PROGRAMME: THREE-YEAR
B.Sc - Mathematics, Physics, Chemistry

SYLLABUS & REGULATIONS

WITH EFFECT FROM 2024-2025

Degree Programme (CBCS) Regulations-2016

Amended as per NEP-2020

(with effect from the batch admitted in the academic year 2024-25)
CHOICE BASED CREDIT SYSTEM (CBCS)

CENTRE FOR DISTANCE AND ONLINE EDUCATION (CDOE)

SRI VENKATESWARA UNIVERSITY

Accredited by "NAAC" with "A^{+} Grade

Tirupati, Andhra Pradesh – 517 502

DEAN
COLLEGE DEVELOPMENT COUNCIL
S.V.UNIVERSITY, TIRUPATI

CENTRE FOR DISTANCE AND ONLINE EDUCATION (CDOE)
SRI VENKATESWARA UNIVERSITY : : TIRUPATI

PROGRAMME: Three-Year B.Sc
Degree Programme (CBCS) Regulations-2016
Amended as per NEP-2020

(with effect from the batch admitted in the academic year 2024-25)

CHOICE BASED CREDIT SYSTEM (CBCS)

B.Sc - Mathematics, Physics, Chemistry

SEMESTER – I

Sl.No.	Course	Name of the Subject	Total Marks	Mid Sem	Sem End	Teaching Hours	Credits
1.	First Language	English	100	25	75	4	3
2.	Second Language	Telugu	100	25	75	4	3
3.	Skill Skills		50	---	50	2	2
4.	Skill Development Courses		50	---	50	2	2
5.	1M	Differential Equations	100	25	75	5	4
6.	1P	Mechanics, Waves and Oscillations	100	25	75	5	4
7.	1C	Inorganic and Organic Chemistry	100	25	75	5	4
		Total	**600**	**125**	**475**	**27**	**22**

B.Sc - Mathematics, Physics, Chemistry

SEMESTER – II

Sl.No.	Course	Name of the Subject	Total Marks	Mid Sem	Sem End	Teaching Hours	Credits
1.	First Language	English	100	25	75	4	3
2.	Second Language	Telugu	100	25	75	4	3
3.	Skill Skills		50	---	50	2	2
4.	Skill Development Courses -1		50	---	50	2	2
	Skill Development Courses -2		50	---	50	2	2
5.	2M	Three Dimensional Analytical Solid Geometry	100	25	75	5	4
6.	2P	Wave Optics	100	25	75	5	4
7.	2C	Physical and General Chemistry	100	25	75	5	4
		Total	**650**	**125**	**525**	**29**	**24**

CENTRE FOR DISTANCE AND ONLINE EDUCATION (CDOE)
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B.Sc - Mathematics, Physics, Chemistry

SEMESTER – III

Sl.No.	Course	Name of the Subject	Total Marks	Mid Sem	Sem End	Teaching Hours	Credits
1.	First Language	English	100	25	75	4	3
2.	Second Language	Telugu	100	25	75	4	3
3.	Skill Skills - 1		50	---	50	2	2
	Skill Skills - 2		50	---	50	2	2
4.	Skill Development Courses		50	---	50	2	2
5.	3M	Abstract Algebra and Real Analysis	100	25	75	5	4
6.	3P	Electricity, Magnetism and Electronics	100	25	75	5	4
7.	3C	In-Organic, Physical, Organic Chemistry	100	25	75	5	4
		Total	**650**	**125**	**525**	**29**	**24**

B.Sc - Mathematics, Physics, Chemistry

SEMESTER – IV

Sl.No.	Course	Name of the Subject	Total Marks	Mid Sem	Sem End	Teaching Hours	Credits
1.	4M1	Linear Programming	100	25	75	5	4
2.	4M2	Mathematics - **Elective**	100	25	75	5	4
3.	4P1	Modern Physics	100	25	75	5	4
4.	4P2	Physics - **Elective**	100	25	75	5	4
5.	4C1	Chemistry & Industry	100	25	75	5	4
6.	4C2	Chemistry - **Elective**	100	25	75	5	4
		Total	**600**	**150**	**450**	**30**	**24**

CENTRE FOR DISTANCE AND ONLINE EDUCATION (CDOE)
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B.Sc - Mathematics, Physics, Chemistry

SEMESTER – I

Paper 1M : Differential Equations

Course Outcomes:

At the end of this course, the student will be able to

1. convert separable and homogeneous equations to exact differential equations by using integrating factors.
2. solve higher-order linear differential equations.
3. understand the concept and apply appropriate methods for solving differential equations.
4. get awareness and skills to apply the differential equations in various fields.

UNIT – I (12 Hours)

Differential Equations of first order and first degree :

Linear Differential Equations; Differential Equations Reducible to Linear Form; Exact Differential Equations; Integrating Factors; Change of Variables.

UNIT – II (12 Hours)

Orthogonal Trajectories

Differential Equations of first order but not of the first degree :

Equations solvable for *p*; Equations solvable for *y*; Equations solvable for *x*; Equations that do not contain. x (or y); Equations of the first degree in *x* and *y* – Clairaut's Equation.

UNIT – III (12 Hours)

Higher order linear differential equations-I :

Solution of homogeneous linear differential equations of order n with constant coefficients; Solution of the non-homogeneous linear differential equations with constant coefficients by means of polynomial operators. General Solution of f(D)y=0

General Solution of f(D)y = Q when Q is a function of x. $\frac{1}{f(D)}$ is Expressed as partial fractions.

P.I. of f(D)y = Q when Q = be^{ax}

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

UNIT – IV (12 Hours)

Higher order linear differential equations-II :

Solution of the non-homogeneous linear differential equations with constant coefficients.

P.I. of f(D)y = Q when Q = bx^k

P.I. of f(D)y = Q when Q = $e^{ax}V$

P.I. of f(D)y = Q when Q = xV

P.I. of f(D)y = Q when Q = x^mV

UNIT –V (12 Hours)

Higher order linear differential equations-III :

Method of variation of parameters; Linear differential Equations with non-constant coefficients; The Cauchy-Euler Equation.

Co-Curricular Activities (15 Hours)

Seminar/ Quiz/ Assignments/ Applications of Differential Equations to Real life Problem /Problem Solving.

Text Book :

Differential Equations and Their Applications by Zafar Ahsan, published by Prentice-Hall of India Learning Pvt. Ltd. New Delhi-Second edition.

Reference Books :

1. A text book of Mathematics for B.A/B.Sc, Vol 1, by N. Krishna Murthy & others, published by S.Chand & Company, New Delhi.
2. Ordinary and Partial Differential Equations by Dr. M.D,Raisinghania, published by S. Chand & Company, New Delhi.
3. Differential Equations with applications and programs – S. Balachandra Rao & HR Anuradha- Universities Press.
4. Differential Equations -Srinivas Vangala & Madhu Rajesh, published by Spectrum University Press

PAPER - IP: Mechanics, Waves and Oscillations

Course Outcomes

On successful completion of this course, the students will be able to:

Understand the Newton's laws of motion and the law of conservation of linear momentum and its application to rocket motion, the concepts of concepts of impact parameter, scattering cross section and Distinguish between elastic and inelastic collisions.

Formulate the rotational kinematic relations, learn the working principle of gyroscope and its applications and explain the precessional motion of a freely rotating symmetric top.

Analyse the general characteristics of central forces and the application of Kepler's laws to describe the motion of planets and satellite in circular orbit through the study of law of Gravitation.

State the postulates of Special theory of relativity and its consequences such as length contraction, time dilation, relativistic mass and mass-energy equivalence.

Understand the phenomena of simple harmonic motion and the distinction between undamped, damped and forced oscillations and the concepts of resonance and quality factor with reference to damped harmonic oscillator.

State the laws of transverse vibrations in a stretched string and their verification using a sonometer and learn the formation of harmonics and overtones in a stretched string.

Acquire knowledge on Ultrasonic waves, their production and detection and their applications in different fields.

Unit-I: Mechanics of Particles

Mechanics of Particles

Review of Newton's Laws of Motion, Conservation of linear momentum, Collisions, Elastic and inelastic collisions, Collisions in one and two dimension, Rocket propulsion, Impact parameter, Scattering cross-section, Rutherford scattering (No derivation-Qualitative ideas only)

Mechanics of Rigid body

Rigid body, Rotational kinematic relations, Rotational kinetic energy and moment of inertia, Angular momentum, Torque, Relation between torque and angular momentum, Conservation of angular momentum, Illustrations, Gyroscopic motion (No derivation - Qualitative ideas only), Precession of the equinoxes.

Unit-II: Central forces

Central force-Definition& examples, General Characteristics of Central forces, Conservative nature of central forces, Planetary motion-Kepler's laws (Statements & Explanation), Deduction of Newton's law of gravitation from Kepler's law, Geostationary Satellite Motion, Uses of communication satellites, Basic idea of Global Positioning System (GPS) and their applications.

Unit-III: Relativistic Mechanics

Inertial and Non-inertial reference frames-Galilean relativity; Special theory of relativity-Statements of the two basic postulates- (Elementary treatment and application only) Lorentz transformation equations (No derivations); length contraction; time dilation; addition of velocities; Einstein's mass - energy equation

Unit-IV: Undamped, Damped and Forced Oscillations

Simple harmonic motion, Characteristics of SHM, Equation of motion and solution, Combination of Simple harmonic motions along a line and perpendicular to each other-Lissajous figures& uses, Damped vibrations: Explanation and examples, Distinction between damped and undamped vibrations, Forced vibrations: Explanation and examples, Resonance, examples – Sharp resonance and Flat resonance, Sharpness of resonance, Q-factor, Volume Resonator- Determination of frequency of a given tuning fork.

Unit-V: Wave Motion

Progressive waves-Equation of a progressive wave, Velocity of transverse waves in elastic media, Standing waves, overtones and harmonics, Sonometer-Verification of laws of transverse vibrations in a stretched string, Phenomenon of beats (qualitative ideas only).

Ultrasonics

Ultrasonics, properties, production of ultrasonics by piezoelectric and magnetostriction methods, detection of ultrasonics, Applications of ultrasonic waves.

REFERENCE BOOKS:

- B. Sc. Physics, Vol.1, Telugu Academy, Hyderabad
- Fundamentals of Physics Vol. I - Resnick, Halliday, Krane ,Wiley India 2007
- College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
- University Physics-FW Sears, MW Zemansky& HD Young,Narosa Publications, Delhi
- Mechanics, S.G.Venkatachalapathy, Margham Publication, 2003.
- Waves and Oscillations. N. Subramanyam and Brijlal, VikasPulications.
- Unified Physics - Waves and Oscillations, Jai PrakashNath&Co.Ltd.
- Waves & Oscillations. S.Badami, V. Balasubramanian and K.R.Reddy, Orient Longman.
- The Physics of Waves and Oscillations, N.K.Bajaj, Tata McGraw Hill
- Science and Technology of Ultrasonics- Baldevraj, Narosa, New Delhi,2004

PAPER - 1C: Inorganic and Organic Chemistry

INORGANIC CHEMISTRY

UNIT –I

1. P-block elements–I

Group-13: Synthesis and structure of diborane and higher boranes

(B_4H_{10} and B_5H_9), boron-nitrogen compounds ($B_3N_3H_6$ and BN)

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

Group - 15: Preparation and reactions of hydrazine, hydroxylamine.

UNIT-II

1. P-block elements -II

Group - 16: Classifications of oxides based on (i) Chemical behaviour and

(ii) Oxygen content.

Group-17: Inter halogen compounds and pseudo halogens.

2. Organometallic Chemistry

Definition - classification of Organometallic compounds - nomenclature, preparation, properties and applications of alkyls of Li and Mg.

ORGANIC CHEMISTRY

UNIT-III

1. Structural theory in Organic Chemistry

Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents including neutral molecules like H_2O,NH_3& $AlCl_3$).

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

Types of Organic reactions : Addition - electrophilic, nucleophilic and free radical. Substitution - electrophilic, nucleophilic and free radical. Elimination- Examples.

UNIT-IV

5. **Acyclic Hydrocarbons**

Alkenes - Preparation of alkenes. Properties: Addition of hydrogen - heat of hydrogenation and stability of alkenes. Addition of halogen and its mechanism. Addition of HX, Markonikov's rule, addition of H_2O, HOX, H_2SO_4 with mechanism and addition of HBr in the presence of peroxide

(anti - Markonikov's addition). Dienes - Types of dienes, reactions of conjugated dienes - 1,2 and 1,4 addition of HBr to 1,3 - butadiene and Diel's - Alder reaction.

Alkynes - Preparation by dehydrohalogenation of dihalides, dehalogenation of tetrahalides, Properties; Acidity of acetylenic hydrogen (formation of Metal acetylides). Preparation of higher acetylenes, Metal ammonia reductions, Physical properties. Chemical reactivity - electrophilic addition of X_2, HX, H_2O (Tautomerism), Oxidation with $KMnO_4$, OsO_4, reduction and Polymerisation reaction of acetylene.

6. **Alicyclic hydrocarbons (Cycloalkanes)**

Nomenclature, Preparation by Freunds method, Wislicenus method. Properties - reactivity of cyclopropane and cyclobutane by comparing with alkanes, Stability of cycloalkanes - Baeyer's strain theory, Sachse and Mohr predictions and Pitzer's strain theory. Conformational structures of cyclobutane, cyclopentane, cyclohexane.

UNIT-V

1. Benzene and its reactivity

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

Reactions - General mechanism of electrophilic substitution, mechanism of nitration, Friedel Craft's alkylation and acylation. Orientation of aromatic substitution - Definition of ortho, para and meta directing groups. Ring activating and deactivating groups with examples (Electronic interpretation of various groups like NO_2 and Phenolic). Orientation of (i) Amino, methoxy and methyl groups (ii) Carboxy, nitro, nitrile, carbonyl and sulphonic acid groups (iii) Halogens

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

B.Sc - Mathematics, Physics, Chemistry

SEMESTER – II

Paper 2M : Three Dimensional Analytical Solid Geometry

Course Outcomes:

At the end of this course, the student will be able to

1. get the knowledge of planes.
2. basic idea of lines, sphere and cones.
3. understand the properties of planes, lines, sphere and cones.
4. express the problems geometrically and then to get the solution.

UNIT – I (12 Hours)

The Plane :

Equation of plane in terms of its intercepts on the axis, Equations of the plane through the given points, Length of the perpendicular from a given point to a given plane, Bisectors of angles between two planes, Combined equation of two planes, Orthogonal projection on a plane.

UNIT – II (12 hrs)

The Line :

Equation of a line; Angle between a line and a plane; The condition that a given line may lie in a given plane; The condition that two given lines are coplanar; Number of arbitrary constants in the equations of straight line; Sets of conditions which determine a line; The shortest distance between two lines; The length and equations of the line of shortest distance between two straight lines; Length of the perpendicular from a given point to a given line.

UNIT – III (12 hrs)

The Sphere :

Definition and equation of the sphere; Equation of the sphere through four given points; Plane sections of a sphere; Intersection of two spheres; Equation of a circle; Sphere through a given circle; Intersection of a sphere and a line; Power of a point; Tangent plane; Plane of contact; Polar plane; Pole of a Plane; Conjugate points; Conjugate planes;

UNIT – IV (12 hrs)

The Sphere and Cones :

Angle of intersection of two spheres; Conditions for two spheres to be orthogonal; Radical plane; Coaxial system of spheres; Simplified from of the equation of two spheres.

Definitions of a cone; vertex; guiding curve; generators; Equation of the cone with a given vertex and guiding curve; equations of cones with vertex at origin are homogenous; Condition that the general equation of the second degree should represent a cone;

UNIT – V (12 hrs)

Cones :

Enveloping cone of a sphere; right circular cone: equation of the right circular cone with a given vertex, axis and semi vertical angle: Condition that a cone may have three mutually perpendicular generators; intersection of a line and a quadric cone; Tangent lines and tangent plane at a point; Condition that a plane may touch a cone; Reciprocal cones; Intersection of two cones with a common vertex.

Text Book :

Analytical Solid Geometry by Shanti Narayan and P.K. Mittal, published by S. Chand & Company Ltd. 7th Edition.

Reference Books :

1. A text book of Mathematics for BA/B.Sc Vol 1, by V Krishna Murthy & Others, published by S. Chand & Company, New Delhi.
2. A text Book of Analytical Geometry of Three Dimensions, by P.K. Jain and Khaleel Ahmed, published by Wiley Eastern Ltd., 1999.
3. Co-ordinate Geometry of two and three dimensions by P. Balasubrahmanyam, K.Y. Subrahmanyam, G.R. Venkataraman published by Tata-MC Gran-Hill Publishers Company Ltd., New Delhi.
4. Solid Geometry by B.Rama Bhupal Reddy, published by Spectrum University Press.

Paper 2P: - Wave Optics

Unit-I: Aberrations

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

Unit-II: Interference of Light

Principle of superposition - coherence-temporal coherence and spatial coherence-conditions for interference of light. Interference by division of wave front: Fresnel's biprism-determination of wavelength of light. Determination of thickness of a transparent material using Biprism, change of phase on reflection, Lloyd's mirror experiment. Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (cosine law) colors of thin films- Non-reflecting films, Interference by a plane parallel illuminated by a point source-Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film). Determination of diameter of wire, Newton's rings in reflected light with and without contact between lens and glass plate, Newtons's rings in transmitted light (Haidinger Fringes)-Determination of wavelength of monochromatic light using Newton's rings and Michelson Interferometer. Types of fringes-Determination of wavelength of monochromatic light, Difference in wavelength of Sodium D1, D2 lines and thickness of a thin transparent plate.

Unit-III: Diffraction of Light

Introduction, distinction between Fresnel and Fraunhoffer diffraction, Fraunhoffer diffraction – Diffraction due to single slit and Circular aperture-Limit of Resoultion-Fraunhoffer diffraction due to double slit-Fraunhoffer diffraction pattern with N slits (diffraction grating). Resolving power of grating, Determination of wavelength of light in normal and oblique incidence methods using and minimum deviation methods using diffraction grating.

Fresnel's Diffraction: Fresnel's half period zones-area of the half period zones-zone plate-comparison of zone plate with convex lens-phase reversal zone plate, diffraction at a straight edge-difference between interference and diffraction.

Unit-IV: Polarisation of Light

Polarized light: Methods of polarization polarization by reflection, refraction, double refraction, selective absorption scattering of light-Brewster's law-Mauls law-Nicol prism polarizer and analyzer-Refraction of plane wave incident on negative and positive crystals (Huygen's explanation)-Quarter wave plate, Half wave plate-optical activity, determination of specific rotation by Laurent's half shade polarimeter-Babinet's compensator - idea of elliptical and circular polarization

Unit-V: Lasers and Holography

Lasers: Introduction, spontaneous emission, stimulated emission. Population Inversion, Laser principle-Einstein coefficients-Types of lasers-He-Ne laser, Ruby laser- Applications of lasers.

Holography: Basic principle of holography-Gabor hologram and its limitations, Applications of holography.

Unit-6: Fiber Optics

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

Paper 2C : Physical and General Chemistry

PHYSICAL CHEMISTRY

UNIT-I

1. **Solidstate:** Symmetry in crystals. Law of constancy of interfacial angles. The law of rationality of indices. The law of symmetry. Definition of lattice point, space lattice, unit cell. Bravis lattices and crystal systems. X-ray diffraction and crystal structure. Bragg's law. Defects in crystals. Stoichiometric and non-stoichiometric defects.

UNIT-II

1. **Gaseous State:** Compression factors, deviation of real gases from ideal behavior. Vander Waal's equation of state. P-V Isotherms of real gases, Andrew's isotherms of carbon dioxide, continuity of state. Critical phenomena. The vander Waal's equation and the critical state. Law of corresponding states.Relationship between critical constants and vander Waal's constants. Joule Thomson effect.
2. **Liquid State**: Structural differences between solids, liquids and gases. Liquid crystals, the mesomorphic state. Classification of liquid crystals into Smectic and Nematic. Differences between liquid crystal and solid/liquid. Application of liquid crystals as LCD devices.

UNIT-III

3. **Solutions:** Liquid-liquid - ideal solutions, Raoult's law. Ideally dilute solutions, Henry's law. Non-ideal solutions. Vapour pressure - composition and vapour pressure- temperature curves. Azeotropes-HCl-H_2O, ethanol-water systems and fractional distillation. Partially miscible liquids-phenol-water, trimethylamine-water, nicotine-water systems. Effect of impurity on consulate temperature. Immiscible liquids and steam distillation.

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

GENERAL CHEMISTRY

UNIT-IV

l. **Surface Chemistry:** Definition of colloids. Solids in liquids(sols), preparation, purification, properties - kinetic, optical, electrical. Stability of colloids, Hardy-Schulze law, protective colloid.

   Liquids in liquids (emulsions) preparation, properties, uses. Liquids in solids (gels) preparation, uses. Adsorption: Physical adsorption, chemisorption. Freundlisch, Langmuir adsorption isotherms. Applications of adsorption

2. **Chemical Bonding:** Valence bond theory, hybridization, VB theory as applied to ClF_3, $Ni(CO)_4$, Molecular orbital theory - LCAO method, construction of M.O. diagrams for homo-nuclear and hetero-nuclear diatomic molecules (N_2, O_2, CO and NO).

UNIT-V

Stereochemistry of Carbon Compounds: Molecular representations- Wedge, Fischer, Newman and Saw-Horse formulae. Optical isomerism: Optical activity- wave nature of light, plane polarised light, optical rotation and specific rotation. Chiral molecules- definition and criteria(Symmetry elements)- Definition of enantiomers and diastereomers – Explanation of optical isomerism with examples Glyceraldehyde, Lactic acid, Alanine, Tartaric acid, 2,3-dibromopentane. D,L and R,S configuration methods and E,Z- configuration with examples.

B.Sc - Mathematics, Physics, Chemistry

SEMESTER – III

Paper 3M : Abstract Algebra and Real Analysis

UNIT - I

GROUPS : Binary operations-Definitions and properties, Groups-Definition and elementary properties, Finite groups and group composition tables, Subgroups and cyclic subgroups. Permutations-Functions and permutations ,groups of permutations, cycles and cyclic notation, even and odd permutations, The alternating groups. Cyclic groups - Elementary properties ,The classification of cyclic groups , sub groups of finite cyclic groups. Isomorphism - Definition and elementary properties, Cayley's theorem, Groups of cosets, Applications, Normal subgroups - Factor groups , Criteria for the existence of a coset group, Inner automorphisms and normal subgroups, factor groups and simple groups, Homomorphism- Definition and elementary properties, The fundamental theorem of homomorphisms, applications.

UNIT - II

RINGS: Definition and basic properties, Fields, Integral domains, divisors of zero and Cancellation laws, Integral domains, The characteristic of a ring, some non – commutative rings, Examples, Matrices over a field, The real quaternions ,Homomorphism of Rings - Definition and elementary properties, Maximal and Prime ideals, Prime fields. Rings of Polynomials – Polynomials in an indeterminate form, The evaluation of homomorphism.

UNIT – III

REAL NUMBERS: The Completeness Properties of R, Applications of the Supremum Property.

Sequences and Series - Sequences and their limits, limit theorems, Monotonic Sequences, Sub-sequences and the Bolzano-Weirstrass theorem,The Cauchy's Criterion, Properly divergent sequences, Introduction to series, Absolute convergence, test for absolute convergence, test for non-absolute convergence.

Continuous Functions-continuous functions, combinations of continuous functions, continuous functions on intervals, Uniform continuity.

UNIT – IV

DIFFERENTIATION AND INTEGRATION: The derivative, The mean value theorems, L'Hospital Rule, Taylor's Theorem. Riemann integration - Riemann integral, Riemann integrable functions, Fundamental theorem.

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Paper 3P: Electricity, Magnetism and Electronics

Unit – I **23 hrs**

1. Electrostatics (10 periods)

Gauss law and its applications-Uniformly charged sphere, charged cylindrical conductor and an infinite conducting sheet of charge. Deduction of Coulmb's law from Gauss law Mechanical force on a charged conductor Electric potential Potential due to a charged spherical conductor, , electric field strength from the electric dipole and an infinite line of charge. Potential of a uniformly charged circular disc.

2. Dielectrics (5 periods)

An atomic view of dielectrics, potential energy of a dipole in an electric field. Polarization and charge density, Gauss's law for dielectric medium Relation between D,E, and P. Dielectric constant, susceptibility and relation between them. Boundary conditions at the dielectric surface. Electric fields in cavities of a dielectric-needle shaped cavity and disc shaped cavity.

3. Capacitance (8 periods)

Capacitance of concentric spheres and cylindrical condenser, capacitance of parallel plate condenser with and without dielectric. Electric energy stored in a charged condenser – force between plates of condenser, construction and working of attracted disc electrometer, measurement of dielectric constant and potential difference.

Unit – II

1. Magnetostatics (6 periods)

Magnetic shell potential due to magnetic shell field due to magnetic shell equivalent of electric circuit and magnetic shell Magnetic induction (B) and field (H) permeability and susceptibility Hysteresis loop.

2. Moving charge in Electric and Magnetic Field (8 periods)

Hall effect, cyclotron, synchrocyclotron and synchrotron force on a current carrying conductor placed in a magnetic field, force and torque on a current loop, Biot Savart's law and calculation of B due to long straight wire, a circular current loop and solenoid.

3. Electromagnetic Induction (10 periods)

Faraday's law Lenz's law expression for induced emf time varying magnetic fields Betatron Ballistic galvanometer theory damping correction self and mutual inductance, coefficient of coupling, calculation of self inductance of a long solenoid toroid energy stored in magnetic field transformer Construction, working, energy losses and efficiency.

Unit – III

1. Varying and Alternating Currents (10 periods)

Growth and decay of currents in LR, CR and LCR circuits Critical damping. Alternating current relation between current and voltage in pure R,C and L-vector diagrams Power in ac circuits. LCR series and parallel resonant circuit Q-factor. AC & DC motors-single phase, three phase (basics only).

2. Maxwell's Equations and Electromagnetic Waves (10 periods)

A review of basic laws of electricity and magnetism displacement current Maxwell's equations in differential form Maxwell's wave equation, plane electromagnetic waves Transverse nature of electromagnetic waves, Poynting theorem, production of electromagnetic waves (Hertz experiment)

Unit – IV

1. Basic Electronics (15 periods)

Formation of electron energy bands in solids, classification of solids in terms of forbidden energy gap. Intrinsic and extrinsic semiconductors, Fermi level, continuity equation p-n junction diode, Zener diode characteristics and its application as voltage regulator. Half wave and full wave rectifiers and filters, ripple factor (quantitative) p n p and n p n transistors, current components in transistors, CB,CE and CC configurations transistor hybrid parameters determination of hybrid parameters from transistor characteristics transistor as an amplifier concept of negative feed back and positive feed back Barkhausen criterion, RC coupled amplifier and phase shift oscillator (qualitative).

2. Digital Principles (8 periods)

Binary number system, converting Binary to Decimal and vice versa. Binary addition and subtraction (1's and 2's complement methods). Hexadecimal number system. Conversion from Binary to Hexadecimal – vice versa and Decimal to Hexadecimal vice versa.

Logic Gates: OR,AND,NOT gates, truth tables, realization of these gates using discrete components. NAND, NOR as universal gates, Exclusive OR gate, De Morgan's Laws statement and proof, Half and Full adders. Parallel adder circuits.

NOTE: Problems should be solved from every chapter of all units.

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Paper 3C: In-Organic, Physical, Organic Chemistry

Unit – I (Inorganic Chemistry-III)

1. Coordination Chemistry

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

2. Spectral and Magnetic properties of Metal Complexes

Electronic absorption spectrum of $[Ti(H_2O)_6]^{3+}$ ion. Types of magnetic behavior, spin-only formula, calculation of magnetic moments, experimental determination of magnetic susceptibility Gouy method.

3. Reactivity of Metal Complexes

Labile and inert complexes, ligand substitution reactions S_N1 and S_N2, substitution reactions of square planar complexes Trans effect and applications of trans effect.

4. Stability of Metal Complexes

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

5.Hard and soft acids bases (HSAB)

Classification, Pearson's concept of hardness and softness, application of HSAB principles Stability of compounds / complexes, predicting the feasibility of a reaction.

6. Bioinorganic Chemistry

Essential elements, biological significance of Na, K, Mg, Ca, Fe, Co, Ni, Cu, Zn and chloride (Cl^-). Metalloporphyrins hemoglobin, structure and function, Chlorophyll, structure and role in photosynthesis.

UNIT – II (Organic Chemistry – III)

1. Nitrogen Compounds

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

Amines (Aliphatic and Aromatic): Nomenclature, Classification into 1^0, 2^0, 3^0 Amines and Quarternary ammonium compounds. Preparative methods -1. Ammonolysis of alkyl halides 2. Gabriel synthesis 3. Hoffman's bromamide reaction (mechanism).

Reduction of Amides and Schmidt reaction. Physical properties and basic character – Comparative basic strength of Ammonia, methyl amine, dimethyl amine, trimethyl amine and aniline – comparative basic strength of aniline, N-methylaniline and N,N-dimethyl aniline (in aqueous and non-aqueous medium), steric effects and substituent effects. Use of amine salts as phase transfer catalysts. Chemical properties: a) Alkylation b) Acylation c) Carbylamine reaction d) Hinsberg separation e) Reaction with Nitrous acid of 1^0, 2^0, 3^0 (Aliphatic and aromatic amines). Electrophilic substitutions of Aromatic amines – Bromination and Nitration. oxidation of aryl and 3^0 Amines. Diazotization

Cyanides and isocyanides: Nomenclature (aliphatic and aromatic) structure. Preparation of cyanides from a) Alkyl halides b) from amides c) from aldoximes. Preparation of isocyanides from Alkyl halides and Amines. Properties of cyanides and isocyanides, a) hydrolysis b) addition of Grignard reagent iii) reduction iv) oxidation.

2. Heterocyclic Compounds

Introduction and definition: Simple 5 membered ring compounds with one hetero atom Ex. Furan. Thiophene and pyrrole. Importance of ring system presence in important natural products like hemoglobin and chlorophyll. Numbering the ring systems as per Greek letter and Numbers. Aromatic character 6- electron system (four-electrons from two double bonds and a pair of non-bonded electrons from the hetero atom). Tendency to undergo substitution reactions.

Resonance structures: Indicating electron surplus carbons and electron deficient hetero atom. Explanation of feebly acidic character of pyrrole, electrophillic substitution at 2 or 5 position, Halogenation, Nitration and Sulphonation under mild conditions. Reactivity of furan as 1,3-diene, Diels Alder reactions (one example). Sulphonation of thiophene purification of Benzene obtained from coal tar). Preparation of furan, Pyrrole and thiophene from 1,4,- dicarbonyl compounds only, Paul-Knorr synthesis, structure of pyridine, Basicity Aromaticity Comparison with pyrrole one method of preparation and properties Reactivity towards Nucleophilic substitution reaction chichibabin reaction.

3. Carbohydrates

Monosaccharides: All discussion to be confined to (+) glucose as an example of aldo hexoses and (-) fructose as example of ketohexoses. Chemical properties and structureal elucidation: Evidences for straight chain pentahydroxy aldehyde structure (Acetylation, reduction to n-hexane, cyanohydrin formation, reduction of Tollen's and Fehling's reagents and oxidation to gluconic and saccharic acid). Number of optically active isomers possible for the structure, configuration of glucose based on D-glyceraldehyde as primary standard (no proof for configuration is required). Evidence for cyclic structure of glucose (some negative aldehydes tests and mutarotation). Cyclic structure of glucose. Decomposition of cyclic structure (Pyranose structure, anomeric Carbon and anomers). Proof for the

ring size (methylation, hydrolysis and oxidation reactions). Different ways of writing pyranose structure (Haworth formula and chair conformationa formula). Structure of fructose: Evidence of 2 – ketohexose structure (formation of penta acetate, formation of cyanohydrin its hydrolysis and reduction by HI to give 2-Carboxy-n-hexane). Same osazone formation from glucose and fructose, Hydrogen bonding in osazones, cyclic structure for fructose (Furanose structure and Haworth formula).

Interconversion of Monosaccharides: Aldopentose to aldo hexose eg: Arabinose to D-Glucose, D-Mannose (Kiliani Fischer method). Epimers, Epimerisation Lobry de bruyn van Ekenstein rearrangement. Aldohexose to Aldopentose eg: D-glucose to D-arabinose by Ruff'f degradation. Aldohexose (+) (glucose) to ketohexose (-) (Fructose) and Ketohexose (fructose) to aldohexose (Glucose)

4. Amino Acids and Proteins

Introduction: Definition of Amino acids, classification of Amino acids into alpha, beta, and gama amino acids. Natural and essential amino acids – definition and examples, classification of alpha amino acids into acidic, basic and neutral amino acids with examples. Methods of synthesis: General methods of synthesis of alpha amino acids (specific examples Glycine, Alanine, valine and leucene) by following methods: a) from halogenated carboxylic acid b) Malonic ester synthesis c) strecker's synthesis.

Physical properties: Optical activity of naturally occurring amino acids: L-configuration, irrespective of sign rotation, Zwitterion structure – salt like character - solubility, melting points, amphoteric character , definition of isoelectric point.

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

5. Mass Spectrometry

Basic principles Molecular ion / parent ion, fragment ions / daughter ions. Theory formation of parent ions. Representation of mass spectrum. Identification of parent ion, (M+1), (M+2), base peaks (relative abundance 100%) Determination of molecular formula – Mass spectra of ethylbenzene, acetophenone, n-butyl amine and 1- proponal.

Unit-III (physical chemistry-III)

1. Chemical Kinetics

Rate of reaction, factors influencing the rate of a reaction-concentration, temperature, pressure, solvent, light, catalyst. Experimental methods to determine the rate of reaction. Definition of order and molecularity. Derivation of rate constants for first, second, third and zero order reactions and examples. Derivation for time half change. Methods to determine the order of reactions. Kinetics of complex reactions (first order only): opposing reactions, parallel reactions, consecutive reactions and

chain reactions. Effect of temperature on rate of reaction, Arrhenius equation, concept of activation energy. Theories of reaction rates- collision theory-derivation of rate constant for bimolecular reaction. The transition state theory (elementary treatment).

2. Photochemistry

Difference between thermal and photochemical processes. Laws of photochemistry-Grothus-Draper's law and Stark-Einstein's law of photochemical equivalence. Quantum yield. Ferrioxalate actinometry. Photochemical hydrogen- chlorine, hydrogen-bromine reaction. Jablonski diagram depicting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing). Photosensitized reactions- energy transfer processes (simple example)

3. Thermodynamics

The first law of thermodynamics-statement, definition of internal energy and enthalpy. Heat capacities and their relationship. Joule's law-Joule-Thomson coefficient. Calculation of w, q, dU and dH for the expansion of perfect gas under isothermal and adiabatic conditions for reversible processes. State function.

Temperature dependence of enthalpy of formation-Kirchoff's equation. Second law of thermodynamics. Different Statements of the law. Carnot cycle and its efficiency. Carnot theorem. Thermodynamic scale of temperature. Concept of entropy, entropy as a state function, entropy changes in cyclic, reversible, and irreversible processes and reversible phase change. Calculation of entropy changes with changes in V & T and P&T. Entropy of mixing inert perfect gases. Entropy changes in spontaneous and equilibrium processes.

The Gibbs (G) and Hlmholtz (A) energies. A & G as criteria for thermodynamic equilibrium and spontaneity-advantage over entropy change. Gibbs equations and the Maxwell relations.
Variation of G with P, V and T.

B.Sc - Mathematics, Physics, Chemistry

SEMESTER – IV

Paper 4M1: Linear Programming

Unit-1

Linear Programming Problem: Convex Set, Extreme Points of convex set,Convex combination, Convex hull, Convex polyhedron, Fundamental theorem of linear programming, Definition, Formulation of linear programming (LPP), Graphical solution of linear programming problems, General formulation of Lp problems, Standard form and matrix form of LP problems.

Unit-2

Simplex Method: Introduction, Definitions and notations, Computational procedure of simplex algorithm, Simple way for simplex computations, Artificial variables, Two-phase method, Alternative method of two –phase simplex method, Big-M method, Degeneracy in LPP and method to solve to resolve degeneracy, Alternative solutions, Unbounded solutions, Non-existing feasible solutions, Solutions of simultaneous equations by simplex method

Unit-3

Duality in Linear Programming and Dual Simplex Method: Introduction**,**Definition of Dual problems, General rules for converting any primal into its Dual ,Relation between the solution of primal and Dual problem, Initial Solution for Dual Simplex Method, Dual Simplex Method.

Unit-4

Assignment Problems: Introduction, Mathematical formulation of Assignment problem, Reduction theorem, Hungarian Method for solving Assignment problem, Unbalanced assignment problem,The traveling salesman problem, Formulation of travelling salesman problem as an Assignment problem and Solution procedure

Unit-5

Transportation Problems

Mathematical formulation of Transportation problem,Tabular Representation,Definitions, Special structure of the solution, North-west corner rule, Lowest cost entry method, Vogel's approximation method, Optimality in transportation Problem,Degeneracy in transportation problems Resolution of degeneracy, Unbalanced transportation problem, Generalized transportation problem.

Paper 4P1: Modern Physics

Unit – I **25 hrs**

Atomic Spectra: Introduction Drawbacks of Bohr's atomic model Sommerfeld's elliptical orbits relativistic correction (no derivation). Stern & Gerlach experiment Vector atom model and quantum numbers associated with it. L-S and j-j coupling schemes. Spectral terms, selection rules, intensity rules. Spectra of alkali atoms, doublet fine structure. Alkaline earth spectra, singlet and triplet fine structure. Zeeman Effect, Paschen-Back Effect and Stark Effect (basic idea).

Molecular Spectroscopy: Types of molecular spectra, pure rotational energies and spectrum of diatomic molecule, determination of internuclear distance. Vibrational energies and spectrum of diatomic molecule. Raman effect, Classical theory of Raman effect. Experimental arrangement for Raman effect and its applications.

Unit – II **25 hrs**

Quantum Mechanics

Inadequacy of classical Physics: (Discussion only): Spectral radiation Planck's law. Photoelectric effect Einstien's photoelectric equation. Compton's effect (quantitative) experimental verification. Stability of an atom Bohr's atomic theory. Limitations of old quantum theory.

Matter Waves:de Broglie's hypothesis wavelength of matter waves, properties of matter waves. Phase and group velocities. Davisson and Germer experiment. Double slit experiment. Standing de Brogile waves of electron in Bohr orbits.

Uncertainty Principle: Heisenberg's uncertainty principle for position and momentum (x and p_X), Energy and time (E and t). Gamma ray microscope. Diffraction by a single slit. Position of electron in a Bohr orbit. Particle in a box. Complementary principle of Bohr.

Schrodinger Wave Equation: Schrodinger time independent and time dependent wave equations. Wave function properties Significance. Basic postulates of quantum mechanics. Operators, eigen functions and eigen values, expectation values. Application of Schrodinger wave equation to particle in one and three dimensional boxes, potential step and potential barrier.

Unit – III **15 hrs**

Nuclear Physics

Nuclear Structure: Basic properties of nucleus size, charge, mass, spin, magnetic dipole moment and electric quadrupole moment. Binding energy of nucleus, deuteron binding energy, p-p and n-p scattering (concepts), nuclear forces. Nuclear models liquid drop model, shell model.

Alpha and Beta Decays: Range of alpha particles, Geiger Nuttal law. Gammow's theory of alpha decay. Geiger Nuttal law from Gammow's theory. Beta spectrum neutrino hypothesis, Fermi's theory of b-decay (qualitative).

Nuclear Reactions: Types of nuclear reactions, channels, nuclear reaction kinematics. Compound nucleus, direct reactions (concepts).

Nuclear Detectors : GM counter, proportional counter, scintillation counter, Wilson cloud chamber and solid state detector.

Unit – IV **25 hrs**

Solid State Physics

Crystal Structure: Crystalline nature of matter. Cystal lattice, Unit Cell, Elements of symmetry. Crystal systems, Bravais lattices. Miller indices. Simple crystal structures (S.C., BCC, CsCl, FCC, NaCl diamond and Zinc Blends)

X-ray Diffraction: Diffraction of X –rays by crystals, Bragg's law, Experimental techniques - Laue's method and powder method.

Nanomaterials: Introduction, nanoparticles, metal nanoclusters, semiconductor nanoparticles, carbon clusters, carbon nanotubes, quantum nanostructures nanodot, nanowire and quantum well. Fabrication of quantum nanostructures.

Bonding in Crystals: Types of bonding in crystals characteristics of crystals with different bindings. Lattice energy of ionic crystals determination of Medelung constant for NaCl crystal, calculation of Born coefficient and repulsive exponent. Born Haber cycle.

Magnetism: Magnetic properties of dia, para and ferromagnetic materials. Langevin's theory of paramagnetism. Weiss' theory of ferromagnetism –Concepts of magnetic domains, antiferromagnetism and ferrimagnetism ferrites and their applications.

Super Conductivity

Basic experimental facts zero resistance, effect of magnetic field, Meissner effect, persistent current, Isotope effect Thermodynamic properties, specific heat, entropy. Type I and Type II superconductors.

Elements of BCS theory-Cooper pairs. Applications. High temperature superconductors (general information)

NOTE: Problems should be solved from every chapter of all units.

Paper 4C1: Chemistry & Industry

UNIT-I: SEPARATION TECHNIQUES

Introduction, Solvent Extraction, Principles and Process, Batch Extraction, Continuous Extraction and Counter Current Extraction, Application and Determination of Iron (III).

Unit-II: SPECTROPHOTOMETRY

Introduction-Chromatography, Classification of Chromatography Methods-Principles of Differential Migration Adsorption Phenomenon, Adsorption Phenomenon, Nature of Adsorbents, Solvent Systems RF Values, Factors Effecting RF Values-Paper Chromatography, Principles of RF Values, Experimental Procedures, Choice of Paper and Solvent Systems, Developments of Chromatography Ascending, Descending and Radial, Two Dimensional Chromatography, Applications-Thin Layer Chromatography (TLC), Advantages, Principles, Factors Effecting Values, Experimental Procedures, Adsorbents and Solvents, Preparation of Plates, Development of the Chromatogram, Detection of the Spots, Applications-Column Chromatography, Principle, Experimental Procedures, Stationary and Mobile Phases, Separation Technique, Applications-High Performance Liquid Chromatography (HPLC) , Principles and Applications-Gas Liquid Chromatography (GLC), Principles and Applications.

Unit-III: MOLECULAR SPECTROSCOPY

General Features of Absorption Spectroscopy-Introduction-Beer Lambort's Law and its Limitations-Introduction- Transmittance-Absorbance and Molar Absorptivity-Single and Double Beam spectrophotometers-Application of Beer-Lambert Law for Quantitative Analysis.

Unit-IV: ELECTRONIC SPECTROSCOPY

Electronic Spectroscopy, Introduction to Molecular Spectroscopy, Interaction of Electromagnetic Radiation with Molecules and Types of Molecular Spectra-Potential Energy Curves for Bonding and Antibonding Molecular Orbitals, Introduction-Energy Levels of Molecules-Selection Rules for Electronic Spectra-Types of Electronic Transitions in Molecules Effect of Conjugation-Concept of Chromophore.

Unit-V: INFRA RED SPECTROSCOPY

Energy Levels of Simple Harmonic Oscillator, Introduction-Molecular Vibration Spectrum, Selection Rules-Determination of Force Constant-Qualitative Relation of Force Constant to Bond Energies-An harmonic Motion of Real Molecules and Energy Levels-Modes of Vibrations in Polyatomic Molecules-Characteristic Absorption Bands of Various Functional Groups-Finger Print Nature of Infrared Spectrum.

Unit-VI: RAMAN SPECTROSCOPY

Concept of Polarizability, Introduction, Selection Rules-Pure Rotational and Pure Vibrational Raman Spectra of Diatomic Molecules, Selection Rules.

Unit-VII: PROTON MAGNETIC RESONANCE SPECTROSCOPY

Principles of Nuclear Magnetic Resonance- Equivalent and Non-Equivalent Protons-Position of Signals and Chemical Shift-NMR Splitting of Signals, Spin-Spin Coupling, Coupling Constants-Applications of NMR.

Unit-VIII: SPECTRAL INTERPRETATION

Spectral Interpretation of Some Compounds, Phenylacetylene, Acetophenone, Cinnamic acid, Paranitroaniline.

Unit-IX: DRUGS

Introduction of Drug and Disease, Historical Evolution, Sources-plant, Animal Synthetic, Biotechnology and Human Genetherapy –Pharmacy, Pharmacology, Pharmacophore, Pharmacodynamics, Pharmacokinetics, Metabolites and Antimetabolities-Nomenclature, Classification Based on Structures and Therapeutic-Synthesis and TherapeuticActivity –Pencillin, Separation and Isolation-Drug Development of different pencillins-Drug Development of HIV-AIDS, Prevention of AIDS, Drugs Available, NNRTIS, NNRTIS, Monographs of Drugs.

Unit-X: FORMULATIONS

Need of Conversion of Drugs into Medicine, Additives used in Preparing the Dosage Form-Different Types of Formulation.

Unit-XI: PESTICIDES

Need of Conversion of Drugs into Medicine, Types of Pesticides-Rodenticides Plant Growth Regulators-Pheremones and Hormones-Synthesis of Pestcides.

Unit-XII: GREEN CHEMISTRY

Introduction, Definition of Green Chemistry , Need of Green Chemistry, Basic Principles of Green Chemistry-Green Synthesis, Evalution of the Type of the Reaction-Pericyclic Reactions (No By-Product)-Selection of Solvents, Green Catalysis, Microwave and Ultrasound Assisted Green Synthesis, Aldol Condensation, Connizaro Reaction, Diels-Alder Reaction, Strecker Synthesis, Willaimson Synthesis Williamson Synthesis, Dieckmann Condensation.

Unit-XIII: MACROMOLECULES

Classification of Polymers-Chemistry of Polymerization-Chain Polymerization-Step Polymerisation-Coordination Polymerization-Tacticity-Molecular Weight of Polymers, Number Average and Weight Average Molecular Weight-Degree of Polymerization-Determination of Molecular Weight of Polymers by Viscometry -Osmometry and Light Scattering Methods-Kinetic of Free Radical Polymerization, Derivation of Rate Law-Preparation and Indudtrial Application, Polyethylene, PVC and Teflon, Poly acrylonitrile, Terelene and Nylon 66-Introduction to Biodegradability

Unit-XIV: MATERIALS SCIENCE

Superconductivity, Characteristics of Superconductors, Meissner Effect, Types of Superconductors and Applications-Nanomaterials, Synthetic Techniques-Types of methods of Nanotechnology, Bottom-up-sol-gel Method, Top-down-Electrodeposition Method-Nanomaterials, Properties and Applications of Nanomaterials-Composites-Definition, General Characteristics-Particle Reinforce and Fiber Reinforce Composites and their Applications.

Unit-XV: CATALYSIS

Homogeneous and Hetrogeneous Catalysis-Kinetics of Specific Acid Catalyzed Reactions, Inversion of Cane Sugar-Kinetic of Specific Base Catalyzed Reactions, Base Catalyzed Conversion of Acetone to Discetone Alcohal-Acid and Base Catalyzed Reactions, Hydrolysis of Esters, Multarotation of Gulcose-Cataytic Activity at Surfaces-Mechanism of Hetrogenous Catalysis-Langmuir-Hinshelwood Mechanism-Enzyme catalysis: Classification and Characteristics of Eznzyme catalysis ,Significance of Michaelis Constant-Factors Affecting Enzyme Catalysis, Effect of Temperature, PH Concentration and Inhibitor-Catalytic Efficiency-Mechanism of Oxidation of Ethanol by Alcohol Dehydrogenase.

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