MCHT 1.1

I Semester M.Sc. in Chemistry Degree Examination, September 2016
INORGANIC CHEMISTRY – I

Time : 3 Hours   Max. Marks : 80

Instruction : *Answer **any eight** questions from Part – **I** and **any four full**
questions from Part – **II**.*

PART – I   **(2×8=16)**

i) Electron affinity of chalcogen is endorgic while that of halogen is exogric.
Substantiate.

ii) The radii of Sr^{3+} and F^- are 132 and 199 pm respectively; predict the most
probable crystal structure for SeF_2.

iii) Explain why the bond order of O_2^- is less than O_2, which inturn less than O_2^+ ?

iv) Hydration energy of Li^+ is larger than K^+. Give reason.

v) Point out the difference between BMO and ABMO.

vi) How are σ and π molecular orbitals formed ?

vii) NaCl does not favour Frenkel defect. Give reason.

viii) Acetic acid behaves as a base in anhydrous sulphuric acid. Why ?

ix) NH_4Cl is behaves as an acid and KNH_2 behaves as a base in liquid ammonia.
Justify.

x) Distinguish between n and p-type semiconductors.

PART – II

1. a) Draw the MO diagram of CO molecular and explain the nature of C-O bond
   and account for its bond order.

   b) Write briefly on the concept of resonance by taking carbonate and nitrate as
   examples.

   c) Explain the factor affecting the radii of ions. The inner ionic distance of
   NaCl is 276 pm. Calculate the ionic radii of Na^+ and Cl^-.   **(4+6+6=16)**

2. d) Illustrate Born-Haber cycle for the formation of a mole of MgO.

   e) Explain the salient features of VSEPR theory. Based on this predict the geometry of SiF_4 and XeF_5.

   f) Outline the preparation of diborane and explain its structure and bonding.

   (4+6+6=16)

3. g) Explain the intermolecular and intramolecular H-bonding. Discuss the methods of detecting them.

   h) What is radius ratio ? Explain its significance. Deduce the limiting ratio for octahedral coordination.

   i) Based on band theory explain how solids are classified ?　　**(4+6+6=16)**

4. j) Describe the Pearson's concepts of hard and soft acid and mention its application. Predict with reason whether the following gas phase reaction will of left or right ?

   $CuI_2 + 2CuF \leftrightarrow CuF_2 + CuI_2$

   k) What is the relation between dipole moment of a liquid and its solving power ?

   l) Acetic acid is a non-aqueous solvent, substantiate your answer. Explain the solvolysis properties of aqueous acetic acid and liquid sulphurdioxide.

   (4+6+6=16)

5. m) Give the Usanovich concept of acids and bases. Outline its salient features.

   n) Set up MO energy level diagram for oxygen and nitrogen molecules and comment on their stability and magnetic properties.

   o) Explain how ionization energy, electron affinity and electronegativity vary with in the table.　　**(4+6+6=16)**

6. p) Write briefly on non-stoichiometric defects in solids.

   q) Mention the postulates of Fajan's rule. Explain these rules help in predicting the partial covalency in ionic compounds.

   r) Explain the structure and indicate the space group of CeCl and TiO_2.
   (4+6+6=16)

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