

Name of the Programme	:	B.Sc. Chemistry
Programme Code	:	USCH
Class	:	F.Y.B.Sc.
Semester	:	II
Course Name	:	Physical and Inorganic Chemistry
Course Code	:	USCH 121
No .of Credits	:	02
No .of Lecture	:	36

Course Objectives:

1. To provide the details concepts involved in solid state and to understand the geometrical parameters.
2. To introduce basic concepts in atomic structure such as, Bohr atomic model, energy level diagrams, hydrogen spectra etc.
3. To aware the basic of quantum chemistry its foundations and starting.
4. To develop knowledge of particle and wave nature of matter and uncertainty principle and its physical significance
5. To develop knowledge about thermochemistry and its applications.
6. To learn basic principle and concepts of theories of overlapping of atomic orbitals. Types of hybridizations involving s , p and d orbital's.
7. To understand the basic of VSEPR theory, bonding and shapes of simple molecules.

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

1. Students should able to get geometrical information of crystal and would able to determine the geometrical parameters such as planar distances, density, etc.
2. Apply theoretical approach to understand the structure of atom.
3. Describe foundation of quantum chemistry and its applications.
4. Discuss the thermo chemistry of different processes and application of Hess's law in thermodynamics.
5. Explain the different types of bonding in a molecule and types of overlapping involving s, p, d, and f orbitals.
6. Identify types of hybridization and describe it with suitable example.
7. Apply the knowledge gained in the course to discuss and solve lab related queries.

Section I: Physical Chemistry

Unit I. Solid State (09L)

Definition of space lattice ,unit cell; Laws of crystallography– (i) Law of constancy of interfacial angles, (ii) Law of rationality of indices (iii) Law of symmetry, Symmetry elements in crystals. Fundamental crystal systems, Characteristic of simple cubic, face-centered cubic and body centered cubic systems, Inter-planar distances in cubic crystals, X-Ray diffraction by crystals, Derivation of Bragg equation, Determination of crystal structure of NaCl, Numerical

Unit II. Atomic structure: (08L)

Historical perspectives of the atomic structure; Bohr's theory, Derivation of atomic radius and energy, energy level diagram of hydrogen atom and limitations of Bohr's theory, atomic spectrum of hydrogen atom

Origin of Quantum Mechanics : Failure of Classical mechanics- black body radiation, photoelectric effect, electron diffraction,

Quantization of energy, deBroglie's hypothesis, Heisenberg's uncertainty principle, Numerical

Unit III. Chemical Energetics (07L)

Review of thermodynamics and the first laws of thermodynamics, Definitions of thermochemistry. Concept of standard state and standard enthalpies of formations, integral and differential enthalpies of solution and dilution, Calculation of bond energy, bond dissociation energy and resonance energy from thermochemical data, Variation of enthalpy of a reaction with temperature – Kirchhoff's equation, Numerical

Section II: Inorganic Chemistry**Unit IV. Chemical Bonding and Structure (4L)**

Recapitulation of bonds: Ionic, covalent, coordinate and metallic.

Types of overlaps: s-s, s-p, p-p, p-d, d-d with examples, formation of sigma and pi bond.

Theories of bonding: Valence bond theory, Heitler-London theory, Pauling Slater theory.

Unit V. Concept of hybridization (8L)

Definition and need of hybridization, steps involved in hybridization, explanation of covalency of atom in the molecules based on hybridization, types of hybridization involving s, p and d orbital.

References:

1. Physical Chemistry, P.W. Atkins, ELBS, 5th Edition.
2. Principles of Physical Chemistry, Maron and Prutton, 4th Edition.
3. Physical Chemistry, G.M. Barrow 4th Edition.
4. Quantum Chemistry, I. Levine, 5th Edition.
5. Essentials of Physical Chemistry, Bhaland Tuli,
6. Principles of Physical Chemistry, Puri, Sharma and Phathania
7. Mathematical Preparation of Physical Chemistry. Daniel, McGraw Hill.
8. Concise Inorganic Chemistry, J.D. Lee, 5th Edition
9. Concept and Models of Inorganic Chemistry, Douglas and Daniel, 3rd Edition
10. Inorganic Chemistry, James Hughey

Class: F.Y.B.Sc. (SEM II)

Subject: Chemistry

Course: Physical and Inorganic Chemistry - II

Course Code: USCH 121

Weightage: 1= weak or low relation, 2= moderate or partial relation, 3= strong or direct relation

Mapping of Course Outcomes with Program Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1	0	0	0	0	0	0	3	0	0
CO2	3	3	0	0	0	0	0	0	0
CO3	3	3	0	0	0	0	0	0	0
CO4	0	0	0	3	0	0	0	0	0
CO5	0	0	0	0	3	0	0	0	0
CO6	0	0	0	0	0	3	0	0	0
CO7	0	0	0	0	0	0	3	0	0

Justification of Mapping

PO1: Disciplinary Knowledge

CO1: Ability to determine geometrical parameters of crystals (Strong Relation: 3)

PO2: Critical Thinking and Problem Solving:

CO2: Understanding the theoretical structure of atoms (Strong Relation: 3)

CO3: Describing foundations of quantum chemistry and its applications (Strong Relation: 3)

PO4: Research-Related Skills and Scientific Temper

CO4: Discussing thermo chemistry and the application of Hess's Law (Strong Relation: 3)

PO5: Trans-Disciplinary Knowledge

CO5: Explaining different types of bonding and overlapping involving orbitals
(Strong Relation: 3)

PO6: Personal and Professional Competence:

CO6: Identifying types of hybridization with suitable examples (Strong Relation: 3)

PO7: Effective Citizenship and Ethics:

CO7: Applying knowledge gained in the course to solve lab-related queries
(Strong Relation: 3)

Name of the Programme	:	B.Sc.Chemistry
Programme Code	:	USCH
Class	:	F.Y.B.Sc.
Semester	:	II
Course Name	:	Organic and Inorganic Chemistry
Course Code	:	USCH122
No. of Credits	:	02
No. of Lecture	:	36

SECTION I: ORGANIC CHEMISTRY

A. Learning Objective:

1. To understand concept of isomerism, types of isomers.
2. To find R/S configuration in compounds containing one Chiral centers.
3. To use different reagents in organic synthesis.
4. To know silent features of periodic table with reference to P-block elements.
5. To understand the structures of compounds and applications of P block elements.
6. Students know the applications of inter halogen compounds.
7. Preparation and Applications of oxidizing and reducing reagents.

B. Course Outcome:

1. This course makes understanding of concept of isomerism, types of isomers.
2. Students should know the confirmations and configurations of acyclic molecules.
3. Students are able to assign R/S configuration in compounds containing one chiral centers.
4. Students are able to learn the fundamentals principles and developments of organic chemistry.
5. Students should know Understand stereo-chemistry by using models and learn reactivity of geometrical isomers.
6. Students are able to use different reagents in organic synthesis.
7. Students are know the symbols, electronic configuration, trends and properties Structures of compounds.

Unit I. Stereochemistry

(12L)

Concept of isomerism, types of isomers, representation of organic molecules (Projection

formulae), Conformational isomerism in alkanes (Ethane, propane and n-butane) with energy

profile diagrams, Geometrical isomerism -definition, conditions for geometrical isomers, physical and chemical properties, E/Z nomenclature of geometrical isomers.

Optical isomers, chirality, optical isomerism with one asymmetric carbon atom, specific rotation, enantiomerism, R/S nomenclature, R/S system nomenclature with wedge and Fischer representation of two chiral centres. Racemic mixture, meso compound and diastereomers.

Ref.1,2,3.

Unit II. Reagents in Organic Synthesis (12L)

Reducing agents: Catalyst (Ni/Pd/Pt) and H_2 , Birch reduction, $NaBH_4$, $LiAlH_4$ and Sn/HCl ,

Oxidising agents: $KMnO_4$, $K_2Cr_2O_7$, Jones reagent, PCC, per acids and OsO_4 .

Ref.1 &3

SECTION II: INORGANIC CHEMISTRY

Unit III. Chemistry of P-Block Elements (12L)

Position of elements in the periodic table, electronic configuration of elements, trends in properties like: atomic size, ionization potential, electro negativity, electron affinity, reactivity, oxidation state.

Structure and Properties of - 1) Borates and Halides of Aluminum 2) Allotropes of Carbon 3) Oxyacids of Phosphorous, Sulphur and Chlorine 4) Interhalogen compounds

References:

1. Organic Chemistry - Morrison and Boyd, 6th edition, Prentice Hall, 2001.
2. Stereochemistry of carbon compounds - E.L. Eliel
3. Reactions, rearrangements and reagents - S.N. Sanyal
4. Inorganic Chemistry - James Hughey
5. General Chemistry - Raymond Chang
6. Concise Inorganic Chemistry - J.D. Lee, 5th Edition - Relevant pages.
7. Concept & Model of Inorganic Chemistry - Douglas McDaniel, 3rd edition.

Class: F.Y.B.Sc. (SEM I)

Subject : Chemistry

Course: Organic and Inorganic Chemistry – II

CourseCode:USCH122

Weightage: 1=weak or low relation,2=moderate or partial relation,3=strong or direct relation

Mapping of Course Outcomes with Program Outcomes

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CO1	3	0	0	0	0	0	0	0	0
CO2	3	0	0	0	0	0	0	0	0
CO3	3	0	0	0	0	0	0	0	0
CO4	3	0	0	0	0	0	0	0	0
CO5	3	0	0	0	0	0	0	0	0
CO6	3	0	0	0	0	0	0	0	0
CO7	3	0	0	0	0	0	0	0	0

Justification of Mapping

PO1: Disciplinary Knowledge:

CO1: Understanding isomerism and types of isomers (Strong Relation: 3)

CO2: Knowledge of conformations and configurations of acyclic molecules (Strong Relation: 3)

CO3: Ability to assign R/S configurations in compounds with one chiral center (Strong Relation: 3)

CO4: Learning the fundamental principles and developments of organic chemistry (Strong Relation: 3)

CO5: Understanding stereochemistry using models and reactivity of geometrical isomers (Strong Relation: 3)

CO6: Using different reagents in organic synthesis (Strong Relation: 3)

CO7: Understanding symbols, electronic configuration, trends, and properties of compounds (Strong Relation: 3)

Name of the Programme	:	B.Sc.Chemistry
Programme Code	:	USCH
Class	:	F.Y.B.Sc.
Semester	:	II
Course Name	:	Chemistry Practical
Course Code	:	USCH123
No. of Credits	:	02
No. of Practicals	:	12

Course Objectives:

1. To introduce chemical and laboratory safety.
2. To adequate students with graph of various functions.
3. To learn basic of chemistry practical from all the discipline of chemistry
4. To learn the estimation of compounds.
5. To know the synthesis of derivatives.
6. To learn the volumetric analysis.
7. To know the preparation of solutions.

Course Outcomes:

1. Student will able to apply mathematical knowledge in graphical representation of experimental data.
2. Students should able to develop the ability of hazardous and nonhazardous chemicals.
3. Students should able to apply the knowledge about the various chemicals methods to solve various scientific problem. it can be useful in research with many interdisciplinary subjects.
4. Students will competency to prepare standard solution required in chemical synthesis or analysis.
5. Students are able to understand the knowledge about general laboratory practices.
6. Students will able to get the skill to ensure presence of cations and anions present in given mixture
7. Students should able to estimate the organic compounds volumetrically.

I: Physical Chemistry (Minimum 4 experiments)

1. Sketch the polar plot of S and P orbital.
2. Assign the lattice structure of NaCl crystal by given data.
3. Determination the heat of solution of KNO_3 / NH_4Cl .
4. Determination of heat of dissolution of NaCl/KCl.
5. Determination of heat of neutralization of strong base and strong acid .
6. Determination of enthalpy of hydration of copper sulphate.

II: Inorganic Chemistry (Minimum 4 experiments)

1. Inorganic Qualitative Analysis (**Three** water soluble mixtures without borate and phosphates)
2. Estimation of water of crystallization in Mohr's salt by titrating it with KMnO_4 .

III. Organic Chemistry (Minimum 4 experiments)

1. Determine amount of aspirin in APC tablet volumetrically.
2. Technique:-Thin layer chromatography.
3. Organic qualitative analysis of single liquid compound (Type, Preliminary test and Physical constant).

4. Determination of elements and functional groups of solid compounds.
5. Determination of elements and functional groups of liquid compounds.

References:

1. Senior practical Physical chemistry, B. D hosla and V.S.Garg.
2. Text book of practical Inorganic Chemistry,A.I. Vogel.
3. Textbook of practical Organic Chemistry,A.I. Vogel.

Class: F.Y.B.Sc. (SEM II)

Subject : Chemistry

Course: Practical course

Course Code: USCH 123

Weightage: 1=weak or low relation,2=moderate or partial relation,3=strong or direct relation

Mapping of Course Outcomes with Program Outcomes

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CO3	0	0	3	0	0	0	0	0	0
CO4	0	0	0	3	0	0	0	0	0
CO5	0	0	0	0	3	0	0	0	0
CO6	0	0	0	0	0	3	0	0	0
CO7	0	0	0	0	0	0	3	0	0

Justification of Mapping

PO1: Disciplinary Knowledge:

CO1: Applying mathematical knowledge in graphical representation of experimental data
(Strong Relation: 3)

PO2: Critical Thinking and Problem Solving:

CO2: Developing the ability to handle hazardous and non-hazardous chemicals (Strong Relation: 3)

PO3: Social Competence:

CO3: Applying chemical knowledge to solve various scientific problems, useful in interdisciplinary research (Strong Relation: 3)

PO4: Research-related Skills and Scientific Temper:

CO4: Competency in preparing standard solutions for chemical synthesis or analysis
(Strong Relation: 3)

PO5: Trans-disciplinary Knowledge:

CO5: Understanding general laboratory practices (Strong Relation: 3)

PO6: Personal and Professional Competence:

CO6: Developing skills to identify cations and anions in mixtures (Strong Relation: 3)

PO7: Effective Citizenship and Ethics:

CO7: Estimating organic