Roll No. | | | | | | | | | | | | Total No. of Pages : 03

Total No. of Questions : 20

M.Sc. (Chemistry) (2018 & Onwards) (Sem.–1)

SPECTROSCOPY - I

Subject Code : CHL404-18

M.Code : 75116

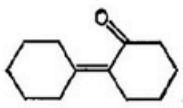
Time : 3 Hrs. Max. Marks : 70

INSTRUCTIONS TO CANDIDATES :

1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
2. **SECTION-B contains EIGHT questions carrying FIVE marks each and students have to attempt any SIX questions.**
3. **SECTION-C will comprise of TWO compulsory questions with INTERNAL CHOICE in both these questions. Each question carries TEN marks.**

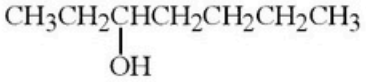
SECTION-A

1. What is the index of hydrogen deficiency in $C_{10}H_{14}N_2$? Explain.
2. Explain diamagnetic shielding of nucleus.
3. Discuss the problems with integration in ^{13}C NMR spectrum.
4. Discuss the peaks of dimethylsulfoxide-d6 (solvent) in ^{13}C NMR.
5. Which will occur at a higher frequency in IR: the C = O stretch of ketone or the C = O stretch of an amide? Explain.
6. What do you understand by IR inactive vibrations?
7. How hydrogen bonding affect the IR spectrum of compounds containing O-H groups?
8. UV absorption spectra of 2,2'-dimethyl derivative of biphenyl becomes almost similar to o-xylene. Explain.
9. What identifying characteristic would be present in the mass spectrum of an organic compound containing a bromine atom?
10. Calculate λ_{max} for the following :

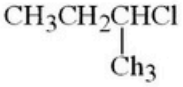


SECTION-B

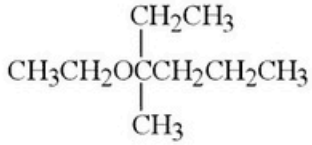
11. Show the principal fragments along with m/z values that would be observed in the mass spectra of the following :



12. Show the principal fragments along with m/z values that would be observed in the mass spectra of the following :

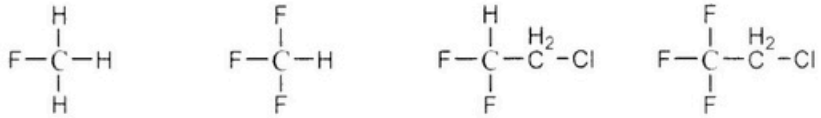


13. Show the principal fragments along with m/z values that would be observed in the mass spectra of the following :



14. Predict and explain the appearance of ^{1}H NMR spectrum of propyl bromide.

15. Predict the appearance of proton-decoupled ^{13}C NMR spectra for the following compounds.

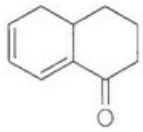


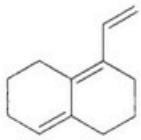
$J_{CF} > 180$ Hz (one bond)
$J_{CF} \cong 40$ Hz (two bond)

16. Describe effect of solvent in the UV-Vis spectroscopy in case of α,β-unsaturated carbonyl compounds.

17. The IR spectra of butyric acid and ethyl butyrate show sharp strong singlet absorption at 1725 cm^{-1} and 1740 cm^{-1}, respectively. By contrast, the IR spectrum of butyric anhydride shows a broad, sharp doublet at 1750 cm^{-1} and 1825 cm^{-1}. Why are these so different?

18. Calculate λ_{max} for the following in hexane (specify each assignment):

(i) 

(ii) 

SECTION-C

19. Discuss theory of electronic spectroscopy.

OR

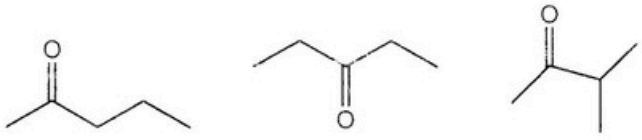
Discuss chemical ionization in mass spectroscopy. How it helps in determining the accurate molecular ion peak?

20. What is Nuclear Overhauser Effect. Discuss its origin.

OR

a) A compound of molecular formula C_4H_8O IR: 1730 cm^{-1}; ^{13}C NMR: 13.3, 15.7, 45.7, and 201.6 p.p.m. Suggest a structure for each compound, explaining how you make your deductions.

b) How would mass spectra help you to distinguish these structures?



NOTE : Disclosure of Identity by writing Mobile No. or Marking of passing request on any paper of Answer Sheet will lead to UMC against the Student.