



I Semester M.Sc. Examination, January 2017
(NS) (2010-2011 Scheme)
CHEMISTRY
C – 101 : Inorganic Chemistry – I

Time : 3 Hours

Max. Marks : 80

Instruction: Answer Q. No. 1 and **any five** of the remaining.

1. Answer **any ten** of the following : (2×10=20)
- How does BrF_3 auto-ionize ? Identify a species each which functions as an acid and a base in BrF_3 .
 - On the basis of HSAB principle, predict whether Fe, Fe^{2+} or Fe^{3+} will react more strongly with CO.
 - Asbestos minerals are fibrous in nature. Give reason.
 - The radii of Mg^{2+} and S^{2-} are 0.66 and 1.84 Å respectively. Predict the most probable crystal structure for MgS.
 - Sketch the LCAO's obtained by the overlaps involving s and p orbitals.
 - Why does Mg show metallic behaviour even though it contains filled 2s band ?
 - Write the resonance structures of thiocyanate ion. Comment on their relative contributions.
 - The B-F bond length of BF_3 is 131 pm while that calculated from covalent radii of atoms is 152 pm. Account for this.
 - Predict the products of the following reactions :
 - $\text{B}_5\text{H}_{11} + \text{KH} \rightarrow \dots$
 - $\text{B}_5\text{H}_9 + \text{NMe}_3 \rightarrow \dots$
 - How are heteropoly acids classified ?
 - What is fission barrier ? What is its significance ?
 - Draw the structure of S_4N_4 molecule and comment on the S-S and S-N bond distances.

P.T.O.



2. a) Describe the wurtzite structure and identify coordination number of ions. Give examples of compounds having this structure.
- b) Calculate the lattice energy of MgO crystal using Born-Lande equation. Given : $n = 7$, $r = 210$ pm and Madelung constant = 1.748.
- c) What are leveling and differentiating solvents ? Explain with an example. **(4+4+4)**
3. a) Construct the M.O. energy level diagram for CO and NO. Explain the sequence of electron filling and comment on their magnetic behaviour.
- b) Illustrate the structural features of zeolites. How do they function a molecular sieves ?
- c) Write a note on polymorphism in carbon. **(4+4+4)**
4. a) How do 'closo' and 'nido' boranes differ from each other structurally ? Correlate their structures with framework electrons.
- b) What are the species formed when the pH of an aqueous solution of molybdate is varied ? Describe the structures of the species.
- c) Discuss the origin of instability in atomic nucleus. **(4+4+4)**
5. a) Write the synthesis and structures of the isomers of $C_2B_{10}H_{12}$. Discuss their reactivities towards strong bases and metal ions.
- b) How are $(NPCI_2)_3$ and $(NPCI_2)_4$ synthesized ? Describe the structure and bonding in the cyclic trimer.
- c) Predict the structures of $XeOF_2$ and $SOCl_2$. Will there be distortion from the regular structure ? If so, indicate. **(4+4+4)**
6. a) How is the existence of hydrogen bonds in molecules detected ? Explain with examples.
- b) What are the polyiodide ions known ? How are they obtained ? Comment on their structural features.
- c) Write a note on super acids. **(4+4+4)**
7. a) Give one example each for oxyacids of P containing (i) P-O-P bond and (ii) P-P bond. Write their structures. What are condensed phosphates ?
- b) Predict the shape of an H_2O molecule on the basis of a Walsh diagram for an XH_2 molecule.
- c) How are silicates classified ? Discuss the structural features of layered silicates. **(4+4+4)**
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