

Course Code: MCH2102

OP JINDAL UNIVERSITY, RAIGARH

END SEMESTER EXAMINATION, JUNE-2023

M.Sc. 3rd Semester

Chemistry [03PG012]



Organic Chemistry- III

Time: 3 Hrs.

Note:

Max. Marks: 100

Answer any one question from each unit

All questions carry equal marks

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Unit-I (20 marks)

1	a.	Explain the radiative and non-radiative processes that occur during a photochemical reaction. Draw Jablonski diagram in support of your answer.	12	1	1
	b.	Photosensitization process, why it is required and how it is done?	8	1	2

OR

2	a.	Define Quantum Yield. Explain the experimental procedure for its determination. Why for some photochemical reactions the quantum yield is too low or too high?	12	1	2
	b.	Differentiate between Fluorescence and Phosphorescence.	8	1	1

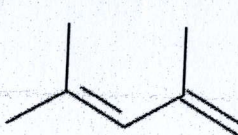
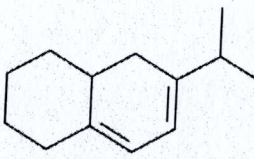
Unit-II (20 marks)

3	a.	What is Photo-stereo-mutation in Alkenes? Explain the mechanism.	10	2	3
	b.	Discuss the mechanism of any one of the following reactions: i. Di- π methane rearrangement ii. Barton reaction	10	2	3

OR


4	a.	What is Photo-stereo-mutation in Alkenes? Explain the mechanism.	10	2	2
	b.	What is a Photo-Fries Rearrangement reaction? Give example and write its mechanism.	10	2	3

Unit-III (20 marks)

5	a.	Define Beer-Lambert's law. Derive its mathematical equation. Discuss the limitations of the law.	10	3	2
	b.	Use Woodward-Fieser rule to calculate λ_{max} for the following compounds: i.  ii. 	10	3	3

OR					
6	a.	Discuss selection Rule for a molecule to be IR active. Discuss various modes of vibrations possible in an IR active molecule.	8	4	2
	b.	With the help of a neat diagram, explain the working of Fourier Transform Spectrometer. Discuss the advantages and applications.	12	4	2
Unit-IV (20 marks)					
7	a.	What is meant by the term chemical shift? What are the factors affecting the value of chemical shift?	10	5	2
	b.	Describe the principle behind nuclear magnetic resonance (NMR) spectroscopy. What information would you get from NMR spectrum of a compound?	10	5	2
OR					
8	a.	Differentiate between Enantiotopic and Diastereotopic Protons	6	5	2
	b.	Why splitting of NMR signals is observed? Explain the information collected from splitting pattern and the separation between them. Discuss the factors affecting it.	14	5	3
UNIT-V (20 marks)					
9	a.	State the principle of Mass Spectrometry. What are the various components of Mass Spectrometer? Briefly state the role of each component.	10	6	2
	b.	What is Mass Analyzer? Discuss Double focusing Mass Analyzer. State its benefits and limitations.	10	6	2
OR					
10	a.	Write a note on any one a. McLafferty rearrangement b. Stevenson's Rule	10	6	3
	b.	Explain Electron Impact Ionization method used in mass spectrometry. State important drawbacks of this method.	10	6	2

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Roll No:		Course Code: MCH 2103				
O P JINDAL UNIVERSITY						
MSc 3 rd Semester Backlog Examinations, June 2023				 <small>UNIVERSITY OF STEEL TECHNOLOGY AND MANAGEMENT</small>		
Physical Chemistry						
MSc Chemistry [03PG012]						
Time: 3 Hrs.		Max. Marks: 100				
Answer any one question from each unit						
All questions carry equal marks						
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Unit-I (20 marks)						
1	a.	Explain various law of radiation of heat transfer?	10	CO1	K2	
	b.	Derive an equation for Bohr's theory of hydrogen atom and hydrogen like atom.	10	CO1	K3	
OR						
2	a.	Define wave function and derive Schrodinger wave equation.	10	CO1	K1	
	b.	Explain origin of hydrogen spectrum	10	CO1	K2	
Unit-II						
3	a.	Give the reason for origin of quantum theory	10	CO2	K2	
	b.	Explain in short about the normalized and orthogonal wave functions	10	CO2	K2	
OR						
4	a.	What is commutator? How is the commutator related to whether two quantities can be observed simultaneously to arbitrary accuracy?	10	CO2	K1	
	b.	What does it mean that two wave functions are orthogonal to each other ? what about a set of wave functions is orthonormal?	10	CO2	K1	
Unit-III						
5	a.	Explain degeneracy of energy levels? Derive the expression for the energy of the particle in one dimensional box?	10	CO3	K2	
	b.	Derive an expression for energy of rigid rotor for diatomic model	10	CO3	K3	
OR						
6	a.	What do you mean by zero point energy? Derive an equation for linear harmonic oscillator?	10	CO3	K2	
	b.	Derive Schrodinger wave equation for particle in three dimensional cubical box	10	CO3	K3	
Unit-IV						
7	a.	Explain Schrodinger wave equations for hydrogen atom in terms of polar coordinates	10	CO4	K3	
	b.	Why it is not possible to derive electronic Schrödinger equation solved in terms of X, Y and Z (Cartesian coordinates)	10	CO4	K2	
OR						
8	a.	Is it possible to derive the Schrödinger equation for Rigid Rotator. If yes then	10	CO4	K2	

		derive it ?			
	b.	Discuss the probability densities for a harmonic oscillator	10	CO4	K2
UNIT-V					
9	a.	Write Schrödinger equation for complex system using perturbation theory	10	CO4	K2
	b.	Write Schrödinger equation for complex systems using the variation method	10	CO4	K2
OR					
10	a.	Explain the application of perturbation theory for studying complex chemical systems	10	CO4	K3
	b.	Explain approximate method for calculations of energy levels of difficult quantum system	10	CO4	K2