

B.Sc -M. Sc. INTEGRATED PROGRAM CHEMISTRY
SEMESTER V EXAMINATION -2019
PAPER TITLE: ORGANIC CHEMISTRY IV
SPECTROSCOPY AND POLYMERS
PAPER CODE: BCH-CC14TH

Time Allowed: 3hrs

Max. marks: 75

Q1. Answer briefly ANY TEN of the following

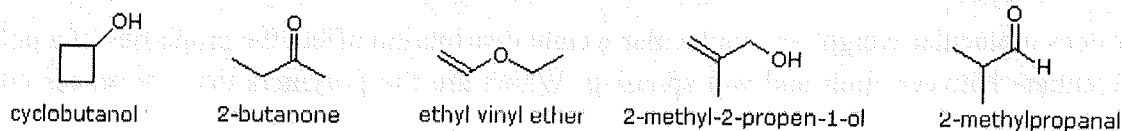
1.5 x 10 = 15

- A. Describe the working of photomultiplier tube.
- B. Discuss with suitable examples, the inductive, resonance and ring size effect in carbonyl stretching frequencies
- C. What are the various UV/Vis radiation sources used in spectrophotometers?
- D. Why is the oxygen-hydrogen absorption of CH_3OH such a broad band in the infrared?
- E. Justify different chemical shift values for ethylenic, acetylenic and aromatic protons in ^1H NMR spectroscopy.
- F. What is coupling constant? What does it indicate?
- G. Differentiate between LDPE, LLDPE and HDPE polyethylenes.
- H. Name two aromatic polyamides.
- I. How are natural and synthetic rubber alike and how do they differ?
- J. Class of carbohydrate which cannot be hydrolyzed further, is known as?
- K. What are the sugars which differ from each other by only around single carbon atom called?
- L. Which glycosidic linkage is found in maltose?
- M. Name the major storage form of carbohydrates in animals?
- N. If a generalized formula of carbohydrates is $\text{C}_n\text{H}_{2m}\text{O}_m$, n and m for sucrose is?
- O. What can TGA tell you about a polymer?

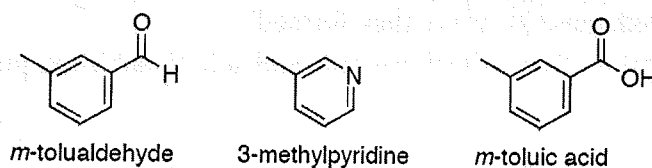
Q2. Attempt ANY THREE of the following

5 x 3 = 15

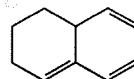
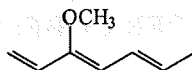
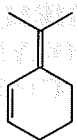
- A. Which of the following compounds has absorbance at the longest wavelength in the UV/Vis spectrum? Give reasons for your answer.
 (a) Ethylene vs 1,3-butadiene (b) glucose vs β -carotene
 (c) Acetone vs 2-butenone
- B. Discuss the principle of UV –VIS spectroscopy? Outline the factors that may cause deviations from Beer and Lambert's law.
- C. Explain how we can differentiate amongst following five $\text{C}_4\text{H}_8\text{O}$ isomers from their IR spectra.



- D. Give the important peaks associated with the IR spectra of the following compounds



E. Use Woodward-Fieser Rules to predict λ_{max} of the following:



Q3. Attempt ANY THREE of the following:

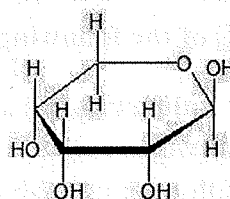
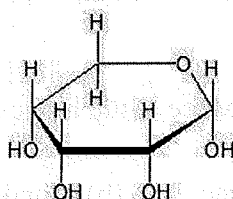
5 x 3 = 15

- A. Predict the splitting pattern expected for each kind of the proton in the ^1H NMR spectrum of the following:
- (a) $\text{CH}_3\text{CH}_2\text{CH}_2\text{Br}$ (b) $(\text{CH}_3)_3\text{COCH}_3$
 (c) Cyclobutanol (d) Trimethylamine
- B. Draw structures for compounds that meet these descriptions below:
- $\text{C}_2\text{H}_6\text{O}$; one singlet
 - $\text{C}_4\text{H}_8\text{O}_2$; one singlet, one triplet, and one quartet
- C. How many peaks would you get for the hydrogens in the molecule $\text{CH}_2\text{ClCH}_2\text{Br}$ and 3-hexanone, how would they be split?
- D. The ^1H NMR peak for the hydrogen in an O-H bond in an alcohol is very variable in position in the spectrum. If someone suspected that they had a peak due to an O-H hydrogen, how could they easily confirm that?
- E. A molecule with the molecular formula $\text{C}_4\text{H}_8\text{O}_2$ shows three peaks in the ratio of 3:2:3 at δ 3.674 (s), 2.324 (q) and 1.148 (t). Give the structure.

Q4. Attempt ANY THREE of the following:

5 x 3 = 15

- A. How many aldohexoses are possible? Write structures.
- B. Examine the given Haworth projections and circle each anomeric carbon, label the alpha and the beta anomer? Are these structures considered enantiomers or diastereomers?



- C. Compare amylopectin and cellulose.
- D. What is the product obtained on Ruff degradation of D-Glucose? Give mechanism.
- E. Give the structure of lactose? Is it a reducing sugar? Explain.

Q5. Attempt ANY THREE of the following

5 x 3 = 15

- A. How does molecular weight and molecular weight distribution affect the properties of a polymer?
- B. Differentiate between melt and wet spinning. Which are the polymers that are processed by these methods?
- C. Discuss how vulcanization of rubber molecules is carried out?
- D. What are Polyurethanes? How are they formed?
- E. Differentiate between free radical, cationic and anionic addition polymerisation of olefins.
