Exam. Code : 107405
Subject Code : 2235

B.Sc. (Biotechnology) 5th Semester

PHYSICAL, ORGANIC AND INORGANIC ASPECTS OF SPECTROSCOPY—A

Paper : BT—7

Time Allowed—3 Hours]   [Maximum Marks—40

SECTION—A

Note :— All questions in this section are compulsory and each question is of **1** mark.

1. Calculate the frequency of radiations whose wavelength is 600 nm. Express this wavelength in wave numbers.

2. Determine the frequency of an electron moving at half the speed of light.

3. When absorption of radiation does occur ?

4. The wave number of absorption due to carbonyl group increases in acid halides, why ?

5. What is force-constant ?

6. How many fundamental vibrational frequencies can be observed in the infrared absorption spectrum of water ?

7. Why do carbon-carbon double bonds and carbonyl bonds absorb at different frequencies ?

8. Describe hyper-chromic effect with an example.

SECTION—B

Note :— Attempt any **five** questions from this section. Each question is of **4** marks.

9. State the factors that complicate infrared spectrum.

10. Explain selection rules in case of IR spectroscopy.

11. What is molar extinction coefficient ? How is it useful in the chemical analysis ?

12. What do you understand by the following terms, explain with an example :

    (a) Chromophore

    (b) Auxochrome.

13. The λ_{max} for methyl chloride is 173 nm while the same for methyl iodide is 259 nm, why ?

14. Mesityl oxide consists of two isomers (a) and (b) as shown below. One isomer exhibit a maximum at 235 nm with $\varepsilon = 12000$ while the other isomer does not show a high intensity absorption above 220 nm. Which of the two isomers absorb at 235 nm and why ?
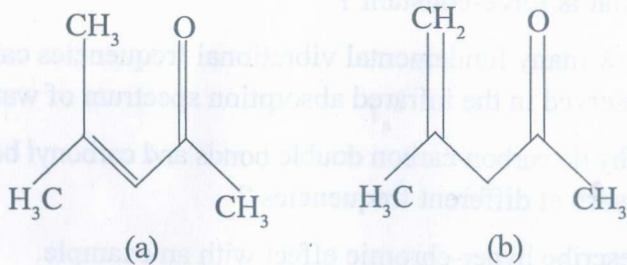
15. Using Woodward Fieser rules calculate the λ_{max} for the following :
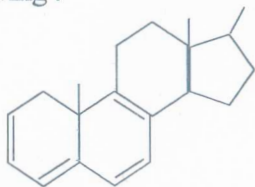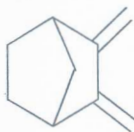
        (i)   (ii)

16. Describe the following :

    (a)   Bathochromic shift

    (b)   Hypsochromic shift.

SECTION—C

Note :— Attempt any **two** questions from this section. Each question is of **6** marks.

17. What is Born-Oppenheimer Approximation ? Describe its usefulness and limitations.

18. What is Beer Lambert's Law ? What are its applications and limitations ? Can this law be applied to a concentrated solution ?

19. Give selection rules for the absorption of radiations by electronic transitions. Also discuss different types of electronic transitions and types of molecules showing these transitions.

20. Explain the applications of UV spectroscopy. How can it be used to determine conjugation of double bonds in case of organic molecules ?