Chemi - II

Inorg. Chem

5/1/10

Q.P. Code : **12775**

(2½ Hours) [Total Marks : 75

N.B. : (1) All questions are compulsory.
(2) Figures to the right indicate full marks.
(3) Use of log table/non-programmable calculator is allowed.

1. Answer any **three** of the following :

(A) Give an account of the following with suitable examples. 5
  (i) Proper Rotation Axis
  (ii) Principal and Subsidiary axes.

(B) Explain - Centre of symmetry. Draw the structures for the following molecules and state whether they have centre of symmetry. Justify your answer. 5
  (i) Benzene (ii) SF_6 (iii) BCl_3

(C) Discuss the point groups assigned to diatomic linear molecules. 5

(D) Distinguish between symmetry element and symmetry operation. give examples. 5

(E) Draw a neat labelled MO diagram for BeH_2 molecule. Give its structure and magnetic property. 5

(F) Write the wave equations for the formation of molecular orbitals in H_2O molecule. (MO diagram not expected) 5

2. Answer any **three** of the following :

(A) Explain the structure of NaCl 5

(B) Name the types in which crystalline solids are classified on the basis of bonding. Explain any one of them. 5

(C) Write short note on 'octahedral voids'. 5

(D) Explain the terms : 5
  (a) Super conductivity transition temperature
  (b) Meissner effect

(E) Give a brief account of organic super conductor. 5

(F) Define atomic packing fraction. Show that void space in bcc unit cell is 32%. 5

3. Attempt any **three** of the following :

(A) Give an account of absorption spectra of Lanthanons. 5

(B) Write a note on 'commercial and nuclear applications' of lanthanons. 5

(C) Write the observed and expected electronic configurations of Lanthanons. 5

(D) Compare the magnetic properties of d-block elements and Lanthanons. 5

(E) (a) Explain why 'TBP' is selected as a suitable solvent for the separation of individual lanthanons. 5

(b) Explain the basicity of Lanthanon hydroxides.

(F) Give three physical properties and two chemical properties of Uranium. 5

4. Answer any **three** of the following :

(A) Define Hydration energy. Explain the equations used in the calculation of hydration energy for cations and anions. 5

(B) What are predominance diagrams ? Explain the predominance diagrams for (a) Weakly basic anions (b) Strongly basic anions. 5

(C) Write a note on 'polyatomic cations'. Explain how charge and radius affect the acidity of oxocations ? 5

(D) Explain (i) acidic (ii) basic (iii) amphiprotic solvents with suitable examples. 5

(E) Explain the properties of the solutions of alkali metals in liquid Ammonia solvent. 5

(F) Justify the following statements.

(a) Solvents with high dielectric constant are better solvents for ionic compounds. 3

(b) Dipole moment of acetic acid is zero. 2

5. Answer the following :

(A) Select and write the most appropriate answer. 4

(a) The angle of rotation for a C_2 axis is .....

(i) 60° (ii) 120° (iii) 180°

(b) The operation that leaves the molecule unchanged is called .....
(i) Centre of gravity (ii) Symmetry (iii) Identity

(c) According to symmetry rules label 'e' denotes ..... degenerate orbitals
(i) Doubly (ii) Triply (iii) non

(d) Structure of H_3^+ ion is .....
(i) linear (ii) tetrahedral (iii) planar triangular

OR

(A) State whether the following statements are **true** or **false**. 4

(p) Walsh diagrams show the change in energy of molecular orbitals with variation in bond length of the molecule.

(q) Though BeH_2 and H_2O have same number of peripheral atoms their structures are different.

(r) Trans dichloro ethylene has C_{2h} point-group.

(s) A plane which bisects the angle formed between two similar consecutive C_2 axes is called dihedral plane.

(B) Select and write the most appropriate answer. 4

(a) Radius of cation 70 pm while that of anion is 185 pm. Radius ratio is .....
(i) 0.520 (ii) 0.378 (iii) 2.64

(b) Platinum crystalises in fcc crystal. It's radius is 139pm. Edge length of unit cell will be .....
(i) 195 (ii) 605 (iii) 393

(c) Carbon atoms in fullerene are ..... hybridised.
(i) sp^2 (ii) sp^2 (iii) dsp^2

(d) The compound with coordination number 4 remains stable if its radius ratio value is between .....
(i) $0.155 \rightarrow 0,225$ (ii) $0.414 \rightarrow 0.732$
(iii) $0.732 \rightarrow 1.00$

OR

(B) State whether the following statements are **true** or **false**. 4

(p) Void space in unit cell is 26% It is primitive cell.

(q) Nearest neighbour distance in hcp unit cell is $a = 2r$

(r) Low temperature superconductors are those whose critical temperature is below 77K

(s) KCl is an example of ionic solid.