagent; oxidation; reduction (Wolff Kishner and Clemmensen); acidity of - hydrogen, aldol condensation, Cannizzaro reaction, Haloform reaction; Chemical tests to distinguish between aldehydes and Ketones,
CARBOXYLIC ACIDS
Acidic strength and factors affecting it.

UNIT 24: ORGANIC COMPOUNDS CONTAINING NITROGEN
General methods of preparation, properties, reactions and uses. Amines: Nomenclature, classification, structure, basic character and identification of primary, secondary and tertiary amines and their basic character. Diazonium Salts: Importance in synthetic organic chemistry.
UNIT 25: POLYMERS
General introduction and classification of polymers, general methods of polymerization- addition and condensation,

copolymerization; Natural and synthetic rubber and vulcanization; some important polymers with emphasis on their monomers and uses - polythene, nylon, polyester and bakelite.

UNIT 26: BIOMOLECULES
General introduction and importance of biomolecules.
CARBOHYDRATES - Classification: aldoses and ketoses; monosaccharides (glucose and fructose) and constituent monosaccharides of oligos acchorides (sucrose, lactose and maltose).
PROTEINS - Elementary Idea of - amino acids, peptide bond, polypeptides; Proteins: primary, secondary, tertiary and quaternary structure (qualitative idea only), denaturation of proteins, enzymes.
VITAMINS - Classification and functions. NUCLEIC ACIDS -
Chemical constitution of DNA and RNA. Biological functions of nucleic acids.

UNIT 27: CHEMISTRY IN EVERYDAY LIFE
Chemicals in medicines - Analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamins - their meaning and common examples. Chemicals in food - Preservatives, artificial sweetening agents - common examples. Cleansing agents - Soaps and detergents, cleansing action.

C. BIOLOGY

BOTANY

Unit–I: History
History, botanical studies, branches of botany, brief classification of plant kingdom. Scope of Botany, cell Biology, cell theory.

Unit–II: Plant cell
Structure of typical plant cell, cell wall and cell membrane, protoplasm – physical and chemical nature, cell organelle – structure and functions, nucleus, Iysosomes, golgi bodies, plastids, ribosomes, mitochondria, chromosomes, spherosomes, Important compounds of cell, water, amino acids, carbohydrates, fats, nucleotides, nucleic acids.
Cell inclusions, physical and chemical nature and functions of enzymes, vitamins and hormones, mode of enzyme action, cell cycle, Mitosis; Meiosis.

Unit–III: Complexities of plant life
Meristematic tissues, permanent, simple and complex tissues, Internal structure of dicot and monocot systems and roots, Internal structure of Isobilateral and Dorsiventral with functions of different tissues, Normal, secondary growth in dicot stems.

Unit–IV: Morphology of angiosperms
Normal and Modified stems, roots and leaves, Inflorescence, Flower and its parts, floral diagram and floral formula, pollination, fertilization, fruits.

Unit–V: Taxonomy of flowering plants
Principle and units of classification (species, genus, family), knowledge of important families and their economic importance.

Unit–VI: Continuity of plant life
Genetics (elementary knowledge), mitosis and meiosis and their significance, principle of Mendel's law of inheritance, monohybrid and dihybrid ratio, concept of gene, elementary idea of gene action, evolution, evidence, theories and mechanism of evolution, variation and mutation, role of mutation in agriculture, origin of species.

Unit–VII: Microorganisms and diversities of plant life: Elementary idea and economic importance of virus, bacteria, fungi, algae and lichen, elementary idea of gryophytes, pterodophytes and gymnosperms.

Unit–VIII: Processes in plants
Absorption and transport of water and minerals, transpiration, stomatal mechanism, life energy and ATP, respiration

and fermentation, photosynthesis, elementary idea of protein synthesis, growth, reproduction, movements (with special reference to geotrposim and phototropism).

Unit–IX: Environmental biology
Man and his environment, biotic community, ecological adaptations (hydrophytes and xerophytes).

Unit–X: Botany and human welfare
Agricultural crops – Brief description and economic importance of crop plants like rice, gram (green gram) Jute, groundnut, sugarcane, and potato.

Unit–XI: Common plant diseases
control of blight in rice, rot of sugarcane, forestry, genetic conservation and crop improvement.
Unit–XII: Genetic engineering and biotechnology
Recombinant DNA, gene library, transgenic plants, fermentation, bakery, antibiotics, monochloral antibodies.

ZOOLOGY

Unit–I: Animal world
Definition, scope and branch of zoology. Species concept, bionomical nomenclature, classification, scientific name of some common animals: Fishes-rohu, bhakura, mrigal, Amphibians-frog, toad, Reptiles-houselizard, garden lizard, crocodile, turtle, snakes-cobra, krait, birds-fowl. peacock, pigeon, mammals-tiger, lion, elephant, cat, dog, cow, rabbit & man.

Unit–II: Diversity of life: Kingdom-protasia
General characters of the phylum, protozoa, Classification - amoeba, entamoeba, paramoecium, euglena, trypanosoma, plasmodium.
Kingdom-animalia: Concept of body plan, symmetry, coelom, germ layershomeothermic and poikilothermic animals. General characters of Non-chordata like - porifera, coelenterata, platy helminthes, nematahelminthes, annelida, arthopoda, mollusca, echinodermata & hemichrhordata.

Unit–III: Multi Cellularity in Animals
Animal tissues - Types- epithelial, connective (details about blood and lymph), muscular & nervous- organs & organ systems.

Unit–IV: Locomotion
Locomotory organelles in protozoans, hydra, annelid, brief account of joints and muscles in movement of man, modes of nutrition - Nutrition in amoeba.
Digestive system of man - Structure and function of alimentary canal associated glands, physiology of digestion and absorption.

Unit–V: Types of Respiration
Structure and function of respiratory system in man: Respiratory organs, mechanics of pulmonary resipiration, plunomary exchange of gas, transport of gases, glycolysis & Kreb's cycle, respiratory quotient.

Unit–VI: Digestive System Organs, Digestion & absorption. **Unit–VII: Types of Circulation**
Open circulation, closed circulatory system in man: Structure of Heart, cardiac cycle, arteries, veins, capillaries, portal system, coronary circulation, blood pressure, respiratory pigments, group and coagulation.

Unit–VIII: Excretory Reproduction in Man
Structure and function of kidney.

Unit–IX: Control and coordination in Man
Nervous system-central, peripheral and autonomic sense organs, endocrine system, Mechanism of Hormone action.

Unit–X: Types of Reproduction
Asexual, binary & multiple fission, budding, cellular growth, re-generation, ageing. **Sexual reproduction in man -**

male & female reproductive system, menstrual cycle. **Unit–XI: Genetics**
Chromosomes and heredity: heredity and viriation, mendelian principle, laws of heredity, chromosomes, Interaction of genes, chromosomal variation.

Unit–XII: Evolution
Origin of life Anatomical, embryological biochemical, palaentological, and biogeographical evidences of evolutions, Darwin's theory of natural selection, modern synthetic theory.

Unit–XIII: Environmental Biology
Meaning of ecology environment, habitat and niche, biosphere and ecosystem, ecological adaptations, biodiversity. **Environmental Pollution -** Source, effects and control of air, water and sound pollution, deforestation, global warming, climate change.

Unit–XIV: Common Human Disease
Non communicable diseases - Diabetes & cardiac diseases. Communicable diseases like, amoebiasis, filariasis, malaria (Mode of inflection- pathogens, prevention and treatment).

Unit – XV: Defence Mechanism of Body
Cells, Immune system and their function, immune deficiency in AIDS.

Unit – XVI: Wildlife Conservation
Importance of wildlife, Causes of extinction, threatened species - endangered, vulnerable and rare species, conservation of wild life.

SUBJECT(S)	NUMBER OF QUESTIONS	MARKS	Type of Question / Duration
PHYSICS	30	30	MCQ (Multiple Choice Questions) / 2 Hours
CHEMISTRY	30	30	
BOTANY	30	30	
ZOOLOGY	30	30	
TOTAL MARKS		120	

SYLLABUS FOR MASTER OF COMPUTER APPLICATION (MCA)

UNIT-I: MATHEMATICS

Logic: Statement, negation, implication, converse, contra positives, conjuction, disjunction, truth Table.

Algebra of Sets: Set operations, union, intersection, difference, symmetric difference, complement, Venn diagram, cartesian products of sets, relation and function, composite function, inverse of a function, equivalence relation, kinds of function.

Number Systems: Real numbers (algebraic and other properties, rational and irrational numbers), complex numbers, algebra of complex numbers, conjugate and square root of a complex number, cube roots of unity, De-Moivre's theorem with simple application. Permutation and combinations and their simple applications, mathematical induction, binomial theorem. Determinants upto third order, minors and cofactors, properties of determinants. Matrices upto third order, types of matrices. Algebra of matrices, adjoint and inverse of a matrix. Application of determinants and matrices to the solution of linear equations (in three unknowns).

Trigonometry: Compound angles, multiple and sub-multiple angles, solution of trigonometric equations, properties of triangles, inverse circular functions.

Co-ordinate Geometry of two dimensions: Straight lines, pairs of straight lines, circles, equations of tangents and normals to a circle. Equations of parabola, ellipse and hyperbola, ellipse and hyperbola in simple forms and their tangents (focus, directix, eccentricity and latus rectum in all cases).

Co-ordinate Geometry of Three Dimensions: Distance and division formulae, direction cosines and direction ratios. Projections, angles between two planes, angle between a line and a plane, distance of a point from a line and plane. equations of a sphere-general equation. Vectors: Fundamentals, dot and cross product of two vectors, scalar triple product, simple applications (to geometry, work and moment).

Differential Calculus: (Concept of limit, continuity, derivation of standard functions, successive differentiation (simple cases, Leibnitz theorem, partial differentiation (simple cases, derivatives as rate measure, maxima and minima indeterminate forms, geometrical applications such as tangents and normals to plane curves.

Integral calculus: Standard methods of integration (substitution, by parts, by partial fractions etc.). Definite integrals and properties of definite integrals, areas under plane curves, differential equations (only simple cases).
(i) $dy/dx = f(x)$ (ii) $dy/dx = f(x)\ g(y)$ (iii) $d2y/dx2 = f(x)$ and application to motions in a straight line with constant acceleration.

Probability and Statistics: Averages (mean, median and mode), dispersion (standard deviation and variance). Definition of probability; mutually exclusive events. independent events, addition theorem.

UNIT-II: COMPUTER AWARENESS

Introduction to Computer: Brief history of computers, components of a computer, computer related general knowledge, application of computers, classification of computers, simple DOS commands.

Computer Arithmetic: Number system with general base, number base conversion, elementary arithmetic operation. BASIC Language Programming: Flow charts, algorithms, constants, variables, arithmetic and logical expression, elementary BASIC statements, writing simple programs (using sequence, repetition and control structures),
'subscripted variables, matrix operations function and subroutines, concept of Files.

Note: The question will cover the entire course and will be multiple choice type.

SYLLABUS FOR BACHELOR IN HOTEL MANAGEMENT & CATERING TECHNOLOGY

Section	No. of Questions
Reasoning	10
Service Aptitude	10
General English	10
General Knowledge	10
General Science	10
Numerical Aptitude	10

SYLLABUS FOR MBA / MBA (HA) / MBA (HM) / M.SC. (ALL) COURSES except M.SC. BIOTECHNOLOGY

Section	No. of Questions
Verbal Reasoning	20
Analytical Reasoning	20
General Knowledge	5
Comprehension	7
Computer Fundamentals	8

SYLLABUS FOR MASTER OF PHARMACY (M.PHARM.)

UNIT-I

Micromeretics & powder rheology, various dispersion systems (viz. colloidal, suspensions & emulsions) kinetics & drug stability, polymorphism, surface & interfacial phenomenon. Liquid dosage forms, pharmaceutical aerosols, ophthalmic preparations. Cosmetic preparations, tablets, capsules & microencapsulation technology. Parenteral products, GMP and quality assurance, biopharmaceutics & pharmacokinetics, compartment model and kinetics, clearance concept, bioavailability & bioequivalence, formulation design of various controlled released drug delivery systems.

UNIT-II

Stereo isomerism, conformational analysis of alkanes and cycloalkanes, relative stabilities of cycloalkanes, study of various heterocyclic compounds & polynuclear aromatic hydrocarbons, study of Amino acids, proteins, carbohydrates & lipids, brief concept on QSAR, steps involved to synthesize various categories of drugs mentioned in I.P and their SAR studies, structure elucidation of some important drugs under the category of vitamins, antibiotics and alkaloids.

UNIT-III

Various limit tests, acid-base titrations, common ion effect, solubility product, theory & choice of indicators, precipitation titrations, non-aqueous titrations, complexometirc & gravimetirc titrations, various oxidation & reduction titrations, RIAS, principle, basic instrumentation, elements of interpretation of spectra and applications of the following analytical tools. UV-Visible spectrophotometer IR & flame photometer NMR spectroscope including 13 CNMR & mass spectrometer, study of various chromatographic instruments viz TLC, column chromatography, HPLC, GLC & HPTLC.

UNIT-IV

Pathophysiology of common diseases, viz. rheumatoid arthritis, gout, epilepsy, psychosis, depression, mania etc. Pharmacology of various drugs acting on peripheral nervous system, central nervous system, on cardiovascular system, on haemopoetic system, urinary system, respiratory system, GI tract system & endocrine system. Principles of chemotherapy and toxicology, pharmacology of autacoids, various bioassay of drugs/hormones & biological standardization. Basic concepts on hospital and clinical pharmacy.

UNIT-V

Study of cultivation, collection, chemical constituents, adulterants and uses of various drugs obtained from natural sources with special emphasis on alkaloids, steroids, cardiac glycosides, terpenes, flavonoids and volatile oils. General techniques of biosynthetic studies and basic metabolic pathways. Brief introduction to biogenesis of secondary metabolites of pharmaceutical importance. Study of Plant tissue culture techniques.

UNIT-VI

Pharmaceutical Biotechnology: Immunology & immunological preparations, genetic code & protein synthesis, genetic recombination, gene cloning and its applications, development of hybridoma for monoclonal antibodies. Microbial transformation, enzyme immobilization, study of drugs produced by biotechnology. blood products and plasma substitutes.

SYLLABUS FOR MASTER OF TECHNOLOGY

EMBEDED SYSTEM AND VLSI DESIGN

Unit – I: ENGINEERING MATHEMATICS

Linear Algebra: Matrix algebra, systems of linear equations, eigen values and eigen vectors.

Calculus: Mean value theorems, theorems of integral calculus, evaluation of definite and improper integrals, partial derivatives, maxima and minima, multiple integrals, fourier series. vector identities, directional derivatives, line, surface and volume integrals, stokes, gauss and green's theorems.

Differential equations: First order equation (linear and nonlinear), higher order linear differential equations with constant coefficients, method of variation of parameters, Cauchy's and Euler's equations, initial and boundary value problems, partial differential equations and variable separable method.

Complex variables: Analytic functions, Cauchy's integral theorem and integral formula, Taylor's and Laurent' series, residue theorem, solution integrals.

Probability and Statistics: Sampling theorems, conditional probability, mean, median, mode and standard deviation, random variables, discrete and continuous distributions, poisson, normal and binomial distribution, correlation and regression analysis.

Numerical Methods: Solutions of non-linear algebraic equations, single and multi-step methods for differential equations.

Transform Theory: Fourier transform, laplace transform, Z-transform.

Unit – II: ELECTRONICS AND COMMUNICATION ENGINEERING

Networks: Network graphs: matrices associated with graphs; incidence, fundamental cut set and fundamental circuit matrices. Solution methods: nodal and mesh analysis. Network theorems: superposition, Thevenin and Norton's maximum power transfer, Wye-Delta transformation. Steady state sinusoidal analysis using phasors. Linear constant coefficient differential equations; time domain analysis of simple RLC circuits, Solution of network equations using Laplace transform: frequency domain analysis of RLC circuits. 2-port network parameters: driving point and transfer functions. State equations for networks.

Electronic Devices: Energy bands in silicon, intrinsic and extrinsic silicon. Carrier transport in silicon: diffusion current, drift current, mobility, and resistivity. Generation and recombination of carriers. p-n junction diode, Zener diode, tunnel diode, BJT, JFET, MOS capacitor, MOSFET, LED, p-I-n and avalanche photo diode, Basics of LASERs. Device technology: integrated circuits fabrication process, oxidation, diffusion, ion implantation, photolithography, n-tub, p-tub and twin-tub CMOS process.

Analog Circuits: Small Signal Equivalent circuits of diodes, BJTs, MOSFETs and analog CMOS. Simple diode circuits, clipping, clamping, rectifier. Biasing and bias stability of transistor and FET amplifiers. Amplifiers: single-and multi- stage, differential and operational, feedback, and power. Frequency response of amplifiers. Simple op-amp circuits. Filters. Sinusoidal oscillators; criterion for oscillation; single-transistor and op-amp configurations. Function generators and wave-shaping circuits, 555 Timers. Power supplies.

Digital circuits: Boolean algebra, minimization of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinatorial circuits: arithmetic circuits, code converters, multiplexers, decoders, PROMs and PLAs. Sequential circuits: latches and flip-flops, counters and shift-registers. Sample and hold circuits, ADCs, DACs. Semiconductor memories. Microprocessor (8085): architecture, programming, memory and I/O interfacing.

Signals and Systems: Definitions and properties of Laplace transform, continuous-time and discrete-time Fourier series, continuous-time and discrete-time Fourier Transform, DFT and FFT, z-transform. Sampling theorem. Linear Time-Invariant (LTI) Systems: definitions and properties; causality, stability, impulse response, convolution, poles and zeros, parallel and cascade

structure, frequency response, group delay, phase delay. Signal transmission through LTI systems.

Control Systems: Basic control system components; block diagrammatic description, reduction of block diagrams. Open loop and closed loop (feedback) systems and stability analysis of these systems. Signal flow graphs and their use in determining transfer functions of systems; transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis: root loci, Routh-Hurwitz criterion, Bode and Nyquist plots. Control system compensators: elements of lead and lag ompensation, elements of Proportional- Integral-Derivative (PID) control. State variable representation and solution of state equation of LTI control systems.

Communications: Random signals and noise: probability, random variables, probability density function, autocorrelation, power spectral density. Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis of these operations, superheterodyne receivers; elements of hardware, realizations of analog communication systems; signal-to-noise ratio (SNR) calculations for amplitude modulation (AM) and frequency modulation (FM) for low noise conditions. Fundamentals of information theory and channel capacity theorem. Digital communication systems: pulse code modulation (PCM), differential pulse code modulation (DPCM), digital modulation schemes: amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK), matched filter receivers, bandwidth consideration and probability of error calculations for these schemes. Basics of TDMA, FDMA and CDMA and GSM.

Electromagnetics: Elements of vector calculus: divergence and curl; Gauss and Stokes theorems, Maxwell's equations: differential and integral forms. Wave equation, Poynting vector. Plane waves: propagation through various media; reflection and refraction; phase and group velocity; skin depth. Transmission lines: characteristic impedance; impedance transformation; Smith chart; impedance matching; S parameters, pulse excitation. Waveguides: modes in rectangular waveguides; boundary conditions; cut-off frequencies; dispersion relations. Basics of propagation in dielectric waveguide and optical fibers. Basics of Antennas: Dipole antennas; radiation pattern; antenna gain.

MACHINE DESIGN AND ROBOTICS

Unit – I: ENGINEERING MATHEMATICS

Linear Algebra: Matrix algebra, Systems of linear equations, Eigen values and eigenvectors.

Calculus: Functions of single variable, Limit, continuity and differentiability, Mean value theorems, Evaluation of definite and improper integrals, Partial derivatives, Total derivative, Maxima and minima, Gradient, Divergence and Curl, Vector identities, Directional derivatives, Line, Surface and Volume integrals, Stokes, Gauss and Green's theorems.

Differential equations: First order equations (linear and nonlinear), Higher order linear differential equations with constant coefficients, Cauchy's and Euler's equations, Initial and boundary value problems, Laplace transforms, Solutions of one-dimensional heat and wave equations and Laplace equation.

Complex variables: Analytic functions, Cauchy's integral theorem, Taylor and Laurent series.

Probability and Statistics: Definitions of probability and sampling theorems, Conditional probability, Mean, median, mode and standard deviation, Random variables, Poisson, Normal and Binomial distributions.

Numerical Methods: Numerical solutions of linear and non-linear algebraic equations Integration by trapezoidal and Simpson's rule, single and multi-step methods for differential equations.

Unit – II: APPLIED MECHANICS AND DESIGN

Engineering Mechanics: Free body diagrams and equilibrium; trusses and frames; virtual work; kinematics and dynamics of particles and of rigid bodies in plane motion, including impulse and momentum (linear and angular) and energy formulations; impact.

Strength of Materials: Stress and strain, stress-strain relationship and elastic constants, Mohr's circle for plane stress and plane strain, thin cylinders; shear force and bending moment diagrams; bending and shear stresses; deflection of beams; torsion of circular shafts; Euler's theory of columns; strain energy methods; thermal stresses.

Theory of Machines: Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of slider-crank mechanism; gear trains; flywheels.

Vibrations: Free and forced vibration of single degree of freedom systems; effect of damping; vibration isolation; resonance, critical speeds of shafts.

Design: Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram; principles of the design of machine elements such as bolted, riveted and welded joints, shafts, spur gears, rolling and sliding contact bearings, brakes and clutches.

Unit – III: FLUID MECHANICS AND THERMAL SCIENCES

Fluid Mechanics: Fluid properties; fluid statics, manometry, buoyancy; control-volume analysis of mass, momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation; viscous flow of incompressible fluids; boundary layer; elementary turbulent flow; flow through pipes, head losses in pipes, bends etc.

Heat-Transfer: Modes of heat transfer; one dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction, fins; dimensionless parameters in free and forced convective heat transfer, various correlations for heat transfer in flow over flat plates and through pipes; thermal boundary layer; effect of turbulence; radiative heat transfer, black and grey surfaces, shape factors, network analysis; heat exchanger performance, LMTD and NTU methods.

Thermodynamics: Zeroth, First and Second laws of thermodynamics; thermodynamic system and processes; Carnot cycle. irreversibility and availability; behaviour of ideal and real gases, properties of pure substances, calculation of work and heat in ideal processes; analysis of thermodynamic cycles related to energy conversion.

Applications: Power Engineering: Steam Tables, Rankine, Brayton cycles with regeneration and reheat. I.C. Engines: air-standard Otto, Diesel cycles. Refrigeration and air-conditioning: Vapour refrigeration cycle, heat pumps, gas refrigeration, Reverse Brayton cycle; moist air: psychrometric chart, basic psychrometric processes. Turbomachinery: Pelton-wheel, Francis and Kaplan turbines, impulse and reaction principles, velocity diagrams.

Unit – IV: MANUFACTURING AND INDUSTRIAL ENGG.

Engineering Materials: Structure and properties of engineering materials, heat treatment, stress-strain diagrams for engineering materials.

Metal Casting: Design of patterns, moulds and cores; solidification and cooling; riser and gating design, design considerations.

Forming: Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk (forging, rolling, extrusion, drawing) and sheet (shearing, deep drawing, bending) metal forming processes; principles of powder metallurgy.

Joining: Physics of welding, brazing and soldering; adhesive bonding; design considerations in welding.

Machining and Machine Tool Operations: Mechanics of machining, single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, principles of design of jigs and fixtures.

Metrology and Inspection: Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly.

Computer Integrated Manufacturing: Basic concepts of CAD/CAM and their integration tools.

Production Planning and Control: Forecasting models, aggregate production planning, scheduling, materials requirement planning.

Inventory Control: Deterministic and probabilistic models; safety stock inventory control systems.

Operations Research: Linear programming, simplex and duplex method, transportation, assignment, network flow models,

simple queuing models, PERT and CPM.

ELECTRIC VEHICLE TECHNOLOGY

Unit – I: ENGINEERING MATHEMATICS

Linear Algebra: Matrix Algebra, Systems of linear equations, Eigen values and eigen vectors.

Calculus: Mean value theorems, Theorems of integral calculus, Evaluation of definite and improper integrals, Partial Derivatives, Maxima and minima, Multiple integrals, Fourier series. Vector identities, Directional derivatives, Line, Surface and Volume integrals, Stokes, Gauss and Green's theorems.

Differential equations: First order equation (linear and nonlinear), Higher order linear differential equations with constant coefficients, Method of variation of parameters, Cauchy's and Euler's equations, Initial and boundary value problems, Partial Differential Equations and variable separable method.

Complex variables: Analytic functions, Cauchy's integral theorem and integral formula, Taylor's and Laurent' series, Residue theorem, solution integrals.

Probability and Statistics: Sampling theorems, Conditional probability, Mean, median, mode and standard deviation, Random variables, Discrete and continuous distributions, Poisson, Normal and Binomial distribution, Correlation and regression analysis.

Numerical Methods: Solutions of non-linear algebraic equations, single and multi-step methods for differential equations.

Transform Theory: Fourier transform, Laplace transform, Z-transform.

Unit – II: ELECTRICAL ENGINEERING

Electric Circuits and Fields: Network graph, KCL, KVL, node and mesh analysis, transient response of dc and ac networks; sinusoidal steady-state analysis, resonance, basic filter concepts; ideal current and voltage sources, Thevenin's, Norton's and Superposition and Maximum Power Transfer theorems, two-port networks, three phase circuits; Gauss Theorem, electric field and potential due to point, line, plane and spherical charge distributions; Ampere's and Biot-Savart's laws; inductance; dielectrics; capacitance.

Signals and Systems: Representation of continuous and discrete-time signals; shifting and scaling operations; linear, time-invariant and causal systems; Fourier series representation of continuous periodic signals; sampling theorem; Fourier, Laplace and Z transforms.

Electrical Machines: Single phase transformer - equivalent circuit, phasor diagram, tests, regulation and efficiency; three phase transformers - connections, parallel operation; auto-transformer; energy conversion principles; DC machines - types, windings, generator characteristics, armature reaction and commutation, starting and speed control of motors; three phase induction motors - principles, types, performance characteristics, starting and speed control; single phase induction motors; synchronous machines - performance, regulation and parallel operation of generators, motor starting, characteristics and applications; servo and stepper motors.

Power Systems: Basic power generation concepts; transmission line models and performance; cable performance, insulation; corona and radio interference; distribution systems; per-unit quantities; bus impedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetrical components; fault analysis; principles of over-current, differential and distance protection; solid state relays and digital protection; circuit breakers; system stability concepts, swing curves and equal area criterion; HVDC transmission and FACTS concepts.

Control Systems: Principles of feedback; transfer function; block diagrams; steady-state errors; Routh and Niquist techniques; Bode plots; root loci; lag, lead and lead-lag compensation; state space model; state transition matrix, controllability and observability. Electrical and Electronic Measurements: Bridges and potentiometers; PMMC, moving iron, dynamometer and induction type instruments; measurement of voltage, current, power, energy and power factor; instrument transformers; digital voltmeters and multimeters; phase, time and frequency measurement; Q-meters; oscilloscopes; potentiometric recorders; error analysis.

Analog and Digital Electronics: Characteristics of diodes, BJT, FET; amplifiers - biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers - characteristics and applications; simple active filters; VCOs and timers; combinational and sequential logic circuits; multiplexer; Schmitt trigger; multi-vibrators; sample and hold circuits; A/D and D/A converters; 8-bit microprocessor basics, architecture, programming and interfacing.

Power Electronics and Drives: Semiconductor power diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs - static characteristics and principles of operation; triggering circuits; phase control rectifiers; bridge converters - fully controlled and half controlled; principles of choppers and inverters; basis concepts of adjustable speed dc and ac drives.

COMPUTER SCIENCE & ENGINEERING

UNIT – I: ENGINEERING MATHEMATICS

Mathematical Logic: Propositional Logic; First Order Logic.

Probability: Conditional Probability; Mean, Median, Mode and Standard Deviation; Random Variables; Distributions; uniform, normal, exponential, Poisson, Binomial.

Set Theory & Algebra: Sets; Relations; Functions; Groups; Partial Orders; Lattice; Boolean Algebra.

Combinatorics: Permutations; Combinations; Counting; Summation; generating functions; recurrence relations; asymptotics.

Graph Theory: Connectivity; spanning trees; Cut vertices & edges; covering; matching; independent sets; Colouring; Planarity; Isomorphism.

Linear Algebra: Algebra of matrices, determinants, systems of linear equations, Eigen values and Eigen vectors.

Numerical Methods: LU decomposition for systems of linear equations; numerical solutions of non linear algebraic equations by Secant, Bisection and Newton-Raphson Methods; Numerical integration by trapezoidal and Simpson's rules.

Calculus: Limit, Continuity & differentiability, Mean value Theorems, Theorems of integral calculus, evaluation of definite & improper integrals, Partial derivatives, Total derivatives, maxima & minima.

UNIT – II: FORMAL LANGUAGES AND AUTOMATA

Regular Languages: Finite automata, regular expressions, regular grammar.
Context free languages: Push down automata, context free grammars.

UNIT – III: COMPUTER HARDWARE

Digital Logic: Logic functions, minimization, design and synthesis of combinatorial and sequential circuits, number representation and computer arithmetic (fixed and floating point)

Computer organization: Machine instructions and addressing modes, ALU and data path, hardwired and microprogrammed control, memory interface, I/O interface (interrupt and DMA mode), serial communication interface, instruction pipelining, cache, main and secondary storage.

UNIT – IV: SOFTWARE SYSTEMS

Data structures and Algorithms : The notion of abstract data types, stack, queue, list, set, string, tree, binary search tree, heap, graph, tree and graph traversals, connected components, spanning trees, shortest paths, hashing, sorting, searching, design techniques (greedy, dynamic, divide and conquer), asymptotic analysis (best, worst, average cases) of time and space, upper and lower bounds, intractability.

Programming Methodology: C programming, program control (iteration, recursion, functions), scope, binding, parameter passing, elementary concepts of object-oriented programming

Operating Systems (in the context of Unix): classical concepts (concurrency, synchronization, deadlock), processes, threads and interprocess communication, CPU scheduling, memory management, file systems, I/O systems, protection and security.

Information Systems and Software Engineering: information gathering, requirement and feasibility analysis, data flow diagrams, process specifications, input/output design, process life cycle, planning and managing the project, design, coding, testing, implementation, maintenance.

Databases: relational model, database design, integrity constraints, normal forms, query languages (SQL), file structures (sequential, indexed), b-trees, transaction and concurrency control.

Data Communication: data encoding and transmission, data link control, multiplexing, packet switching, LAN architecture, LAN systems (Ethernet, token ring), Network devices: switches, gateways, routers.

Network: ISO/OSI stack, sliding window protocols, routing protocols, TCP/UDP, application layer protocols & systems (http, smtp, dns, ftp), network security

Web technologies: three tier web-based architecture; JSP, ASP, J2EE, .NET systems; html, XML.

CIVIL ENGINEERING (STRUCTURAL ENGINEERING)

UNIT- I: ENGINEERING MATHEMATICS

Linear Algebra: Matrix algebra, Systems of linear equations, Eigen values and eigenvectors.

Calculus: Functions of single variable, Limit, continuity and differentiability, Mean value theorems, Evaluation of definite and improper integrals, Partial derivatives, Total derivative, Maxima and minima, Gradient, Divergence and Curl, Vector identities, Directional derivatives, Line, Surface and Volume integrals, Stokes, Gauss and Green's theorems.

Differential equations: First order equations (linear and nonlinear), Higher order linear differential equations with constant coefficients, Cauchy's and Euler's equations, Initial and boundary value problems, Laplace transforms, Solutions of one-dimensional heat and wave equations and Laplace equation.

Complex variables: Analytic functions, Cauchy's integral theorem, Taylor and Laurent series. Probability and

Statistics: Definitions of probability and sampling theorems, Conditional probability, Mean, median, mode and standard deviation, Random variables, Poisson, Normal and Binomial distributions.

Numerical Methods: Numerical solutions of linear and non-linear algebraic equations Integration by trapezoidal and Simpson's rule, single and multi-step methods for differential equations.

UNIT - II: STRUCTURAL ENGINEERING

Mechanics: Bending moment and shear force in statically determinate beams. Simple stress and strain relationship: Stress and strain in two dimensions, principal stresses, stress transformation, Mohr's circle. Simple bending theory, flexural and shear stresses, unsymmetrical bending, shear centre. Thin walled pressure vessels, uniform torsion, buckling of column, combined and direct bending stresses.

Structural Analysis: Analysis of statically determinate trusses, arches, beams, cables and frames, displacements in statically determinate structures and analysis of statically indeterminate structures by force/ energy methods, analysis by displacement methods (slope deflection and moment distribution methods), influence lines for determinate and indeterminate structures. Basic concepts of matrix methods of structural analysis.

Concrete Structures: Concrete Technology- properties of concrete, basics of mix design. Concrete design- basic working stress and limit state design concepts, analysis of ultimate load capacity and design of members subjected to flexure, shear, compression and torsion by limit state methods. Basic elements of prestressed concrete, analysis of beam sections at transfer and service loads.

Steel Structures: Analysis and design of tension and compression members, beams and beam columns, column bases. Connections- simple and eccentric, beam–column connections, plate girders and trusses. Plastic analysis of beams and frames.

UNIT - III: GEOTECHNICAL ENGINEERING

Soil Mechanics: Origin of soils, soil classification, three - phase system, fundamental definitions, relationship and interrelationships, permeability and seepage, effective stress principle, consolidation, compaction, shear strength.

Foundation Engineering: Sub-surface investigations- scope, drilling bore holes, sampling, penetration tests, plate load test. Earth pressure theories, effect of water table, layered soils. Stability of slopes- infinite slopes, finite slopes. Foundation types- foundation design requirements. Shallow foundations- bearing capacity, effect of shape, water table and other factors, stress distribution, settlement analysis in sands and clays. Deep foundations – pile types, dynamic and static formulae, load capacity of piles in sands and clays, negative skin friction.

UNIT - IV: WATER RESOURCES ENGINEERING

Fluid Mechanics and Hydraulics: Properties of fluids, principle of conservation of mass, momentum, energy and corresponding equations, potential flow, applications of momentum and Bernoulli's equation, laminar and turbulent flow, flow in pipes, pipe networks. Concept of boundary layer and its growth. Uniform flow, critical flow and gradually varied flow in channels, specific energy concept, hydraulic jump. Forces on immersed bodies, flow measurements in channels, tanks and pipes. Dimensional analysis and hydraulic modeling. Kinematics of flow, velocity triangles and specific speed of pumps and turbines.

Hydrology: Hydrologic cycle, rainfall, evaporation, infiltration, stage discharge relationships, unit hydrographs, flood estimation, reservoir capacity, reservoir and channel routing. Well hydraulics. Irrigation: Duty, delta, estimation of evapo-transpiration. Crop water requirements. Design of lined and unlined canals, waterways, head works, gravity dams and spillways. Design of weirs on permeable foundation. Types of irrigation system, irrigation methods. Water logging and drainage, sodic soils.

UNIT - V: ENVIRONMENTAL ENGINEERING

Water requirements: Quality standards, basic unit processes and operations for water treatment. Drinking water standards, water requirements, basic unit operations and unit processes for surface water treatment, distribution of water. Sewage and sewerage treatment, quantity and characteristics of wastewater. Primary, secondary and tertiary treatment of wastewater, sludge disposal, effluent discharge standards. Domestic wastewater treatment, quantity of characteristics of domestic wastewater, primary and secondary treatment Unit operations and unit processes of domestic wastewater, sludge disposal.

Air Pollution: Types of pollutants, their sources and impacts, air pollution meteorology, air pollution control, air quality standards and limits.

Municipal Solid Wastes: Characteristics, generation, collection and transportation of solid wastes, engineered systems for solid waste management (reuse/ recycle, energy recovery, treatment and disposal).

Noise Pollution: Impacts of noise, permissible limits of noise pollution, measurement of noise and control of noise pollution.

UNIT - VI: TRANSPORTATION ENGINEERING

Highway Planning: Geometric design of highways, testing and specifications of paving materials, design of flexible and rigid pavements.

Traffic Engineering: Traffic characteristics, theory of traffic flow, intersection design, traffic signs and signal design, highway capacity.

UNIT - VII: SURVEYING

Importance of surveying, principles and classifications, mapping concepts, coordinate system, map projections, measurements of distance and directions, leveling, theodolite traversing, plane table surveying, errors and adjustments, curves.

SYLLABUS FOR M.SC. AGRICULTURE

The question of entrance test will be comprised of two parts, Part-A and Part-B. There will be 100 general multiple- choice questions (Non-crop specific) in part-A and 20 crop specific (Field crop and Horticultural crops in equal proportion) questions in part-B following the common syllabi of Agriculture and Horticulture faculties. Candidates have to appear all the questions.

SYLLABUS FOR M.SC. NURSING

UNIT–I: NURSING FOUNDATIONS

Nursing as a Profession & it's concept and Practice, Nursing trends and theories, Hospital Admission & discharge, Nursing Process, Intra personal relationship, Recording & reporting, vital signs, Health assessment, Equipment and linen management, Meeting needs of patient, Urinary & Bowel elimination, Psychosocial needs, Infection control & Microbiology, Administration of medication & it's management, Care of terminally ill patients

UNIT–II: MEDICAL SURGICAL NURSING

New trends and concepts, Role & responsibilities of a Nurse in Client & family, Anatomy & Physiology related to each system, Management of patients having disorders in respiratory, cardiovascular & cardiothoracic, digestive, genitourinary, reproductive, endocrine, integumentary, musculoskeletal and immunological system etc., nursing management of patient with disorders in eye, ENT, and neurological system, management of burns and reconstructive and cosmetic surgery, management of oncological conditions, emergency and disaster management, care of elderly, management of patients C.C.U, management of occupational and industrial disorders

UNIT-III: COMMUNITY HEALTH NURSING

Determinants of health, epidemiology and nursing management of communicable and non-communicable diseases, demography, population and its control, health planning policies and problems, delivery of community health services, concepts and approach of community health nursing, national health and family welfare programmes, national and international health agencies, waste management at home and community, medical care follow up,

UNIT–IV: CHILD HEALTH NURSING & NEONATOLOGY

Modern concept of childcare, care of neonate, IMNCI, management of behavioural and social problems in children, milestones, pediatrics medicine and surgery ICU management.

UNIT-V: MENTAL HEALTH NURSING

Concepts and principles, therapeutic communication, treatment modalities and therapies used in mentally disorder, nursing management of patient with schizophrenia, psychotic and neurotic, somatisation disorder, substance used disorders, stress related disorders, personality, childhood and adolescent disorders, psychiatric emergencies and crisis intervention, legal issues in mental health nursing.

UNIT-VI: GYNAECOLOGY AND OBSTETRICAL NURSING

Anatomy & Physiology of reproductive system, assessment and management of antenatal, intranatal and postnatal mothers (normal & abnormal cases), assessment and management of normal neonates, high risk pregnancy assessment, abnormal labour management, management of high risk new borns, pharmaco-therapeutics in obstetrics, family welfare programme.

UNIT-VII: ADMINISTRATION AND EDUCATION IN NURSING

Management in Nursing, management process and nursing services in the hospital, community and educational institutions, organizational behavior and human relation, in service education and professional advancement, guidance and counseling, method of teaching educational media, I.E.C for Health, legal aspects in Nursing, professional advancement.

UNIT–VIII : NURSING RESEARCH AND NURSING STATISTICS

Research process, research problems and questions, review of literature, research approaches and designs, sampling and data collection, introduction to statistics(mean, median, mode, frequency distribution, coefficient, correlation statistical package and its application), biostatistics , communication and utilization of research.

SYLLABUS FOR POST BASIC B. Sc. NURSING

UNIT-I: Anatomy & Physiology: Organization of body cell, tissue, organs and different systems.

UNIT-II: Microbiology: Immunity, infection, sterilization & micro-organism.

UNIT-III: Psychology & Sociology: Human behaviour, learning, attention, perception, intelligence and personality.

UNIT-IV: Fundamentals of Nursing: Basic needs and care of the patients, therapeutic nursing care, nursing process, ethics in nursing, First-Aid

UNIT-V: Medical-Surgical Nursing: Management of patients with pain, undergoing surgery, respiratory, gastrointestinal, urinary, cardiovascular disorders nursing & Communicable diseases, assessment altered immune response, Emergency management, nursing care of elderly people. Oncology nursing.

UNIT-VII: Psychiatric Nursing: Mental health assessment, disorder and nursing & crisis intervention, legal aspects.

UNIT-VIII: Mid-wifery & Gyneacological nursing: Embryology and fiddle development, nursing management of pregnant women, labour, nursing management of baby at birth and mother during puriterium. Hi-risk pregnancy, obstetric operation

UNIT-IX: Pediatric Nursing: Newborn, healthy child, sick child, behavioural disorder and common health problems during childhood, children with congenital defect, welfare of children.

UNIT-X: Professional Trends: Nursing as a profession, professional ethics, personal and professional growth and development, legislation in nursing, professional and related organisation.

Administration and Management: Hospital and ward.

SYLLABUS FOR BBA / BCA / Integrated MBA

Section	No. of Questions
English including comprehension	15
General Knowledge / Current Affairs	15
Elementary Numerical Aptitude	15
Logical Reasoning	15

SYLLABUS FOR B.A. LLB (H) / B.B.A. LLB (H) / LL.B. (H)

Section	No. of Questions
English including comprehension	10
General Knowledge / Current Affairs	10
Elementary Numerical Aptitude	10
Legal Aptitude / Legal Awareness	15
Logical Reasoning	15

SYLLABUS FOR LLM

Section	No. of Questions
Legal Theory	10
Constitutional Law	15
Criminal Law	15
Law of Torts	10
Law of Contracts	10

SYLLABUS FOR INTEGRATED M.SC. BIOTECHNOLOGY

A. BOTANY

UNIT–I: HISTORY

History, botanical studies, branches of botany, brief classification of plant kingdom. Scope of Botany, cell Biology, cell theory.

UNIT–II: PLANT CELL

Structure of typical plant cell, cell wall and cell membrane, protoplasm - physical and chemical nature, cell organelle structure and functions, nucleus, Iysosomes, golgi bodies, plastids, ribosomes, mitochondria, chromosomes, spherosomes, Important compounds of cell, water, amino acids, carbohydrates, fats, nucleotides, nucleic acids. Cell inclusions, physical and chemical nature and functions of enzymes, vitamins and hormones, mode of enzyme action, cell cycle, Mitosis; Meiosis.

UNIT–III: COMPLEXITIES OF PLANT LIFE

Meristematic tissues, permanent, simple and complex tissues, Internal structure of dicot and monocot systems and roots, Internal structure of Isobilateral and Dorsiventral with functions of different tissues, Normal, secondary growth in dicot stems.

UNIT–IV: MORPHOLOGY OF ANGIOSPERMS

Normal and Modified stems, roots and leaves, Inflorescence, Flower and its parts, floral diagram and floral formula, pollination, fertilization, fruits.

UNIT–V: TAXONOMY OF FLOWERING PLANTS

Principle and units of classification (species, genus, family), knowledge of important families and their economic importance.

UNIT–VI: CONTINUITY OF PLANT LIFE

Genetics (elementary knowledge), mitosis and meiosis and their significance, principle of Mendel's law of inheritance, monohybrid and dihybrid ratio, concept of gene, elementary idea of gene action, evolution, evidence, theories and mechanism of evolution, variation and mutation, role of mutation in agriculture, origin of species.

UNIT–VII: MICROORGANISMS AND DIVERSITIES OF PLANT LIFE

Elementary idea and economic importance of virus, bacteria, fungi, algae and lichen, elementary idea of gryophytes, pterodophytes and gymnosperms.

UNIT–VIII: PROCESSES IN PLANTS

Absorption and transport of water and minerals, transpiration, stomatal mechanism, life energy and ATP, respiration and fermentation, photosynthesis, elementary idea of protein synthesis, growth, reproduction, movements (with special reference to geotrposim and phototropism).

UNIT–IX: ENVIRONMENTAL BIOLOGY

Man, and his environment, biotic community, ecological adaptations (hydrophytes and xerophytes).

UNIT–X: BOTANY AND HUMAN WELFARE

Agricultural crops - Brief description and economic importance of crop plants like rice, gram (green gram) Jute, groundnut, sugarcane, and potato.

UNIT–XI: COMMON PLANT DISEASES

Control of blight in rice, rot of sugarcane, forestry, genetic conservation and crop improvement.

UNIT–XII: GENETIC ENGINEERING AND BIOTECHNOLOGY

Recombinant DNA, gene library, transgenic plants, fermentation, bakery, antibiotics, monochloral antibodies.

B. ZOOLOGY

UNIT–I: ANIMAL WORLD

Definition, scope and branch of zoology. Species concept, bionomical nomenclature, classification, scientific name of some common animals: Fishes-rohu, bhakura, mrigal, Amphibians-frog, toad, Reptiles-houselizard, garden lizard, crocodile, turtle, snakes-cobra, krait, birds-fowl. Peacock, pigeon, mammals-tiger, lion, elephant, cat, dog, cow, rabbit & man.

UNIT–II: DIVERSITY OF LIFE: KINGDOM-PROTASIA

General characters of the phylum, protozoa, Classification - amoeba, entamoeba, paramoecium, euglena, trypanosoma, plasmodium.

Kingdom-animalia: Concept of body plan, symmetry, coelom, germ layershomeothermic and poikilothermic animals. General characters of Non-chordata like - porifera, coelenterata, platy helminthes, nematahelminthes, annelida, arthopoda, mollusca, Echinodermata & hemichrhordata.

UNIT–III: MULTI CELLULARITY IN ANIMALS
Animal tissues - Types- epithelial, connective (details about blood and lymph), muscular & nervous- organs & organ systems.

UNIT–IV: LOCOMOTION
Locomotory organelles in protozoans, hydra, annelid, brief account of joints and muscles in movement of man, modes of nutrition - Nutrition in amoeba. Digestive system of man - Structure and function of alimentary canal associated glands, physiology of digestion and absorption.

UNIT–V: TYPES OF RESPIRATION
Structure and function of respiratory system in man: Respiratory organs, mechanics of pulmonary resipiration, pulmonary exchange of gas, transport of gases, glycolysis &Kreb's cycle, respiratory quotient. Unit–VI: Digestive System Organs, Digestion & absorption.

UNIT–VII: TYPES OF CIRCULATION
Open circulation, closed circulatory system in man: Structure of Heart, cardiac cycle, arteries, veins, capillaries, portal system, coronary circulation, blood pressure, respiratory pigments, group and coagulation.
Unit–VIII: Excretory Reproduction in Man: Structure and function of kidney.

UNIT–IX: CONTROL AND COORDINATION IN MAN
Nervous system-central, peripheral and autonomic sense organs, endocrine system, Mechanism of Hormone action.

UNIT–X: TYPES OF REPRODUCTION
Asexual, binary & multiple fission, budding, cellular growth, re-generation, ageing. Sexual reproduction in man- male & female reproductive system, menstrual cycle.

UNIT–XI: GENETICS
Chromosomes and heredity: heredity and viriation, mendelian principle, laws of heredity, chromosomes, Interaction of genes, chromosomal variation.

UNIT–XII: EVOLUTION
Origin of life Anatomical, embryological biochemical, palaentological, and biogeographical evidences of evolutions,
Darwin's theory of natural selection, modern synthetic theory.

UNIT–XIII: ENVIRONMENTAL BIOLOGY
Meaning of ecology environment, habitat and niche, biosphere and ecosystem, ecological adaptations, biodiversity.
Environmental Pollution - Source, effects and control of air, water and sound pollution, deforestation, global warming, climate change.

UNIT–XIV: COMMON HUMAN DISEASE
Non communicable diseases - Diabetes & cardiac diseases. Communicable diseases like, amoebiasis, filariasis, malaria (Mode of inflection- pathogens, prevention and treatment).

UNIT – XV: DEFENCE MECHANISM OF BODY
Cells, Immune system and their function, immune deficiency in AIDS.

UNIT – XVI: WILDLIFE CONSERVATION
Importance of wildlife, causes of extinction, threatened species - endangered, vulnerable and rare species, conservation of wild life.

C. CHEMISTRY

PHYSICAL CHEMISTRY

UNIT 1: SOME BASIC CONCEPTS IN CHEMISTRY
Matter and its nature, Dalton's atomic theory; Concept of atom, molecule, element and compound; Physical quantities and their measurements in Chemistry, precision and accuracy, significant figures, S.I. Units, dimensional analysis; Laws of chemical combination; Atomic and molecular masses, mole concept, molar mass, percentage composition, empirical and molecular formulae; Chemical equations and stoichiometry.

UNIT 2: STATES OF MATTER
Classification of matter into solid, liquid and gaseous states. Gaseous State: Measurable properties of gases; Gas laws
- Boyle's law, Charle's law, Graham's law of diffusion, Avogadro's law, Dalton's law of partial pressure; Concept of Absolute scale of temperature; Ideal gas equation; Kinetic theory of gases (only postulates), Real gases.

UNIT 3: ATOMIC STRUCTURE
Thomson and Rutherford atomic models and their limitations; Nature of electromagnetic radiation, photoelectric effect; Spectrum of hydrogen atom, Bohr model of hydrogen atom - its postulates, derivation of the relations for energy of the electron and radii of the different orbits.

UNIT 4: CHEMICAL BONDING AND MOLECULAR STRUCTURE
Kossel - Lewis approach to chemical bond formation, concept of ionic and covalent bonds. Ionic Bonding: Formation of ionic bonds, factors affecting the formation of ionic bonds;

UNIT 5: CHEMICAL THERMODYNAMICS
Fundamentals of thermodynamics: System and surroundings, extensive and intensive properties, state functions, types of processes. laws of thermodynamics.

UNIT 6: SOLUTIONS
Different methods for expressing concentration of solution - molality, molarity, mole fraction, percentage, vapour pressure of solutions, vapour pressure.

UNIT 7: EQUILIBRIUM
Meaning of equilibrium, concept of dynamic equilibrium. Equilibria involving physical processes: Solid -liquid, liquid - gas and solid - gas equilibria.

UNIT 8: REDOX REACTIONS AND ELECTROCHEMISTRY
Electronic concepts of oxidation and reduction, redox reactions, oxidation number, rules for assigning oxidation number, balancing of redox reactions. Eectrolytic and metallic conduction, conductance in electrolytic solutions.

UNIT 9: CHEMICAL KINETICS
Rate of a chemical reaction, factors affecting the rate of reactions: concentration, temperature, pressure and catalyst; elementary and complex reactions

UNIT-10: SURFACE CHEMISTRY
Adsorption - Physisorption and chemisorption and their characteristics, factors affecting adsorption of gases on solids.

INORGANIC CHEMISTRY

UNIT 11: CLASSIFICATON OF ELEMENTS AND PERIODICITY IN PROPERTIES
Modem periodic law and present form of the periodic table, s, p, d and f block elements, periodic trends in properties of elements atomic and ionic radii, ionization enthalpy, electron gain enthalpy, valence, oxidation states and chemical reactivity.

UNIT 12: GENERAL PRINCIPLES AND PROCESSES OF ISOLATION OF METALS
Modes of occurrence of elements in nature, minerals, ores; Steps involved in the extraction of metals - concentration, reduction (chemical and electrolytic methods) and refining with special reference to the extraction of Al, Cu, Zn and Fe.

UNIT 13: HYDROGEN
Position of hydrogen in periodic table, isotopes, preparation, properties and uses of hydrogen; Physical and chemical properties of water and heavy water.

UNIT 14: S - BLOCK ELEMENTS (ALKALI AND ALKALINE EARTH METALS)
Group - 1 and 2 Elements General introduction, electronic configuration and general trends in physical and chemical properties of elements, Preparation and properties of some important compounds - sodium carbonate and sodium hydroxide; Industrial uses of lime, limestone, Plaster of Paris and cement; Biological significance of Na, K, Mg and Ca.

UNIT 15: P - BLOCK ELEMENTS
Group - 13 to Group 18 Elements General Introduction: Electronic configuration and general trends in physical and chemical properties of elements across the periods and down the groups; unique behaviour of the first element in each group. Groupwise study of the p - block elements.

UNIT 16: d - and f - BLOCK ELEMENTS
Transition Elements General introduction, electronic configuration, occurrence and characteristics, general trends in properties of the first row transition elements - physical properties, ionization enthalpy, oxidation states, atomic radii, colour, catalytic behaviour, magnetic properties, complex formation, interstitial compounds, alloy formation.

UNIT 17: CO-ORDINATION COMPOUNDS

Introduction to co-ordination compounds, Werner's theory; ligands, co-ordination number, denticity, chelation; IUPAC nomenclature of mononuclear co-ordination compounds, isomerism; Bonding-Valence bond approach.

UNIT 18: ENVIRONMENTAL CHEMISTRY

Environmental pollution - Atmospheric, water and soil. Atmospheric pollution- Tropospheric and Stratospheric Greenhouse effect and Global warming; Acid rain; Particulate pollutants: Smoke, dust, smog, fumes, mist; their sources, harmful effects and prevention. Stratospheric pollution-Formation and breakdown of ozone, depletion of ozone layer, Water Pollution -Major pollutants such as, pathogens, organic wastes and chemical pollutants; Soil pollution - Major pollutants such as: Pesticides (insecticides, herbicides and fungicides), Strategies to control environmental pollution.

ORGANIC CHEMISTRY

UNIT 19: PURIFICATION & CHARACTERISATION OF ORGANIC COMPOUNDS

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

UNIT 20: SOME BASIC PRINCIPLES OF ORGANIC CHEMISTRY

Tetravalency of carbon; Shapes of simple molecules - hybridization (s and p); Classification of organic compounds based on functional groups: - C = C -, - C h C - and those containing halogens, oxygen, nitrogen and sulphur; Homologous series; Isomerism structural and stereoisomerism. Nomenclature (Trivial and IUPAC) Covalent bond fission, free radicals, electrophiles and nucleophiles. Electronic displacement in a covalent bond -Inductive effect, electromeric effect, resonance and hyperconjugation.

UNIT 21: HYDROCARBONS

Classification, isomerism, IUPAC nomenclature, Alkanes, Mechanism of halogenation of alkanes. Alkenes - Geometrical isomerism; Ozonolysis and polymerization. Alkynes - Acidic Nomenclature, benzene - structure and aromaticity; Mechanism of electrophilic substitution: halogenation, nitration, Friedel - Craft's alkylation and acylation.

UNIT 22: ORGANIC COMPOUNDS CONTAINING HALOGENS

General methods of preparation, properties and reactions; Nature of C-X bond; Mechanisms of substitution reactions.Uses; Environmental effects of chloroform & iodoform.

UNIT 23: ORGANIC COMPOUNDS CONTAINING OXYGEN

General methods of preparation, properties, reactions and uses. alcohols, phenols and ethers Alcohols: Identification of primary, secondary and tertiary alcohols; mechanism of dehydration. Important reactions such as - Nucleophilic addition reactions (addition of HCN, NH3 and its derivatives), Grignard reagent; oxidation; reduction (Wolff Kishner and Clemmensen); acidity of - hydrogen, aldol condensation, Cannizzaro reaction,

UNIT 24: ORGANIC COMPOUNDS CONTAINING NITROGEN

General methods of preparation, properties, reactions and uses. Amines: Nomenclature, classification, structure, basic character and identification of primary, secondary and tertiary amines and their basic character.

UNIT 25: POLYMERS

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

UNIT 26: CHEMISTRY IN EVERYDAY LIFE

Chemicals in medicines - Analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamins - their meaning and common examples. Chemicals in food - Preservatives, artificial sweetening agents - common examples. Cleansing agents - Soaps and detergents, cleansing action.

Section	No. of Questions (60)
Botany	24 (40%)
Zoology	24 (40%)
Chemistry	12 (20%)

SYLLABUS FOR M.SC. (BIOTECHNOLOGY)

BIOTECHNOLOGY

UNIT-I: INTRODUCTION TO BIOTECHNOLOGY

Definition of Biotechnology; Old Biotechnology and the beginning of modern Biotechnology; Overview of plant, animal and microbial cultures; Basic principles of recombinant DNA technology; Common methods and applications- Plant, Animal and Medical Biotechnology; Ethical, legal and social implications of Biotechnology.

UNIT-II: BIO-MOLECULES AND ENZYME TECHNOLOGY

Concept of Biomolecules, Chemical bonds, Water: structure, ionization, weak acids and weak bases, Buffers. Amino Acids and proteins: types, properties, peptides, Conformation of proteins: Ramachandran plot, secondary structure, three-dimensional structure of protein, Carbohydrates: Monosaccharides, disaccharides, polysaccharides, Proteo- glycans, Glycoprotien and Glycolipids, Lipids: Storage Lipids, Structural Lipids, Lipids as signals, cofactors and pigments, Vitamins, Nucleotides and Nucleic Acids.History, General characteristics,Nomenclature and classifications of enzymes,Enzyme kinetics, Competitive, noncompetitive, uncompetitive inhibition, Allosteric enzymes, Enzyme activity, Factors affecting enzyme activity.

UNIT-III: CELL BIOLOGY

Prokaryotic and eukaryotic cell-structure, Organelle functions, Transport across membrane, Cell communication and signalling. Cell signalling systems, second messengers and their role in signal transduction, Cell surface receptors; Interaction and regulation of cell signalling pathways; Cell Cycle and Cell Division, Photo-autotrophism, Heterotrophism, Stress physiology, Ageing of cells.

UNIT-IV: BIOCHEMISTRY

Metabolic disorders, Oxidation-reduction potentials, ATP synthesis-oxidative and photo-phosphorylation, Electron acceptors and donors in plants and animals.

UNIT-V: MOLECULAR BIOLOGY

Introduction to Molecular Biology; DNA replication: Prokaryotic and Eukaryotic DNA replication; DNA Repair; Recombination. Transcription: Prokaryotic and Eukaryotic transcription, RNA polymerases, General and specific transcription factors, Regulatory elements, and Mechanism of transcription regulation. Splicing, Editing, Nuclear export of mRNA, mRNA stability; Transcriptional and Post-transcriptional gene silencing. Translation: Prokaryotic and Eukaryotic translation, Regulation of translation, Co- and Post- translational modifications of proteins. Oncogenes and Tumor Suppressor Genes: Cellular and Viral oncogenes, Tumor suppressor genes from humans. Structure, function and mechanisms of action of pRB and p53 tumor suppressor proteins.

UNIT-VI: CONCEPT OF RECOMBINANT DNA TECHNOLOGY

Tools of recombinant technology, Restriction enzymes, Ligases, Enzymes used in gene cloning, Cloning vectors: Plasmids, Bacteriophages, Cosmids, Phagemids, YACs, BACs, Adapters and Linkers, Genomic libraries, Methods of gene transfer: Physical, Chemical and Biological methods. Alpha complementation, Gene regulation, Gene silencing, Gene therapy strategies. Transposons and its types. Recombinant proteins, production of recombinant proteins. Applications of recombinant DNA technology.

UNIT-VII: PLANT AND ANIMAL TISSUE CULTURE

History of tissue culture techniques, General requirements of plant and animal tissue culture, Micropropagation, Shoot-tip culture, callus culture, suspension culture, protoplast culture, Somatic hybridization, Somaclonal variation, Somatic hybrids and cybrids, Germplasm conservation, Animal organ culture, Hybridoma technology, Cryopreservation, Applications of tissue culture.

UNIT-VIII: IMMUNOLOGY

Introduction to Immunology, Innate and adaptive immunity, T-cells and B-cells, Antigen and super antigens, Antibodies, Antigen-Antibody interaction, Structure and functions of immunoglobulin, ELISA

UNIT-VIII: BIO-TECHNIQUES

Microscopy: Principles of Light microscope, Phase-contrast microscope, Fluorescence microscope, Transmission and scanning microscope. Principle and use of analytical instruments: pH meter, UV-VIS Spectrophotometer, IR- spectrophotometer, ESR and NMR Spectroscopy. Separation Techniques in Biology: Molecular separation by Chromatography, Electrophoresis, Organelles separation by centrifugation, cell separation by flow cytometry. Polymerase Chain Reaction, Isotopes Techniques in Biology, their safety and handling.

UNIT-IX: GENETICS

Mendelian laws of inheritance, Application, Linkage and crossing over, Gene mapping,Genetic polymorphism, Hardy-Weinberg genetic equilibrium, Causes of changes in gene frequency (migration, selection, genetic drift, inbreeding and mutations), Chromosomal aberration, Theories of mutation and evolution, Genetic disorders.

UNIT-X: GENOMICS AND BIOINFORMATICS

Introduction to genomics, sequencing of genomes, Molecular markers, DNA sequencing strategies, Structural and functional genomics, Introduction to bioinformatics, Databases and search tools; NCBI, EMBL, DDBJ, Homology search, Sequence allignment.

UNIT-XI: ANIMAL & PLANT PHYSIOLOGY

Physiology and development of circulatory, Nervous system, Photo systems, Endocrine and exocrine system, Hormone diversity and action, Plant hormones, Transport across plant cell, Transpiration, Flowering, Plant tissue culture, Production of transgenic plants

UNIT-XII: MICROBIOLOGY

Characterization, Classification and Identification of different groups of microorganisms, Microbiological methodologies: isolation, maintenance, preservation, sterilization, Antimicrobial agents, Drug resistance, Microbial Growth and metabolism: Cultivation of bacteria, growth, Nutrition and transport, Carbohydrate and Nitrogen metabolism, Microbial Genetics: bacterial recombination, transformation, transduction, conjugation, Mutation, isolation of mutants, Microbiology of environment: soil, air, water, Microorganisms and Diseases: Air and water- borne diseases and their control, Microbiology of fuel and Industrial microbiology.

UNIT-XII: ECOLOGY AND EVOLUTION

Components and types of ecosystem, Environmental pollution, Biogeochemical cycles, Biotic interactions, Hardy Weinberg law, Population genetics, Mechanism of speciation, Origin of life, Biological rhythms, Biological control.

CHEMISTRY

PHYSICAL CHEMISTRY

UNIT 1: SOME BASIC CONCEPTS IN CHEMISTRY

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

UNIT 2: STATES OF MATTER

Classification of matter into solid, liquid and gaseous states. Gaseous State: Measurable properties of gases; Gas laws - Boyle's law, Charle's law, Graham's law of diffusion, Avogadro's law, Dalton's law of partial pressure; Concept of Absolute scale of temperature; Ideal gas equation; Kinetic theory of gases (only postulates), Real gases.

UNIT 3: ATOMIC STRUCTURE

Thomson and Rutherford atomic models and their limitations; Nature of electromagnetic radiation, photoelectric effect; Spectrum of hydrogen atom, Bohr model of hydrogen atom - its postulates, derivation of the relations for energy of the electron and radii of the different orbits.

UNIT 4: CHEMICAL BONDING AND MOLECULAR STRUCTURE

Kossel - Lewis approach to chemical bond formation, concept of ionic and covalent bonds. Ionic Bonding: Formation of ionic bonds, factors affecting the formation of ionic bonds;

UNIT 5: CHEMICAL THERMODYNAMICS

Fundamentals of thermodynamics: System and surroundings, extensive and intensive properties, state functions, types of processes. laws of thermodynamics.

UNIT 6: SOLUTIONS

Different methods for expressing concentration of solution - molality, molarity, mole fraction, percentage, vapour pressure of solutions, vapour pressure.

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UNIT 26: CHEMISTRY IN EVERYDAY LIFE
Chemicals in medicines - Analgesics, tranquilizers, antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamins - their meaning and common examples. Chemicals in food - Preservatives, artificial sweetening agents - common examples. Cleansing agents - Soaps and detergents, cleansing action.

Section	No. of Questions (60)
Biotechnology	48 (80%)
Chemistry	12 (20%)

SYLLABUS FOR LATERAL ENTRY (B.TECH.)

This paper is common to all the disciplines, except Pharmacy and HMCT.

UNIT-I: BASIC ELECTRICAL ENGINEERISNG

Electrostatics, electromagnetism & electrodynamics: Coulomb's Law, Gauss theorem and its applications in calculating the field intensity, potential gradient due to spherical, cylindrical and plane charges. Calculation of capacitance of spherical, coaxial, cylindrical and parallel plate condensers, dielectrics, energy stored in and electric field.

Circuital Law of magnetism, magnetic field intensity and flux density due to a long straight conductor, solenoid. Ferromagnetic material in a magnetic field, permeability B-H curves, cyclic magnetisation and hysteresis. Idea of magnetic circuit, mmf and reluctance, calculation of simple magnetic circuits, effect of leakage.

Faraday's law of electrodimagnetic induction, e.m.f in a conductor and a coil moving in a magnetic field. Self and mutual, inductance series parallel combination, energy stored in magnetic field.

D.C. Circuits: Idea of d.c. circuits, power and energy in electric circuits, reduction of electric network by series, parallel and star-delta conversion, representation of voltage source and current source, Kirchoff laws and their application to solve electrical circuits by branch and loop current method and nodal method.

A.C. Circuits: Alternating current voltage, different wave forms, average value, effective value and form factor. Sinusodial voltage and current., amplitude, frequency and phase, addition and substraction of A.C. quantities, phasor diagram, complex representation of sinusoidal quantities, reactance, impedance and admittance, simple series and parallel circuits and use of complex algebra in solving them, power and power factor, active and reactive components, idea of power factor improvement, series and parallel resonance Q - factor. Introduction to three phase circuits, relation between phase and line quantities. Star and Delta connection of sources and loads, active and reactive power in 3-phase circuits, single and two wattmeter method of power measurement. Steady circuit equations, solutions of simple coupled circuits containing R,L, C and M.

Instruments: Construction and principle of operation of permanent magnet moving coil, moving iron and dynamometer type ammeters and voltmeters, dynamometer type wattmeters.

Illumination: Definition and units of luminous flux, luminous intensity, illumination, brightness, luminous efficiency.

Production of light: Filament lamps, halogen lamps, sodium and mercury vapour lamps, fluorescent lamps, lighting calculation by inverse Square law and light flux method, co-efficient of utilization and maintenance factor.

UNIT-II: MATHEMATICS

Ordinary Differential Equations: Differential equations of first order, physical applications, linear differential equations, homogeneous and non- homogeneous second order linear differential equation with constant co-efficients. Application to free and forced vibration of spring mass systems, method of variation of parameters. Normal form changes of dependent and independent variables. Cauchy's Euler's equation.

Series Method: Properties of power series, solution of ordinary differential equations. Legendre equations. Legendre Polynpmials and functions, methods of Frobenius, the Gamma function, the Bessel -Clifford equations, Bessel's equation, non-homogeneous equations.

Laplace Transforms: The Laplace transforms (L.T), L.T. of derivaties and integrals, derivatives and integrals of Laplace transforms, L.T. of periodic functions, Inverse Laplace transforms, Convolution theorem, Application of L. T. to solution of differential equations, special techniques.

Fourier Series: Fourier theorem, Fourier expansion, even and odd functions, half range expansion, seems and scale changes, forced oscillation, Miscellaneous expansion techniques.

Matrices: Notation and terminology, solution of simultaneous equations by Gaussian elimination, Rank, computation of rank by reduction of Rewechelon normal form, algebra of matrix, inverse determinants, linear dependence and independence, solution of homogeneous and non-homogenous systems.

Norms and products, Gram-schemidt Process, projection matrix, eiegenvalues, eigenvectors, symmetric and simple matrix, System of linear differential equations the homogenous case.

Vectors: Vector algebra, vector differentiation, vector operator del, gradient, divergence, curl, integral theorem.

UNIT-III: ENGINEERING MECHANICS

Statics: System of co-planer forces - Condition for equilibrium- concept of free body diagrams - Methods of solution of engineering problems, problem with friction, belt friction and screw jack. Force analysis of plane trusses (Method of joints and method of sections) Analysis of frames (Method of members). First moment of area and centroid - theorem of Papus, second moment of areas, polar moment of inertia. Principle of virtual work for a single particle, rigid bodies, ideal systems and constrained bodies.

Dynamics: Kinematics of rigid body - Plane motion, kinetics of translation and rotating rigid bodies, moment of inertia of bodies.

D'Alembert's Principle- Application to a single particle rigid body in translation 'and rotation" ideal systems. Momentum and impulse, application to principle of linear momentum to a single particle, rigid bodies and ideal systems, impact - application of principle of angular momentum to a single particle and rotating rigid bodies, principle of conservation of momentum.

Work and energy: Principle of work and energy for a single particle, rotating rigid body and ideal systems, principle of conservation of energy.

SYLLABUS FOR LATERAL ENTRY FOR B.PHARM.

The course content is same as the syllabus of Part-I of Diploma in Pharmacy as per the Education Regulation - 1991 of Pharmacy Council of India.

SYLLABUS FOR LATERAL ENTRY FOR BHMCT

First, Second and Third-year syllabus as approved by the Ministry of Tourism, Government of India.