MCHT 1.4

I Semester M.Sc. Degree Examination, May 2015
CHEMISTRY
Chemical Spectroscopy

Time : 3 Hours

Max. Marks : 80

Instructions : *Answer question No.* ***1*** *and* ***any four full*** *questions from the remaining.*

1. Answer **any eight** questions : **(8×2=16)**

   a) What is electromagnetic radiation ? How it should be produced ?

   b) How many peaks are obtained for benzene radical in ESR spectra ?

   c) Why microwave spectra are not observed in liquid and solid samples ?

   d) What are auxochromes ? Give three examples.

   e) Why n-σ^* transition is not observed in protonoted dimethylaniline ?

   f) What are parallel and perpendicular vibration ?

   g) What is fringer print region ? Give its significance.

   h) How many signals are expected for propane and isobutane in proton NMR ?

   i) Write two differences between equivalent and non-equivalent protons.

   j) Define base peak in mass spectrum.

2. a) Explain the consequences of interaction of molecules with different regions of electromagnetic radiations.

   b) Explain the spin-lattice and spin-spin relaxation mechanism in ESR spectroscopy.

   c) Describe the chemical shift and spin-spin coupling in NMR spectroscopy. **(5+5+6)**

3. a) Explain the classification of molecules based on the three principle moments of inertia.

   b) The rotational constant for $H^{35}Cl$ is observed at 10.5909 cm. Calculate the moment of inertia and bond length.

   c) Write a note on K-band, E-band and B-band. **(5+5+6)**

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4. a) Write a note on fundamental and overtone bands.
   b) What are Rayleigh, stokes and antistokes lines ?
   c) Discuss the vibration-rotation spectra of diatomic molecule. **(5+5+6)**

5. a) What are basic requirement of a nucleus to show NMR spectroscopy ? Give two examples each of NMR active and inactive nucleus.
   b) Identify the number of equivalent and nonequivalent protons present in (i) N-N, dimethylacetamide, (ii) Methyl-tertiary butyl ether, (iii) Trimethyl silane.
   c) Describe coupling constant. How it will helpful to identify cis and trans isomers ? **(5+5+6)**

6. a) What is g-factor ? Describe the width and position of spectral lines in ESR spectra.
   b) Explain briefly the factors determine the intensities of rotational lines for linear molecules.
   c) Write a note on Bathochromic and Hypsochromic shifts. **(5+5+6)**

7. a) Discuss the effect of ring strain, resonance and inductive effect on IR spectra.
   b) What are the complimentary features of IR and Raman spectra ?
   c) With example describe various factors affecting the magnitude of chemical shift. **(5+5+6)**