Reg. No. : ....

Name : ....

Second Semester M.Sc. Degree Examination, August 2015
Branch : Chemistry
CH/CL/CA/CM 221 : INORGANIC CHEMISTRY – II
(2013 Admission)

Time : 3 Hours   Max. Marks : 75

SECTION – A

Answer **any two** among **(a), (b)** and **(c)** from **each** question. **Each** sub-question carries **2 marks**.

1. a) How does S_4N_4 react with :

    i) $AlCl_3$ and

    ii) $SnCl_2$ in ethanol ?

  b) Give a method for the preparation of $(NPCl_2)_3$.

  c) Classify the following into Closo, Nido and Arachano : $C_2B_3H_7$, $C_2B_6H_{12}$ and $C_2B_3H_5$.

2. a) List the selection rules for electronic transition.

  b) What is nephelauxetic effect ? How is it represented ?

  c) What are Pascals constants ? Where are they used ?

3. a) Define crystal lattice, basis and crystal structure. How are they related ?

  b) Find the number of octahedral and tetrahedral voids around an atom in FCC.

  c) What is point defect ? Explain.

4. a) Eu^{2+} and Yb^{2+} are the most stable dipositive species among the lanthanide ions. Why ?

   b) Yttrium is concentrated along with lanthanides. Why ?

   c) Compared to lanthanide oxides, many actinide oxides are non-stoichiometric. Why ?

5. a) What are k space and Brillonin zones ?

   b) What are extrinsic semiconductors ? How are they further classified ?

   c) What is the principle of zone refining ? How is it used for the synthesis and purification of semiconducting materials.   **(10×2=20 Marks)**

SECTION – B

Answer either **(a)** or **(b)** of **each** question. **Each** question carries **5** marks.

6. a) How is $(SN)_x$ prepared ? Give its structure. Explain its conductivity at room temperature and at very low temperature.

   b) Discuss the synthesis, structure and bonding of boron nitride.

7. a) What are Orgel diagrams ? Draw the Orgel diagrams of d^2 and d^4 ions in octahedral and tetrahedral ligand fields.

   b) Explain the temperature dependence of magnetism. What is TIP ?

8. a) Briefly discuss the 7-crystal systems and associated lattices.

   b) Explain the uses of crystals as transmission and reflection gratings.

9. a) What is actinide contraction ? What are its consequences ? Compare it with lanthanide contraction.

   b) Give the composition of monazite. Explain the method of isolation of Th from it.

10. a) What is Hall effect ? Explain, how it is used to determine the mobility of carriers.

    b) Write briefly on solar batteries.   **(5×5=25 Marks)**

SECTION – C

Answer **any three** questions. **Each** question carries **10** marks.

11. Discuss the bonding in higher boranes and $B_n H_n^{-2}$ ions. Illustrate the importance of icosahedral framework of boron atoms in boron chemistry.

12. What is meant by spin-only value of magnetic moment ? How is it calculated using the number of unpaired electrons ? Taking the complexes of Ni (II) as examples, illustrate the use of magnetic studies for the structural elucidation of transition metal complexes.

13. a) Suggest a method to determine the enthalpy of formation of Frenkel defects in crystals.

    b) Describe 'edge dislocation' and 'screw dislocation'. How will you distinguish them ?

14. Give a comparative account of size, oxidation state, magnetic and spectral properties of lanthanides and d-block elements.

15. Discuss the salient features of classical free electron theory of solids. What are its drawbacks ? How are they rectified by the introduction of quantum mechanics ?

(3×10=30 Marks)