

# VIDHYADEEP UNIVERSITY

## B.Sc. CHEMISTRY (04)

### Teaching & Evaluation Scheme

#### Semester – I & II

Course name: Bachelor of Science (Chemistry)			Semester I						
Grade System:									
Subject			Teaching Scheme		Examination Scheme		Passing Scheme		Total Marks
Subject Code	Paper No.	Paper Title	Hours/week	Credit	Theory		Passing Head		
			Theory	Theory	Internal	External	Internal	External	
1091104101	CHEM. 101	Inorganic & Physical Chemistry.	2	2	20	50	9	17	70
1091104102	CHEM. 102	Organic Chemistry	2	2	20	50	9	17	70
1091104103	CHEM.P 103	Practicals	4	2	20	40	9	14	60

Course name: Bachelor of Science (Chemistry)			Semester II						
Grade System:									
Subject			Teaching Scheme		Examination Scheme		Passing Scheme		Total Marks
Subject code	Paper No.	Paper Title	Hours/week	Credit	Theory		Passing Head		
			Theory	Theory	Internal	External	Internal	External	
1091204201	CHEM . 201		2	2	20	50	9	17	70
1091204202	CHEM . 202		2	2	20	50	9	17	70
1091204203	CHEM .P 203	Practicals	4	2	20	40	9	14	60

Program Outcome	<p>PO1: The aim is to augment one's knowledge in the various domains of chemistry and attain mastery in the chosen branch of the field, while also fostering clear and effective communication within and across disciplinary boundaries.</p> <p>PO2: Develop entrepreneurial skills by leveraging the industrial hub situated in the vicinity of our university.</p> <p>PO3: Establish a research center with the support of interdisciplinary subjects offered at the university.</p> <p>PO4: Pursue a doctoral degree in the Organic Chemistry and continue further studies.</p> <p>PO5: Develop short-term courses relevant to the demanded subject to enhance knowledge and its practical application.</p> <p>PO6: Provide training/internship opportunities to students for employment in public and private sectors, as well as national laboratories.</p> <p>PO7: Engage in scientific discourse with a respectful demeanor and take the lead in interdisciplinary &amp; multidisciplinary collaborations with experts from diverse fields.</p> <p>PO8: Acquire knowledge and implement best safety practices in chemical research &amp; Industry.</p>
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Objective of Program	<p>The primary goal of the B.Sc. Organic Chemistry program is to equip students with the skills and knowledge necessary to pursue dynamic careers in industry and academia by offering a superb teaching and research environment in both core and emerging areas of the discipline.</p>
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Program Specific Outcomes	<p>PSO1: Demonstrate a comprehensive understanding of the Organic principles, concepts, and theories in various branches of chemistry.</p> <p>PSO2: Apply theoretical knowledge and practical skills to analyze and solve complex chemical problems.</p> <p>PSO3: Utilize advanced laboratory techniques and instrumentation for chemical analysis and experimentation.</p> <p>PSO4: Apply mathematical and statistical methods to analyze and interpret experimental data in chemistry.</p> <p>PSO5: Communicate scientific information effectively through written reports, presentations, and scientific discussions.</p> <p>PSO6: Demonstrate awareness of safety protocols and ethical considerations in chemical research and laboratory practices.</p> <p>PSO7: Apply critical thinking and scientific reasoning to evaluate and interpret scientific literature and research findings in chemistry.</p> <p>PSO8: Exhibit teamwork, leadership, and interpersonal skills in collaborative scientific projects and research.</p>
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Mapping between POs and PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	PO1	✓	✓		✓		✓	✓	✓
	PO2	✓	✓			✓			✓
	PO3			✓	✓	✓			
	PO4	✓	✓	✓			✓	✓	✓
	PO5	✓			✓	✓		✓	
	PO6		✓	✓			✓		✓
	PO7	✓			✓			✓	
	PO8		✓			✓			✓

Course Objectives:	<p><b>CO-1:</b> Study definition of space lattice, Unit cell, Difference between crystalline and amorphous state, types of crystals with illustrations, Law of crystallography. Steno's law and laws of symmetry, lattice planes, Miller indices, Bravais indices, type of cubic system, diagrammatic representation of cubic system and d100, d110, d111 planes, Bragg's equation (X-ray diffraction), Crystal structure of NaCl, KCl.(Numerical based on Bragg's equation and Miller indices)</p> <p><b>CO-2:</b> understand basic concepts Arrhenius theory, Lowry Bronsted theory, Lewis theory, Solvent – Solute concept of acidbase, Soft-Hard acid base and its application</p> <p><b>CO-3:</b> Historical perspective of atomic structure; Rutherford's atomic model, Bohr's theory and its limitation, Spectrum of Hydrogen atom (Lyman, Balmer, Paschen, Brackett &amp; Pfund), Quantum numbers, Aufbau, Hund and Pauli exclusion principles, Penetration and shielding, Effective nuclear charge (Slater rule)</p> <p><b>CO-4:</b> Chemical kinetics and its scope, rate of reaction, factors affecting rate of reaction : temperature, concentration, pressure, solvent, light and catalyst, Molecularity of reaction, Classification of chemical reaction, Order of reaction with illustration (first order, second order, third order, zero order, pseudo first order) reaction, : second order (a=b), half life and mean life.</p> <p><b>CO-5:</b> Define of atomic and ionic radii, ionisation energy, electron affinity and electron negativity, S-Block elements: Comparative study, diagonal relationship, salient features of hydrides.</p>
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Mapping between CO and PSO		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
	CO1	✓			✓	✓	✓		
	CO2	✓	✓				✓		✓
	CO3			✓		✓	✓	✓	
	CO4	✓			✓				
	CO5		✓	✓		✓		✓	

**VIDHYADEEP UNIVERSITY**

**VIDHYADEEP INSTITUTE OF SCIENCE, ANITA(KIM)**

**DEPARTMENT OF CHEMISTRY(04)**

**F.Y. SEM-1**

➤ **PAPER :-101- INORGANIC & PHYSICAL CHEMISTRY (TOTAL HOURS-30)**

- **UNIT-1 SOLID STATE (10-H)**

- DEFINITION OF SPACE LATTICE, UNIT CELL, DIFFERENCE BETWEEN CRYSTALLINE AND AMORPHOUS STATE, TYPES OF CRYSTALS WITH ILLUSTRATIONS, LAW OF CRYSTALLOGRAPHY. STENO'S LAW AND LAWS OF SYMMETRY, LATTICE PLANES, MILLER INDICES, BRAVAIS INDICES, TYPE OF CUBIC SYSTEM, DIAGRAMMATIC REPRESENTATION OF CUBIC SYSTEM AND  $D_{100}$ ,  $D_{110}$ ,  $D_{111}$ , PLANES, BRAGG'S EQUATION. (X-RAY DIFFRACTION), CRYSTAL STRUCTURE OF NaCl, KCl, (NUMERICAL BASED ON BRAGG'S EQUATION AND MILLER INDICES)

- **REFERENCE BOOKS:**

1. ESSENTIALS OF PHYSICAL CHEMISTRY BY A.S. BHALL AND PUB. S. CHAND, G.D. TULI.
2. ADVANCE PHYSICAL CHEMISTRY BY D.N. BAJPAI, SUB: S. CHAND
3. NUMERICAL PROBLEMS BY DOGRA AND DOGRA (FOR NUMERICAL)

- **UNIT-2(A) CO-ORDINATION CHEMISTRY (6-H)**

- SHAPE OF d-ORBITALS, CFT-BASIC ASSUMPTION, SPLITTING OF d-ORBITALS IN OCTAHEDRAL, TETRAHEDRAL, SQUARE PLANER COMPLEXES, DISTRIBUTION OF  $d^x$  ELECTRONS IN OCTAHEDRAL AND TETRAHEDRAL COMPLEXES AND CFSE(calculation).

- **REFERENCE BOOKS:**

1. INORGANIC CHEMISTRY BY WAHID MALIK, G.D. TULI, R.D. MADAN : PUB. S. CHAND
2. COORDINATION CHEMISTRY BY GURDIP CHATWAL, M.S. YADAV : PUB. HIMALAYA PUB. HOUSE
3. ADVANCE INORGANIC CHEMISTRY (VOL.2) BY SATYA PRAKASH, G.D. TULI, S.K. BASU, R.D. MADAN : PUB. S. CHAND

- **UNIT-2(B) ACID-BASE THEORIES (4-H)**

- ACID AND BASE DEFINITION
- $P^H$  OF ACIDS AND BASES
- PROPERTIES OF ACIDS AND BASES
- ARRHENIUS THEORY
- LOWRY BRONSTED THEORY
- LEWIS THEORY
- SOLVENT- SOLUTE CONCEPT OF ACID- BASE
- HARD-SOFT ACID BASE AND ITS APPLICATION

- **REFERENCE BOOKS:**

1. ESSENTIALS OF PHYSICAL CHEMISTRY BY A.S. BAHL AND G.D. TULI, PUB : S. CHAND

- **UNIT-3(A) CHEMICAL KINETICS** **(6-H)**
- CHEMICAL KINETICS AND IT'S SCOPE, RATE OF REACTION, FACTORS AFFECTING RATE OF REACTION : TEMPERATURE, CONCENTRATION, PRESSURE, SOLVENT, LIGHT AND CATALYST, MOLECULARITY OF REACTION, CLASSIFICATION OF CHEMICAL REACTION, ORDER OF REACTION WITH ILLUSTRATION. SECOND ORDER ( $a=b$ ), HALF LIFE AND MEAN LIFE.

- **REFERENCE BOOKS:**

1. ESSENTIALS OF PHYSICAL CHEMISTRY BY A.S. BAHL AND G.D. TULI, PUB: S. CHAND
2. ADVANCE PHYSICAL CHEMISTRY BY D.N. BAJPAI, PUB : S. CHAND
3. NUMERICAL PROBLEMS BY D.V.S. JAIN, PUB : MC GRAW HILL (FOR NUMERICAL)

- **UNIT-3(B) PERIODIC PROPERTIES** **(4-H)**
- DEFINITION OF ATOMIC AND IONIC RADII, IONISATION ENERGY, ELECTRON AFFINITY AND ELECTRONE NEGATIVITY.
- S-BLOCK ELEMENTS : COMPARATIVE STUDY, DIAGONAL RELATION SHIP, SALIENT FEATURES OF HYDRIDES.

- **REFERENCE BOOKS:**

1. MODERN INORGANIC CHEMISTRY BY GURDEEP RAJ
2. PRINCIPALS OF INORGANIC CHEMISTRY BY PURI, SHARMA AND KALIA, PUB: VISHAL PUBLISHING
3. INORGANIC CHEMISTRY BY J.D. LEE

Course Outcome : After finishing this course, the student will be	
1.	To analyze and explain the atomic and molecular arrangements in solids, comprehend the relationships between structure and properties, and apply their knowledge to predict and interpret the behaviour of solid materials in various fields such as materials science, solid-state physics, and crystallography.
2.	Able to analyze and interpret the coordination behaviour of metal complexes, comprehend acid-base theories and their applications in chemical reactions, and apply their knowledge to predict and explain the reactivity and properties of coordination compounds and acid-base systems in various areas such as inorganic chemistry, catalysis, and bioinorganic chemistry.
3.	Able to analyze and interpret the rates of chemical reactions, understand the factors affecting reaction rates, comprehend the periodic trends in atomic and molecular properties, and apply their knowledge to predict and explain the behavior of chemical reactions and the properties of elements across the periodic table in various fields such as physical chemistry, environmental chemistry, and materials science.

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**DEPARTMENT OF CHEMISTRY(04)**  
**F.Y. SEM-2**

Course Objectives:	<p><b>CO-1:</b> Study definition of Electrical conductance, Specific conductance, equivalent conductance, Molar conductance, Effect of dilution on concentration, Cell constant, Determination of Cell constant, Ostwald's dilution law and its limitations, Acid &amp; Basic buffer actions (Henderson-Hasselbach equation), Buffer capacity, Numeric</p> <p><b>CO-2:</b> understand Second law of thermodynamics (in detail), Carnot cycle and its efficiency, Entropy concept, Change of entropy for reversible isothermic, isobaric, isochoric and adiabatic processes. Entropy change for ideal gases (T &amp; V as variables, P &amp; T as variables), Numerical.</p> <p><b>CO-3:</b> Study [I] Dry Reaction: theory behind borax bead test with equation, Flame test (Theory, structure of non luminous Bunsen flame) [II] Analysis of Cation : Application of common ion effect, solubility product constant. Complexometric reactions involved in qualitative analysis; 1. For identification [reaction between Cu(II) ion with ammonia, Fe(III) with thiocyanide, NH<sub>4</sub><sup>+</sup> with Nessler Reagent]. 2. For masking [Cd<sup>2+</sup>, Cu<sup>2+</sup>]. 3. Separation of two ions [Ag-Hg, Zn<sup>2+</sup>, Mn<sup>2+</sup>]</p> <p><b>CO-4:</b> Study shape of d-orbitals, CFT – Basic assumption, splitting of d-orbitals in Octahedral, Tetrahedral, Square planer complexes, distribution of dx electrons in Octahedral and Tertahedral complexes and CFSE.</p> <p><b>CO-5:</b> Define chemical bonds (covalent, co-ordinate covalent, ionic, metallic, H-bond, Wan der walls forces of attraction), Polarisability (Fajan's rule), Molecular Orbital theory ; LCAO method, Bonding molecular orbital, non-bonding molecular orbital, anti-bonding molecular orbital, bond order, magnetic properties and molecular orbital energy level diagram of hetero diatomic molecule : CO and NO, VSEPR theory.</p>
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Mapping between CO and PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	✓			✓	✓	✓		
CO2	✓	✓				✓		✓
CO3			✓		✓	✓	✓	
CO4	✓			✓				
CO5		✓	✓		✓		✓	

**PAPER : 201- INORGANIC & PHYSICAL CHEMISTRY (TOTAL HOURS-30)**

- **UNIT-1(A) BASIC PRINCIPLES OF QUALITATIVE. (4-H)**
- DRY REACTION : THEORY BEHIND BORAX BEAD TEST WITH EQUATION, FLAME TEST (THEORY, STRUCTURE OF NON LUMINOUS BUNSEN FLAME)

- ANALYSIS OF CATION : APPLICATION OF COMMONION EFFECT, SOLUBILITY PRODUCT CONSTANT COMPLEXOMETRIC REACTIONS INVOLVED IN QUALITATIVE ANALYSIS.

**(1)** (1) FOR IDENTIFICATION (REACTION BETWEEN Cu (II) ION WITH AMMONIA

FE (III) WITH THIOCYANIDE  $\text{NH}_4^+$  WITH NESSLER REAGENT)

**(2)** FOR MASKING ( $\text{Cd}^{+2}$ ,  $\text{Cu}^{+2}$ )

**(3)** SEPARATION OF TWO IONS ( $\text{Ag-Hg}$ ,  $\text{Zn}^{+2}$ ,  $\text{Mn}^{+2}$ )

- **REFERENCE BOOKS:**

1. QUALITATIVE ANALYSIS BY R.A. DAY AND A.L. UNDERWOOD
2. VOGEL'S QUALITATIVE INORGANIC ANALYSIS

- **UNIT-1(B) ATOMIC STRUCTURE. (6-H)**

- HISTORICAL PERSPECTIVE OF ATOMIC STRUCTURE : RATHER FORD'S ATOMIC MODEL, BOHR'S THEORY AND ITS LIMITATION, SPECTRUM OF HYDROGEN ATOM (LYMAN, BALMER, PASCHEN, BRACKETT & P FUND), QUANTUM NUMBERS, AUFBAU, HUND AND PAULI EXCLUSION PRINCIPLES, PENETRATION AND SHIELDING, EFFECTIVE NUCLEAR CHARGE (SLATER RULE)

- **REFERENCE BOOKS:**

1. UNIVERSITY GENERAL CHEMISTRY BY C.N. RAO PUB: MC MILLAN
2. PRINCIPLES OF PHYSICAL CHEMISTRY BY MARON & PRUTON, 4<sup>TH</sup> EDITION PUB: OXFORD & IBH
3. PHYSICAL CHEMISTRY BY G.M. BARROW

- **UNIT-2(A) CHEMICAL BONDING. (5-H)**

- DEFINITION OF CHEMICAL BONDS (COVALENT, CO-ORDINATE COVALENT, IONIC, METALLIC, H-BOND, VAN-DERWALLS FORCES OF ATTRACTION), POLARISABILITY (FAJAN'S RULE), MOLECULAR ORBITAL THEORY, LCAO METHOD, BONDING MOLECULAR ORBITAL, NON-BONDING MOLECULAR ORBITAL, ANTI-BONDING MOLECULAR ORBITAL, BOND ORDER, MAGNETIC PROPERTIES AND MOLECULAR ORBITAL ENERGY LEVEL DIAGRAM OF HETERO DIATOMIC MOLECULE : CO AND NO VSEPR THEORY.

- **REFERENCE BOOKS:**

1. CONCISE INORGANIC CHEMISTRY (5<sup>TH</sup> ED) BY J.D. LEE.
2. BASIC INORGANIC CHEMISTRY BY COTTON & WILKINSON.

- **UNIT-2(B) THERMODYNAMICS. (5-H)**

1. BASIC CONCEPTS IN THERMODYNAMICS

(1) TYPES OF SYSTEMS

(2) PROPERTIES OF SYSTEM

- (3) STATE
- (4) TYPES OF PROCESSES

- 2. CONCEPT OF HEAT AND WORK
- 3. FIRST LAW OF THERMODYNAMICS

(1) INTERNAL ENERGY, ENTHALPY (2) HEAT CAPACITY, RELATION BETWEEN  $C_p$  AND  $C_v$  IN GASEOUS STATE (3) JOULE-THOMSON EFFECT (QUALITATIVE DISCUSSION AND EXPERIMENTATION) (4) WORK DONE FOR ADIABATIC AND ISOTHERMAL PROCESSES.

- **REFERENCE BOOKS:**

1. PHYSICAL CHEMISTRY BY ARUNBAHL, B.S. BAHL AND G.D. TULI, PUB: S. CHAND
2. ADVANCE PHYSICAL CHEMISTRY BY D.N. BAJPAI, PUB: S. CHAND

- **UNIT-3(A) CONDUCTANCE AND IONIC EQUILIBRIUM. (5-H)**

- ELECTRICAL CONDUCTANCE, SPECIFIC CONDUCTANCE, EQUIVALENT CONDUCTANCE, MOLAR CONDUCTANCE, EFFECT OF DILUTION ON CONCENTRATION, CELL CONSTANT, DETERMINATION OF CELL CONSTANT, OSTWALD'S DILUTION LAW AND ITS LIMITATIONS, ACID AND BASIC BUFFER ACTIONS (HENDERSON- HASSELBACH EQUATION), BUFFER CAPACITY, NUMERICAL.

- **REFERENCE BOOKS:**

1. TEXT BOOK OF PHYSICAL CHEMISTRY BY P.L. SONI, O.P. DHARMA, PUB: S. CHAND

- **UNIT-3(B) PHYSICAL PROPERTIES AND CHEMICAL CONSTITUTION. (5-H)**

- CLASSIFICATION OF PHYSICAL PROPERTIES (ADDITIVE, CONSTITUTIVE COLLIGATIVE ADDITIVE CONSTITUTIVE), ATOMIC VOLUME, MOLAR VOLUME AND CHEMICAL CONSTITUTION, KOPP'S LAW, SURFACE TENSION, DROP NUMBER METHOD, PARACHOR, VISCOSITY, DETERMINATION OF VISCOSITY BY OSTWALD VISCOMETER NUMERICAL.

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- **REFERENCE BOOKS:**

1. PRINCIPLES OF PHYSICAL CHEMISTRY BY PURI, SHARMA AND MADAN, PUB: VISHAL PUBLISHING
2. ADVANCE PHYSICAL CHEMISTRY BY D.N. BAJPAI, PUB: S. CHAND

Course Outcome : After finishing this course, the student will be	
1.	To analyze and explain the atomic and molecular arrangements in solids, comprehend the relationships between structure and properties, and apply their knowledge to predict and interpret the behaviour of solid materials in various fields such as materials science, solid-state physics, and crystallography.
2.	Able to analyze and interpret the coordination behaviour of metal complexes, comprehend acid-base theories and their applications in chemical reactions, and apply their knowledge to predict and explain the reactivity and properties of coordination compounds and acid-base systems in various areas such as inorganic chemistry, catalysis, and bioinorganic chemistry.
3.	Able to analyze and interpret the rates of chemical reactions, understand the factors affecting reaction rates, comprehend the periodic trends in atomic and molecular properties, and apply their knowledge to predict and explain the behavior of chemical reactions and the properties of elements across the periodic table in various fields such as physical chemistry, environmental chemistry, and materials science.

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**DEPARTMENT OF CHEMISTRY**  
**F.Y. SEM-1**

Course Objectives:	<p><b>CO-1:</b> define the terms related to organic reactions such as Homolytic and Heterolytic fission free radicals carbonium ions, carbanions, carbenes, arynes and nitrenes;</p> <p><b>CO-2:</b> classify organic reactions like Addition, substitution, elimination, rearrangements, addition, and substitution with respect to electrophilic and nucleophilic, SN<sub>1</sub>, SN<sub>2</sub>, Mechanism of addition reaction to alkenes and dienes, substitution in benzene, Perkin reaction, Benzoin condensation and Cannizzaro's reaction;</p> <p><b>CO-3:</b> determine empirical formula and its relation with molecular formula determination of molecular weight of organic acid by titration and silver salt method and organic base by chloroplatinate method and its limitations;</p> <p><b>CO-4:</b> define the term carbohydrate, its classification, structure of glucose and fructose, conversion of glucose to fructose and fructose to glucose, step up, step down and Kiliani synthesis;</p> <p><b>CO-5:</b> identify Alkenes: Nomenclature, method of preparation, properties and uses of ethylene and propylene Markovnikov's rule and Saytzeff rule, polymerization of ethylene styrene and vinyl chloride;</p>
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Mapping between CO and PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	✓			✓	✓	✓		
CO2	✓	✓				✓		✓
CO3			✓		✓	✓	✓	
CO4	✓			✓				
CO5		✓	✓		✓		✓	

**PAPER:- 102- ORGANIC CHEMISTRY**

**(TOTAL HOURS-30)**

**- UNIT-1 ALKANES AND CYCLOALKANES.**

**(10-H)**

**(A) ALKANES :** IUPAC NOMENCLATURE OF BRANCHED AND SIMPLE CHAIN ALKANES, CLASSIFICATION OF CARBON ATOMS IN ALKANES. ISOMERISM IN ALKANES, SOURCES, METHODS OF FORMATION SPECIAL. REFERENCE TO WURTZ REACTION, KOLBE REACTION AND COREY- HOUSE REACTION AND DECARBOXYLATION OF CARBOXYLIC ACIDS. PHYSICAL PROPERTIES AND CHEMICAL REACTIONS OF ALKANES. MECHANISM OF FREE RADICAL HALOGENATIONS OF ALKANES: ORIENTATION, REACTIVITY & SELECTIVITY.

**(B) CYCLOALKANES :** NOMENCLATURE, METHODS OF FORMATION, CHEMICAL REACTIONS, BAEYER'S STRAIN THEORY AND ITS LIMITATIONS RING STRAIN IN SMALL RINGS (CYCLO PROPANE AND CYCLO BUTANE , THEORY OF STRAINLESS RING. THE CASE OF CYCLO PROPANE RING, BANANA BONDS(CYCLOHAXEN-CHAIN AND BOAT FORM).

- **UNIT-2 (A) EMPIRICAL FORMULA, MOLECULAR FORMULA AND STRUCTURAL FORMULA. (4-H)**

- DETERMINATION OF EMPIRICAL FORMULA AND ITS RELATION WITH MOLECULAR FORMULA, DETERMINATION OF MOLECULAR WEIGHT OF **(A)** ORGANIC ACID BY SILVER SALT METHOD **(B)** ORGANIC BASE BY CHLOROPLATINATE METHOD AND ITS LIMITATIONS. NUMERICAL EXAMPLE.
- **(C)** C-H BOND EMPIRICAL FORMULA METHOD.

**UNIT-2(B) CARBOHYDRATES : (6-H)**

MODERN DEFINITION OF CARBOHYDRATES, CLASSIFICATION OF CARBOHYDRATES, FUNCTION OF CARBOHYDRATES, OPTICAL ISOMERS, DIASTEREOMERS, ENANTIOMERS RACIMATES OF GLUCOSE AND FRUCTOSE STRUCTURE OF GLUCOSE AND FRUCTOSE ISOMERS, MUTAROTATION, GLUCOSIDE LINKAGE (PYRANOSE AND FURANOSE) D & L ISOMERS OF GLUCOSE AND FRUCTOSE, DERIVATIVES OF MONOSACCHARIDE STEP UP AND STEPDOWN SYNTHESIS, KILYANI SYNTHESIS, CONVERSION OF GLUCOSE TO FRUCTOSE AND CONVERSION OF FRUCTOSE TO GLUCOSE.

**UNIT-3 (A) ORGANIC QUALITATIVE ANALYSIS. (2-H)**

- (1)** ELEMENTAL ANALYSIS (LASSAIGN'S TEST WITH EQUATION).
- (2)** SOLUBILITY OF ORGANIC COMPOUND (REF. VOGEL'S QUALITATIVE ORGANIC ANALYSIS).
  - CHEMICAL METHODS : SOLUBILITY IN  $\text{NaHCO}_3$ ,  $\text{NaOH}$  AND  $\text{HCL}$  AND AMPHOTERIC COMPOUNDS (SULPHANILIC ACID AND ANTHRANILIC ACID).

- **UNIT-3 (B) HETROCYCLIC COMPOUNDS. (5-H)**

- NOMENCLATURE AROMATICITY AND SYNTHESIS PROPERTIES USES AND CANONICAL STRUCTURES OF PYRROL, FURAN, THIOPHENE, PYRIDINE.

- **UNIT-3 (C) POLYNUCLEAR HYDROCARBONS.**

**(3-H)**

- CLASSIFICATION AROMATICITY AND INDUSTRIAL PREPARATION, PROPERTIES, USES AND CANONICAL STRUCTURES OF NAPHTHALENE, ANTHRACENE AND PHENANTHRENE.

Course Outcome : After finishing this course, the student will be	
1.	To analyze and explain the atomic and molecular arrangements in solids, comprehend the relationships between structure and properties, and apply their knowledge to predict and interpret the behaviour of solid materials in various fields such as materials science, solid-state physics, and crystallography.
2.	Able to analyze and interpret the coordination behaviour of metal complexes, comprehend acid-base theories and their applications in chemical reactions, and apply their knowledge to predict and explain the reactivity and properties of coordination compounds and acid-base systems in various areas such as inorganic chemistry, catalysis, and bioinorganic chemistry.
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**DEPARTMENT OF CHEMISTRY**  
**F.Y. SEM-2**

Course Objectives:	<p><b>CO-1:</b> define the terms related to organic reactions such as Homolytic and Heterolytic fission free radicals carbonium ions, carbanions, carbenes, arynes and nitrenes;</p> <p><b>CO-2:</b> classify organic reactions like Addition, substitution, elimination, rearrangements, addition, and substitution with respect to electrophilic and nucleophilic, SN<sub>1</sub>, SN<sub>2</sub>, Mechanism of addition reaction to alkenes and dienes, substitution in benzene, Perkin reaction, Benzoin condensation and Cannizzaro's reaction;</p> <p><b>CO-3:</b> determine empirical formula and its relation with molecular formula determination of molecular weight of organic acid by titration and silver salt method and organic base by chloroplatinate method and its limitations;</p> <p><b>CO-4:</b> define the term carbohydrate, its classification, structure of glucose and fructose, conversion of glucose to fructose and fructose to glucose, step up, step down and Kiliani synthesis;</p> <p><b>CO-5:</b> identify Alkenes: Nomenclature, method of preparation, properties and uses of ethylene and propylene Markovnikov's rule and Saytzeff rule, polymerization of ethylene styrene and vinyl chloride;</p>
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Mapping between CO and PSO		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	✓				✓	✓	✓		
CO2	✓	✓					✓		✓
CO3				✓		✓	✓	✓	
CO4	✓				✓				
CO5		✓	✓	✓		✓		✓	

➤ **PAPER :- 202- ORGANIC CHEMISTRY** **(TOTAL HOURS-30)**  
 - **UNIT-1 REACTION MECHANISM** **(10-H)**

a HOMOLYTIC AND HETEROLYTIC FISSION REACTIVE INTERMEDIATE(FREE RADICALS, CARBONIUM ION(CARBOCATIONS)AND CARBANIONS,CARBENES, ARYNES AND NITRENES)

TYPES OF REAGENTS, ELECTROPHILES, NUCLEOPHILES

**(A)** ELECTROMERIC, INDUCTIVE, CONJUGATIVE EFFECT

**(B)** TYPES OF REACTIONS: ADDITION, SUBSTITUTION, ELIMINATION, REARRANGEMENTS ADDITION AND SUBSTITUTION WITH RESPECT TO ELECTROPHILIC AND NUCLEOPHILIC REACTION, SN<sup>1</sup> & SN<sup>2</sup>.

- (C) MECHANISM OF (1)ADDITION REACTION TO ALKENES AND DIENES (2)SUBSTITUTION IN BENZENE RING, (NITRATION, SULPHONATION, ALKYLATION, ACYLATION, HALOGENATION, CYANOHYDRIN FORMATION AND ACETAL FORMATION).
- (D) REACTION MECHANISM (PERKIN REACTION, BENZOIN CONDENSATION AND CANNIZARO'S REACTION).

- **UNIT-2 STREOCHEMISTRY. (10-H)**

- (A) ISOMERISM- OPTICAL ACTIVITY, CHIRAL AND ACHIRAL MOLECULES.
- (B) OPTICAL ISOMERISM OF TARTARIC ACID, ENANTIOMERS, DIASTEREOMERS (THRE & ERYTHRO), MESO COMPOUNDS RESOLUTION OF RACEMATES, INVERSION RETENTION AND RACEMIZATION.
- (C) GEOMETRICAL ISOMERISM : ALKENE DERIVATIVE & OXIMES E & Z SYSTEM AND NOMENCLATURE.
- (D) RELATIVE AND ABSOLUTE CONFIGURATION,SEQUENCE RULES d & l AND R & S SYSTEM OF NOMENCLATURE.

- **UNIT-3 ALKENES, DIENES AND ALKYNES:. (10-H)**

- (A) **ALKENES** : NOMENCLATURE,METHOD OF PREPARATION, PROPERTIES AND USES OF ETHYLENE AND PROPYLENE, MARKOVNIKOFFS RULE AND SATYRZEFF RULE,POLYMERIZATION OF ETHYLENE STYRENE AND VINYL CHLORIDE.  
**ALKENES REACTIONS** : HYDROBORATION, OXIDATION, EPOXIDATION, OZONOLYSIS, OXYMERCURATION, HYDROXYLATION, HYDROHALOGENATION, DEHYDRAHALOGENATIONS, HYDRATION.
- (B) **DIENES** : NOMENCLATURE, CLASSIFICATION OF DIENES METHODS OF FORMATION OF BUTADIENE CHEMICAL REACTIONS 1,2 AND 1,4 ADDITIONS, DIEL'S-ALDER REACTION.
- (C) **ALKYNES** : NOMENCLATURE, METHOD OF FORMATION CHEMICAL REACTIONS : HYDROBORATION, OXIDATION, METAL AMMONIA REDUCTION, POLYMERIZATION, ELECTROPHILIC AND NUCLEOPHILIC ADDITION REACTIONS OF ACETYLENE.

- **REFERENCE BOOKS :**

- (1) ORGANIC CHEMISTRY VOL. I & VOL.II BY I.L. FINAR
- (2) ORGANIC CHEMISTRY BY P.L. SONI
- (3) ORGANIC CHEMISTRY BY B.K. SHARMA
- (4) ORGANIC CHEMISTRY BY BAHL AND BAHL
- (5) ORGANIC REACTION MECHANISM BY MUKHARJI & SINGH
- (6) FUNDAMENTALS OF ORGANIC CHEMISTRY BY SOLOMAN JOHN WIELY

Course Outcome : After finishing this course, the student will be

1.	To analyze and explain the atomic and molecular arrangements in solids, comprehend the relationships between structure and properties, and apply their knowledge to predict and interpret the behaviour of solid materials in various fields such as materials science, solid-state physics, and crystallography.
2.	Able to analyze and interpret the coordination behaviour of metal complexes, comprehend acid-base theories and their applications in chemical reactions, and apply their knowledge to predict and explain the reactivity and properties of coordination compounds and acid-base systems in various areas such as inorganic chemistry, catalysis, and bioinorganic chemistry.
3.	Able to analyze and interpret the rates of chemical reactions, understand the factors affecting reaction rates, comprehend the periodic trends in atomic and molecular properties, and apply their knowledge to predict and explain the behavior of chemical reactions and the properties of elements across the periodic table in various fields such as physical chemistry, environmental chemistry, and materials science.

**VIDHYADEEP INSTITUTE OF SCIENCE, ANITA(KIM)**  
**DEPARTMENT OF CHEMISTRY**  
**F.Y. SEM-1 PRACTICAL -103**

Course Objectives:	CO1: To provide students with hands-on experience and skills in conducting qualitative tests to identify organic compounds based on their functional groups and chemical properties, as well as understanding the principles and techniques of organic qualitative analysis. CO2: To provide students with practical skills and knowledge in performing volumetric analysis, including the principles, techniques, and calculations involved in accurate titrations.
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Mapping between CO and PSO		PSO 1	PSO 2	PSO 3	PSO 4	PSO5	PSO6	PSO7	PSO8
	CO1	✓	✓		✓	✓		✓	
	CO2		✓	✓		✓	✓		✓

**(A) ORGANIC SPOTTING**

- PRIMARY TESTS, IGNITION TEST, DETECTION OF ELEMENTS NATURE OF THE SUBSTANCE (SOLUBILITY TEST), FUNCTIONAL GROUP TESTS, C.T., MOLECULAR FORMULA, STRUCTURAL FORMULA & M.P. / B.P. OF THE GIVEN SUBSTANCE.
  - **ACID** – BENZOIC ACID, PHTHALIC ACID, SALICYLIC ACID
  - **BASE** – ANILINE, P&O NITRO ANILINE
  - **PHENOL** –  $\alpha$ -NAPHTHOL,  $\beta$ -NAPHTHOL
  - **NEUTRAL** –
  - **CARBOHYDRATE** – GLUCOSE, FRUCTOSE
  - **KETONE** – ACETONE, ACETOPHENONE
  - **ESTER** – ETHYLE ACETATE , METHYL ACETATE
  - **ALCOHOL** – METHANOL, ETHANOL
  - **HYDROCARBON** – TOLUENE, NAPHTHALENE
  - **HALOGENATED HYDROCARBON** – CARBON TETRACHLORIDE  
CHLOROBENZENE
  - **NITRO HYDROCARBON** - NITROBENZENE M-DINITRO  
BENZENE
  - **AMIDE** – UREA
  - **ANILIDE** – ACETANILIDE
- N.B. CANDIDATE SHOULD PERFORM THE ANALYSIS OF AT LEAST 8 SUBSTANCES.

**(B) VOLUMETRIC EXERCISE**

H <sub>2</sub> SO <sub>4</sub>	NaHCO <sub>3</sub>	HNO <sub>3</sub>
KMnO <sub>4</sub>	H <sub>2</sub> C <sub>2</sub> O <sub>4</sub> .7H <sub>2</sub> O	KOH
KMnO <sub>4</sub>	FeSO <sub>4</sub>	K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>
K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub>	Fe-NH <sub>4</sub> -SO <sub>4</sub>	KMnO <sub>4</sub>
H <sub>2</sub> C <sub>2</sub> O <sub>4</sub>	KMnO <sub>4</sub>	FeSO <sub>4</sub>

N.B. CANDIDATE SHOULD PERFORM AT LEAST 4 VOLUMETRIC EXERCISE.

Course Outcome : After finishing this course, the student will have	
1.	able to perform a range of qualitative tests to identify organic compounds, interpret the results of these tests to determine functional groups and compound identities, apply their knowledge of organic reactions and properties to conduct appropriate tests, and develop critical thinking and analytical skills in organic compound identification.
2.	Able to perform various volumetric titrations, accurately measure volumes of solutions and perform calculations to determine the concentration of analytes, understand the principles of different types of titrations, analyze experimental data, and apply their knowledge and skills in quantitative analysis and titration-based experiments.

**VIDHYADEEP UNIVERSITY**  
**VIDHYADEEP INSTITUTE OF SCIENCE, ANITA(KIM)**  
**DEPARTMENT OF CHEMISTRY**  
**F.Y. SEM-2 PRATICAL (203)**

Course Objectives:	CO1: To provide students with hands-on experience and skills in conducting qualitative tests to identify organic compounds based on their functional groups and chemical properties, as well as understanding the principles and techniques of organic qualitative analysis. CO2: To provide students with practical skills and knowledge in performing volumetric analysis, including the principles, techniques, and calculations involved in accurate titrations.
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Mapping between CO and PSO	PSO 1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1	✓	✓		✓	✓		✓	
CO2		✓	✓		✓	✓		✓

**(A) INORGANIC QUALITATIVE ANALYSIS**

**LIST OF INORGANIC CHEMICALS :**

**CHLORIDES :** Cu<sup>+2</sup>, Fe<sup>+3</sup>, Mn<sup>+2</sup>, Co<sup>+2</sup>, Ni<sup>+2</sup>, Ca<sup>+2</sup>, Sr<sup>+2</sup>, Na<sup>+</sup>, K<sup>+</sup>, NH<sub>4</sub><sup>+</sup>, Ba<sup>+2</sup>

**BROMIDE :** Na<sup>+</sup>, K<sup>+</sup>, NH<sub>4</sub><sup>+</sup>

**IODIDE :** K<sup>+</sup>

**NITRATE :** Pb<sup>+2</sup>, Co<sup>+2</sup>, Ni<sup>+2</sup>, Ba<sup>+2</sup>, Sr<sup>+2</sup>, Na<sup>+</sup>, K<sup>+</sup>

**SULPHIDE :** Zn<sup>+2</sup>

**SULPHATE :** Cu<sup>+2</sup>, Al<sup>+3</sup>, Fe<sup>+2</sup>, Zn<sup>+2</sup>, Mn<sup>+2</sup>, Ca<sup>+2</sup>, Ni<sup>+2</sup>, Mg<sup>+2</sup>, Na<sup>+</sup>, K<sup>+</sup>, NH<sub>4</sub><sup>+</sup>

**CHROMATE :** Na<sup>+</sup>, K<sup>+</sup>

**CARBONATE :** Cu<sup>+2</sup>, Zn<sup>+2</sup>, Mn<sup>+2</sup>, Co<sup>+2</sup>, Ni<sup>+2</sup>, Ca<sup>+2</sup>, Ba<sup>+2</sup>, Sr<sup>+2</sup>, Mg<sup>+2</sup>, Na<sup>+</sup>, K<sup>+</sup>, NH<sub>4</sub><sup>+</sup>

**PHOSPHATE :** Cu<sup>+2</sup>, Al<sup>+3</sup>, Fe<sup>+3</sup>, Zn<sup>+2</sup>, Mn<sup>+2</sup>, Mg<sup>+2</sup>, Na<sup>+</sup>, K<sup>+</sup>, NH<sub>4</sub><sup>+</sup>

N.B. CANDIDATE SHOULD PERFORM THE ANALYSIS OF AT LEAST 8 COMPOUNDS.

**(B) PREPERATION OF STANDARD SOLUTION (BY STUDENT) OF FOLLOWING**

1. 0.1 N SUCCINIC ACID AGAINST NaOH
2. 0.1 N KHP AGAINST NaOH / KOH
3. 0.01 N Na<sub>2</sub>S<sub>2</sub>O<sub>3</sub> AGAINST I<sub>2</sub> SOLUTION
4. 0.1N H<sub>2</sub>C<sub>2</sub>O<sub>4</sub>·2H<sub>2</sub>O AGAINST KMnO<sub>4</sub> SOLUTION
5. 0.1 N K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> AGAINST FeSO<sub>4</sub>·7H<sub>2</sub>O

**(OR)**

FeSO<sub>4</sub>(NH<sub>4</sub>)<sub>2</sub>SO<sub>4</sub>·10H<sub>2</sub>O SOLUTION

N.B. CANDIDATE SHOULD PERFORM AT LEAST 3 VOLUMETRIC EXERCISE.

Course Outcome : After finishing this course, the student will have

1.	able to perform a range of qualitative tests to identify organic compounds, interpret the results of these tests to determine functional groups and compound identities, apply their knowledge of organic reactions and properties to conduct appropriate tests, and develop critical thinking and analytical skills in organic compound identification.
2.	Able to perform various volumetric titrations, accurately measure volumes of solutions and perform calculations to determine the concentration of analytes, understand the principles of different types of titrations, analyze experimental data, and apply their knowledge and skills in quantitative analysis and titration-based experiments.