



HCG-1327

Seat No. \_\_\_\_\_

M. Sc. (Sem. II) Examination

April / May - 2015

Chemistry : CHN-504(A) (Spectroscopy)

Time : 2 Hours]

[Total Marks : 50

1 Answer any five :

20

- (a) Explain one dimensional Harmonic oscillator. Explain the potential energy curve. Discuss the probability of finding the oscillator at a certain location.
- (b) Write a note on zeropoint energy of a diatomic molecule and for a poly atomic molecule.
- (c) Give the principle and applications of microwave spectroscopy.
- (d) Describe quantum mechanical description of Raman effect. What is Tyndall scattering ?
- (e) Write an account on Resonance Raman spectroscopy.
- (f) Illustrate mutual exclusion principle. How many fundamental vibrational frequencies are there for  $\text{CO}_2$ ,  $\text{H}_2\text{O}$  and  $\text{NCS}^-$ .
- (g) Write a note on metal-ligand vibrations.

2 Answer any five :

20

- (a) Discuss the  $^1\text{H}$  NMR of 3 fluoropropanoic acid. What is  $^1\text{H}$ - $^{19}\text{F}$  coupling ?

- (b) Discuss the factors affecting vicinal spin-spin coupling in  $^1\text{H-NMR}$ .
- (c) Give an account on the chemistry part of Magnetic Resonance Imaging.
- (d) Discuss the role of multiplicity and peak area intensity in  $^{13}\text{C-NMR}$  spectra. What is broadband  $^{13}\text{C} - ^1\text{H}$  decoupling spectra ?
- (e) Give an account on  $^{19}\text{F}$  NMR.
- (f) Write a note on advantages of FT-NMR over continuous wave NMR spectrometer. Write the ranges of  $^1\text{H}$ ,  $^{13}\text{C}$  and  $^{31}\text{P}$  NMR spectra.
- (g) Explain shielding and deshielding of protons. What do you mean by magnetic anisotropy ?

3 Answer any five questions in brief :

10

- (a) Give any two examples of geminal coupling constants. Explain briefly what it is.
- (b) Discuss the difference of basic principles of IR and Raman spectra.
- (c) Explain gyromagnetic ratio.
- (d) What are symmetric top molecules ?
- (e) Define chemical shift.
- (f) Explain energy absorption and resonance in NMR.
- (g) What are overtones and hot bands ?
- (h) Why do anti stokes lines have lower intensity compared to stokes lines ?