

22-3-2018



**DOON UNIVERSITY, DEHRADUN**  
**Mid Semester Examination, Sixth Semester, 2018**  
 Academic Year 2017-18 ( Even Semester)  
 School of Physical Sciences, Department of Chemistry  
 Programme Name: Integrated M.Sc. Chemistry, 6<sup>th</sup> Semester  
 Course Code with Title : CYC-352; Org. Chem. V: Carbohydrates, Dyes,  
 Polymers and Basics of Org. Spectroscopy.

Time Allowed 2.00 Hours

Maximum Marks: 30

Date: 22/03/2018

## SECTION : A

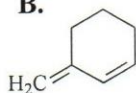
## (Very Short Answer Type Questions)

- [1] Which of the following molecules are conjugated. Show such molecules in your answer booklet and Also draw a circle at appropriate portion to show conjugation in the molecules. [1]

A.



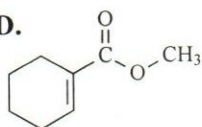
B.



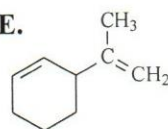
C.



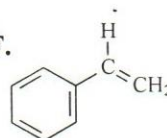
D.



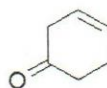
E.



F.



- [2] (a) Which of the following molecule is not conjugated? Draw the structures of such a molecule in your answer booklet. [1/2]



- (b) How many  $\pi$  (pi) bonding molecular orbitals are present in 1,3,5-hexatriene?

[1/2]

- [3] (a) Arrange the following alkenes in order of least stable to most stable. [1/2]



A



B



C

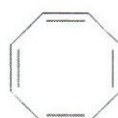
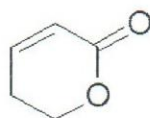
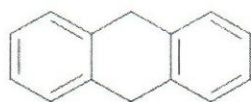
- (b) UV/Visible spectroscopy is based on \_\_\_\_\_ excitation. [1/2]

(i) electronic (ii) rotational (iii) nuclear (iv) vibrational

- [4] Which of the following statements is not true regarding ultraviolet/visible spectroscopy? Also describe brief justification in support of your answer. [1]

- As the extent of conjugation in a molecule increases,  $\lambda_{max}$  increases.
- As the extent of conjugation in a molecule increases, the HOMO-LUMO gap increases.
- The ultraviolet/visible region of the electromagnetic spectrum ranges from 200 – 800 nm.
- The amount of UV light absorbed by a compound can be expressed by its molar absorptivity,  $\epsilon$ .
- As the path length of the sample increases, its absorbance increases.

- [5] (a) Which of the following compounds is most likely to absorb in the visible region of the electromagnetic spectrum? Draw the structure of such a molecule in your answer booklet and also provide justification in support of your answer. [1/2]



- (b) Describe the type of electronic transition that occurs for conjugated molecules in ultraviolet/visible spectroscopy. [½]

- (6) Describe Beer Law and Beer Lambert Law in short with formula. [½ + ½]

SECTION : B

( Short Answer Type Questions )

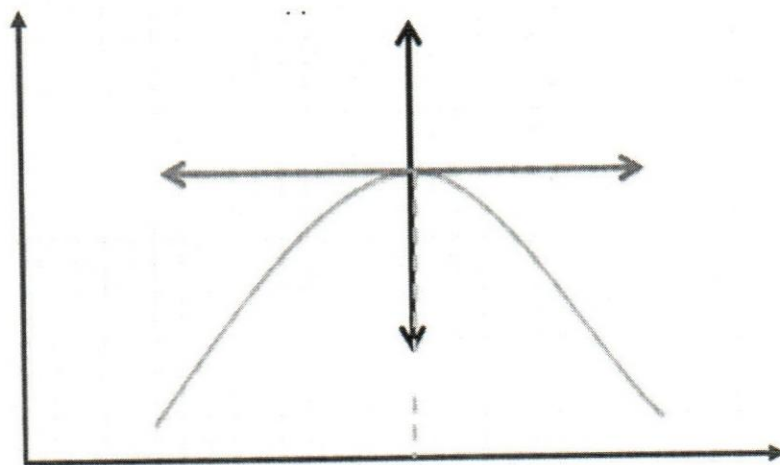
[7] Write notes in detail on following with examples and explanation. [3]

(a) Chromophore

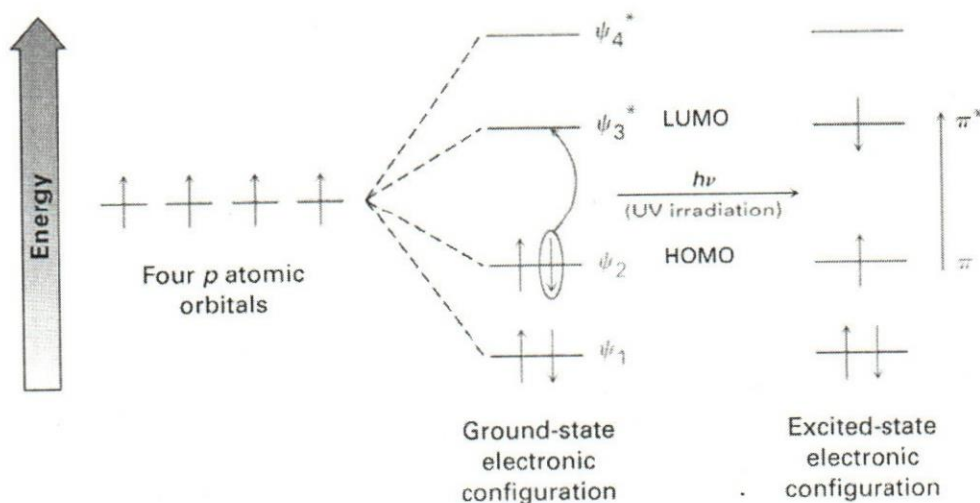
(b) Auxochrome

(c) Bathochromic Shift

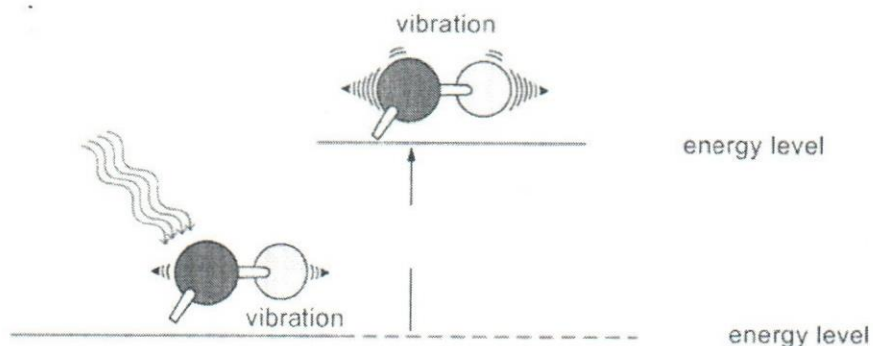
[8] Describe the following plot in context of: (i) Hypsochromic shift (ii) Hyperchromic effect and (iii) Hypochromic Effect. Provide appropriate explanation with suitable examples. Also write the value on X axis and Y axis. [3]



[9] (a) Comment on the following image in context of 1,3-butadiene. [1]

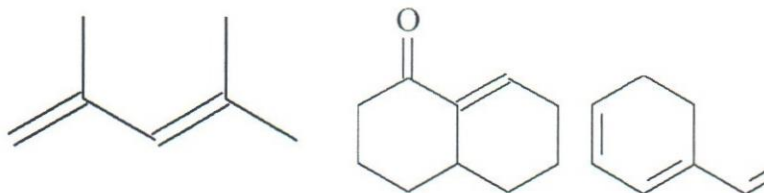


(b) Explain very clearly what is being revealed by the following image. [1]



(c) Explain how the frequency ( $\nu$ ) of a given stretching vibration of a covalent bond depends on: (i) strength of covalent bond and (ii) masses of the bonded atoms. [1]

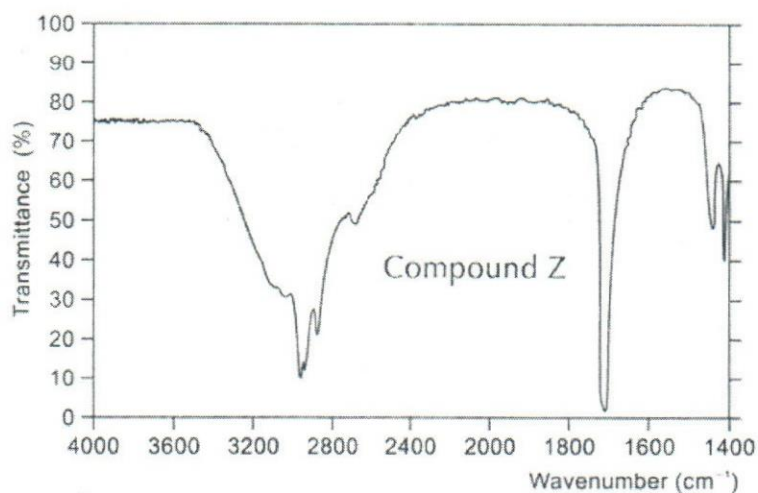
(10) Calculate expected  $\lambda_{\max}$  for following three different molecules: [3]



### SECTION : C

#### ( Long Answer Type Questions )

[11] (a) An organic compound Z with a relative molecular mass of 88.0 was found to contain 54.54% carbon, 36.36% oxygen and 9.10% hydrogen by mass. A portion of its infra-red spectrum is shown below:



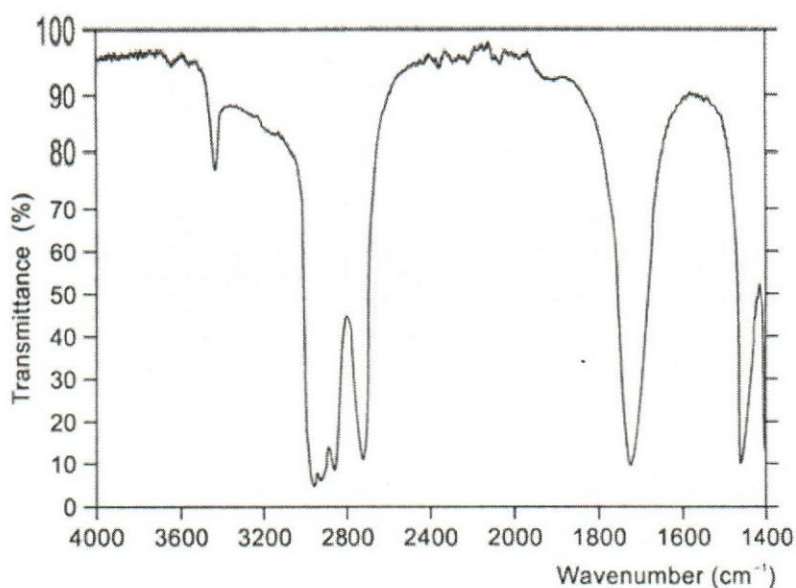
Determine the molecular formula of compound Z. Based on the result from (i), draw two possible structures of the compound, each of which must belong to a different



homologous series. Using the information from the IR spectrum, name the homologous series that compound Z belongs to. Explain your answer. [3]

(b) Write complete reaction mechanism of Free Radical Addition Polymerization of Ethene. [3]

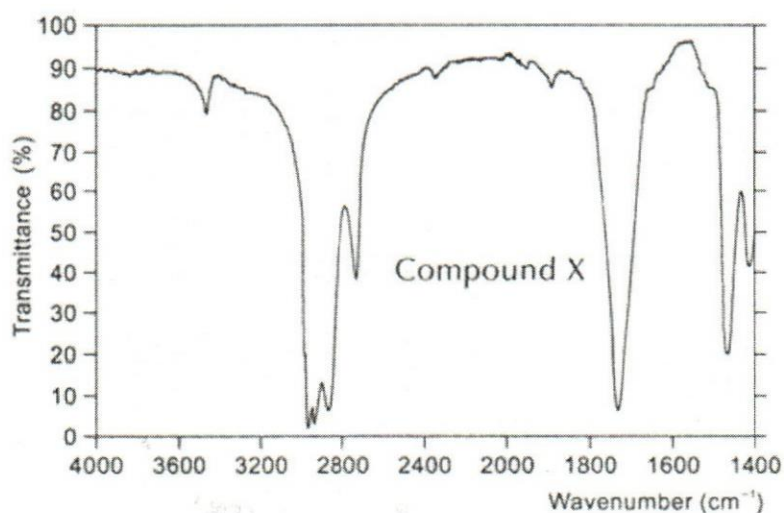
- [12] (a) An organic compound with a relative molecular mass of 72.0 was found to contain 66.66% carbon, 22.23% oxygen and 11.11% hydrogen by mass. A portion of its infra-red spectrum is shown below.

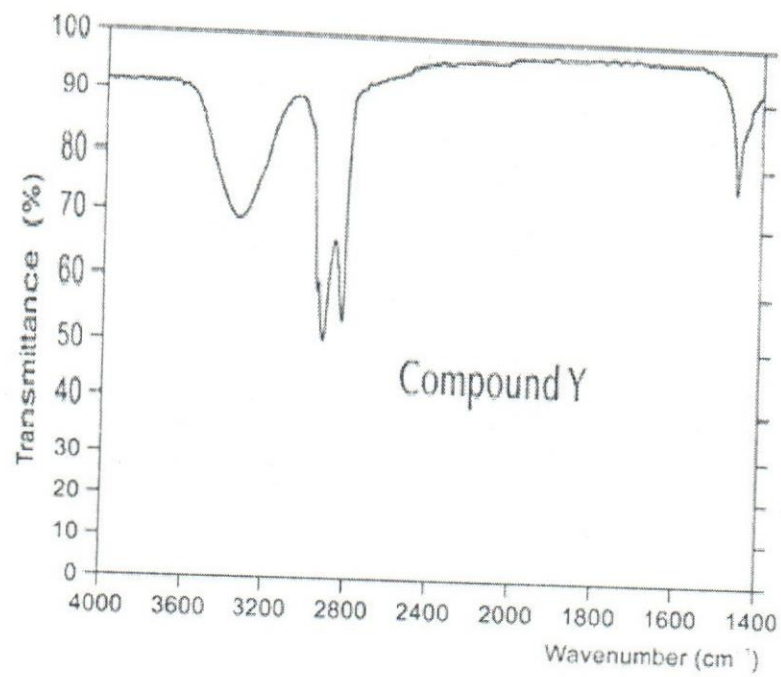


Determine the molecular formula of the compound.

Deduce two possible structures of the compound, each of which belongs to a different homologous series. [3]

(b) An organic compound X forms a silver mirror with ammoniacal silver nitrate solution. Another organic compound Y reacts with ethanoic acid to give a product with a fruity smell. The portions of infra-red spectra of X and Y are shown below. [3]





Sketch the infra-red spectrum of a carboxylic acid based on the IR spectra of X and Y. □

Ⓢ