Roll No.: .....

Total No. of Questions : 11] [Total No. of Printed Pages : 7

PK-412

M.Sc. II Semester Chemistry (Reg./ATKT) Examination June 2018

SPECTROSCOPY - II

Paper : MCH-409

Time Allowed : Three Hours] ***[Maximum Marks : 85***

Note : Attempt all questions.

Section - A

Objective Type Questions

10×1=10

Q.1. Choose the correct answer.

i) The aldehydic proton appears much downfield in the PMR because aldehydic proton is-

(a) strongly shielded

(b) it lies in the deshielding zone of the carbonyl group

(c) it occurs at 10 δ ppm

(d) all of the above

ii) When a carbon is bonded to two hydrogens and to two different groups, the two H_S are-

(a) Diastereotopic protons

(b) Enantiotopic protons

(c) Heterotopic protons

(d) All of the above

iii) If a nucleus is located in a site of tetrahedral or higher symmetry, the net field gradient is

(a) 0 (b) 1

(c) 2 (d) 3

iv) The electrons which contribute to EFG are-

(a) only p and d electrons in a valance shell

(b) closed shell electrons

(c) s electrons

(d) all of the above

v) H_2 and D_2 can be easily distinguished by neutron diffraction method because-

(a) H_2 has a negative scattering factor for neutrons

(b) D_2 has a positive scattering factor

(c) Both a and b

(d) H-atom can be located with high accuracy

vi) Anisotropic crystals show-

(a) double refraction

(b) diffraction

(c) reflection

(d) interference

vii) The removal of degeneracy of spin states by the internal magnetic field of paramagnetic electron is termed as-

(a) Fine splitting

(b) Zero-field splitting

(c) Both a and b

(d) Hyper fine splitting

viii) When η is large, the observed transitions are

(a) Forbidden $(\Delta m_I = \pm 2)$

(b) Strongly allowed $(\Delta m_I = \pm 1)$

(c) Both a and b

(d) None of these

ix) The total amount of energy per unit volume, μ obeys $\mu = \sigma T^4$. It is

(a) Plank's law (b) Jean's law

(c) Stefan's law (d) None of these

x) Photon of wavelength 400 nm corresponds to-

(a) 20,000 cm^{-1}

(b) 25,000 cm^{-1}

(c) 50,000 cm^{-1}

(d) 40,000 cm^{-1}

Section - B

Short Answer Type Questions

5×5=25

Q.2. What happens when a spinning nucleus is placed in a magnetic field? Explain in detail.

OR

What do you mean by chemically equivalent protons? Explain with examples.

Q.3. Explain electric field gradient and coupling constant.

OR

Write a short note on quadrupole moment.

Q.4. Explain the difference between ESR and NMR.

OR

The interaction of an unpaired electron with N^{14} causes a splitting of three lines while with Mn^{55} it gives six lines. Why?

Q.5. Explain Mosley's law.

OR

What is X-ray diffraction and Bragg's law?

Q.6. What is Wierl equation?

OR

Explain Low Energy Electron Diffraction (LEED).

Section - C

Long Answer Type Questions

5×10=50

Q.7. Write the structural formulae for the compounds with the following formulae that show only one signal in their PMR spectra.

a) C_5H_{12}

b) C_3H_6

c) C_2H_6O

d) C_3H_4

OR

Explain in detail the term 'chemical shift' and its measurements.

Q.8. Discuss the theory of NQR.

OR

What are the applications of NQR?

Q.9. Discuss different components of ESR spectrometer and its experimental techniques.

OR

Write in detail the types of hyperfine interactions.

Q.10. Deduce Bragg's equation and find the distance between successive lattice planes in crystal.

OR

Calculate the distance, d in rock salt, if its density is 2.18 g/cc and molecular weight 58.5.

Q.11. Explain in detail the factors causing Neutron diffraction and its measuring techniques.

(7)

OR

Explain in detail scattering techniques and scattering angles. Explain the elucidation of structure of simple gas phase molecules by Electron diffraction studies.

❖❖❖❖❖❖❖