ARSD College, University of Delhi

Model Course Handout/Lesson Plan

Course Name : B.Sc. (IC) Chemistry						
Semester	**Course Code**	**Course Title**	**Lecture (L)**	**Tutorial (T)**	**Practical (P)**	**Credit (C)**
VI	CHEMISTRY DSE-2	**DSE-2 Organometallics, Bioinorganic Chemistry, Polynuclear Hydrocarbons and UV, IR Spectroscopy**	4	0	0	4
Teacher/Instructor(s)		Dr Snehlata and Dr Omprakash Yadav				
Session		2021-22				

Course Objective:

The purpose of the course is to introduce students to some important 3d metals and their compounds which they are likely to come across. Students learn about organometallic compounds and bioinorganic chemistry which are currently frontier areas of chemistry providing an interface between organic chemistry, inorganic Chemistry and biology.The functional group approach to organic chemistry introduced in the previous courses is reinforced through the study of the chemistry of carboxylic acids and their derivatives, Amines and diazonium salts, active methylene compounds. The students will also be introduced to the chemistry and applications of polynuclear hydrocarbons and heterocyclic compounds.The learners are introduced to spectroscopy, an important analytical tool which allows identification of organic compounds by correlating their spectra to structure.

Course Learning Outcomes:

- Understand the chemistry and applications of 3d elements including their oxidation states and important properties of the familiar compounds potassium dichromate, potassium permanganate and potassium ferrocyanide.

- Use IR data to explain the extent of back bonding in carbonyl complexes.

- Get a general idea of toxicity of metal ions through the study of Hg^{2+} and Cd^{2+} in the physiological system.

- Understand the fundamentals of functional group chemistry, polynuclear hydrocarbons and heterocyclic compounds through the study of methods of preparation, properties and chemical reactions with underlying mechanism.

- Gain insight into the basic fundamental principles of IR and UV-Vis spectroscopic techniques.

- Use basic theoretical principles underlying UV-visible and IR spectroscopy as a tool for functional group identification in organic molecules.

Lesson Plan:

Unit No.	Learning Objective	Lecture No.	Topics to be covered
4.		1	Structure elucidation of naphthalene

	Polynuclear and heteronuclear aromatic compounds	2,3	preparation and properties of naphthalene
		4,5	preparation and properties of anthracene
		6,7	Preparation and Properties of furan with reference to electrophilic and nucleophilic substitution
		8,9	Preparation and Properties of pyrrole with reference to electrophilic and nucleophilic substitution
		10,11	Preparation and Properties of thiophene with reference to electrophilic and nucleophilic substitution
		12,13	Preparation and Properties of pyridine with reference to electrophilic and nucleophilic substitution
5.	Active methylene compounds	14,15	Preparation: Claisen ester condensation, Reactions:
		16	Keto-enol tautomerism.
		17,18	Synthetic uses of ethylacetoacetate (preparation of non-heteromolecules having up to 6 carbons).
6.	UV-Visible and infrared spectroscopy and their application to simple organic molecules.	19, 20	Electromagnetic radiations and their properties; double bond equivalence and hydrogen deficiency. UV-Visible spectroscopy (electronic spectroscopy)
		21, 22	General electronic transitions, λ_{max} &ε_{max}, chromophores & auxochromes, bathochromic & hypsochromic shifts.
		23, 24	Application of Woodward rules for calculation of λ_{max} for the following systems: conjugated dienes - alicyclic, homoannular and heteroannular; α,β-unsaturated aldehydes and ketones, charge transfer complex.
		25, 26	Infrared (IR) Spectroscopy: Infrared radiation and types of molecular vibrations, significance of functional group & fingerprint region.
		27, 28	IR spectra of alkanes, alkenes, aromatic hydrocarbons (effect of conjugation and resonance on IR absorptions), simple alcohols (inter and intramolecular hydrogen bonding and IR absorptions).
		29, 30	IR spectra of phenol, carbonyl compounds, carboxylic acids and their derivatives (effect of substitution on >C=O stretching absorptions).

Evaluation Scheme:

No.	Component	Duration	Marks
1.	Internal Assessment		25
	• Quiz		
	• Class Test		
	• Attendance		

	• Assignment		
2.	End Semester Examination	3 hr	75

Details of the Course		
Unit	**Contents**	**Contact Hours**
IV	Structure elucidation of naphthalene, preparation and properties of naphthalene and anthracene. Preparation and Properties of the following compounds with reference to electrophilic and nucleophilic substitution: furan, pyrrole, thiophene, and pyridine.	13
V	Preparation: Claisen ester condensation, Keto-enol tautomerism. Reactions: Synthetic uses of ethylacetoacetate (preparation of non-heteromolecules having up to 6 carbons).	5
VI	Electromagnetic radiations and their properties; double bond equivalence and hydrogen deficiency. UV-Visible spectroscopy (electronic spectroscopy): General electronic transitions, λ_{max} & ε_{max}, chromophores & auxochromes, bathochromic & hypsochromic shifts. Application of Woodward rules for calculation of λ_{max} for the following systems: conjugated dienes - alicyclic, homoannular and heteroannular; α,β-unsaturated aldehydes and ketones, charge transfer complex. Infrared (IR) Spectroscopy: Infrared radiation and types of molecular vibrations, significance of functional group & fingerprint region. IR spectra of alkanes, alkenes, aromatic hydrocarbons (effect of conjugation and resonance on IR absorptions), simple alcohols (inter and intramolecular hydrogen bonding and IR absorptions), phenol, carbonyl compounds, carboxylic acids and their derivatives (effect of substitution on >C=O stretching absorptions).	**12**
	Total	**30**

Suggested Books:

Sl. No.	Name of Authors/Books/Publishers	Year of Publication/Reprint
1.	Finar, I. L. Organic Chemistry (Volume 1 & 2), Dorling Kindersley (India) Pvt. Ltd. (Pearson Education)	1997
2.	Morrison, R. N.; Boyd, R. N. Organic Chemistry, Dorling Kindersley (India) Pvt. Ltd. (Pearson Education).	1995
3.	Bahl, A; Bahl, B. S., Advanced Organic Chemistry, S. Chand.	2012

Mode of Evaluation:	Internal Assessment / End Semester Exam