Avinashilingam Institute for Home Science and Higher Education for Women
Coimbatore – 641 043

Master's Degree Examination – November 2017
III-Semester

Class : II PG
Major : Chemistry

Max. Marks: 60
Time: 3 hours

12MCHC13 Spectroscopy - II

Part A (10x1/2= 5)

Choose the correct answer

1. Acetylene does not show IR absorption in the region 2000 – 2500 cm^{-1} because
   a) C ≡ C stretching occurs at 1640 cm^{-1}
   b) No change in dipole moment when C ≡ C stretches
   c) Change in dipole moment when C ≡ C stretches
   d) C ≡ C stretches occur at lower energies

2. The order of C = O stretching in the IR spectra is
   a) Anhydride > amide > Ketone b) Ketone > amide > anhydride
   c) amide > anhydride > Ketone d) Anhydride > Ketone > amide

3. All IR active modes are Raman active in
   a) CO_2 b) Acetylene c) hydrogen d) SO_2

4. Which of the following does not give rotational Raman Spectrum
   a) H_2 b) HCl c) CO d) CH_4

5. The intensity of (M+2) peak with respect to molecular ion peak observed for 'S' atom in the mass spectrum is
   a) 1 b) 4 c) 23 d) 50

6. A compound has molecular weight 218. It is correct molecular formula is
   a) $C_{11}H_{14}N_4O$ b) $C_{14}H_9N_3$ c) $C_{15}H_9NO$ d) $C_{10}H_{11}NO_4$

7. In Moss – Bauer spectroscopy, Doppler shift is equal to
   a) υ b) λ c) $\left(\frac{\gamma}{c}\right)/\upsilon$ d) $\gamma \cdot v/c$

8. Which of the following shows quadrupole splitting in Moss – Bauer spectra?
   a) $Fe(CO)_5$ b) $FeSO_4 \cdot 5H_2O$ c) $[Fe(CN)_6]^{4-}$ d) $Fecl_2 \cdot 2H_2O$

9. Interferences are removed in AAS using
   a) $C_2O_4^{2-}$ b) PO_4^{2-} c) S^{2-} d) SO_4^{2-}

10. Which of the following is not a component of emission system in flame emission spectroscopy?
    a) burner b). atomiser c). fuel gases and regulators d). Chopper

Part B (5 x 4 = 20)

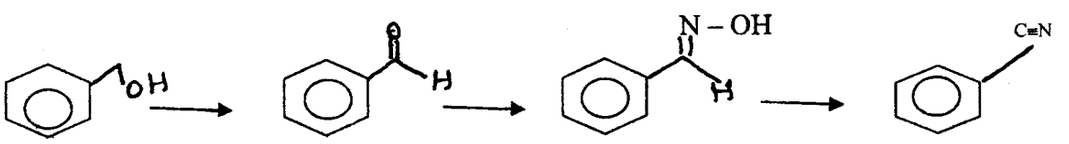
Answer ALL questions

Each answer should not exceed 200 words or one page

11. a) Write a note on the source and detector used in IR spectroscopy.

(or)

b) How will you monitor the following reaction sequence by IR spectroscopy?



12. a) A sample was exited by 4358A° line of mercury. A Raman line was observed at 4447A° Calculate the Raman shift in cm^{-1}. At what wavelength will antistokes lines appear?

(or)

b) Compare IR and Raman spectra.

13. a) Account for the following

(i) The mass spectrum of 4 – methyl – 1 – hexane shows intense peak at m/e = 57 and 41

(ii) The mass spectrum of 1 – hexanol gives a base peak at m/e = 56

(or)

b) An organic compound gives the highest peak at m/e = 73 and base peak at m/e = 58. It easily reacts with acid. What is its probable structure ?

14. a) Define isomer shift in Moss – bauer spectroscopy. Explain the factors affecting its magnitude.

(or)

b) What is meant by Doppler effect? Explain its significance in Mass – bauer spectroscopy.

15. a) Explain the principle of FES.

(or)

b) Discuss briefly the role of atomizer unit in AAS.

Part C (5 x 7 = 35)

Answer ALL questions

Each answer should not exceed 600 words or three pages

16. a) How will you distinguish the following by IR spectroscopy?

(i) Cyclohexanol and Cyclopentanol

(ii) Esters and lactones

(iii) primary, secondary and tertiary amines

(iv) mono and disubstituted benzenes

(or)

b) (i) Trace the origin of overtone, combination and Fermi resonance band in IR spectroscopy (4)

(ii) Explain the effect of H – bonding in IR spectra. (3)

17. a) Rule of mutual exclusion provides valuable information about the structure of the molecule – Justify.

(or)

b) Discuss the quantum theory of Raman effect.

18. a) (i) What is β - cleavage in mass spectra? Explain it with an example.

(ii) An Organic compound of M.F.$C_{10}H_{12}O$ answers iodoform test and burns with a sooty flame. The mass spectrum shows the following peaks, m/e = 15, 43, 57,91,105,148. Assign the structure and account for the peaks.

(or)

b) How will you distinguish the following by mass spectra?

(i) isomers of butanol (ii) 3 – Pentanone and 2 – Pentanone

19. a) How is Moss – Bauer spectra used to elucidate the structure of the following compounds?

(i) Nitroprusside ion (ii) $Fe_3 (Co)_{12}$

(or)

b) Explain the following in Moss – Bauer spectroscopy

(i) Quadrupole splitting (ii) Zeeman splitting

20. a) What is the significance of burners in AAS? Explain their types with neat diagram.

(or)

b) Explain with examples the various types of chemical interferences encountered in AAS.

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