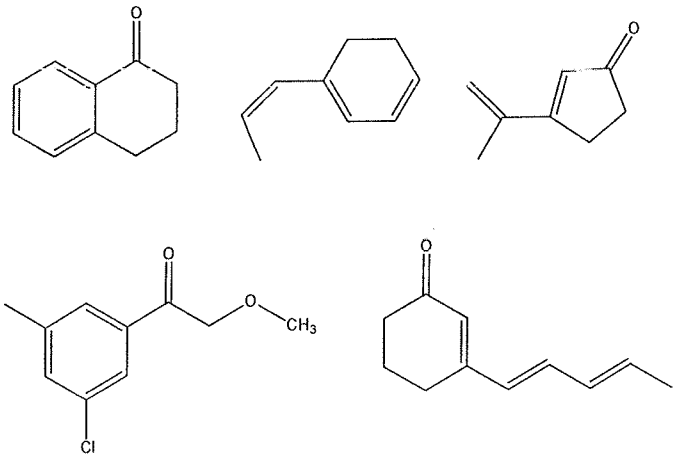
JAMIA HAMDARD
Department of Chemistry
School of Chemical and Life Sciences (SCLS)
B.Sc-M.Sc-Integrated program in Chemistry, V Semester
End-term Examination 2023

Paper Name: Spectroscopy and Polymers | **Paper Code: BCH-CC14T H**
Time: 3 hours | **Maximum Marks: 75**

Note: This paper has 3 sections A, B, and C, Attempt all the three sections
Section A: *Answer all the questions;* ***Section B****: Answer any 2 out of 4;* ***Section C:*** *Answer all the questions, each question has an internal choice*

Abbreviations Used
CLO- Course Learning Outcome, PLO- Program learning Outcome, BTL- Bloom Taxonomy Level: BT level 1-Remember; BT level 2-Understand; BT level 3-Apply; BT level 4-Analyse; BT level 5-Evaluate, BT level 6-Create

		BTL	CLO	PLO
	SECTION A			
Attempt ***all*** questions		(10 x 2 = 20) Marks		
A 1.	How does conjugation affect Carbonyl bond stretching frequency?	1/2	1-3	1-3
A 2.	Give the recycle codes for different plastics.	1/2	1-3	1-3
A 3.	Which polymer is used in making baby diapers?	1/2	1-3	1-3
A 4.	Give an example of a molecule that can exist as a liquid crystal.	1/2	1-3	1-3
A 5.	Are the anomeric carbons of the monosaccharide units in sucrose bonded or free?	1/2	1-3	1-3
A 6.	What are chromophores and auxochromes?	1/2	1-3	1-3
A 7.	Why can't humans digest cellulose?	3/4	4,5	3,4
A 8.	Calculate the index of hydrogen deficiency for $C_5H_{13}N$ and C_6H_5OCl ?	3/4	4,5	3,4
A 9.	Why is tetramethyl silane used as an NMR chemical shift reference?	3/4	4,5	3,4
A 10	Do homonuclear diatomic molecules show IR absorption?	3/4	4,5	3,4
	SECTION B			
Attempt ***any two*** out of four		(2 x 10 = 20) Marks		
B 1.	Predict the λmax of the following compounds	3/4	4,5	3,4



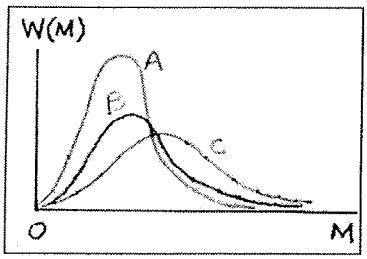
B 2.	What is a coupling constant? How can coupling constant help us to distinguish between cis and trans alkenes?	2/3	3-5	1-4
B 3.	What will you do to determine the ring size of glucose and fructose?	3/4	4,5	3,4
B 4.	Can GPC act as an absolute method for the determination of the molecular weight of a polymer? If so explain how?	5	5,6	4,5

SECTION C

Attempt ***all*** questions, each question has an ***Internal choice*** (7 x 5 =35) Marks

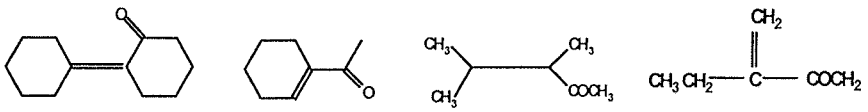
C 1.	A conjugated diene has a λ_{max} at 219 nm in hexane. What will happen to the λ_{max} if the solvent is changed to ethanol? What should we do to cause a bathochromic shift in the λ_{max}?	5/6	5,6	4,5
	OR			
	Compound with molecular formula C_7H_8O, shows in its IR spectrum absorptions at 3400cm^{-1} . 3200cm^{-1}, 3100cm^{-1}, 2900 cm^{-1}, 1450-1500 cm^{-1}. Predict the structure of the compound	5/6	5,6	4,5
C 2.	A compound has a molecular formula C_3H_6O, its ^{1}HNMR spectrum shows a 3-proton singlet at δ 3.6, and three doublets integrating for 1 proton each at δ 6.5, 4.2, and 4.0. Give the structure of the compound.	5/6	5,6	4,5
	OR			
	Alkenes absorb at ~δ 5-6 in NMR, while as alkynes absorb at ~δ 2-3. Can Anisotropy account for this?	5/6	5,6	4,5
C 3.	Which polymers can be processed into fibers using the wet spinning method? Give examples to explain	5/6	5,6	4,5
	OR			
	Gauge the advantages/ disadvantages of synthetic rubber over natural rubber	5/6	5,6	4,5
C 4.	How can you convert D-Glyceraldehyde into D Erythrose and D-Threose?	5/6	5,6	4,5
	OR			
	Show the reaction pathway of the formation of D-Arabinose from D-Glucose and D-Mannose	5/6	5,6	4,5
C 5.	The ε_{max} for aniline at λ_{max}, 280 nm is 1430. A sol. of aniline gives a percentage transmission in a 1.0 cm cell of 30. How many grams of aniline will be required to prepare 100 ml of solution?	5/6	5,6	4,5
	OR			
	Which initiators can be used to carry out anionic polymerization?	3/4	4,5	3,4
C 6.	Identify the functional groups and determine the nature of the compound with the molecular formula C_6H_6S. It is showing a sharp absorption peak at 3100cm^{-1}, a sharp absorption at 2550 cm^{-1} and peaks at 1450-1600 cm^{-1} in its IR spectrum	5/6	5,6	4,5
	OR			

	How can the oxidation of glucose be carried out to get Gluconic acid or Glucaric acid?	5/6	5,6	4,5
C 7.	Which among the three polymeric materials-A, B and C, shown in the figure, having the same number average molecular weight will have better mechanical properties and how can we improve the properties of A?	5/6	5,6	4,5



OR

	Measurement of UV spectra of the contents of the four bottles gave λ_{max} at 221, 249, 233 and 258nm. Assign the appropriate $\lambda_{max.}$ to the following structures	5/6	5,6	4,5



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