I Semester M.Sc. Degree Examination, January 2015
(2010-11 Onwards (NS) Scheme)
CHEMISTRY
C-101 : Inorganic Chemistry – I

Time : 3 Hours　　　　　　　　　　　　　　　　　　　　　　Max. Marks : 80

Instruction : *Answer question* **1** *and* **any five** *of the remaining.*

1. Answer **any ten** of the following : 　　　　　　　　　　　**(2×10=20)**

   a) What are Slater's rules ? Using these rules calculate the effective nuclear charge experienced by
      i) 4s electron of potassium and
      ii) 3d electron of Nickel

   b) Using electron dot diagrams and formal charges, find the bond order for each bond in POF_3 and XeO_3.

   c) What is hybridization ? Using this concept explain the shape of BH_3.

   d) How are σ, π and δ orbitals formed ? Illustrate their formation with appropriate orbital sketches.

   e) 'Borazine is known as inorganic benzene'. Substantiate.

   f) What are zintl isoelectronic relationships in solids ? Explain giving examples.

   g) Depict the M.O diagram of XeF_2 and explain.

   h) Draw a plot of variation of viscosity of sulphur with temperature and explain this behaviour.

   i) Write the equation for self ionization of N_2O_4 and BrF_3. Justify the ionization with any one reaction for each.

   j) What are amphiboles ? Write their structure.

k) Calculate the binding energy per nucleon in ^{64}Zn nucleide, whose mass is 63.9493 amu.

(Given : mass of neutron = 1.0090 amu, mass of proton = 1.0081 amu and 1 amu = 931.45 MeV).

l) Write any two applications of borosilicate glasses.

2. a) What are the postulates of VSEPR theory ? Using this model, predict and explain the shapes of TeF_5^-, XeO_3F_2, TaF_8^{3-}.

b) What is the basis for the estimation of electronegativity of an atom by Allen and Allred-Rochow methods ? Discuss.

c) What is multicenter bonding ? Explain with an example. **(5+4+3=12)**

3. a) Derive Born-Lande equation for the Lattice energy of an ionic solid.

b) Draw the M.O diagram of CO and explain its salient features. Comment on its bonding ability to d-block metals.

c) What are Fajau's rules ? How are they useful in explaining the degree of covalent character in ionic solids ? **(4+4+4=12)**

4. a) How are trimeric and tetrameric cyclo-phosphazenes prepared ? Write the structure of trimer and explain the bonding.

b) How are oxyacids of phosphorous obtained ? Write the structure of ortho-, pyro-, meta- and hypo-phosphoric acids and comment on their properties.

c) Give the preparation of a tetraborane and discuss its structure.

(4+4+4=12)

5. a) Discuss the classification of silicates. Sketch and explain the structure of one silicate in each case.

b) Write a brief note on condensed phosphates.

c) Discuss the chemistry of any one zeolite with respect to its composition, structure and application. **(5+3+4=12)**

6. a) What are 'hard-soft acids and bases' ? Discuss the HSAB principle and its applications.

   b) Discuss the preparation, properties and applications of isopolytungstates.

   c) What are the evidences for shell model of the nucleus ? Based on this model, predict the nuclear spin and parity of ^{7}Li and ^{17}O. **(4+4+4=12)**

7. Write short notes on the following : **(3+3+3+3=12)**

    i) Metallocarboranes

    ii) Metallic bonding

    iii) Super acids

    iv) Vitreous silicates.

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