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SB-3433

M. Sc. (Part - I) Examination

March / April – 2011

Inorganic Chemistry : Paper - IV

(Old Course)

Time : **3** Hours] [Total Marks : **54**

Instructions :

(1)

નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fillup strictly the details of ☛ signs on your answer book.

Name of the Examination :

☛ **M. Sc. (Part - 1)**

Name of the Subject :

☛ **Inorganic Chemistry : Paper - 4 (Old)**

☛ Subject Code No. : **3 4 3 3** ☛ Section No. (1, 2,.....) : **1&2**

Seat No. :

Student's Signature

(2) Answer to the two sections should be written in the separate answer books.

(3) Figures to the right indicate full marks of the questions.

SECTION - I

1 (a) Write a brief note on Born-Oppenheimer approximation. **9**

(b) Discuss the importance of stark effect.

(c) Which of the following molecules are micro active ? Give reason :
HCl, C_2H_2, CO, Cl_2, C_2H_6, N_2

OR

1 (a) Explain the phenomena of absorption and emission of electromagnetic radiation by the matter. **9**

(b) Explain the selection rule in rotational spectroscopy.

(c) State the salient features of the time dependent perturbation theory.

2 (a) Derive an energy expression for IR spectroscopy. Explain the selection rule for IR. Give its application. **9**

(b) Draw Morse potential energy diagram and explain its salient features.

(c) Discuss the various features of quantum theories of Raman effect.

OR

2 (a) Explain the meaning of 9
(i) Zero Point energy
(ii) Bond Strength and
(iii) Force constant with respect to IR spectroscopy.
(b) What are the P, Q, R branches in vibrational rotational spectrum ?
(c) State and explain the coheront Anti Stokes Raman spectroscopy.

3 (a) Discuss the spectrum of Lithium metal atom with vector representation. 9
(b) Discuss the electronic spectra of transition metal complexes having d^2 and d^8 configuration.
(c) Discuss the basic principle of Koopman's theorem.

OR

3 (a) What is the origin of Auger spectroscopy ? 9
(b) What are the basic differences between radiative and non-radiative decay ?
(c) Give basic principles of photo-electric effect.

SECTION - II

4 (a) Give the advantages of FTNMR. 9
(b) Describe the use of NMR technique in MRI investigation.
(c) Give the factors affecting the 'g' value in ESR spectroscopy.

OR

4 (a) Explain the phenomena of shielding the magnetic nuclei. 9
(b) State the basic principle of ESR spectroscopy.
(c) What are the various applications of NQRS technique ?

5 (a) State the variation theorem and give its applications. 9
(b) State Pauli's exclusion principle and its significance.
(c) Write a brief note on Ladder operator for electron spin.

OR

5 (a) Explain briefly the principle of time independent perturbation theory. 9
(b) Describe in brief the spin magnetic moment.
(c) Describe Hartree-Fock self consistent field method for many electron atoms system.

6 (a) Draw Walsh diagram for PCl_5 molecule. **9**

(b) State the Bent rule. How will you explain the structure of compound using Bent rule ?

(c) Give any three compounds with $d_\pi - p_\pi$ bonds.

OR

6 (a) Discuss the theory of hybridization. **9**

(b) Comment on energies of sp and sp^2 hybridization.

(c) Enlist various characteristics of VSEPR theory.
