

DEPARTMENT OF CHEMISTRY				CLASS: I B.Sc. Chemistry				
SEM	Course type	Course Code	Course Title	Credits	Contact Hours/week	CIA	Ext	Total
I	Part-III-Core	20U1CMC1	General Chemistry – I	3	3	25	75	100

Course Objectives: The objective of this course is to make the student

1. To classify the organic compound based on the different functional groups and illustrate IUPAC nomenclature of organic compounds
2. To predict hybridization and geometry of organic molecule
3. To discuss the electronic effects on physical properties of organic compounds
4. To outline the basic concept on dissociation of bonds, formation and stability of intermediates
5. To categorize bonding and properties of chemical bonds based on the bonds present in it

UNIT-I: Fundamentals in Organic chemistry

(9 hours)

Classification of organic compounds - IUPAC system of nomenclature of common organic compounds (upto C-10) - cycloalkanes and aromatic compounds- Naming of organic compounds with one functional group/ two functional groups/heterocyclic compounds containing one and two hetero atoms present in five/six membered rings - calculation of empirical and molecular formulae - definitions and problems - basics in isomerism-Hybridization and geometry of molecules (sp , sp^2 , sp^3) (methane, ethane, ethylene and acetylene) - sigma and pi bonds – Multiple bonds and their characteristics -bond angle, bond length, bond strength of C-H and C-C bonds.

UNIT-II: Basic concepts of Organic compounds-I

(9 hours)

Bond polarity of some important bonds (C-C, C-O, C-N, C=C, C-Cl, C=O, H-H, O-H, N-H and S-H bonds -dipole moment of simple organic molecules-- Van der Waal's interactions-Hydrogen bonds- Inter & Intra molecular forces in organic compounds and their effects on physical properties-Electron displacement in organic compounds - Inductive effect- Electromeric effect-Resonance- Resonance theory-Delocalization -vinylic and allylic system- Resonance effect –Hyper conjugation- steric effect - steric overcrowding - steric inhibition of resonance - steric relief (with examples).

UNIT-III: Basic concepts of Organic compounds-II

(9 hours)

Dissociation of bonds - Homolysis and Heterolysis – Types of reagent-Free radicals-Carbocation, Carbanion – carbene – Nitrene – structure, geometry and stability of these intermediates-Electrophiles and Nucleophiles - Types of organic reactions - Basic ideas of nucleophilic, electrophilic addition substitution and Elimination reactions (elementary idea with examples) –Energy consideration.

UNIT-IV: Acid Base Chemistry

(9 hours)

Theories of acids and bases – Arrhenius, Bronsted - Lowry theory proton donor - acceptor system. Theory of solvent system, Lewis-electron dot system and: pH of strong and weak acid solutions. Buffer solutions. Hendersonequations. Preparation of acidic and basic buffers. Relative strength of acids and bases from k_a and K_b values
Non-aqueous solvents: Classification of solvents – General properties of ionizing solvents chemical reactions. Water, liquid ammonia, liquid SO_2

UNIT-V: Chemical bonding-I

(9 hours)

Types of chemical bonds -Ionic bond – illustration of the formation of ionic bond (NaCl, MgO, CaF₂, Al₂O₃ only) Properties of ionic compounds-factors favoring the ionic compounds- ionization potential – electron affinity – electronegativity – Lattice energy – Born-Haber Cycle – Polarizing power and Polarizability – Partial ionic character from electronegativity. Transition from ionic to covalent character and vice versa – Covalent character of ionic compounds – Fajan's rules – Covalent bond – structure and bonding of homo and heteronuclear molecules (HF, H₂O, NH₃, O₂ and N₂ only)– Hydrogen bonds in H₂O and NH₃ molecules- Vander Waals forces – ion dipole-dipole interaction- London forces.

Books for Study

1. ArunBahl and B.S. Bahl, A Text Book of Organic Chemistry, 22ndedn, S Chand & Company, 2016.
2. R. T. Morrison, R. N. Boyd and S.K.Bhattacharjee, Organic chemistry, 7thedn, Pearson Education Asia,2010
3. M.K. Jain and S. C. Sharma, Modern Organic Chemistry, Visal Publishing Co, 2015.
4. R. D. Madan, Modern Inorganic Chemistry, 3rdedn, S. Chand & Company Ltd., Reprint2014.

Books for Reference

1. I. L. Finar, Organic Chemistry Vol-1& 2, 6thedn, Pearson Education Asia,2004.
2. P.L. Soni, Text book of Ionrganic Chemistry, 20thedn, Sultan chand& Sons,2000.
3. B.R. Puri, L.R. Sharma, K.K. Kalia, Principles of Inorganic Chemistry, 23rdedn, New Delhi, ShobanLalNagin Chand & Co.,1993.

Web Resources

1. <https://nptel.ac.in/courses/104106119/>
2. <https://ocw.mit.edu/courses/chemistry/5-12-organic-chemistry-i-spring-2005/syllabus/>
3. <https://www.khanacademy.org/science/chemistry/chemical-bonds/types-chemical-bonds/v/ionic-bonds-and-coulombs-law?modal=1>

Pedagogy

1. Chalk-Talk class room activities
2. Group Discussion
3. Seminar
4. Quiz through ICT- Mode

Lesson Plan		Staff Name	Hours	Lecture Mode
Unit	Descriptions			
I	Classification of Organic compounds Based on the nature of carbon skeleton and functional groups	-	1	BB
	Classification of C and H atoms of organic compounds (primary/secondary/tertiary) -	-	3	BB/PPT
	IUPAC system of nomenclature of common organic compounds	-	1	BB
	Alkanes, alkenes, alkynes, (upto C-10) cycloalkanes, and aromatic compounds.	-	4	BB/PPT
II	Naming of Organic compounds Naming of organic compounds with one functional group	-	1	BB/PPT
	halogen compounds, alcohols, phenol, aldehydes, ketones- (Both aliphatic and aromatic)	-	2	BB
	carboxylic acids and its derivatives, cyano compounds, amines, nitro compounds-(Both aliphatic and aromatic)	-	2	BB
	Naming of compounds with two functional groups	-	2	BB
	naming of compounds with more than one carbon chain	-	1	BB
	Naming of heterocyclic compounds containing one and two hetero atoms present in five/six membered rings	-	1	BB
III	Basic concepts in Organic compounds Hybridization and geometry - bond angle, bond length, bond strength of C-H and C-C bonds	-	1	BB/PPT/Animated Videos
	Van der Waal's interactions, Inter & Intra molecular forces and their effects on physical properties -	-	2	BB/PPT/Animated Videos
	Electronic effects - inductive effect, resonance effect - drawing of resonance structures - conditions for resonance - stability of resonance structures,	-	3	BB/PPT/Animated Videos
	hyper conjugation, electromeric effect, steric effect - steric overcrowding - steric inhibition of resonance - steric relief (with examples).	-	3	BB/PPT/Animated Videos
IV	Bonding in Organic Molecules Dissociation of bonds - homolysis and heterolysis	-	1	BB/PPT/Animated Videos
	Radicals, carbocations, carbanions - electrophiles and nucleophiles	-	2	BB/PPT/Animated Videos
	Influence of electronic effects - dipole moment - relative strengths of acids and bases	-	3	BB/PPT/Animated Videos
	Stability of olefins - stability of radicals, carbocations and carbanions.	-	3	BB/PPT/Animated Videos
V	Chemical bonding-I Ionic bond – Properties of ionic compounds	-	1	BB/PPT/Animated Videos
	Factors favoring the ionic compounds- ionization potential – electron affinity – electronegativity – Lattice energy – Born-Haber Cycle	-	2	BB/PPT/Animated Videos
	Pauling and Mulliken's scales of electronegativity – Polarizing power and Polarizability – Partial ionic character from electronegativity.	-	2	BB/PPT/Animated Videos

Transition from ionic to covalent character and vice versa – Covalent character of ionic compounds – Fajan’s rules	-	1	BB/PPT/Animated Videos
Covalent bond – structure and bonding of homo and heteronuclear molecules	-	1	BB/PPT/Animated Videos
Hydrogen bonding – Its nature, types-effect on properties– Intermolecular forces–London forces and vander Waals forces – ion dipole-dipole interaction.	-	2	BB/PPT/Animated Videos
Total Hours		45	

BB-Block board/Chalk and Talk

PPT-Power point presentation

Course Learning Outcome: After successful completion of this course, the student will be able

	CLO statement	Knowledge level
CLO1	To explain organic compounds and its classification with various functional groups	K2
CLO2	To apply IUPAC nomenclature concept to name organic compounds	K3
CLO3	To Find the hybridization and geometry of organic compounds and predict the influence of Electronic effects on the stability of the organic molecules	K3
CLO4	To identify the geometry and stability of organic intermediates formed by homolytic and heterolytic cleavages	K4
CLO5	To apply knowledge about the common themes running through ionic covalent and hydrogen bonding	K3

PO and CLO Mapping:

	PO 1	PO 2	PO 3	PO 4	PO 5
CLO1	3	2			
CLO2	3	2			
CLO3	3	2			
CLO4	3	2			
CLO5	3	2			

PSO and CLO Mapping:

	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6	PSO 7
CLO1	3	2		3	2		
CLO2	3	2		3	2		
CLO3	3	2		3	2		
CLO4	3	2		3	2		
CLO5	3	2		3	2		

3-Advance application; 2-Intermediate level;1-Basic level