B.Pharm (Lateral Entry)	Pharmaceutical Chemistry-I	50	4	200	02 hours
	Pharmaceutical Chemistry-II	50	4	200	
	Total	**100**		**400**	
MBA	Numerical Ability and Analytical Aptitude	25	4	100	02 hours
	Reasoning and logical deduction	25	4	100	
	General Knowledge and current affairs	25	4	100	
	English Language	25	4	100	
	Total	**100**		**400**	
M.Sc. (Maths/ Physics/Chemistry)	Core subject opted (Maths / Physics / Chemistry)	75	4	300	02 hours
	Total	**75**		**300**	
M.Tech. (Civil Engineering / Computer science & Engineering/IT / Electrical Engineering / Electronics & Communications Engg. and Mechanical Engineering	Core subject opted (Civil/ Mechanical/ Electrical/ Electronic and Communications/ Computer Science and Engineering/ IT)	75	4	300	02 hours
	Total	**75**		**300**	

SYLLABUS
UPCET 2021

(APTITUDE TEST FOR BHMCT/BFAD/BFA/B.Voc/MBA (Integrated))

Syllabus of Examination for BHMCT, BFA, BFAD, B. Voc. and MBA (Integrated). UPCET 2021

Test duration: 02 hours. No negative marking

Subject	No. of questions	Marks per question	Total marks
NUMERICAL ABILITY AND ANALYTICAL APTITUDE	25	4	100
REASONING AND LOGICAL DEDUCTION	25	4	100
GENERAL KNOWLEDGE AND CURRENT AFFAIRS	25	4	100
ENGLISH LANGUAGE	25	4	100
Total	**100**		**400**

Section A (Numerical Aptitude): Numerical calculation, arithmetic, simple algebra, geometry and trigonometry, Interpretation of graphs, charts and tables.

- Arithmetical questions up to 10^{th}standard
- Calculation of fraction, percentages, square roots etc.
- Profit & Loss and Interest calculations
- Data/Table analysis, Graph & Bar Diagram and Pie Chart analysis
- Questions related to common use of science(Physics & Chemistry)
- Health & Nutrition

Section B (Reasoning and logical deduction) **Thinking and Decision Making:** Creative thinking, unfamiliar relationships, verbal reasoning, finding patterns trends and Assessment of figures & diagrams.

- Geometrical designs &Identification
- Selection of related letters / words / numbers /figures
- Identification of odd thing / item out from a group
- Completion of numerical series based on the pattern /logic
- Fill in the blanks of the series based on the numerical pattern and logic of the series
- Syllogisms (logic based questions), Identification of logic & selection of correct answers based on the logic

Section C (General Awareness): Knowledge of current affairs and other issues related to trade, industry, economy, sports, culture and science.

- Current affairs / Events (Political, Social, Cultural & Economics)
- Historical events
- Geography including Tourist Places/Spots
- Current affairs relating to Business & Trade
- Countries &Currencies
- Latest Who's Who?
- Sports & Games

Section D (English Language): Grammar, vocabulary, uncommon words, sentence completion, synonyms, antonyms, relationship between words & phrases and comprehension of passages

- Word Meanings
- Antonyms & Synonyms
- Meaning of Phrases &Idioms
- Fill in the blanks
- Complete / Improvement of the sentences with correct use of Pronouns, Verbs, Adverbs & Adjectives
- Reading comprehension's followed by questions

(APTITUDE TEST FOR GENERAL AWARENESS (B. Des)
Syllabus of Examination for admission to B. Des UPCET 2021

Test duration: 02 hours. No negative marking

Subject	No. of questions	Marks per question	Total marks
Numerical Ability and Analytical Aptitude	20	4	80
Reasoning and logical deduction	20	4	80
General Knowledge and current affairs	20	4	80
English Language	20	4	80
Design	20	4	80
Total	**100**		**400**

Section A (Numerical Aptitude): Numerical calculation, arithmetic, simple algebra, geometry and trigonometry, Interpretation of graphs, charts and tables.

- Arithmetical questions up to 10^{th}standard
- Calculation of fraction, percentages, square roots etc.
- Profit & Loss and Interest calculations
- Data/Table analysis, Graph & Bar Diagram and Pie Chart analysis
- Questions related to common use of science(Physics & Chemistry)
- Health & Nutrition

Section B (Thinking and Decision Making): Creative thinking, unfamiliar relationships, verbal reasoning, finding patterns trends and Assessment of figures & diagrams.

- Geometrical designs &Identification
- Selection of related letters / words / numbers /figures
- Identification of odd thing / item out from a group
- Completion of numerical series based on the pattern /logic
- Fill in the blanks of the series based on the numerical pattern and logic of the series
- Syllogisms (logic based questions), Identification of logic & selection of correct answers based on the logic

Section C (General Awareness): Knowledge of current affairs and other issues related to trade, industry, economy, sports, culture and science.

- Current affairs / Events (Political, Social, Cultural & Economics)
- Historical events
- Geography including Tourist Places/Spots
- Current affairs relating to Business & Trade
- Countries &Currencies
- Latest Who's Who?
- Sports & Games

Section D (English Language): Grammar, vocabulary, uncommon words, sentence completion, synonyms, antonyms, relationship between words & phrases and comprehension of passages

- Word Meanings
- Antonyms & Synonyms
- Meaning of Phrases &Idioms
- Fill in the blanks
- Complete / Improvement of the sentences with correct use of Pronouns, Verbs, Adverbs & Adjectives
- Reading comprehension's followed by questions

Section E (Design Aptitude): Observation And Visualization Ability

Pictorial and diagrammatic questions to test, understanding of transformation and/or manipulation of 2D shapes and 3D objects and their spatial relationships, knowledge of practical and everyday mechanical and scientific concepts. Ability to detect concealed properties in ordinary things, people, situations, and events, and thinking critically about them. Applying attention to certain details, analysing, reasoning, classifying, inferring and predicting. Ability to discern subtle differences in visual properties and aesthetic outcomes.

APTITUDE TEST FOR DIPLOMA HOLDERS IN ENGINEERING
Syllabus of Examination for B.Tech (Lateral Entry for Diploma Holders) UPCET 2021

Test duration 02 hours. No negative marking

Subject	No. of questions	Marks per question	Total marks
ENGINEERING APTITUDE	100	4	400
Total	**100**		**400**

1. Engineering Mechanics,
2. Engineering Graphics,
3. Basic Electrical Engineering
4. Basic Electronics Engineering
5. Elements of Computer Science,
6. Elementary Biology,
7. Basic Workshop Practice and
8. Physics/Chemistry/Maths of Diploma standard.

APTITUDE TEST FOR DIPLOMA HOLDERS IN PHARMAC)
Syllabus of Examination for B. Pharm (Lateral Entry) UPCET 2021

Test duration 02 hours. No negative marking

Subject	No. of questions	Marks per question	Total marks
PHARMACEUTICAL CHEMISTRY-I	50	4	200
PHARMACEUTICAL CHEMISTRY-II	50	4	200
Total	**100**		**400**

1. Pharmaceutics-I
2. Pharmaceutical Chemistry -I
3. Pharmacognosy
4. Biochemistry and Clinical Pathology
5. Human Anatomy and Physiology
6. Health Education & Community Pharmacy

7. Pharmaceutics -II
8. Pharmaceutical Chemistry -II
9. Harmacology and Toxicology
10. Pharmaceutical Jurisprudence
11. Drug Store and Business management
12. Hospital and Clinical Pharmacy

Syllabus of Examination for B.Tech (Lateral Entry for B.Sc. Graduates) UPCET 2021

Test duration 02 hours. No negative marking

Subject	No. of questions	Marks per question	Total marks
MATHEMATICS	75	4	300
COMPUTER CONCEPTS	25	4	100
Total	**100**		**400**

MATHEMATICS:

Algebra: Sets relations & functions, De-Morgan's Law, Mapping Inverse relations, Equivalence relations, Peano's axioms, Definition of rationals and integers through equivalence relation, Indices and surds, Solutions of simultaneous and quadratic equations, A.P., G.P. and H.P., Special sums i.e. $\sum n^2$ and $\sum n^3$ ($n \sum N$), Partial fraction, Binomial theorem for any index, exponential series, Logarithm and Logarithmic series. Determinants and their use in solving simultaneous linear equations, Matrices, Algebra of matrices, Inverse of a matrix, Use of matrix for solving equations.

Probability: Definition, Dependent and independent events, Numerical problem on addition and multiplication, theorem of probability**.**

Trigonometry: Identities, Trigonometric equations, properties of triangles, solution of triangles, heights and distances, Inverse function, Complex numbers and their properties, Cube roots of unity, De-Moivre's theorem. **Co-ordinate Geometry**: Pair of straight lines, Circles, General equation of second degree, parabola, ellipse and hyperbola, tracing of conics.

Calculus: Limits & continuity of functions, Differentiation of function of function, tangents & normal, Simple examples of Maxima & Minima, Indeterminate forms, Integration of function by parts, by substitution and by partial fraction, definite integral, application to volumes and surfaces of frustums of sphere, cone and cylinder. Differential equations of first order and of first degree.

Vectors: Algebra of vectors, scalar and vector products of two and three vectors and their applications.

Dynamics: Velocity, composition of velocity, relative velocity, acceleration, composition of accelerations, Motion under gravity, Projectiles, Laws of motion, Principles of conservation of momentum and energy, direct impact of smooth bodies.

Statics: Composition of coplanar, concurrent and parallel forces moments and couples resultant of set of coplanar forces and condition of equilibrium, determination of centroid in simple cases, Problems involving friction.

COMPUTER CONCEPTS:

Computer Basics: Organization of computer, Central Processing unit (CPU), Structure of instructions in CPU, Input/ Output devices, Computer memory, Memory organization,

Data Representation-: Representation of characters, Integers, Binary and hexadecimal representation, Binary arithmetic – addition, subtraction, division, multiplication, signed arithmetic and two's complement arithmetic. Floating point representation of numbers, normalized floating point representation, Boolean algebra, truth tables, Venn diagrams

Data Structures: Arrays, lists, stacks, queues

Computer Architecture: Block structure of computers, Communication between processor and I/O devices, Interrupts

Computer Language:-Assembly language and high level language, Computer programming in C

Operating System Basics:

Syllabus for MCA- UPCET2021

I. Syllabus of Examination for admission to MCA

Test duration 02 hours. No negative marking

Subject	No. of questions	Marks per question	Total marks
Numerical Ability and Analytical Aptitude	25	4	100
Reasoning and logical deduction	25	4	100
Mathematics	25	4	100
Computer awareness	25	4	100
Total	**100**		**400**

Section A (Numerical Aptitude): Numerical calculation, arithmetic, simple algebra, geometry and trigonometry, Interpretation of graphs, charts and tables.

- Arithmetical questions up to 10^{th}standard
- Calculation of fraction, percentages, square roots etc.
- Profit & Loss and Interest calculations
- Data/Table analysis, Graph & Bar Diagram and Pie Chart analysis
- Questions related to common use of science(Physics & Chemistry)
- Health & Nutrition

Section B (Reasoning and logical deduction) Thinking and Decision Making: Creative thinking, unfamiliar relationships, verbal reasoning, finding patterns trends and Assessment of figures & diagrams.

- Geometrical designs &Identification
- Selection of related letters / words / numbers /figures
- Identification of odd thing / item out from a group
- Completion of numerical series based on the pattern /logic
- Fill in the blanks of the series based on the numerical pattern and logic of the series
- Syllogisms (logic based questions), Identification of logic & selection of correct answers based on the logic

Section C (Mathematics):

- Set Theory: Concept of sets – Union, Intersection, Cardinality, Elementary counting; permutations and combinations. • Probability and Statistics: Basic concepts of probability theory, Averages, Dependent and independent events, frequency distributions, measures of central tendencies and dispersions.
- Algebra: Fundamental operations in algebra, expansions, factorization, simultaneous linear /quadratic equations, indices, logarithms, arithmetic, geometric and harmonic progressions, determinants and matrices.
- Coordinate Geometry: Rectangular Cartesian coordinates, distance formulae, equation of a line, and intersection of lines, pair of straight lines, equations of a circle, parabola, ellipse and hyperbola.
- Calculus: Limit of functions, continuous function, differentiation of function, tangents and normals, simple examples of maxima and minima. Integration of functions by parts, by substitution and by partial fraction, definite integrals, applications of definite integrals to areas.
- Vectors: Position vector, addition and subtraction of vectors, scalar and vector products and their applications to simple geometrical problems and mechanics.
- Trigonometry: Simple identities, trigonometric equations, properties of triangles, solution of triangles, heights and distances, general solutions of trigonometric equations.

Section D (Computer Awareness):

- Computer Basics: Organization of a computer, Central Processing Unit (CPU), structure of instructions in CPU, input/output devices, computer memory, and back-up devices.
- Data Representation: Representation of characters, integers and fractions, binary and hexadecimal representations, binary arithmetic: addition, subtraction, multiplication, division, simple arithmetic and two's complement arithmetic, floating point representation of numbers, Boolean algebra, truth tables, Venn diagrams.

Syllabus of Examination for admission to MCA (Integrated) UPCET 2021

Test duration 02 hours. No negative marking

Subject	No. of questions	Marks per question	Total marks
NUMERICAL ABILITY AND ANALYTICAL APTITUDE	25	4	100
REASONING AND LOGICAL DEDUCTION	25	4	100
MATHEMATICS/STATISTICS/ACCOUNTS	50	4	200
Total	**100**		**400**

Section A (Numerical Aptitude): Numerical calculation, arithmetic, simple algebra, geometry and trigonometry, Interpretation of graphs, charts and tables.

- Arithmetical questions up to 10^{th}standard
- Calculation of fraction, percentages, square roots etc.
- Profit & Loss and Interest calculations
- Data/Table analysis, Graph & Bar Diagram and Pie Chart analysis
- Questions related to common use of science(Physics & Chemistry)
- Health & Nutrition

Section B (Reasoning and logical deduction) Thinking and Decision Making: Creative thinking, unfamiliar relationships, verbal reasoning, finding patterns trends and Assessment of figures & diagrams.

- Geometrical designs &Identification
- Selection of related letters / words / numbers /figures
- Identification of odd thing / item out from a group
- Completion of numerical series based on the pattern /logic
- Fill in the blanks of the series based on the numerical pattern and logic of the series
- Syllogisms (logic based questions), Identification of logic & selection of correct answers based on the logic

Section C (Mathematics/Statistics/Accounts)

MATHEMATICS

Algebra: Sets relations & functions, De-Morgan's Law, Mapping Inverse relations, Equivalence relations, Peano's axioms, Definition of rationals and integers through equivalence relation, Indices and surds, Solutions of simultaneous and quadratic equations, A.P., G.P. and H.P., Special sums i.e. $\sum n^2$ and $\sum n^3$ ($n\sum N$), Partial fraction, Binomial theorem for any index, exponential series, Logarithm and Logarithmic series.Determinantsandtheiruseinsolvingsimultaneouslinearequations,Matrices,Algebraofmatrices, Inverse of a matrix, Use of matrix for solving equations.

Probability: Definition, Dependent and independent events, Numerical problem on addition and multiplication, theorem of probability**.**

Trigonometry: Identities, Trigonometric equations, properties of triangles, solution of triangles, heights and distances, Inverse function, Complex numbers and their properties, Cube roots of unity, De-Moivre's theorem. **Co-ordinate Geometry**: Pair of straight lines, Circles, General equation of second degree, parabola, ellipse and hyperbola, tracing of conics.

Calculus: Limits & continuity of functions, Differentiation of function of function, tangents & normal, Simple examples of Maxima & Minima, Indeterminate forms, Integration of function by parts, by substitution and by partial fraction, definite integral, application to volumes and surfaces of frustums of sphere, cone and cylinder. Differential equations of first order and of first degree.

Vectors: Algebra of vectors, scalar and vector products of two and three vectors and their applications.

STATISTICS (10+2) Syllabus NCERT

ACCOUNTS (10+2) Syllabus NCERT

Syllabus for for B. Pharm, B.Tech (BT)– UPCET 2021

Scheme of Examination: Test duration: 03 hours. No negative marking

Subject	No. of questions	Marks per question	Total marks
Physics	50	4	200
Chemistry	50	4	200
Biology/Mathematics	50	4	200
Total	**150**		**600**

Syllabus for for B.Tech (AG) – UPCET 2021

Scheme of Examination: Test duration: 03 hours. No negative marking

Subject	No. of questions	Marks per question	Total marks
Physics	50	4	200
Chemistry	50	4	200
Mathematics	50	4	200
Total	**150**		**600**

PHYSICS

Measurement: Dimensional analysis and error estimation, dimensional compatibility and significant figures. **Motion in one dimension:** Average velocity, instantaneous velocity, one-dimensional motion with constant accelerations, freely falling bodies.

Laws of Motion: Force and inertia, Newton's laws of motion, and their significance.

Motion in two dimensions: Projectile motion, uniform circular motion, tangential and radial acceleration in curve-linear motion, relative motion and relative acceleration.

Work, Power and Energy: Work done by a constant and variable forces, kinetic and potential energy, power, Conservative and non-conservative forces, conservation of energy, gravitational energy, work energy theorem, potential energy stored in a spring.

Linear Momentum & collisions: Linear momentum & impulse, conservation of linear momentum for two particle system, collisions, collision in one dimension, collision in two dimension, rocket propulsion.

Rotation of a rigid body about a fixed axis: Angular velocity and angular acceleration, rotational kinematics, rotational motion with constant angular acceleration relationship between angular and linear quantities, rotational energy, moment of inertia for a ring, rod, spherical shell, sphere and plane lamina, torque and angular acceleration, work and energy in rotational motion, rolling motion of a solid sphere and cylinder. **Gravitation:** Gravitational field, Kepler's laws and motion of planets, planetary and satellite motion, geostationary satellite.

Oscillatory motion: Harmonic motion, oscillatory motion of mass attached to a spring, kinetic & potential energy, Time Period of a simple pendulum, comparing simple and harmonic motion with uniform circular motion, forced oscillations, damped oscillations and resonance.

Mechanics of solids and fluids: States of matter young's modulus, bulk modulus, shear modulus of rigidity, variations of pressure with depth, Buoyant forces and Archimedes principle, Pascal's law, Bernoulli's theorem and its application, surface energy, surface tension, angle of contact, capillary rise, coefficient of viscosity, viscous force, terminal velocity, Stoke's law, stream line motion, Reynold's numbers.

Heat and thermodynamics: First law of thermodynamics, specific heat of an ideal gas at constant volume and constant pressure, relation between them, thermodynamics process (reversible, irreversible, isothermal, adiabatic), second law of thermodynamics, concept of entropy and concept of absolute scale, efficiency of a Carnot engine, thermal conductivity, Newton's law of cooling, black body radiation, Wien's displacement law, Stefan's law.

Wave: Wave motion, phase, amplitude and velocity of wave, Newton's formula for longitudinal waves, propagation of sound waves in air, effect of temperature and pressure on velocity of sound, Laplace's correction, Principle of superposition, formation of standing waves, standing waves in strings and pipes, beats, Doppler's effect.

Electrostatics: Coulomb's law, electric field and potential due to point charge, dipole and its field along the axis and perpendicular to axis, electric flux, Gauss's theorem and its applications to find the field due to infinite sheet of charge, and inside the hallow conducting sphere, capacitance, parallel plate capacitor with air and dielectric medium between the Plates, series and parallel combination of capacitors, energy of a capacitor, displacement currents.

Current Electricity: Concept of free and bound electrons, drift velocity and mobility, electric current, Ohm's law, resistivity, conductivity, temperature dependency of resistance, resistance in series and parallel combination, Kirchhoff's law and their application to network of resistances, principle of potentiometer, effect of temperature on resistance and its application.

Magnetic Effect of Current: Magnetic field due to current, Biot- Savart's law, magnetic field due to solenoid, motion of charge in a magnetic field, force on a current carrying conductors and torque on current loop in a magnetic field, magnetic flux, forces between two parallel current carrying conductors, moving coil galvanometer and its conversion into ammeter and voltmeter.

Magnetism in Matter: The magnetization of substance due to orbital and spin motions of electrons, magnetic moment of atoms, diamagnetism, para magnetism, ferromagnetism, earth's magnetic field and its components and their measurement.

Electromagnetic induction: Induced e.m.f., Faraday's laws, Lenz's law, electromagnetic induction, self and mutual induction, B-H curve, hysteresis loss and its importance, eddy currents.

Ray Optics and optical instruments: Sources of light, luminous intensity, luminous flux, illuminance, photometry, wave nature of light, Huygen's theory for propagation of light and rectilinear propagation of light, reflection of light , total internal reflection, reflection and refraction at spherical surfaces, focal length of a combination of lenses, spherical and chromatic aberration and their removal, refraction and dispersion of light due to a prism, simple and compound microscope, reflecting and refracting telescope, magnifying power and resolving power.

Wave Optics: Coherent and incoherent sources of light, interference, young's double slit experiment diffraction due to a single slit, linearly polarized light, Polaroid.

Modern Physics: Photo-electricequation,matterwaves,quantization,Planck'shypothesis,Bohr's model of hydrogen atom and its spectra, ionization potential, Rydberg constant, solar spectrum and Fraunhofer lines, fluorescence and phosphorescence, X-Rays and their productions, characteristic and continuous spectra.

Nuclear Instability, radioactive decay laws, Emission of α, β, γrays, Mass - defect, Mass Energy equivalence, Nuclear Fission Nuclear Reactors, Nuclear Fusion.

Classification of conductors, Insulators and semiconductors on the basis of energy bands in solids, PN junction, PN Diode, junction Transistors, Transistor as an amplifier and Oscillator.

Principles of Logic Gates (AND, OR and NOT) Analog Vs Digital communication, Difference between Radio and television, Signal propagation, Principle of LASER and MASER, Population Inversion, Spontaneous and stimulated Emission.

CHEMISTRY

Atomic Structure: Bohr's concept. Quantum numbers, Electronic configuration, molecular orbitaltheory for homo-nuclear molecules, Pauli's exclusion principle.

Chemical Bonding: Electrovalency, co-valency, hybridization involving s, p and d orbitals hydrogen bonding.

Redox Reactions: Oxidation number, oxidising and reducing agents, balancing of equations.

Chemical Equilibrium and Kinetics: Equilibrium constant (for gaseous system only) Le Chatelier's principle, ionic equilibrium, Ostwald's dilution law, hydrolysis, pH and buffer solution, solubility product, common-ion effect, rate constant and first order reaction.

Acid-Base Concepts: Bronsted Lowry & Lewis. **Electrochemistry**: Electrode potential and electro-chemical series. **Catalysis**: Types and applications.

Colloids: Types and preparation, Brownian movement, Tyndall effect, coagulation and peptization. **Colligative Properties of Solution**: Lowering of vapor pressure, Osmotic pressure, depression of freezing point, elevation of boiling point, determination of molecular weight.

Periodic Table: Classification of elements on the basis of electronic configuration, properties of s,p and d block elements, ionization potential, electronegativity & electron affinity.

Preparation and Properties of the following: Hydrogen peroxide. copper sulfate, silver nitrate, plaster of paris, borax, Mohr's salt, alums, white and red lead, microcosmic salt and bleaching powder, sodium thiosulfate.

Thermo-chemistry: Exothermic & endothermic reactions Heat of reaction, Heat of combustion & formation, neutralization, Hess's law.

General Organic Chemistry: Shape of organic compounds, Inductive effect, mesomeric effect, electrophiles & nucleophiles, Reaction intermediates: carbonium ion, carbanions & free radical, Types of organic reactions, Cannizzaro Friedel Craft, Perkin, Aldol condensation.

Isomerism: Structural, Geometrical & Optical **IUPAC**: Nomenclature of simple organic compounds.

Polymers: Addition & condensation polymers **Corbohydrates**: Monosaccharides.

Preparation and Properties Of the Followings: Hydrocarbons, monohydric alcohols, aldehydes, ketones, monocarboxylic acids, primary amines, benzene, nitrobenzene, aniline, phenol, benzaldehyde, benzoic acid, Grignard Reagent.

Solid State: Structure of simple ionic compounds,Crystal imperfections (point defects only), Born-Haber cycle

Petroleum: Important industrial fractions, cracking, octane number, anti-knocking compounds.

MATHEMATICS

Algebra: Sets relations & functions, De-Morgan's Law, Mapping Inverse relations, Equivalence relations, Peano's axioms, Definition of rationals and integers through equivalence relation, Indices and surds, Solutions of simultaneous and quadratic equations, A.P., G.P. and H.P., Special sums i.e. $\sum n^2$ and $\sum n^3$ ($n\sum N$), Partial fraction, Binomial theorem for any index, exponential series, Logarithm and Logarithmic series.Determinantsandtheiruseinsolvingsimultaneouslinearequations,Matrices,Algebraofmatrices, Inverse of a matrix, Use of matrix for solving equations.

Probability: Definition, Dependent and independent events, Numerical problem on addition and multiplication, theorem of probability**.**

Trigonometry: Identities, Trigonometric equations, properties of triangles, solution of triangles, heights and distances, Inverse function, Complex numbers and their properties, Cube roots of unity, De-Moivre's theorem.
Co-ordinate Geometry: Pair of straight lines, Circles, General equation of second degree, parabola, ellipse and hyperbola, tracing of conics.

Calculus: Limits & continuity of functions, Differentiation of function of function, tangents & normal, Simple examples of Maxima & Minima, Indeterminate forms, Integration of function by parts, by substitution and by partial fraction, definite integral, application to volumes and surfaces of frustums of sphere, cone and cylinder. Differential equations of first order and of first degree.

Vectors: Algebra of vectors, scalar and vector products of two and three vectors and their applications.
Dynamics: Velocity, composition of velocity, relative velocity, acceleration, composition of accelerations, Motion under gravity, Projectiles, Laws of motion, Principles of conservation of momentum and energy, direct impact of smooth bodies.

Statics: Composition of coplanar, concurrent and parallel forces moments and couples resultant of set of coplanar forces and condition of equilibrium, determination of centroid in simple cases, Problems involving friction.

BIOLOGY

ZOOLOGY

Origin of Life: Oparin's theory, Miller's Experiment, Viruses - structure, properties, distribution, classification and pathogenesis (Eg. AIDS, CANCER), Viroids& Prions, Biotic balance.

Organic Evolution: Relationship among organisms and Evidences of organic Evolution - Principles of Evolution - Lamarckism, Darwinism and Speciation.

Mechanism of Organic Evolution: Variations - Definition, causes and types, Mutations (Principles of Hugo de'vries), Role of mutations in speciation. Evolution through ages and human evolution

Human Genetics and Eugenics: Human hereditary traits, study of Twins, A.B.O. blood groups and their inheritance, Rh-factor, Sex determination. Chromosomal aberrations, Important human syndromes, Sex linked characters and their inheritance, Applied Genetics - eugenics, euthenics, euphenics& I.Q. Test.

Applied Biology: Wild life of India - Endangered species: Biosphere Reserves, National Parks and sanctuaries, Project Tiger, Conservation of wild life, Bio-energy, Poultry, Fisheries (edible fishes), Human Population, Population explosion, problems & control. Test-Tube babies, & Amniocentesis, Application of Biotechnology in human welfare. Human Aging.

Mammalian Anatomy (Eg. Rabbit): Reproductive system (excluding embryonic development) Osteology, structure and organization of different systems.

Animal Physiology:

(A) Animal Nutrition: Food, Balanced diet, Nutritional imbalances and deficiency diseases, Digestion, Absorption, Assimilation of food, (comparison between human and Rabbit).

(B) Animal Excretion and Osmoregulation: Chemical nature of excretory products in various animals, Physiology of excretion, Function of liver and kidney (Homeostatic regulatory functions of kidneys), Formation of urine, Osmoregulation by kidneys.

(C) Respiratory system: Exchange and transport of gases (O_2 and Co_2) factors affecting O_2 and Co_2 transport, Cellular respiration, different lung volumes, breathing and sound production.

(D) Nervous systems: Central, autonomic and peripheral nervous system, Receptors, Effectors, Reflex action. Nature and conduction of Nerve- impulses, Synapse, Sense organs - Structure & working of Eye & Ear, Biochemistry of vision and taste buds.

(E) Endocrine System: Different endocrine glands and Hormones - definition, types, characteristics and their functions, (in relation to human beings), Hormonal disorders and pheromones.

(F) Circulatory System: Circulation of body fluids- Blood and lymph, Open and closed vascular systems, Structure and working physiology of Heart, Comparison between arteries and veins, Lymphatic system.

(G) Animal Diversity: Classification of Animal kingdom (Basedon Storar & Eusinger),Characteristic feature of different phyla and classes with examples.

Detailed studies of followings:

A. Protozoa
B. Amoeba-Habit & Habitat, structure, locomotion, reproduction, Osmoregulation, Parasitic amoeba
C. Entamoeba histolytica and Entamoeba gingivalis, structure, diseases caused by them and their control measures.
D. Plasmodium vivax-life-cycle, malaria therapy and control.
E. Protozoan and diseases
F. Porifera: A simple sponge (Leucosolenia); detailed study of structure & physiology, Sponge industry.
G. Coelenterata: Hydra - Habit and Habitat, morphology, tissue differentiation in relation to physiological division of labour and regeneration.
H. Aschelminthes: Ascaris- morphology, life-cycle, therapy and control.
I. Annelida: Pheretima posthuma - Bionomics and economic importance.
J. Arthropoda: (Periplaneta): Structure- external and internal.

Comparison between Periplaneta and Blatta.

(i) House fly & Mosquito: structure and life–cycle

(ii) Economic importance of insets & their control.

BOTANY

Plant Cell: Structure & functions electron microscopic structured mitochondria, Plastids centrosomes. Lysosomes, microsomes, endoplasmic reticulum, Nucleus, Golgibodes, D.N.A & R.N.A. Cytoplasm, membranes and cell wall.

Protoplasm: structure, components physical and chemical properties.

Cell division (formation) - free cell formation, Amitosis & Meiosis, Duplication of D.N.A.

Ecology: Ecological factors (atmospheric, edaphic, climatic, geological & biotic factors).

Ecosystem: Structure, components of ecosystem eg. Water soluble minerals and gases, producers consumers, decomposers, Pond and forest ecosystem.

Atmospheric pollution-causes and control, Types of pollution - Detergents, chemicals automobile exhaust, Radioactive matter, Smog, sound, Pesticides.

Genetics: Mendalism, Mendals experiment and law of inheritance.

Modern Classification of plant kingdom- (according to Ostwald &Tippo) (outline).

Seeds in angiospermic plants: description of development of angiospermic plants (life history of angiospermic plants).

Fruits: Dispersal of fruits and seeds

Cell differentiation Plant Tissue: Meristematic classification of meristematic & permanent tissue and functions and classification of tissue system.

Anatomy of Root, stem and leaf: difference between dicot and Monocot stem. Secondary growth of stem and root. Anatomy of hydrophytes, Xeophytes & Mesophytes.

Important phylums:

Algae: Habitat, general characters & uses, description of ulothrix& spirogyra. Bacteria: structure - types of nutrition, reproduction and economic importance.

Fungi: structure description of Rhizopus and yeast and their economic importance, Fermentation. Broyophyta: structure and economic importance, description of funaria (Moss)

Pteridophyta: general structures of pteridophytes description of fern (Droypteris) General study of gymnosperms and life history of cycas.

Classification of angiosperm, Description of families - identification and economic importance Cruciferae, Malvaceae, Leguminosae, compositeae, cucurbitaceae.

Soil: Absorption of water through root hairs osmosis, Translocation and Root pressure Nitrogen cycle.

Special modes of nutrition in plants (Autotrophic, heterotrophic, Parasites, saprophytes, Symbionts insectivorous and their ecological relation.

Photosynthesis: Chloroplast, light, chlorophyll and Carbon dioxide, Mechanism of photosynthesis formation of A.T.P. and their functions and importance of photosynthesis.

Transpiration: factors and importance, Mechanism of opening and closing of stomata.

Respiration: aerobic, anaerobic respiration, mechanism of respiration (Glycolysis, Kreb's cycle, E.T.S.) Growth & movement: definition of growth, Region of growth & their measurements, types of movements in plants, Growth harmone.

Syllabus of Examination for BBA

Qualitative **and** Quantitative Aptitude**:** Number System, Profit & Loss, Percentage & Average, Work & Time,HCF & LCM, Ratio & Proportion, Time-Speed-Distance, Algebra & Geometry, Coding & Decoding, Multidimensional Arrangements, Visual Reasoning, Course of Action, Critical Reasoning, Statement Conclusions, Pie Chart, Syllogisms, Puzzles

English**:** Verbal Reasoning, Syllogisms, Jumbled Paragraphs, Sentence Completion, Sentence Correction, SameWord & different usage, Idioms & Analogies, Synonyms & Antonyms, One-word Substitution.

Test duration: 02 hours. No negative marking

Subject	No. of questions	Marks per question	Total marks
NUMERICAL ABILITY AND ANALYTICAL APTITUDE	25	4	100
REASONING AND LOGICAL DEDUCTION	25	4	100
GENERAL KNOWLEDGE AND CURRENT AFFAIRS	25	4	100
ENGLISH LANGUAGE	25	4	100
Total	**100**		**400**

Section A (Numerical Aptitude): Numerical calculation, arithmetic, simple algebra, geometry and trigonometry, Interpretation of graphs, charts and tables.

- Arithmetical questions up to 10^{th}standard
- Calculation of fraction, percentages, square roots etc.
- Profit & Loss and Interest calculations
- Data/Table analysis, Graph & Bar Diagram and Pie Chart analysis
- Questions related to common use of science(Physics & Chemistry)
- Health & Nutrition

Section B (Reasoning and logical deduction) **Thinking and Decision Making:** Creative thinking, unfamiliar relationships, verbal reasoning, finding patterns trends and Assessment of figures & diagrams.

- Geometrical designs &Identification
- Selection of related letters / words / numbers /figures
- Identification of odd thing / item out from a group
- Completion of numerical series based on the pattern /logic
- Fill in the blanks of the series based on the numerical pattern and logic of the series
- Syllogisms (logic based questions), Identification of logic & selection of correct answers based on the logic

Section C (General Awareness): Knowledge of current affairs and other issues related to trade, industry, economy, sports, culture and science.

- Current affairs / Events (Political, Social, Cultural & Economics)
- Historical events
- Geography including Tourist Places/Spots
- Current affairs relating to Business & Trade
- Countries &Currencies
- Latest Who's Who?
- Sports & Games

Section D (English Language): Grammar, vocabulary, uncommon words, sentence completion, synonyms, antonyms, relationship between words & phrases and comprehension of passages

- Word Meanings
- Antonyms & Synonyms
- Meaning of Phrases &Idioms
- Fill in the blanks
- Complete / Improvement of the sentences with correct use of Pronouns, Verbs, Adverbs & Adjective
- Reading comprehension's followed by questions

Syllabus of Examination for MBA

Test duration: 02 hours. No negative marking

Subject	No. of questions	Marks per question	Total marks
NUMERICAL ABILITY AND ANALYTICAL APTITUDE	25	4	100
REASONING AND LOGICAL DEDUCTION	25	4	100
GENERAL KNOWLEDGE AND CURRENT AFFAIRS	25	4	100
ENGLISH LANGUAGE	25	4	100
Total	**100**		**400**

Section A (Numerical Aptitude): Numerical calculation, arithmetic, simple algebra, geometry and trigonometry, Interpretation of graphs, charts and tables.

- Arithmetical questions up to 10^{th}standard
- Calculation of fraction, percentages, square roots etc.
- Profit & Loss and Interest calculations
- Data/Table analysis, Graph & Bar Diagram and Pie Chart analysis
- Questions related to common use of science(Physics & Chemistry)
- Health & Nutrition

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- Reading comprehension's followed by questions

Scheme of Examination for M.Tech. (Civil Engineering / Computer Science & Engineering /IT/ Electrical Engineering/Electronics and Communications Engineering and Mechanical Engineering.

Test duration: 02 hours. No negative marking. Each paper will be on anyone of the core subject opted by the candidate.

Subject	No. of questions	Marks per question	Total marks
Core subject opted (Civil/ Computer Science and Engineering/ IT/ Electrical Engineering/ Electronic & Communication Engineering/ Mechanical Engineering)	75	4	300
Total	**75**		**300**

Syllabus for Admission test of M.Tech.

For admission to M.Tech. programme, the admission test shall include objective type questions from the core subjects of the respective disciplines (Civil Engineering / Computer science & Engineering/IT/Electrical Engineering/ Electronics and Communications Engineering and Mechanical Engineering.

I. Scheme of Examination for M.Sc. (Maths / Physics/ Chemistry)

Test duration: 02 hours. No negative marking. Each paper will be on anyone of the core subject opted by the candidate.

Subject	No. of questions	Marks per question	Total marks
Core subject opted (Maths / Physics / Chemistry)	75	4	300
Total	**75**		**300**

Syllabus for Admission test of M.Sc. Mathematics

Sequences and Series of Real Numbers: Sequence of real numbers, convergence of sequences, bounded and monotone sequences, convergence criteria for sequences of real numbers, Cauchy sequences, subsequences, Bolzano-Weierstrass theorem. Series of real numbers, absolute convergence, tests of convergence for series of positive terms- comparison test, ratio test, root test; Leibniz test for convergence of alternating series.

Mathematical Programming: Simplex method, Dual Simplex method, Transportation Problem, Assignment Problem, Game Theory.

Numerical Analysis: Finite differences, Numerical solutions of algebraic equation, Method of iteration and Newton-Raphson method, Rate of convergence, Solution of systems of linear algebraic equations using Gauss elimination and Gauss-Seidel method.

Integral Calculus: Integration as the inverse process of differentiation, definite integrals and their properties, fundamental theorem of calculus. Double and triple integrals, change of order of integration, calculating surface areas and volumes using double integrals, calculating volumes using triple integrals.

Differential Equations: Ordinary differential equations of the first order of the form $y'=f(x,y)$, Bernoulli's equation, exact differential equations, integrating factor, orthogonal trajectories, homogeneous differential equations, variable separable equations, linear differential equations of second order with constant coefficients, method of variation of parameters, Cauchy-Euler equation.

Vector Calculus: Scalar and vector fields, gradient, divergence, curl, line integrals, surface integrals, Green, Stokes and Gauss theorems.

Group Theory: Groups, subgroups, Abelian groups, non-Abelian groups, cyclic groups, permutation groups, normal subgroups, Lagrange's Theorem for finite groups, group homomorphisms and basic concepts of quotientgroups.

Linear Algebra: Finite dimensional vector spaces, linear independence of vectors, basis, dimension, linear transformations, matrix representation, range space, null space, rank-nullity theorem. Rank and inverse of a matrix, determinant, solutions of systems of linear equations, consistency conditions, eigen values and eigenvectors for matrices, Cayley-Hamilton theorem.

Real Analysis: Interior points, limit points, open sets, closed sets, bounded sets, connected sets, compact sets, completeness of R. Power series (of real variable), Taylor's series, radius and interval of convergence, term- wise differentiation and integration of power series. Functions of One Real Variable: Limit, continuity, partial derivatives, differentiability, maxima and minima. Functions of Two or Three Real Variables: Limit, continuity, partial derivatives, differentiability, maxima and minima.

Syllabus for Admission test of M.Sc. Physics

Mathematical Methods: Calculus of single and multiple variables, partial derivatives, Jacobian, imperfect and perfect differentials, Taylor expansion, Fourier series. Vector algebra, Vector Calculus, Multiple integrals, Divergence theorem, Green's theorem, Stokes' theorem. First order equations and linear second order differential equations with constant coefficients. Matrices and determinants, Algebra of complex numbers.

Mechanics and General Properties of Matter: Newton's laws of motion and applications, Velocity and acceleration in Cartesian, polar and cylindrical coordinate systems, uniformly rotating frame, centrifugal and Coriolis forces, Motion under a central force, Kepler's laws, Gravitational Law and field, Conservative and non- conservative forces. System of particles, Center of mass, equation of motion of the CM, conservation of linear and angular momentum, conservation of energy, variable mass systems. Elastic and inelastic collisions. Rigid body motion, fixed axis rotations, rotation and translation, moments of Inertia and products of Inertia, parallel and perpendicular axes theorem. Principal moments and axes. Kinematics of moving fluids, equation of continuity, Euler's equation, Bernoulli's theorem.

Oscillations, Waves and Optics: Differential equation for simple harmonic oscillator and its general solution. Superposition of two or more simple harmonic oscillators. Lissajous figures. Damped and forced oscillators, resonance. Wave equation, traveling and standing waves in one-dimension. Energy density and energy transmission in waves. Group velocity and phase velocity. Sound waves in media. Doppler Effect. Fermat's Principle. General theory of image formation. Thick lens, thin lens and lens combinations. Interference of light, optical path retardation. Fraunhofer diffraction. Rayleigh criterion and resolving power. Diffraction gratings. Polarization: linear, circular and elliptic polarization. Double refraction and optical rotation.

Electricity and Magnetism: Coulomb's law, Gauss's law. Electric field and potential. Electrostatic boundary conditions, Solution of Laplace's equation for simple cases. Conductors, capacitors, dielectrics, dielectric polarization, volume and surface charges, electrostatic energy. Biot-Savart law, Ampere's law, Faraday's law of electromagnetic induction, Self and mutual inductance. Alternating currents. Simple DC and AC circuits with R, L and C components. Displacement current, Maxwell's equations and plane electromagnetic waves, Poynting's theorem, reflection and refraction at a dielectric interface, transmission and reflection coefficients (normal incidence only). Lorentz Force and motion of charged particles in electric and magnetic fields.

Kinetic theory, Thermodynamics: Elements of Kinetic theory of gases. Velocity distribution and Equipartitionof energy. Specific heat of Mono-, di- and tri-atomic gases. Ideal gas, van-der-Waals gas and equation of state. Mean free path. Laws of thermodynamics. Zeroth law and concept of thermal equilibrium. First law and its consequences. Isothermal and adiabatic processes. Reversible, irreversible and quasi-static processes. Second
law and entropy. Carnot cycle. Maxwell's thermodynamic relations and simple applications. Thermodynamic potentials and their applications. Phase transitions and Clausius-Clapeyron equation. Ideas of ensembles, Maxwell-Boltzmann, Fermi-Dirac and Bose-Einstein distributions.

Modern Physics: Inertial frames and Galilean invariance. Postulates of special relativity. Lorentz transformations. Length contraction, time dilation. Relativistic velocity addition theorem, mass energy equivalence. Blackbody radiation, photoelectric effect, Compton effect, Bohr's atomic model, X-rays. Wave- particle duality, Uncertainty principle, the superposition principle, calculation of expectation values, Schrodinger equation and its solution for one, two and three dimensional boxes. Solution of Schrodinger equation for the one-dimensional harmonic oscillator. Reflection and transmission at a step potential, Pauli exclusion principle. Structure of atomic nucleus, mass and binding energy. Radioactivity and its applications. Laws of radioactive decay.

Solid State Physics, Devices and Electronics: Crystal structure, Bravais lattices and basis. Miller indices. X- ray diffraction and Bragg's law; Intrinsic and extrinsic semiconductors, variation of resistivity with temperature. Fermi level. p-n junction diode, I-V characteristics, Zener diode and its applications, BJT: characteristics in CB, CE, CC modes. Single stage amplifier, two stage R-C coupled amplifiers. Simple Oscillators: Barkhausen condition, sinusoidal oscillators. OPAMP and applications: Inverting and non-inverting amplifier. Boolean algebra: Binary number systems; conversion from one system to another

system; binary addition and subtraction. Logic Gates AND, OR, NOT, NAND, NOR exclusive OR; Truth tables; combination of gates; de Morgan's theorem.

Atomic Physics and Laser: Bohr and Sommerfeld model of atom. Idea of discrete energy levels and electron spin: Fanck – Hertz and Stern – Gerlach experiments. Significance of four quantum numbers and concept of atomic orbitals. Orbital magnetic dipole moment, Orbital, spin and total angular momenta, Larmor precession, Vector model of atom, Electronic configuration and atomic states, Spin-orbit interaction and fine structure, Intensity of spectral lines, General selection rules. Normal Zeeman Effect. Two valence electron atoms: LS and JJ coupling schemes and resulting spectra. Idea of normal and inverted doublet. Basics of stark effect. Einstein coefficients, Threshold condition for LASER action, Rate equation for three level laser system, Characteristics of laser radiation. He-Ne and Nd-YAG Laser. Significance of non-linear polarization of lasers and some applications: Second harmonic generation using non-linear optical methods.

Syllabus for Admission test of M.Sc. Chemistry

Reactions and reagents: Organometallic compounds - Grignard reagent - synthesis of different types of compounds like alcohol, aldehyde, acid, amine and organometallic. Acetoacetic ester - tautomerism - base hydrolysis - acid hydrolysis - malonic ester - cyano acetic ester - synthesis of dicarboylic acids and unsaturatedacids.

Carbohydrates:Occurrence, classification and their biological importance. Monosaccharides: Constitution and absolute configuration of glucose and fructose, epimers and anomers, mutarotation, determination of ring size ofglucose and fructose, Haworth projections and conformational structures.

Alicyclic compounds, aromatic compounds, fats and oils: Alicyclic compounds - nomenclature - synthesis of alicyclic compounds using carbon - acroyloin condensation - Diels Alder reaction, Freunds's synthesis - bayer's strain theory postulates, drawbacks - theory of strainless rings - conformations of cyclohexane.

Amino Acids, Peptides and Proteins: Amino acids, Peptides and their classification. α-Amino Acids - Synthesis, ionic properties and reactions. Zwitterions, pKa values, isoelectric point and electrophoresis; Study of peptides: determination of their primary structures-end group analysis, methods of peptide synthesis. Synthesis of peptides using N-protecting,

Nucleic acids: Structure of components of nucleic acids: Bases, Sugars, Nucleosides and Nucleotides. Nomenclature of nucleosides and nucleotides, structure of polynucleotides (DNA and RNA), Biological roles ofDNA and RNA.

Heterocyclic compounds and natural products: Heterocyclic compounds-synthesis and reaction of pyrrole ,furan ,thiophene, pyridine, quinine, isoquinoline. Alkaloids-Isolation from natural products-colour reaction- structural elucidation of nicotine. Terpenoids- Isolation - Isoprene rule-structural elucidation of citral.

Polymer: Nomenclature, functionality, classification, methods of polymerization, mechanism of polymerization, molecular weight determination-Viscometry, light scattering methods. Plastics-Moulding constituents of a plastics and moulding of plastics into articles. Important thermoplastics and thermosetting resins- synthesis & applications. Conductivepolymers.

Nucleophilic substitution: Reactivity, structural and solvent effects, substitution in SN^1, SN^2, SN^i. Neighbouring group participation -Norbornyl and bridgehead systems, substitution at allylic and vinylic carbons, substitution by ambident nucleophiles, aromatic nucleophilic substitution, SN Ar, benzyne, SN^1. Aromatic nucleophilic substitution of activatedhalides

Elimination reactions: E1, E2, E1CB- mechanism, stereochemistry, orientation of double bonds - Hoffmann, Zaitsev, Bredts rule - pyrolytic elimination, Chugaev reaction. Oxidation and reduction: Reduction using hydride reagents, $LiAlH_4$, $NABH_4$ and other organoboranes.

Theories of aromaticity: Aromaticity, antiaromaticity, Huckel's rule, annulences and heteroannulenes, fullerenes (C60). Other conjugated systems, Chichibabin reaction. Aromatic electrophilic substitution: Orientation, reactivity, and mechanisms.

Addition to carbon-carbon multiple bonds: Electrophilic, nucleophilic and free radical addition. Stereochemistry and orientation of the addition. Hydrogenation, halogenation, hydroxylation, hydroboration. Addition to carbonyl compounds - 1,2 and 1,4-addition, benzoin, Knoevenegal, Stobbe and Darzen glycidicester reactions.

Photochemistry: Characteristics of electromagnetic radiation, Lambert-Beer's law and its limitations, physical significance of absorption coefficients. Laws of photochemistry, quantum yield, actinometry, examples of low and high quantum yields, photochemical equilibrium and the differential rate of photochemical reactions,photosensitised reactions, quenching.

Gaseous state: Kinetic theory of gases, Vander waal's equation. Law of equipartition principle, Translational, Rotational and vibrational energies of molecules, Joule-Thomson effect, liquefaction of gases. Criticalconstants. **Atomic structure:** Photoelectric effect, dual nature of electrons, Heisenberg's uncertainty principle, quantum numbers, electronic configuration, wavemechanics.

Reaction kinetics: Rate order and molecularity of chemical reactions. Methods of their evaluation. Calculation of rate constants. Consecutive - Parallel and opposing reactions. Chain reactions. Energy of activation - Theorieson reaction rates. Heterogeneous reactions - zero orderreactions.

Phase equilibria: Phase rule: Application - to one components system (water, sulphur and carbon dioxide), Two component systems (Eutetic, Intermediate compound formation and solid solutions) and simple three componentsystems.

Solutions and Colligative Properties: Dilute solutions; lowering of vapour pressure, Raoult's law. Thermodynamic basis of the colligative properties - lowering of vapour pressure, elevation of Boiling Point, Depression of Freezing point and Osmotic pressure and derivation of expressions for these using

chemical potential. Application of colligative properties in calculating molar masses of normal, dissociated and associatedsolutes in solutions.

Electrochemistry: Conductivity of electrolytes- Specific, molar and equivalent conductivity, Nernst equation for electrode potential, EMF series, hydrogen electrode, calomel electrode, glass electrode, Electrolytic and galvanic cells, cell EMF, its measurement and applications.

Ionic equilibrium: Acids, bases - definitions a) based on proton transference, dissociation constant, amphoteric electrolyte - pH -Buffer solutions. Salts - water of crystallization, double salts, complex ions and salts, hydrolysis. Decomposition potential, over voltage, e.m.f. and energy relations. Conductometry, Potentiometry, their applications, Fuelcells.

Surface chemistry: Derivation of Langmuir adsorption isotherm, B.E.T adsorption isotherm, Determination of surface area of solids by B.E.T. method. Catalysis- Homogeneous catalysis, heterogeneous catalysis, Enzyme catalysis, adsorptionchromatography.

Thermodynamics: Entropy as a thermodynamic quantity, entropy changes in isothermal expansion of an ideal gas, reversible and irreversible processes, physical transformations, work & free energy functions, Helmholtz and Gibbs free energy functions, Gibbs-Helmholtz equation, Gibbs-Duhem equation, Clapeyron-Clausius equation & its applications, Van't Hoff isotherm andapplications.

Chemical Bonding: Basic concepts, bonding in metals, electron gas theory, physical properties of metals. Alloy-substitutional alloys, interstitial alloys. Coordinate bond, EAN rule, 16 & 18 electronrule.

Shape & Intermolecular Interactions: Shape-Lewis dot structures, formal charge, VSEPR method, consequences of shape, dipole moment, valence bond theory; Intermolecular interactions-ion ion interactions, ion-dipole interactions, hydrogen bonding, dipole-dipole interactions, London / dispersion forces, relative strength of intermolecular forces; Consequences-surface tension.

Solid State: Types of solids - close packing of atoms and ions - bcc , fcc structures of rock salt - cesium chloride- spinel - normal and inverse spinels, Stoichiometric Defect, controlled valency & Chalcogen semiconductors.

Theories of coordination compounds - VB theory - CFT - splitting of d orbitals in ligand fields and different symmetries - CFSE - factors affecting the magnitude of 10 Dq - evidence for crystal field stabilization -spectrochemical series - site selection in spinels - tetragonal distortion from octahedral symmetry - Jahn-Teller distortion.

Nuclear Chemistry: Mass defect and binding energy, nuclear reactions, fission and fusion, nuclear reactor and breeder reactors, radio dating.

Electronic spectra and magnetism: Microstates, terms and energy levels for d1–d9 ions in cubic and square fields - selection rules - band intensities and band widths - evaluation of 10 Dq and β for octahedral complexes of cobalt and nickel - charge transfer spectra - magnetic properties of coordination compounds - change in magnetic properties of complexes.

Rotational spectra: Diatomic and polyatomic molecules - selection rules, rotational Raman spectra - vibrational spectra of diatomic molecules - rotational character of vibration spectra - morse potential of real molecules - selection rules - overtones and combination – Fermi resonance.

Vibrational spectra: Polyatomic molecules - harmonic and anharmonic oscillators - Morse potential - selection rules - normal modes of vibrations of polyatomic molecules - selection rules - Fourier transformation in IR spectroscopy - Raman spectroscopy – fundamentals - rotational Raman - vibrational Raman spectra - IR/ Ramaninstrumentation.

Periodic table of elements: s-block, p-block, d-block and f-block elements, their periodicity and general properties.

Separation techniques: Solvent extraction, chromatography - thin layer chromatography, ion exchange chromatography and size exclusion chromatography, HPLC, Gaschromatography.