ORDINANCES, TEST OUTLINES, SYLLABI and READING COURSES

For

M.Sc. CHEMISTRY PART I

(SEMESTER I & II)

Academic Sessions

2025–26, 26-27

Under

Choice-Based Credit System (CBCS)

Scheme of

NEP 2020

PROGRAMME CODE: MCHE

POST GRADUATE DEPARTMENT OF CHEMISTRY

GURU NANAK COLLEGE

BUDHALADA

(An Autonomous College)

NAAC Accredited 'A++' Grade

College with Potential for Excellence Status by

UGC, Star College Status-DBT

E-mail: gncbudhlada@yahoo.co.in

Website: www. https://www.gncbudhlada.org

Under Punjabi University, Patiala

M.Sc. (CHEMISTRY) Part-I
(SEMESTER I & II)
SESSIONS: 2025-26, 26-27

Semester-I							
Paper Code	**Title of Paper**	**Credits**	**No. of Lectures**	**Max Marks**	**External Exam**	**Internal Assessment**	**Time allowed**
MCHE1101T	Inorganic Chemistry-I	04	60	100	70	30	3 hrs.
MCHE1102T	Organic Chemistry-I	04	60	100	70	30	3 hrs.
MCHE1103T	Physical Chemistry-I	04	60	100	70	30	3 hrs.
Elective Subjects							
MCHE1104T(A)*	Mathematics for Chemists	04	60	100	70	30	3 hrs.
MCHE1105T(B)*	Biology for Chemists	04	60	100	70	30	3 hrs.
Practicals							
MCHE1106P	Inorganic Chemistry-P	02	100	100	70	30	6 hrs.
MCHE1107P	Analytical Chemistry-P	02	100	100	70	30	6 hrs.
MCHE1108T** MCHE1109T***	Importance of Chemistry or Compulsory Punjabi (Mudla Gyan)	04 04	60 60	100 100	70 70	30 30	3 hrs. 3 hrs.
semester-II							
MCHE1201T	Inorganic Chemistry-II	04	60	100	70	30	3 hrs.
MCHE1202T	Organic Chemistry-II	04	60	100	70	30	3 hrs.
MCHE1203T	Physical Chemistry-II	04	60	100	70	30	3 hrs.
Elective Subjects							
MCHE1204T	Computer Fundamentals and Programming with C	04	60	100	70	30	3 hrs.
Practicals							
MCHE1205P	Organic Chemistry-P	02	100	100	70	30	6 hrs.
MCHE1206P	Physical Chemistry-P	02	100	100	70	30	6 hrs.

*** Note:** B.Sc. Non-medical students will take Biology for Chemists paper while B.Sc. Medical students will take the paper Mathematics for Chemists.

**This paper will be taught in Punjabi language & its contents are also in the Punjabi medium. The credits of this paper will not be counted among the total credits of the semester. It is a compulsory qualifying paper.

***This paper will be taught to the students who have not studied Punjabi at the Matric level in place of Paper "Importance of Chemistry". The credits of this paper will not be counted among the total credits of the semester. It is a compulsory qualifying paper.

SEMESTER - I

MCHE1101T: INORGANIC CHEMISTRY-I

Max Marks : 100 **60 hours; Credits: 04**
End Semester Exam: 70 **Time allowed - 3 hrs**
Internal Assesments: 30 **5 period/week**
Pass Marks : 35%

OBJECTIVES:

1. To understand the concepts of metal ligand bonding in transition complex compounds.
2. To understand the concepts like atomic structure, chemical bonding (ionic, covalent, metallic), molecular geometry, and the periodic trends of elements.
3. To understand the concept of theories of bonding in metals.
4. To understand the chemistry of organometalic compounds and bonding in pi acid ligands.
5. To understand the electronic spectra of complexes.
6. To understand the bioinorganic compounds and their use in medicines.

COURSE OUTCOMES:

After the completion of the course, Students will be able to

1. Explain advance idea and theoretical treatment of chemical bonding and structures
2. Recognize the molecular orbital and crystal field theories of complexes.
3. Understand spectral and magnetic properties of chemical compounds
4. Predict term symbols arising out of various configurations and determine splitting of term symbols in weak crystal fields.
5. Learn bioinorganic complexes and their applications.

INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three Sections: A, B and C. Section A will have four questions (from the respective section of syllabus) carrying 12 marks each, Section B will have also four questions (from the respective section of syllabus) carrying 12 marks each. Section C will consist of 11 short answer questions that will cover the entire syllabus and will be of two marks each.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions selecting two questions from each of Section A & B and entire Section C.

Section - A **30 Hrs.**

Chemical Bonding

The ionic bond, covalent bond, the variation method, ground state energy of hydrogen atom, the secular equations, electron distribution in hydrogen molecule ion, symmetric and antisymmetric energy states, the classical interaction energy, resonance, sp^3 hybridisation, 3c-2e bond, Linnetts doublet - quartet approach, the Pauli's exclusion principle.

Molecular orbital theory, Oh, Td and square planar complexes, complexes with no pi bonding, complexes with pi-bonding, Crystal field theory: Oh, Td and square planar complexes, applications of the crystal field theory & ligand field theories, orbital splitting and magnetic properties.

Pi Acid Ligands: CO, isocyanide, dinitrogen, CS, NO, trivalent phosphorus compound, multiple bonds from ligands to metal, pi complexes of unsaturated organic molecules : alkene & alkyne, enyl ligands, aromatic ring systems.

Section - B **30 Hrs.**

Spectra and Magnetism

Ionic radii, Jahn-Teller effects, thermodynamic effects of d-orbital splitting, magnetic properties of chemical compounds, origin of magnetic behavior, magnetic susceptibility and types of magnetic behavior : diamagnetism, paramagnetism, ferromagnetism : types of paramagnetic behavior : Large multiplet separation, small multiplet separations, spin only, high spin-low spin cross overs. Russel - Saunder's term, selection rules, break down of selection rules, band widths & shapes, electronic spectra of complexes, distortion from octahedral symmetry, Orgel diagrams - weak fields, charge - transfer spectra, photochemical reactions of chromium & ruthenium complexes.

Bioinorganic Chemistry

Introduction, the biochemistry of Iron : iron storage and transport ferritin, transferrin, bacterial iron transport, hemoglobin and myoglobin, nature of the heme-dioxygen binding, model systems, cooperativity in hemoglobin cytochromes, other iron - porphyrin bimolecule peroxidases & catalases, cytochrome P_{450} enzymes, other natural oxygen carriers - hemerythrins, iron - sulfur proteins. The biochemistry of other metals : zinc (carboxypetidase A, carbonic anhydrase, metallothioneins), copper (superoxide dismutase (CuZn SOD), hemocyanins, oxidases), cobalt (cyanocobalamin), molybdenum (nitrogenases) & tungsten other miscellaneous metals such as platinum, vanadium, chromium & nickel, chelates in chemotherapy, synthetic metal chelates as antimicrobial agents, lithium and mental health, gold and its compounds, metal complexes as antitumour agents – cis platin (mechanism of action).

LIST OF BOOKS:

1. Advanced Inorganic Chemistry - Cotton & Wilkinson (3rd, 4th & 5th Ed.)
2. Theoretical Inorganic Chemistry - Day & Selbin.
3. Inorganic Chemistry - Shriver, Atkins & Lang Ford.
4. Inorganic Chemistry of Biological Processes - Hughes.
5. Bio-Inorganic Chemistry - R.W. Hay (John Wiley & Sons).

MCHE1102T: ORGANIC CHEMISTRY-I

Max Marks: 100 marks **60 hours; Credits: 04**
End Semester Exam: 70 marks **Time allowed: 3 hrs.**
Internal Assessments: 30 **5 period/week**
Pass Marks: 35%

COURSE OBJECTIVE–

1 To understand the structure, stability, and reactivity of key reactive intermediates in organic chemistry.
2 To study elimination and pericyclic reactions with emphasis on stereoelectronic factors.
3 To apply experimental and theoretical tools to elucidate organic reaction mechanisms.
4 To explore concepts of aromaticity and non-covalent bonding in complex molecular systems.
5 To use molecular orbital theory in understanding reaction pathways and intermediate behavior.

COURSE OUTCOMES – By the end of the course, students will be able to:

1. Explain the structure and reactivity of major reactive intermediates.
2. Analyze organic reaction mechanisms using experimental evidence.
3. Differentiate elimination pathways and predict stereochemical outcomes.
4. Apply molecular orbital theory to pericyclic reactions.
5. Understand aromaticity and bonding in complex organic systems.
6. Use mechanistic tools to interpret reaction pathways.

INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three Sections-A, B & C. Section-A will have four questions (from the respective section of syllabus) carrying 12 marks each. Seetion-B will also have four questions (from the respective section of syllabus) carrying 12 marks each. Section-C will consist of 11 short answer questions that will cover the entire syllabus and will be of two marks each.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions selecting two questions from each of Section-A & Section-B while Section-C is compulsory.

Section - A

30 Hrs.

Reactive Intermediate: Carbocations: Formation, structure, and stability. Detection using NMR spectroscopy. Allylic, benzyllic and aromatic carbocations. Stereochemistry and typical reactions of carbocations; **Non classical carbocations:** Phenonium ion, norbornyl system, explaination based on rearrangement; **Carbanions:** Formation, structure, stability, and stereochemistry, Tautomerism and prototropy, General reactions; **Carbenes:** Formation and structure. Singlet and triplet carbenes. Stereochemistry and characteristic reactions; **Nitrenes:** Formation, Structure, Singlet & Triplet nitrene, Stereochemsitry and reactions; **Arynes:** Formation, Structure and reactions; **Free radicals**: Formation, Structure, Stability, Stereo-chemistry and reactions.

Reaction of Free Radicals: Free radical polymerisation mechanisms and examples. Halogenation: Chlorination and bromination, Allylic bromination using NBS (N-Bromosuccinimide), Iodination and fluorination, Influence of polar effects on halogenations; Addition Reactions : Free radical addition of HBr, HCl. HI thiols and halogens. Oxidation of aldehydes to carboxylic acids, Auto-oxidation process. Free radical rearrangements, Hunddiecker reaction.

Nature of Bonding in Organic Molecules: Aromaticity and Aromatic Character: Concept and criteria of aromaticity, Aromaticity in benzenoid and non-benzenoid compounds, Alternant and non-alternant hydrocarbons, Hückel's Rule and its application, Anti-aromaticity and homoaromaticity, PMO (Perturbation Molecular Orbital) approach to aromaticity; Introduction to fullernes: Structure and bonding in fullerenes.

Bonding weaker than Covalent :Formation and nature of addition compounds, Crown ether complexes and cryptands, Inclusion compounds (host–guest chemistry), Cyclodextrins: Structure and inclusion behaviour, Catenanes and Rotaxanes: Mechanically interlocked molecular systems.

Methods usedfor determination of reaction mechanism (Non-kinetic method): Use of optical, Stereochemical and isotopiclabelling techniques. Reaction studies from identification of products. Determination of the presence of intermediates- Isolation, Detection, Trapping of intermediate, crossover experiments Role of catalysts in revealing mechanistic steps, Mechanistic elucidation in reactions like Favorskii, Claisen, and Benzyne using isotopic studies, Study of hydride transfer mechanism in the Cannizzaro reaction.

Section - B

30 Hrs.

Elimination Reactions: Introduction, E_2, E_1 and E_1cB mechanism, Stereochemistry Product ratio, Orientation of double bond. Hofman Rule. Saytzeff Rule, Factors Governing E_2&E_1 Mechanism. Stereochemistry of E_2 reaction. Cyclic Elimination: Amine Oxide, Cope elimination, Esters, Xanthate and Free radical elimination. Dehalogenation by zinc, Triple bond formation by elimination, Elimination versus substitution, Effect of solvent, temperature, Nature of Base, Structure of the reactants. Peterson elimination. Aromatic Elimination: Benzyne, Nucleophillic aromatic substitution, addition elimination.

Pericyclic Reactions: Molecular Orbital symmetry, Frontier Orbitals of ethylene, 1,3 - butadiene, 1, 3, 5-hexatriene and allylsystem (allylcation, allyl anion and allyl radical). Classification of Pericyclic reactions.Woodward-Hoffman rule, correlation diagrams, FMO and PMO approach for pericyclic reactions. Electrocyclic reactions - conrotatory and disrotatory motions 4n, 4n+2 and allyI systems. Cycloadditions - antarafacial and suprafacial additions 4S+2S Systems and 2S+2S additionsof alkene. Sigmatropic rearrangement - suprafacial and antarafacialshift involving carbon moieties [1,3], [1,5], [1,7], [3,3] and[5, 5]-sigmatropic rearrangement, Claisen, Cope-rearrangement reactions.

SUGGESTED BOOKS:

1. Advanced Organic Chemsitry - Reaction, Mechanism and Structure.Jerry March, JohnyWiley.
2. Advanced Organic Chemistry, F.A. Carey and R.J. Sundberg, Plenum.
3. A Guide Book to Mechanism in Organic Chemistry. Peer Sykes, Longman.
4. Structure and Mechanism in Organic Chemistry, C.K. Ingold, Comell University Press.
5. Organic Chemistry, R.T. Morrison and R.N. Boyd, Prentice-Hall.
6. Principles of Organic Synthesis, R.O.C. Norman and J.M. Coxon.Blackie Academic &Professional.
7. Pericyclic Reactions. S.M. Mukherji, Macmilian. India.
8. Reaction Mechanism in Organic Chemistry. S.M. Mukherjii and S.P. Singh, Macmillan.

MCHE1103T: PHYSICAL CHEMISTRY-I

Max Marks : 100 **60 hours; Credits:04**
End Semester Exam: 70 **Time allowed - 3 hrs**
Internal Assessments: 30 **5 period/week**
Pass Marks : 35%

OBJECTIVES:

1. To learn advanced idea of thermodynamics.
2. Engaging in research activities to push the boundaries of thermodynamic knowledge and contribute to the development of new technologies and solutions.
3. To study application in understanding energy transformations and resource efficiency.

COURSE OUTCOMES:

1. To learn advanced idea of thermodynamics.
2. To study thermodynamic phenomenon of coupled biological reactions.
3. To provide an insight into the characteristics of different types of interactions in solutions and electrochemical phenomena.
4. To study various electrochemical energy storage devices and their applications
5. Corrosion monitoring and methods of corrosion prevention.

INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three Sections: A, B and C. Section A will have four questions (from the respective section of syllabus) carrying 12 marks each, Section B will have also four questions (from the respective section of syllabus) carrying 12 marks each. Section C will consist of 11 short answer questions that will cover the entire syllabus and will be of two marks each.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions selecting two questions from each of Section A & B and entire Section C.

Section - A **30 Hrs.**

Thermodynamics

(i) Recapitulation of first and second law of thermodynamics, Isothermal and adiabatic processes, Entropy, free energy and chemical equilibrium. Thermodynamic equation of state. Maxwell relations.

(ii) Non-ideal systems : Excess functions for non-ideal systems. Concept of Activity, activity coefficients, fugacity and their experimental determination. Partial molal properties and their determination.

(iii) Third law of the thermodynamics : Nernst postulate, Plank's contribution. Alternate formulation of third law. Residual Entropy, Cooling by adiabatic and demagnetization, Determination of absolute entropy of solids, liquids and gases.

(iv) Thermodynamic and living systems : Simultaneous or coupled reactions. Coupled reactions and metabolism. Free energy utilisation in metabolism. Terminal oxidation chain. Overall metabolic plan.

Statistical Thermodynamics

(i) General introduction : Phase space, microstates, macrostates, thermodynamic probability. Brief introduction to Maxwell-Boltzmann, Bose-Einstein and Fermi-Drac statistics.

Ensemble concept. Canonical, grand canonical and micro canonical ensembles. Stirling approxination, Maxwell Baltzmann distribution law.

(ii) Partition function and thermodynamic properties : Partition function and its factorization. Translational, rotational, vibrational; electronic and nuclear partition functions. Expressions for internal energy, entropy, Helmholtz function, Gibb's function, pressure, work and heat in terms of partition function. Thermodynamic properties of ideal gases. Vibrational, rotational, electronic and nuclear partition functions.

Section - B **30 Hrs.**

Electrochemistry

(i) Ion-solvent interactions : Born model of ion-solvent interactions, Experimental determination of salt-solvent interactions. Relative heats of solvation of ions in the hydrogen scale. Evaluation of ion-solvent interactions from experimental data of salt-solvent interactions.

(ii) Ion - ion interactions : Debye - Huckel theory of ion - ion interactions. Verification of Debye - Huckel limiting law. Activity, coefficients at moderate concentrations and higher concentrations. Mean activity coefficients and their experimental determination.

(iii) Conductance and Ionic mobilities : Variation of equivalent conductance with concentration. Debye - Huckel - Onsager theory. Modification of Debye - Huckel - Onsager equation. Ionic conductances. Ion-association and ion-pair formation. Ion-triplets in electrolyte solutions. Ion-triplets and conductance.

Applied Electrochemistry

(i) Electrical Double layer : Electrokinetic phenomenon. Null point and its determination. Structure of electrical double layer, parallel plate condenser theory, diffuse layer theory and adsorption theory of double layer.

(ii) Electrocatalysis : A chemical catalyst and an electrochemical catalyst, Electrocatalysis in redox reactions. Electrocatalysis in reactions involving adsorbed species. Some specific feature of electrocatalysis.

(iii) Electrochemical Energy Conversion and Electricity storage : Efficiency of electrochmical energy convertors. Some typical examples of electrochemical energy convertors. Advantages and applications of fuel cells. Various electricity storers and their applications.

(iv) Corrosion of Metals: Classification of corrosion processes, theories of corrosion processes, passivation of metals. Corrosion monitoring and methods of corrosion prevention.

SUGGESTED BOOKS:

1. Bockris and Reddy, *Modern Electrochemistry*, Vol. I & II.
2. Antropov, *Theoretical Electrochemisty*.
3. Glasstone, *Electrochemistry*.
4. Aston and Fritz, *Thermodynamic and Statistical Thermodynamics*.
5. Lee, Seers and Turcotte; *Statistical Thermodynamics*.
6. Dickerson, *Molecular Thermodynamics*.
7. Glasstone, *Thermodynamics for Chemists*.

MCHE1104T(A): MATHEMATICS FOR CHEMIST

Max Marks : 100 **60 hours; Credits: 04**
End Semester Exam: 70 **Time allowed - 3 hrs**
Internal Assesments: 30 **5 period/week**
Pass Marks : 35%

COURSE OBJECTIVES:
The course aims to develop a strong foundation in vector analysis, matrix algebra, coordinate geometry, and trigonometry. It enhances analytical and problem-solving skills through differential and integral calculus, differential equations, and series solutions. Students will also gain basic knowledge of permutations, probability, and their applications in physical sciences.

COURSE OUTCOMES:
1. Apply vector operations and calculus tools (gradient, divergence, curl) to solve physical and mathematical problems.
2. Solve systems of linear equations using matrix algebra, including eigenvalue problems and the Cayley-Hamilton theorem.
3. Analyze geometric relationships using coordinate geometry and trigonometric identities.
4. Use differential and integral calculus for solving problems involving rates of change, area, and optimization.
5. Solve basic differential equations and apply them to physical models such as chemical kinetics and harmonic oscillators.
6. Apply concepts of permutations, combinations, and probability to analyze and interpret scientific data.

INSTRUCTIONS FOR THE PAPER-SETTER

The question paper will consist of three Sections: A, B and C. Section A will have four questions (from the respective section of syllabus) carrying 12 marks each, Section B will have also four questions (from the respective section of syllabus) carrying 12 marks each. Section C will consist of 11 short answer questions that will cover the entire syllabus and will be of two marks each.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions selecting two questions from each of Section A & B and entire Section C.

SECTION-A **30hrs**

Vectors : Vectors, dot, cross and triple products. The gradient, divergence and curl.

Matrix Algebra : Addition and multiplication, determinants (up to 4th order) inverse, adjoint and transpose of matrices, special matrices (Symmetric, skew-symmetric, Hermitian; skew-Hermitian, unit, diagonal, unitary etc.) and their properties. Matrix equations : Homogeneous, non-homogeneous, linear equations and conditions for the solution, linear dependence and independence. Cayley Hamilton theorem, matrix eigenvalues and eigenvectors.

Coordinate Geometry: Cartesian system of co-ordinates in the plane, slope of a line, parallel and perpendicular lines, intercepts of a line on the co-ordinate axes, Various forms of equations of a line-parallel to axis, slope intercept form, the point slope form, two point form, intercept form, normal form and general forms.

Trigonometry: Degree and radian measure of positive and negative angles, relation between degree and radian, definition of trigonometric functions with the help of unit circle, Periodic functions, Concept of periodicity of trigonometric functions, values of trigonometric functions for different angles, trigonometric functions of sum and differences of angles, addition and subtraction formulae.

SECTION-B **30hrs**

Differential Calculus: Functions, continuity and differentiability, rules for differentiation, applications of differential calculus including maxima and minima. Functions of several variables, partial differentiation, Euler's theorem co-ordinate transformations (e.g. cartesian to spherical polar).

Integral calculus: Basic rules for integration, integration by parts, partial fraction and substitution definite integrals. Reduction formulae.

Elementary Differential Equations

Variables: separable and exact, first order differential equations. Homogeneous, exact and linear equations. Applications to chemical kinetics, secular equilibria, quantum chemistry etc. Solutions of differential equations by the power series method, Fourier series, solutions of harmonic oscillator and Legendre equation, spherical harmonics.

Permutation and Probability: Permutations and combinations, probability and probability theorems, probability curves, average, root mean square and most probable errors, examples from the kinetic theory of gases, curve fitting (including least square fit) with a general polynomial fit.

SUGGESTED BOOKS:

1. The Chemistry Mathematics Book, E. Steiner, Oxford University Press.
2. Mathematics for Chemistry, Doggett and Sucliffe, Longman.
3. Mathematical Preparation for Physical Chemistry, F. Daniels, McGraw Hill.
4. Chemical Mathematics, D.M. Hirst, Longman.
5. Applied Mathematics for Physical Chemistry, J.R. Barrante, Prentice Hall.
6. Basic Mathematics for Chemists, Tebbutt Wiley.

SUPPLEMENTARY READING

1. Higher Engineering Mathematics, S. S. Grewal (Khanna Pub.)

MCHE1105T(B): BIOLOGY FOR CHEMISTS

Max Marks: 100 **Lectures: 60; Credit 04**
Semester paper: 70 **Time allowed - 3 hrs**
Internal Assessments: 30 **Pass Marks: 35%**

COURSE OBJECTIVE-

1. To understand the chemical basis of biological structures and functions.
2. To bridge the gap between chemistry and life sciences for interdisciplinary research.
3. To apply chemical techniques to study and analyze biological systems.

COURSE OUTCOMES

1. Understand fundamental biological systems and their chemical basis.
2. Explain the structure and function of key biomolecules.
3. Analyze biochemical pathways using chemical principles.
4. Apply interdisciplinary knowledge to solve bio-chemical problems.
5. Interpret experimental data from molecular biology and biochemistry techniques.

INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three Sections: A, B and C. Section A will have four questions (from the respective section of syllabus) carrying 12 marks each, Section B will have also four questions (from the respective section of syllabus) carrying 12 marks each. Section C will consist of 11 short answer questions that will cover the entire syllabus and will be of two marks each.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions selecting two questions from each of Section A & B and entire Section C.

Section – A **30 hrs**

Origin of Life

Unique properties of Carbon, Chemical evolution and rise of living systems. Introduction of biomolecules, building blocks of biomolecules, Energy Cycle

Cell Structure, Functions

Classification of Carbohydrates,Structure of prokaryotic .& eukaryotic cells, Monosaccharides, Polysaccharides Intercellular organelles and their functions, Comparison of plant and animal cells. Overview of metabolic process - catabolism and Anabolism. ATP - the Biological energy currency. Cell division stages of mitosis & meiosis. Significance of cell division and fertilization

Carbohydrates

Monosaccharides, structure & functions of important derivatives of monosaccharides(Enantiomers, Epimers, Hemiacetal, Hemiketalepanomers). O-glycosidic bond disaccharide & Polysaccharides. Structural polysaccharides. Reducing and non-reducing sugars. Structural Polysaccharides - cellulose and chitin. Storage Polysaccharides - starch and glycogen. Structure and Biological functions. Carbohydrate metabolism - Kreb's Cycle, glycolysis, glycogenesis and glycogenolysis, gluconeogenesis, Pentose phosphate Pathway.

Lipids

Classification, Structure of lipids with functions in biosystems; Fatty acids, essential fatty acids, structure and function. Triacyl glycerols. Structural lopids-phospholipids, Glycolopids &

Archae bacterial ether lipids. Lipoproteins — composition and function. Lipids as Signals, cofactor and pigments, Lipid and cell memberane. Properties of lipid aggregates: micelles, bilayers, liposomes, Biological membranes and transport. Fluid mosaic model of membrane structure. Lipid metabolism - β - oxidation of fatty acids.

Section – B **30 hrs**

Structure of Proteins

Introduction of Amino acids, Essential and non Essential Amino acids structure, properties and classification, Ionic and Chemical Properties of amino acids. pka and zwitterion form, Peptide bond, polypeptides. Primary structure - peptide chain. Secondary structure of proteins, - α halix, beta sheets. Tertiary structure of protein. Quarternary structure of homoglobin. Degradation and biosynthesis of amino acids, sequence determination : chemical/ enzymatic/mass spectral, racemization/detection

Enzymes

Enzymes as biological catalyst and mode of their action, Denaturation of Enzymes

Structure of Nucleic Acids

Definition of Nucleic Acid, Primary Building Blocks of Nucleic Acid. Purines and Pyrimidine bases of nucleic acids, Structure of ribonuclic acids (RNA) and deoxyribonucleic acids (DNA), Types of DNA and RNA, double helix model of DNA and forces responsible for holding it Chemical and enzymatic hydrolysis of Nucleic acids.

Replication of DNA

The chemieal basis of heredity and overview of replication of DNA.

Protein synthesis & Genetic Code

Transcription, translation and genetic code, chemical synthesis of mono and trinucleoside.

SUGGESTED BOOKS:

1. *Principles of Biochetnistry,* A.L. Lehninger, Worth Publishers.
2. *Biochemistry*, L. Stryer, W.H. Freeman.
3. *Biochemistry*, J. David Rawn, Neil Patterson.
4. *Biochemistry*, Voet and Voet, John Wiley.
5. *Outlines of Biochemistry*, E.E. Conn and P.K. Stumpf, John Wiley.

MCHE1106P: INORGANIC CHEMISTRY PRACTICALS-P

Max Marks : 100 **6 hrs/week; Credits:02**
End Semester Exam: 70 **Internal Assessments: 30**
Pass Marks : 35%

COURSE OBJECTIVE:

1. To learn synthesis of coordination compounds.
2. To perform redox and complexometric titrations.
3. To estimate metal ions using EDTA and spectrophotometry.
4. To analyze metal mixtures by gravimetric and titrimetric methods.
5. To separate metal ions using chromatography.

COURSE OUTCOMES:

On completion of the course the students will be able to:

1. Prepare various types of complexes of tin, lead, mercury, chromium and cobalt
2. Carry out oxidation-reduction titrations
3. Estimation metals by complexometric titrations using EDTA
4. Spectrophotometric estimation of heavy metal ions.
5. Perform gravimetric/titrimetric determination of mixed metal ions
6. Carry out synthesis of simple coordination compounds.
7. Separation of metal ions by chromatography techniques

PREPARATION AND ESTIMATIONS

1. Preparation of Tris-thioureacuprous chloride.
2. Estimation of Cu and Chloride.
3. Preparation of Hexathioureaplumbousnitrate $Pb.6CS(NH_2)_2(NO_3)_2$.
4. Estimation of lead.
5. Preparation of Tin tetraiodide.
6. Estimation of Sn.
7. Preparation of K_3 $[Fe(C_2O_4)_3]$.
8. Estimation of iron.
9. Preparation of Hg $[Co(NCS)_4]$
10. Simultaneous estimation of Hg and Co.
11. Preparation of $(NH_3)_2Hg$ Cl_2.
12. Estimation of Hg.
13. Mercuration of phenol and separation of the compound into o—, and p—, isomers.
14. Preparation of $K_3[Cr(C_2O_4)_3]$
15. Estimation of Cr and oxalate.
16. Preparation of $[Co(acac)_3]$.
17. Estimation of cobalt.
18. Spectrophotometric Estimation of
    (a) tin with toluene 3,4-dithiol (dithiol)
    (b) Chromium with diphenyl carbazide.
19. Separation of metal ions (Co, Cu, Ni) using Paper chromatography taking rubeanic acid as developing agent.

SUGGESTED BOOKS:

1. Vogel's Quantitative chemical Analysis, Pearson Education, 6th edition.
2. Vogel's Qualitative Inorganic Analysis, Pearson Education, 5th edition.
3. Advanced Practical Inorganic Chemistry, Gurdeep Raj, Krishna Prakashan.

MCHE1107P: ANALYTICAL CHEMISTRY PRACTICALS-P

Max Marks : 100 **6 hrs/week; Credits:02**
End Semester Exam: 70 **Internal Assessments: 30**
Pass Marks : 35%

COURSE OBJECTIVES:

1. To learn and apply techniques for identifying, separating, and quantifying substances, as well as developing critical thinking and problem-solving skills.
2. Gaining proficiency in using laboratory equipment and techniques, including pipetting, titrations, and spectroscopic measurements.

COURSE OUTCOMES:

1. Students are able to learn the principle and working of pH meter.
2. Students are able to learn the principle and working of conductometer.
3. Students are able to find the percentage purity and strength of different solutions using different methods.
4. Students are able to learn the principle and working of potentiometer and colorimeter.

SECTION-A

1. To determine the percentage purity of given sample of $ZnSO_4.7H_2O$ by complexo-metric titration.
2. Determine the percentage purity of the given sample of $NiSO_4.7H_2O$ by complexometric titration using Eriochrome black-T.
3. To determine the composition of Calcium and Magnesium in the mixture of the given solution.
4. To find the strength of ascorbic acid in the given solution of Vitamin C tablet by titrating against (I) Standard I_2 solution (II) Standard Sodium thiosulphate solution.
5. To determine the percentage purity of sample of KBr using adsorption indicator.
6. To determine the amount of H_2O_2 in the given solution by titrating against.
   (I) Standard $KMnO_4$ (II) Standard Sodium thiosulphate solution.
7. To find out the percentage purity of KI by titrating it against standard KIO_3 solution.

SECTION-B

1. To determine the strength of HCl solution by titrating it against NaOH pH-metrically.
2. To determine the strength of acetic acid solution by titrating it against NaOH pH-metrically.
3. To determine the composition of the mixture of HCl & CH_3COOH by titrating it against NaOH pH^- metrically.
4. Determine the strength of HCl solution by titrating it against NaOH conductometrically.
5. Determine the strength of CH_3COOH solution by titrating it against NaOH conductometrically.
6. To determine the composition of the mixture of HCl & CH_3COOH by titrating it against NaOH conductometrically.
7. Determine the strength of $FeSO_4.7H_2O$ solution by titrating it against $KMnO_4$ potentiometrically.
8. Determine the strength of $CuSO_4.7H_2O$ Colorimetrically.
9. Determine the strength of $K_2Cr_2O_7$ solution Colorimetrically.

10. Determine the strength of Titanium Colorimctrically.

SUGGESTED BOOKS:

1. Senior Practical Physical Chemistry by B D Khosla, V C Garg, Adarsh Gulati
2. Advance Practical Physical Chemistry by JP Yadav. Krishna Prakashan Media
3. Advance Physical Chemistry Experiments by Gurtu & Gurtu. Pragati Parakashan
4. University Practical Chemistry by PC Kamboj Vishal Publishing Co.

ਰਸਾਇਣ ਵਿਗਿਆਨ ਦੀ ਮਹੱਤਤਾ

Paper Code: MCHE1108T

ਕੁੱਲ ਨੰਬਰ = 100 **60 hrs; Credits: 04**

i. ਸਮੈਸਟਰ ਪੇਪਰ = 70 ਨੰਬਰ **Time Allowed: 3 hours**

ii. ਇੰਟਰਨਲ ਅਸੈਸਮੈਂਟ = 30 ਨੰਬਰ **Pass marks: 35%**

ਪੇਪਰ ਸੇਟਰ ਲਈ ਹਦਾਇਤਾਂ:

ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਵਿੱਚ ਤਿੰਨ ਭਾਗ ਓ, ਅ ਅਤੇ ੲ ਹੋਣਗੇ। ਭਾਗ ਓ ਅਤੇ ਅ ਵਿੱਚ 4 ਪ੍ਰਸ਼ਨ ਹੋਣਗੇ (ਸਿਲੇਬਸ ਦੇ ਸਬੰਧਤ ਭਾਗ ਤੋਂ) ਹਰੇਕ ਵਿੱਚ 11 ਅੰਕ ਹੋਣਗੇ। ਭਾਗ C ਵਿੱਚ 11 ਛੋਟੇ ਜਵਾਬ ਹੋਣਗੇ ਜੋ ਪੂਰੇ ਸਿਲੇਬਸ ਨੂੰ ਕਵਰ ਕਰਨਗੇ ਅਤੇ ਹਰੇਕ ਦੇ 3 ਅੰਕ ਹੋਣਗੇ।

ਉਮੀਦਵਾਰਾਂ ਲਈ ਹਦਾਇਤਾਂ:

ਉਮੀਦਵਾਰਾਂ ਨੂੰ ਸੈਕਸ਼ਨ ਏ ਅਤੇ ਬੀ ਅਤੇ ਪੂਰੇ ਸੈਕਸ਼ਨ ਸੀ ਵਿੱਚੋਂ 2-2 ਪ੍ਰਸ਼ਨ ਚੁਣਦੇ ਹੋਏ 5 ਪ੍ਰਸ਼ਨਾਂ ਦੀ ਕੋਸ਼ਿਸ਼ ਕਰਨ ਦੀ ਲੋੜ ਹੁੰਦੀ ਹੈ।

ਭਾਗ -ਓ

ਰੋਜ਼ਾਨਾ ਜੀਵਨ ਵਿੱਚ ਰਸਾਇਣ: ਦਵਾਈਆਂ ਵਿੱਚ ਰਸਾਇਣ। ਡਰੱਗ ਦੀ ਡਿਜ਼ਾਈਨਿੰਗ ਅਤੇ ਦਵਾਈਆਂ ਦਾ ਵਰਗੀਕਰਨ, ਟੀਚਿਆਂ ਨਾਲ ਦਵਾਈਆਂ ਦਾ ਆਪਸੀ ਤਾਲਮੇਲ, ਰੀਸੈਪਟਰ ਟੀਚਿਆਂ ਨਾਲ ਦਵਾਈਆਦਾ ਪਰਸਪਰ ਪ੍ਰਭਾਵ, ਦਵਾਈਆਂ ਦੀਆਂ ਕਿਸਮਾਂ, ਨਿਊਰੋਲੋਜੀਕਲ ਤੌਰ 'ਤੇ ਕਿਰਿਆਸ਼ੀਲ ਦਵਾਈਆਂ, ਐਂਟੀਪਾਇਰੇਟਿਕਸ, ਐਂਟੀਮਾਈਕਰੋਬਾਇਲਸ, ਐਂਟੀਬਾਇਓਟਿਕਸ, ਐਂਟੀਸੈਪਟਿਕਸ ਅਤੇ ਕੀਟਾਣੂਨਾਸ਼ਕ, ਐਂਟੀਏਸਿਡਸ, ਐਂਟੀਹਿਸਟਾਮਾਈਨਜ਼।

ਬਾਇਓਮੋਲੀਕਿਊਲਜ਼: ਕਾਰਬੋਹਾਈਡਰੇਟ, ਮੋਨੇਸੈਕਰਾਈਡਸ-ਗਲੂਕੋਜ਼ ਅਤੇ ਫਰਕਟੋਜ਼ (ਸਿਰਫ਼ ਖੁੱਲ੍ਹੀ ਅਤੇ ਰਿੰਗ ਬਣਤਰ), ਡਿਸੈਕਰਾਈਡਜ਼, ਸੁਕਰੋਜ਼, ਪੋਲੀਸੈਕਰਾਈਡਜ਼-ਸਟਾਰਚ ਅਤੇ ਸੈਲੂਲੋਜ਼, ਘਟਾਉਣ (Reducing) ਅਤੇ ਨਾ-ਘਟਾਉਣ ਵਾਲੀ (Non-Reducing) ਸ਼ੂਗਰ, ਕਾਰਬੋਹਾਈਡਰੇਟ ਦੀ ਮਹੱਤਤਾ, ਪ੍ਰੋਟੀਨ, α-ਐਮੀਨੋ ਐਸਿਡ, α -ਐਮੀਨੋ ਐਸਿਡ ਦੇ ਗੁਣਾਂ ਦਾ ਵਰਗੀਕਰਨ, ਪ੍ਰੋਟੀਨ ਦਾ ਵਿਕਾਰ (Denaturation), ਐਨਾਜ਼ਾਈਮਜ਼ ਅਤੇ ਵਿਟਾਮਿਨ (ਸਿਰਫ ਕੁਝ ਮਹੱਤਵਪੂਰਨ ਵਿਟਾਮਿਨਾਂ ਦੀਆਂ ਵਿਸ਼ੇਸ਼ਤਾਵਾਂ, ਸਰੋਤ ਅਤੇ ਕਮੀ ਤੋਂ ਬਿਮਾਰੀ)।

ਭਾਗ-ਅ

ਵਾਤਾਵਰਣ ਰਸਾਇਣ: ਵਾਤਾਵਰਣ ਅਤੇ ਵਾਤਾਵਰਣ ਪ੍ਰਦੂਸ਼ਕ: ਜਾਣ-ਪਛਾਣ, ਪ੍ਰਦੂਸ਼ਕ ਦੀ ਕਿਸਮ। ਪ੍ਰਦੂਸ਼ਣ ਦੀਆਂ ਕਿਸਮਾਂ:ਹਵਾ ਜਾਂ ਵਾਯੂਮੰਡਲ ਪ੍ਰਦੂਸ਼ਣ:ਜਾਣ-ਪਛਾਣ, ਹਵਾ/ਵਾਯੂਮੰਡਲ ਦੇ ਪ੍ਰਦੂਸ਼ਣ ਦੇ ਸਰੋਤ।

ਪਾਣੀ ਅਤੇ ਇਸ ਦਾ ਇਲਾਜ (Treatment): ਜਲ ਪ੍ਰਦੂਸ਼ਣ ਦੀਆਂ ਕਿਸਮਾਂ, ਪਾਣੀ ਦੇ ਪ੍ਰਦੂਸ਼ਣ ਦੇ ਸਰੋਤ/ਕਾਰਨ, ਪਾਣੀ ਦੇ ਪ੍ਰਦੂਸ਼ਕਾਂ ਦਾ ਵਰਗੀਕਰਨ, ਪੀਣ ਵਾਲੇ ਪਾਣੀ ਲਈ ਅੰਤਰਰਾਸ਼ਟਰੀ ਮਿਆਰ, ਬੀਓਡੀ, ਸੀਓਡੀ।

ਪੋਸਟ ਗ੍ਰੈਜੂਏਸ਼ਨ ਪੱਧਰ ਦੇ ਕੋਰਸਾਂ ਲਈ ਸਾਂਝਾ ਸਿਲੇਬਸ

ਪੰਜਾਬੀ ਲਾਜ਼ਮੀ (ਮੁੱਢਲਾ ਗਿਆਨ)

Paper Code: MCHE1109T

ਕੁੱਲ ਅੰਕ: 100 **ਵਿਸ਼ੇ ਵਿਚੋਂ ਪਾਸ ਹੋਣ ਲਈ ਅੰਕ: 35**

ਅੰਦਰੂਨੀ ਮੁਲਾਂਕਣ: 30 ਅੰਕ **ਕ੍ਰੈਡਿਟ:04**

ਬਾਹਰੀ ਪਰੀਖਿਆ: 70 ਅੰਕ

ਸਮਾਂ: 3 ਘੰਟੇ

ਅੰਕ-ਵੰਡ ਅਤੇ ਪੇਪਰ ਸੈਂਟਰ ਲਈ ਹਦਾਇਤਾਂ

1. ਪਾਠਕ੍ਰਮ ਦੇ ਸਾਰੇ ਭਾਗਾਂ ਵਿਚੋਂ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ।
2. ਪੇਪਰ ਨੂੰ ਤਿੰਨ ਭਾਗਾਂ ਉ, ਅ ਅਤੇ ੲ ਵਿੱਚ ਵੰਡਿਆ ਜਾਵੇਗਾ।
3. ਵਿਦਿਆਰਥੀ ਪਹਿਲੀ ਵਾਰ ਗੁਰਮੁਖੀ ਲਿਪੀ ਸਿੱਖ ਰਹੇ ਹਨ। ਹੋ ਸਕਦਾ ਹੈ ਵਿਦਿਆਰਥੀ ਪੰਜਾਬੀ ਭਾਸ਼ਾ ਤੋਂ ਵੀ ਅਨਜਾਣ ਹੋਣ ਸੋ ਪ੍ਰਸ਼ਨ ਪੱਤਰ ਤਿਆਰ ਕਰਦੇ ਸਮੇਂ ਵਿਦਿਆਰਥੀਆਂ ਦੀ ਇਸ ਸੀਮਾ ਨੂੰ ਧਿਆਨ ਵਿਚ ਰੱਖਿਆ ਜਾਵੇ।
4. ਉ ਭਾਗ ਦੇ ਦੋ ਉਪ-ਭਾਗਾਂ ਉ-1 ਅਤੇ ਉ-2 ਭਾਗ ਵਿਚੋਂ ਦੋ-ਦੋ ਪ੍ਰਸ਼ਨ ਪੁੱਛੇ ਜਾਣਗੇ, ਹਰੇਕ ਭਾਗ ਵਿਚੋਂ ਵਿਦਿਆਰਥੀ ਨੇ ਕ੍ਰਮਵਾਰ ਇਕ-ਇਕ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨਾ ਹੋਵੇਗਾ, ਜਿਸ ਦੇ ਪ੍ਰਤੀ ਪ੍ਰਸ਼ਨ 12 ਅੰਕ ਹੋਣਗੇ ਅਤੇ ਉ ਭਾਗ ਦੇ ਕੁੱਲ 24 ਅੰਕ ਹੋਣਗੇ ।
5. ਭਾਗ ਅ ਦੇ ਦੋ ਉਪ ਭਾਗਾਂ (ਅ-1, ਅ-2.) ਵਿਚੋਂ ਪੁੱਛੇ 4 ਪ੍ਰਸ਼ਨਾਂ ਵਿੱਚੋਂ ਦੋ ਪ੍ਰਸ਼ਨ ਹੱਲ ਕਰਨੇ ਹਨ। ਇਕ ਉਪ-ਭਾਗ ਵਿਚੋਂ ਕੇਵਲ ਇੱਕ ਪ੍ਰਸ਼ਨ ਹੀ ਹੱਲ ਕਰਨਾ ਹੈ। ਇਹਨਾਂ ਦੇ ਪ੍ਰਸ਼ਨਾਂ ਦੇ 12 X 2=24 ਅੰਕ ਹੋਣਗੇ।
6. ਭਾਗ-ੲ ਦੇ ਸਾਰੇ 11 ਪ੍ਰਸ਼ਨ ਲਾਜ਼ਮੀ ਹਨ, ਇਹਨਾਂ ਪ੍ਰਸ਼ਨਾਂ ਦਾ ਸੰਖੇਪ ਉੱਤਰ ਦੇਣਾ ਹੈ। ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦੇ 2 ਅੰਕ ਹਨ।
7. ਹਰੇਕ ਪ੍ਰਸ਼ਨ ਦਾ ਉੱਤਰ ਪ੍ਰਸ਼ਨ ਨੂੰ ਧਿਆਨ ਵਿਚ ਰੱਖਕੇ ਅਤੇ ਪ੍ਰਸ਼ਨ ਦੀ ਸੀਮਾ ਵਿਚ ਰਹਿ ਕੇ ਦਿੱਤਾ ਜਾਵੇ।

ਭਾਗ-ਉ

ਪੰਜਾਬੀ ਧੁਨੀ-ਵਿਉਂਤ ਅਤੇ ਗੁਰਮੁਖੀ ਲਿਪਾਂਕਣਕਾਰੀ/ਲੇਖਣ-ਪ੍ਰਬੰਧ

ਉ- ਭਾਗ 1. ਪੰਜਾਬੀ ਧੁਨੀ-ਵਿਉਂਤ, ਪੰਜਾਬੀ ਵਿਅੰਜਨ ਅਤੇ ਗੁਰਮੁਖੀ ਵਰਨਮਾਲਾ

ii. ਪੰਜਾਬੀ ਧੁਨੀ ਵਿਉਂਤ ਨਾਲ ਮੁਢਲੀ ਜਾਣ-ਪਛਾਣ: ਪੰਜਾਬੀ ਖੰਡੀ ਧੁਨੀਆਂ: ਵਿਅੰਜਨ ਧੁਨੀਆਂ (ਕੰਠੀ ਤਾਲਵੀ, ਉਲਟਜੀਭੀ, ਦੰਤੀ, ਹੋਂਠੀ ਅਤੇ ਸੁਰ-ਯੰਤਰੀ ਧੁਨੀਆ) ਸੁਰ ਧੁਨੀਆਂ ਅਤੇ ਅਖੰਡੀ ਧੁਨੀਆਂ ਸੁਰ, ਬਲ, ਨਾਸਿਕਤਾ

iii. ਗੁਰਮੁਖੀ ਅੱਖਰਾਂ ਦੇ ਨਾਮ ਅਤੇ ਰੂਪ ਦੀ ਪਛਾਣ ਅਤੇ ਉਹਨਾਂ ਦੀ ਤਰਤੀਸ਼ ਅਤੇ ਉਹਨਾਂ ਦਾ ਲਿਖਣ-ਅਭਿਆਸ (ਗੁਰਮੁਖੀ ਵਰਨਮਾਲਾ ਦੇ ਸੱਤ ਵਰਗ ਅਤੇ ਪੈਰ-ਬਿੰਦੀ ਵਰਗ)

iv. ਗੁਰਮੁਖੀ ਦੇ ਵਿਅੰਜਨ ਸੂਚਕ ਅੱਖਰਾਂ ਅਤੇ ਉਹਨਾਂ ਦੁਆਰਾ ਪ੍ਰਗਟ ਕੀਤੀਆਂ ਜਾਣ ਵਾਲੀਆਂ ਧੁਨੀਆਂ ਦੀ ਜਾਣਕਾਰੀ ਅਤੇ ਉਹਨਾਂ ਦੀ ਵਰਤੋਂ ਦੇ ਨਿਯਮ

v. ਗੁਰਮੁਖੀ ਦੇ ਪੈਰੀਂ ਅੱਖਰ: ਪਛਾਣ ਅਤੇ ਵਰਤੋਂ 12 ਅੰਕ

ੳ-ਭਾਗ 2. ਪੰਜਾਬੀ ਸ੍ਵਰ ਅਤੇ ਅਖੰਡੀ ਧੁਨੀਆਂ ਦਾ ਲੇਖਣ-ਪ੍ਰਬੰਧ/ਦੀ ਲਿਪਾਂਕਣਕਾਰੀ

i. ਪੰਜਾਬੀ ਲਗਾਂ-ਮਾਤਰਾਵਾਂ ਦੇ ਨਾਮ ਅਤੇ ਰੂਪ ਦੀ ਪਛਾਣ ਅਤੇ ਉਹਨਾਂ ਦੀ ਵਰਤੋਂ ਸੰਬੰਧੀ ਜਾਣਕਾਰੀ ਅਤੇ ਉਹਨਾਂ ਦਾ ਲਿਖਣ-ਅਭਿਆਸ

ii. ਲਗਾਂ-ਮਾਤਰਾਵਾਂ (ਸ੍ਵਰ-ਵਾਹਕ ਤੋਂ ਬਿਨਾਂ) ਦੀ ਵਰਤੋਂ (ਲਗਾਂ-ਮਾਤਰਾਵਾਂ ਅਤੇ ਉਹਨਾਂ ਦੁਆਰਾ ਪ੍ਰਗਟ ਸ੍ਵਰਾਂ ਦੀ ਪਛਾਣ ਅਤੇ ਸ਼ਬਦ ਵਿੱਚ ਉਹਨਾਂ ਦੀ ਵਰਤੋਂ ਦੇ ਨਿਯਮ (ਵਿਚਰਨ ਸਥਾਨ ਦੇ ਸੰਦਰਭ ਵਿੱਚ)

iii. ਪੰਜਾਬੀ ਸ੍ਵਰ-ਵਾਹਕਾਂ ਦੇ ਨਾਲ ਲਗਾਂ-ਮਾਤਰਾਵਾਂ ਦੀ ਵਰਤੋਂ(ਸ੍ਵਰ-ਵਾਹਕਾਂ ਦੇ ਨਾਲ ਲਗਾਂ-ਮਾਤਰਾਵਾਂ ਦੀ ਵਰਤੋਂ ਦੀ ਪਛਾਣ ਅਤੇ ਉਹਨਾਂ ਦੀਆਂ ਵਰਤੋਂ-ਸਥਿਤੀਆਂ ਸੰਬੰਧੀ ਜਾਣਕਾਰੀ (ਜਿਸ ਵਿੱਚ ਸ਼ਬਦ ਦੇ ਮੁੱਢ ਅਤੇ ਸ਼ਬਦ ਵਿੱਚ ਕਿਸੇ ਹੋਰ ਸ੍ਵਰ ਤੋਂ ਬਾਅਦ ਵਿੱਚ ਹੀ ਸ੍ਵਰ ਨੂੰ ਪ੍ਰਗਟਾਉਣ ਲਈ ਸ੍ਵਰ-ਵਾਹਕ ਨਾਲ ਲਗ-ਮਾਤਰਾ ਦੀ ਵਰਤੋਂ ਦਾ ਹੋਣਾ ਆਦਿ ਸ਼ਾਮਲ ਹੈ।)

iv. ਨਾਸਿਕਤਾ ਅਤੇ ਬਿੰਦੀ, ਟਿੱਪੀ ਦੀ ਵਰਤੋਂ (ਵੱਖ-ਵੱਖ ਮਾਤਰਾਵਾਂ ਦੇ ਸੰਦਰਭ ਵਿੱਚ)

v. ਬਲ ਅਤੇ ਦੁੱਤੀਕਰਨ ਅਤੇ ਅਧਕ ਦਾ ਪ੍ਰਯੋਗ 12 ਅੰਕ

ਅ-ਭਾਗ

ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ: ਮੁਢਲਾ ਸਿਧਾਤਕ ਗਿਆਨ, ਸ਼ਬਦ-ਰਚਨਾ ਅਤੇ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ

ਅ-ਭਾਗ 1. ਪੰਜਾਬੀ ਸ਼ਬਦ-ਬਣਤਰ ਅਤੇ ਸ਼ਬਦ-ਰਚਨਾ

i. ਵਿਭਿੰਨ ਲਗਾਂ-ਮਾਤਰਾਵਾਂ ਦੀ ਵਰਤੋਂ ਨਾਲ ਇੱਕ-ਅੱਖਰੀ, ਦੋ-ਅੱਖਰੀ ਅਤੇ ਤਿੰਨ-ਅੱਖਰੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਂ ਦੀ ਰਚਨਾ (ਹਰ ਲਗ-ਮਾਤਰਾ ਨਾਲ ਪੰਜ-ਪੰਜ ਸ਼ਬਦਾਂ ਦੀ ਰਚਨਾ ਦਾ ਅਭਿਆਸ ਹੋਣਾ)

ii. ii. ਇੱਕ, ਦੋ ਅਤੇ ਤਿੰਨ ਅੱਖਰੀ ਸ਼ਬਦਾਂ ਨੂੰ ਪੜ੍ਹਨ ਦਾ ਅਭਿਆਸ

iii. ਪੰਜਾਬੀ ਸ਼ਬਦਾਂ ਦੀ ਬਣਤਰ: ਧਾਤੂ ਅਗੇਤਰ ਅਤੇ ਪਿਛੇਤਰ

iv. ਕਿਸੇ ਪੰਜ ਅਗੇਤਰਾਂ ਅਤੇ ਪੰਜ ਪਿਛੇਤਰਾਂ ਨਾਲ ਸ਼ਬਦਾਂ ਦੀ ਰਚਨਾ

v. ਪੰਜਾਬੀ ਵਿੱਚ ਆਪਣੇ ਸੰਖੇਪ ਨਿੱਜੀ ਜੀਵਨ-ਵੇਰਵਾ (ਬਾਇਓਡੇਟਾ) ਦੀ ਰਚਨਾ ਕਰਨਾ (ਘੱਟੋ-ਘੱਟ 10 ਵੇਰਵੇ) 12 ਅੰਕ

ਅ-ਭਾਗ 2. ਪੰਜਾਬੀ ਸ਼ਬਦ-ਸ਼੍ਰੇਣੀਆਂ, ਵਿਆਕਰਨਿਕ ਸ਼੍ਰੇਣੀਆਂ ਅਤੇ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ

i. ਸ਼ਬਦ-ਸ਼੍ਰੇਣੀਆਂ (ਨਾਂਵ, ਪੜਨਾਂਵ, ਵਿਸ਼ੇਸ਼ਣ, ਕਿਰਿਆ, ਕਿਰਿਆ ਵਿਸ਼ੇਸ਼ਣ, ਸੰਬੰਧਕ, ਯੋਜਕ, ਵਿਸਮਿਕ ਆਦਿ) ਸੰਬੰਧੀ ਮੁਢਲੀ ਜਾਣਕਾਰੀ (ਹਰ ਸ਼ਬਦ-ਸ਼੍ਰੇਣੀ ਦੀਆਂ ਘੱਟੋ-ਘੱਟ ਪੰਜ ਉਦਾਹਰਨਾਂ ਦੀ ਜਾਣਕਾਰੀ ਸਮੇਤ)

ii. ਵਿਆਕਰਨਿਕ ਸ਼੍ਰੇਣੀਆਂ ਲਿੰਗ ਅਤੇ ਵਚਨ: ਪੰਜਾਬੀ ਵਿੱਚ ਲਿੰਗ-ਤਬਦੀਲੀ ਅਤੇ ਵਚਨ-ਤਬਦੀਲੀ ਦੇ ਕਿਸੇ ਦੇ ਪੈਟਰਨਾਂ ਦੀ ਜਾਣਕਾਰੀ

iii. ਰੋਜ਼ਾਨਾ ਜ਼ਿੰਦਗੀ ਵਿੱਚ ਵਰਤੀ ਜਾਣ ਵਾਲੀ ਪੰਜਾਬੀ ਸ਼ਬਦਾਵਲੀ: ਹਫ਼ਤੇ ਦੇ ਦਿਨਾਂ, ਰੰਗਾਂ, ਮੌਸਮਾਂ, ਪੰਜਾਬੀ ਖਾਇਆਂ, ਪੰਜਾਬੀ ਪਹਿਰਾਵੇ, ਕਿੱਤਿਆ, ਪਸੂਆਂ ਅਤੇ ਪੰਛੀਆਂ ਦੇ ਨਾਂ 12 ਅੰਕ

ਭਾਗ-ਏ

ਸੰਖੇਪ ਉੱਤਰਾਂ ਵਾਲ਼ੇ ਪ੍ਰਸ਼ਨ

ਉਪਰੋਕਤ (ਓ) ਅਤੇ (ਅ) ਭਾਗ ਉੱਤੇ ਆਧਾਰਿਤ ਸੰਖੇ ਉੱਤਰਾਂ ਵਾਲ਼ੇ 11 ਪ੍ਰਸ਼ਨ 11×2=22 ਅੰਕ

ਸਹਾਇਕ ਪੁਸਤਕਾਵਲੀ

1. Gurinder Singh Mann, Gurdit Singh and others, AN INTRODUCTION TO PUNJABI: GRAMMAR, CONVERSATION AND LITERATURE, Publication Bureau, Punjabi University, Patiala, 2011.
2. Henry A. Gleason and Harjeet Singh Gill, A start in Punjabi, Publication Bureau, Punjabi University, Patiala, 1997.
3. Hardev Bahri, Teach Yourself Punjabi, Publication Bureau, Punjabi University, Patiala, 2011.
4. Mangat Rai Bhardwaj, Colloquial Panjabi: The Complete Course for Beginner, Routledge, 2015.
5. Ujjal Singh Bahri and Paramjit Singh Walia, Introductory Punjabi, Publication Bureau, Punjabi, University, Patiala, 2003.
6. ਸਤਿਨਾਮ ਸਿੰਘ ਸੰਧੂ, ਆਓ ਪੰਜਾਬੀ ਸਿੱਖੀਏ, ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ, ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ, ਪਟਿਆਲਾ, 2009.
7. ਸੀਤਾ ਰਾਮ ਬਾਹਿਰੀ,ਪੰਜਾਬੀ ਸਿੱਖੀਏ, ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ, ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ, ਪਟਿਆਲਾ, 2002 (ਹਿੰਦੀ).
8. ਬੂਟਾ ਸਿੰਘ ਬਰਾੜ, ਪੰਜਾਬੀ ਵਿਆਕਰਨ: ਸਿਧਾਂਤ ਅਤੇ ਵਿਹਾਰ, ਚੇਤਨਾ ਪ੍ਰਕਾਸ਼ਨ ਲੁਧਿਆਣਾ, 2018.
9. ਰਾਜਵਿੰਦਰ ਸਿੰਘ, ਪੰਜਾਬੀ ਗਿਆਨ ਸੀ.ਡੀ. (ਕੰਪਿਊਟਰ ਐਪਲੀਕੇਸ਼ਨ ਟੂ-ਲਰਨ ਐਂਡ ਟੀਚ ਪੰਜਾਬੀ) ਪਬਲੀਕੇਸ਼ਨ ਬਿਊਰੋ, ਪੰਜਾਬੀ ਯੂਨੀਵਰਸਿਟੀ, ਪਟਿਆਲਾ, 2011.
10. Website: elearnpunjabi.com, Developer Research Center for Technical Development of Punjabi language, Literature and Culture, Punjabi University Patiala

SEMESTER - II

MCHE1201T: INORGANIC CHEMISTRY-II

Max Marks: 100 marks **60 hours; Credits: 04**
End Semester Exam: 70 marks **Time allowed: 3 hrs.**
Internal Assessments: 30 **5 period/week**
Pass Marks: 35%

OBJECTIVES:

1. To Study the synthesis, properties, and reactions of various inorganic compounds, including coordination complexes and main group compounds.
2. To study the symmetries of molecules and their consequences.
3. To understanding the formation and nature of molecular orbitals, crucial for explaining chemical bonding.
4. To predict and interpret spectroscopic data, including vibrational and electronic spectra.
5. To analyze the symmetry of molecular vibrations, determining which vibrations are infrared or Raman active.

COURSE OUTCOMES:

After the completion of the course, Students will be able to

1. Learn the synthesis and properties of main group elements and Inorganic compounds
2. Know the nature of chemical bonds and their relationship to molecular symmetry.
3. Determine the symmetry of molecular vibrations and predicts which modes are infrared or Raman active.
4. Develop a more comprehensive understanding of molecular structures and their properties.
5. Encourages critical analysis of structures and relationships, enhancing problem-solving abilities.

INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three Sections-A, B & C. Section-A will have four questions (from the respective section of syllabus) carrying 12 marks each. Seetion-B will also have four questions (from the respective section of syllabus) carrying 12 marks each. Section-C will consist of 11 short answer questions that will cover the entire syllabus and will be of two marks each.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions selecting two questions from each of Section-A & Section-B while Section-C is compulsory-

SECTION - A

30 Hrs.

Chemistry of Main Group Elements (Groups I A to IV A):

Hydrogen and Its Compounds: Transition metal hydrides.

Group I A Elements (Alkali Metals): Organometallic compounds of alkali metals.

Group II A Elements (Alkaline Earth Metals): Organo-beryllium compounds, Organo-magnesium compounds.

Group III A Elements (Boron Family): Structure and bonding in polyhedral boranes, Structural analysis using NMR spectroscopy, Wade's rules for boranes, Carboranes and other heteroboranes, Organoboron compounds, Organoaluminium compounds.

Group IV A Elements (Carbon Family): Compounds containing C–N bonds, Thiocarbonates and dithiocarbamates, Zeolites and clays.

Chemistry of Main Group Elements (Groups V A to VIII A):

Group V A Elements (Nitrogen Family): Types of covalency in nitrogen, Stereochemistry of nitrogen compounds, Dinitrogen and its role as a ligand, Nitrogen-containing ligands: ammonia and amines, Phosphorus–nitrogen compounds

Group VI A Elements (Oxygen Family): Chemical properties of dioxygen and singlet oxygen, Dioxygen as superoxo and peroxo ligands, Peroxy compounds of boron, carbon, and sulphur, Sulphur–nitrogen compounds, Sulphur–sulphur compounds as ligands, Iso- and heteropoly acids and anions of molybdenum (Mo) and tungsten (W).

Group VII A Elements (Halogen Family): Charge-transfer complexes of halogens, Polyiodide anions, Pseudohalogens.

Group VIII A Elements (Noble Gases): Chemistry of xenon, krypton, and radon.

SECTION - B

30 Hrs.

Group Theory:

Group Theory Basics: Order, classes of group, representation of a group, transformation of coordinates matrices, matrix representation of symmetry operation, reducible and irreducible representations and C_{2v},C_{3v}, D_4, T_d, O_h, character tables, symmetry, the method of finding the number of irreducible representation in a reducible representation, separation of d orbitals under influence of octaheral. tetrahedral, square planar and trigonal bipyramidal symmetry, the separation of P. D .F etc. free ion terms into symmetry labelled electric field terms under the influence of octahedral field, the directed valence for T_d, & O_h, symmety, direct product for O_h, T_d,. C_{3v}, D_{4h} & D_{5h}, and the method of descending symmetry for d^2 configuration.

Applications of Group Theory

Suitable metal orbitals and ligand or orbitals combination to form molecular orbitals in coordination complexes O_h. T_d, & square planar complexes, symmetry consideration regarding selection rules and spectral intensties, vibronic coupling, vibronic polarization in centrosymmetric complexes O_h, & D_{4h} and non centro symmetric complexes C_{3v}, T_d, polarization of electronically allowed transitions, selection rules, fundamentals, overtones and combinations in vibrational spectroscopy — the symmetry symbols for normal modes of vibrations. IR and Raman activity of their fundamentals and nature of vibrations in terms of change in internal coordinates in simple molecules like trans N_2F_2, SF_6, Fermi resonance.

SUGGESTED BOOKS:

1. Advanced Inorganic Chemistry by Cotton & Wilkinson (5th Ed.)
2. Chemical Applications of Group Theory - F. A. Cotton.
3. Introductory Group Theory For Chemists - George Davidson.
4. Introduction to Ligand Fields - B. N. Figgis.
5. Inorganic Chemistry - Shriver, Atkins & Langford.

MCHE1202T: ORGANIC CHEMISTRY-II

Max Marks: 100 marks **60 hours; Credits: 04**
End Semester Exam: 70 marks **Time allowed: 3 hrs.**
Internal Assessments: 30 **5 period/week**
Pass Marks: 35%

COURSE OBJECTIVE–

- To provide fundamental and advanced knowledge of stereochemistry and stereoselective reactions.
- To understand stereoisomerism, optical and geometrical isomerism, and conformational analysis.
- To study the stereochemistry of addition, reduction, and condensation reactions.
- To develop skills in analyzing molecular geometry and predicting reaction outcomes.

COURSE OUTCOMES – By the end of the course, students will be able to:

- Understand and classify stereoisomers – enantiomers, diastereomers, meso compounds.
- Use Fischer, Newman, and Sawhorse projections for molecular representation.
- Explain chirality, optical activity, and symmetry elements.
- Analyze optical isomerism in molecules with one or more chiral centers.
- Describe racemization, epimerization, and mutarotation processes.
- Evaluate conformational isomerism and its effect on stability/reactivity.
- Perform conformational analysis of cyclohexane and fused ring systems.
- Identify and determine geometrical isomerism using E/Z and cis–trans nomenclature.
- Explain stereochemistry of addition to C=C, C≡C, and C=O systems.
- Understand mechanisms and stereochemistry of reductions and condensation reactions.
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INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three Sections-A, B & C. Section-A will have four questions (from the respective section of syllabus) carrying 12 marks each. Seetion-B will also have four questions (from the respective section of syllabus) carrying 12 marks each. Section-C will consist of 11 short answer questions that will cover the entire syllabus and will be of two marks each.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions selecting two questions from each of Section-A & Section-B while Section-C is compulsory.

Section-A **30hrs**

Stereochemistry: Stereoisomerism: Introduction to stereoisomerism and its classification, Types of stereoisomers: Enantiomers, diastereomers, meso compounds, etc. Structural representations of organic molecules: Fischer projection, Newman projection and Sawhorse projection; Optical Isomerism: Conditions for optical activity, Optical isomerism in compounds with one chiral (asymmetric) centre; Element of symmetry (Plane of symmetry, Axis of symmetry, center of symmetry, alternate axis & reflection symmetry), Dissymmetry as a cause of optical activity. Compounds with two asymmetric centres; Optical Isomerism due to restricted rotation: biphenyls, allenes, Alkylidenes and spiranes; Racemic Modification and Racemisation: Racemisation Mechanisms; Thermal, anionic, cationic, and free radical racemisation. Epimerisation. Mutarotation (Definition and explanation with examples); Types of Racemic Forms: Racemic compounds, racemic mixtures, and solid solutions.

Disastercoisomerism : Resolution of acids, bases, amino acids, alcohols, aldehydes and Ketones. Absolute and Relative configuation, Different systems of rotation. Assymetrie induction, methods

of determining the configuration, erythreo and threo nomenclature, Cram's Rule and Prelog's Rule.

Conformation Isomerism: **Introduction to Conformations**, Conformation and reactivity: Influence of conformation on reactivity in alicyclic compounds, Conformation and Physical properties, dipole moment, NMR, IR and X-rays. Conformational effects on stability and reactivity; Conformational Studies in Specific Systems : Conformational studies in Cyclohexane (Chair and boat forms, mono- and disubstituted cyclohexanes (1,2-, 1,3-, 1,4-disubstitution), Its stability and reactivity. Energy determination in chair and boat form; **Fused Ring Systems**: Conformational analysis of decalins (cis and trans) and Perhydrophenanthrenes.

Section – B **30hrs**.

Geometrical Isomerism: Concept and origin of geometrical (cis–trans) isomerism, Nomenclature- E/Z system based on Cahn–Ingold–Prelog priority rules, Syn/Anti terminology, Nature of geometrical isomerism and determination of configuration of geometrical isomerism, Curtin - Hammet Principle, Study of Physical properties of the isomers (melting point, boiling point, solubility, and dipole moment). Relative stability and interconversion: Factors affecting stability of isomers, Conditions and mechanisms for interconversion between geometrical isomers.

Addition to carbon - carbon multiple bond: Mechanism and stereochemistry of addition reactions involving electrophiles, nucleophiles, free radicals and carbenes. Regio and chemoselectivity. Orientation and reactivity; Addition to Cyclopropane ring, Hydrogenation (heterogenous and homogenous) of double and Triple bond, hydrogenation of aromatic rings, Hydroboration, Michael-reaction, sharpless asymmetric epoxidation.

Addition to Carbon - Hetero multiple bond: Mechanism of metal hydride ($LiAlH_4$, $NaBH_4$,$LiBH_4$) reduction of carbonyl compounds and other functional groups; Addition of Grignard's reagent, organozinc and organo lithium reagents to carbonyl and unsaturated carbonyl compounds; Dissolving metal reductions of carbonyl functions and conjugated systems; Wolf Kishner reduction: Clemmenson reduction, and Meerwein Pondroff Varley reduction, Wittig's Reaction; Mechanism of condensation reactions involving enolates - Aldol, knoevengel, Claisen, Mannich, Benzoin, Perkin and stobbe reactions; Hydrolysis of esters and amides, Ammonloysis of esters.

SUGGESTED BOOKS:

1. Stereochemistry of Carbon Compounds by Ernest, L. Eliel, Tata McGraw-Hill.
2. Stereochemistry of Organic Compounds. D. Nasipuri. New Age International.
3. Stereochemistry of Organic Compounds. P.S. Kalsi. New Age, International.
4. Modern Organic Reactions, H.C. House. Benjamin.
5. Advanced Organic Chemsitry - Reaction, Mechanism and Structure.Jerry March, JohnyWiley.
6. Advanced Organic Chemistry, F.A. Carey and R.J. Sundberg, Plenum.

MCHE1203T: PHYSICAL CHEMISTRY-II

Max Marks : 100 **60 hours; Credits:04**
End Semester Exam 70 **Time allowed - 3 hrs**
Internal Assessments: 30 **5 period/week**
Pass Marks : 35%

OBJECTIVES:

1. It aims to interpret and predict the behavior of molecules and their interactions by applying the principles of quantum mechanics
2. To understand the mechanisms and outcomes of chemical reactions by simulating the interaction of molecules.
3. To determine the speed or rate of chemical reactions and understand the factors that influence these rates.

COURSE OUTCOMES:

1. To learn concepts of the fundamentals of quantum mechanics and its applications in the study of structure of atoms, bonding in molecules.
2. To understand the requirement of approximation methods in quantum mechanics.
3. To gain insight into Molecular orbital theory molecular orbital theory and its application to different molecules.
4. To provide an insight into the thermodynamic, kinetic aspects, techniques and mechanism of different chemical reactions.

INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three Sections: A, B and C. Section A will have four questions (from the respective section of syllabus) carrying 12 marks each, Section B will have also four questions (from the respective section of syllabus) carrying 12 marks each. Section C will consist of 11 short answer questions that will cover the entire syllabus and will be of two marks each.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions selecting two questions from each of Section A & B and entire Section C.

Section - A **30 Hrs.**

Quantum Chemistry

Introduction to exact quantum mechanical result

Fundamental concepts of quantum mechanics, setting up of operators for different observables, Hermitian, unitary and linear operators, postulates of quantum mechanics. Discussion of solution of Schrodinger equation to some model systems. (viz. particle in a box, the harmonic oscillator, the rigid rotator).

Hydrogen and hydrogen like atoms

Solution of Schrodinger equation for hydrogen and hydrogen like atoms, physical representation of s and p orbitals, radial plots, angular plots, probability functions and plots.

Approximate Methods

The variation principle, perturbation theory (first order and non degenerate), applications of variation method and perturbation theory to the helium atom.

Angular Momentum

Eigen function and eigen values of angular momentum using ladder operators, addition of angular momentum.

Electronic Structure of Atom

Electronic states of complex atoms, anti-symmetry and Pauli's exclusion principle, Hartree method,

Molecular Orbital Theory

Huckel Theory of conjugated systems, bond order and charge density calculation, applications of Huckel molecular orbital theory to ethylene, butadiene, cyclopropenyl radical, cyclobutadiene systems. Introduction to extended Huckel theory.

Section - B **30 Hrs.**

Chemical Kinetics

1. Introduction : Rate of reaction, empirical rate-equation, order and molecularity of a reaction, effect of temperature on reaction rates.
2. Theories of reaction rates : Number of bimolecular collisions and derivation of rate constant from it, steric factor & its calculation, factors determining effectiveness of collisions, Lindemann mechanism, statistical derivation of rate equation (Eyring equation), transmission co-efficient, tunnelling effect, partition functions for translation, rotation & vibration, comparision of collision and transition state theories.
3. Fast reactions : Study of fast reactions by stopped flow technique, relaxation methods, magnetic resonance technique.
4. Thermodynamic treatment of reaction rates : free energy of activation, heat of activation and its relationship with various kinds of activation energies, relationship between steric factor and entropy of activation.
5. Kinetics in solution : Primary and secondary salt effects, effect of polarity and nature of solvent on rate of reaction.
6. Complex reactions : Various types of complex reactions, parallel first order reactions producing a common product, parallel higher order reactions, reactions approaching equilibrium, Michaelis-Menten mechanism for enzyme catalysis, consecutive reactions, oscillating reactions.

SUGGESTED BOOKS:

1. *Kinetics and Mechanism* by A.A. Frost & R.G. Pearson, John-Wiley & Sons, Inc., New York.
2. *Physical Chemistry* by P.W. Atkins.
3. *Chemical Kinetics Methods* by C. Kalidas, New Age International Publishers.
4. *The Foundation of Chemical Kinetics* by S.W. Benson.
5. *Introduction to Quantum Chemistry*, A.K. Chandra, Tata McGraw Hill.
6. *Quantum Chemistry* by I.N. Levine, Prentice Hall.
7. *Quantum Chemistry* by W. Kauzmann.
8. *Quantum Chemistry* by Eyring, Walter and Kimball.

MCHE1204T: FUNDAMENTALS AND PROGRAMMING WITH C

Max Marks : 100 **60 hours; Credits: 04**
End Semester Exam: 70 **Time allowed - 3 hrs**
Internal Assessments: 30 **5 period/week**
Pass Marks : 35%

OBJECTIVES:

1. Understand basics of hardware, software, and programming languages.
2. Learn number systems and conversions (binary, octal, hexadecimal).
3. Develop problem-solving and programming logic.
4. Gain foundational knowledge of C language and its features.

COURSE OUTCOMES:
After the completion of the course, Students will be able to

1. Describe computer organization and number systems.
2. Write basic C programs using variables and control structures.
3. Use decision-making and looping constructs effectively.
4. Apply functions, arrays, and pointers in problem-solving.

INSTRUCTIONS FOR THE PAPER SETTER

The question paper will consist of three Sections: A, B and C. Section A will have four questions (from the respective section of syllabus) carrying 12 marks each, Section B will have also four questions (from the respective section of syllabus) carrying 12 marks each. Section C will consist of 11 short answer questions that will cover the entire syllabus and will be of two marks each.

INSTRUCTIONS FOR THE CANDIDATES

Candidates are required to attempt five questions selecting two questions from each of Section A & B and entire Section C.

Section - A **30 Hrs.**

Computer organization: Hardware, Software, Programming languages with special reference to BASIC, Fortran and C.

Binary representation : Binary numbers, Conversion of decimal to binary and binary to decimal, Idea of Octal and hexa-decimal numbers.

Problem solving: Problem analysis, Algorithm development, Program Coding, Program Compilation and execution.

Introduction to C : Historical development of C, The C character set, Constants, variables and keywords, Types of C constants and variables, C keywords.

C instructions : Type declaration instruction, Arithmetic instructions, Integer and float conversion, Type conversion in assignment, Hierarchy of operations, Writing of a first program in C, Control Instructions in C. Simple problems with sequential structure.

Section – B **30 Hrs**

Decision and control structure : The if statement, The if-else statement, The nested if-else statement, Use and hierarchy of logical operators, Conditional operators.

Loop control structure : The while loop. The for loop. Nesting of loops, The do-while loop. Break and continue statements.

Case control studies : Decision using switch, The go to statement, Simple problems with Selective and repetitive structures.
Functions: What is function, why use functions, Passing values between a functions. Role of functions.
Advanced features of functions: Function declaration and prototypes, Call by values and call by reference, An introduction to pointer, Pointer notion.
Arryas: What are arrays, Initialization of arrays.

SUGGESTED BOOKS:

1. Let Us C by Yashavant Kanetkar, (BPB Publications, New Delhi).
2. Programming in ANS/ by E. Balgurusamy, Tata McGraw-Hill Publishing Co. I.T., New Delhi.
3. Programming with Fortran-77 by Ran Kumar, Tata McGraw-Hill Publishing Co. I.T., New Delhi.

MCHE1205P: ORGANIC CHEMISTRY PRACTICALS-P

Max Marks: 100 marks **6 hrs/week; Credits: 02**
End Semester Exam: 70 marks **Pass Marks: 35%**
Internal Assessments: 30

COURSE OBJECTIVE–

- To impart practical knowledge in the separation, purification, and identification of organic compounds.
- To train students in classical and modern techniques of qualitative analysis, derivative preparation, and spectral characterization.
- To develop hands-on skills in organic synthesis and product analysis using IR and NMR spectroscopy.

COURSE OUTCOMES:

By the end of the course, students will be able to:

- Apply separation and purification techniques for various binary mixtures.
- Perform solvent extraction based on solubility principles.
- Identify organic compounds using classical tests.
- Prepare derivatives for compound confirmation.
- Use preparative TLC for component separation.
- Analyze compounds using IR and NMR spectroscopy.
- Carry out key organic synthesis reactions.
- Synthesize heterocycles and substituted aromatics.
- Characterize products using spectral methods.
- Combine synthesis and analysis for complete qualitative evaluation.

Qualitative Organic Analysis: Separation and Purification of Binary Mixtures

- Techniques based on solubility behaviour and solvent extraction
- Types of binary mixtures:
    - Solid/Solid
    - Solid/Liquid
    - Liquid/Liquid

Identification and Confirmation

- Chemical tests for identification of individual components
- Preparation of suitable solid derivatives for confirmation

Chromatographic Separation and Spectral Analysis

- Preparative Thin Layer Chromatography (TLC) for separation
- Analysis of separated components using Infrared (IR) and Proton Magnetic Resonance (PMR) spectroscopy

Organic Synthesis:

- **Benzoylation:**
    - Preparation of Hippuric acid
- **Oxidation Reactions**
    - Synthesis of Adipic acid or *p*-Nitrobenzoic acid
- **Aldol Condensation**
    - Preparation of Dibenzalacetone or Cinnamic acid
- **Sandmeyer Reaction**
    - Synthesis of *p*-Chlorotoluene

- **Benz-Fused Heterocycles**
    - Preparation of Benzimidazole
- **Cannizzaro Reaction**
    - Using *p*-Chlorobenzaldehyde as substrate
- **Friedel-Crafts Acylation**
    - Synthesis of *S*-Benzoylpropionic acid
- **Aromatic Electrophilic Substitution**
    - Preparation of *p*-Nitroaniline or *p*-Iodoaniline
- **Product Characterization**
    - Characterisation of synthesised compounds using spectral techniques (e.g., IR, NMR, etc.)

SUGGESTED BOOKS:

1. Vogels's Textbook of Practical Organic Chemistry, 5th Edition ELBS (Longman), 1996.
2. Practical Organic Chemistry by F.G. Mann and B.C. Saunders, 5th Edition, Orient Longman Limited, 1986.

MCHE1206P: PHYSICAL CHEMISTRY PRACTICALS-P

Max Marks : 100 **6 hrs/week; Credits:02**
End Semester Exam: 70 **Pass Marks : 35%**
Internal Assessments 30

OBJECTIVES:

1. To provide students with hands-on experience in experimental techniques
2. To study data analysis, and problem-solving, while reinforcing theoretical concepts and fostering independent research skills.
3. To enhance knowledge in various fields, including industry, academia, and research**.**

COURSE OUTCOMES:

1. Students are able to determine density of given liquids using Pyknometer.
2. Students are able to determine molecular weight of different polymers by viscosity method.
3. Students are able to detect molar refractivity of given solid.
4. Students are able to determine equilibrium constant for various reactions by Partition method.

SECTION-A

1. To determine the Molecular weight of given polymer by viscosity method.
2. To find out the value of coefficient of expansion for the given liquid with the help of Pyknometer.
3. To determine the atomic Parachors of C, H & O.
4. To compare the cleansing powers of two samples of detergents by surface tension method.
5. To determine the interfacial tension between two immiscible solvents.
6. To find out the equilibrium constant for the reaction,
   $K I + I_2 \leftrightarrow KI_3$ by partition method.

SECTION-B

1. To determine the rate constant of the hydrolysis of ethyl acetate catalysed by an acid and also find out the half life period of the reaction.
2. To determine the order of saponification of ethylacetate with sodium hydroxide.
3. To find out the molar refractivities of homologous series of alcohols & also find out the atomic refractivities of C & H.
4. To find out the molar refractivity of the given solid.
5. To study the adsorption of acetic acid on activated charcoal & prove the validity of Freundlich Adsorption Isotherm.
6. To find out the molecular weight of benzoic acid in bezene cryoscopically & hence find out its degree of association.
7. To find out the degree of hydrolysis of sodium acetate cryoscopically.
8. To determine the density of given liquids with the help of Pyknometer.

SUGGESTED BOOKS:

1. *Practical Physical Chemistry*, A. M. James and F. E. Prichard, Longman.
2. *Advanced Physical Experiments*, Gurtu - Gurtu, Pragati Prakashan, Meerut.
3. *Practical Physical Chemistry*, Alexander and Findley.