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SB-3431

M. Sc. (Part - I) Examination

March / April - 2011

Inorganic Chemistry : Paper - I

(Old Course)

Time : Hours] [Total Marks : **52**

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 - 1 (OLD)

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

Seat No. :

Student's Signature

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

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

SECTION - I

1 (a) Discuss Mean value theorem. **9**

(b) What is a linear harmonic oscillator ? Show that total energy of the oscillator in one dimensional oscillation is, $E = \frac{1}{2} KA^2$.

(c) What are shift operators ? Show that ladder of eigen states of $\hat{L}_x$ cannot be expanded indefinitely.

OR

1 (a) State and explain selection rules for harmonic oscillator. **9**

(b) Derive the expression for kinetic energy of a rigid rotator.

(c) What are orthogonal wave function ? Prove : If two wave functions of a Hermitian operator have different eigen values, they are orthogonal.

2 (a) Construct character table for C_{3V} symmetry point group. **9**

(b) State orthogonality theorem. Explain the terms in it. Give its important consequences.

(c) Explain reducible and irreducible representations. Find out number of irreducible representation for PF_5 molecule.

OR

2 (a) What is matrices ? Find out inverse of following matrices : **9**

$$A=\begin{bmatrix}5 & 3\\ 3 & 2\end{bmatrix},\quad B=\begin{bmatrix}1 & 4 & 3\\ 2 & 1 & 0\\ 1 & 3 & 0\end{bmatrix},\quad C=\begin{bmatrix}4 & 5\\ 3 & 4\end{bmatrix}$$

(b) What is similarity transformation ? Find out number of irreducible representation for NH_3 molecule.

(c) Define :

(i) Character

(ii) reducible representation

(iii) Class

(iv) Point group.

3 (a) Explain (i) Labile (ii) Inert (iii) Stable and (iv) Less stable metal complexes with proper illustrations. **8**

(b) Justify, "There is no relationship between thermodynamic stability and lability of complexes."

(c) Show, how spectrometric method can be useful in determining rate of ligand substitution reaction.

OR

3 (a) What is acid hydrolysis ? Discuss any two factor's affecting acid hydrolysis . **8**

(b) Write a brief note on oxidation-reduction reactions in transition metal complexes.

(c) Give in short the potentiometric method to follow rate of a reaction giving suitable example.

SECTION - II

4 (a) What is diamagnetism ? Derive the following expression for diamagnetic susceptibility : **9**

$$x_{m(dia)} = -\frac{Ne^2}{6mc^2}\Sigma\bar{r}^2$$

(b) Discuss Gouy method to determine magnetic susceptibility of a substance.

(c) Define magnetism. Give the cause of magnetism.

OR

4 (a) Discuss Faraday method to determine magnetic susceptibility of a substance. **9**

(b) State and explain Curie-Weiss law. Write significance of Weiss constant in the equation.

(c) Define :

(i) Mass susceptibility

(ii) Diamagnetism

(iii) Magnetic induction.

5 (a) Justify, transition metal complexes with no ligand are considered as nitrosonium salts. **9**

(b) How is vibrational spectroscopy helped in determination of geometries of metal carbonyls ? Give your answer with suitable examples.

(c) What are π-acceptor ligands ? Discuss in detail the nature of bonding involved in metal carbonyls.

OR

5 (a) What are metal carbonyls ? Give classification of metal carbonyls. **9**

(b) Explain why $pd(CO)_4$ and $pt(CO)_4$ do not exist where as $Ni(CO)_4$ exists as a stable metal carbonyl.

(c) Write short note on miscellaneous nitrosyl compounds.

6 (a) Explain viscometry method for determination of molecular weight of an inorganic polymer. 8

(b) Explain crystallinity of polymers. Give its importance and requirements.

(c) What are polyphosphazenes ? Give structure and uses of some of them.

OR

6 (a) What is polymerisation ? Give the classification of inorganic polymers. 8

(b) Give in brief the techniques used to determine number average molecular weight of a polymer.

(c) Write short note on polysiloxanes.
