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Reg. No. : .....

Name : .....

Second Semester M.Sc. Degree Examination, August 2016
Branch : CHEMISTRY
CH/CL/CA/CM 221 : Inorganic Chemistry – II
(2013 Admission Onwards)

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) What are the structures exhibited by $P_4N_4X_8$?
   b) Describe the structures of P_4S_7 and P_4S_{10}.
   c) Complete the following reactions :
      i) $B_2H_6 + NH_3 \rightarrow$
      ii) $B_2H_6 + Me_3N \rightarrow$

2. a) The complex ion $[CoF_6]^{3-}$ is blue but $[Co(NH_3)_6]^{3+}$ is yellow in color. Explain.
   b) What do you mean by spin only value of magnetic moment ? Calculate the spin-only magnetic moment of a manganese (II) complex in a weak field.
   c) The ligand to metal charge transfer energy increases in the series $[CrI(NH_3)_5]^{2+}$, $[CrBr(NH_3)_5]^{2+}$, $[CrCl(NH_3)_5]^{2+}$. Explain.

3. a) Distinguish between point group and space group.
   b) Differentiate between Schottky and Frenkel defect.
   c) What do you mean by color centers in alkali halide crystals ?

4. a) Zirconium and Hafnium cannot be separated easily. Why ?
   b) Why lanthanide elements in general show magnetic moments calculated using the lowest J values of the Ln^{3+} ?
   c) Comment on the oxidation states of actinides.

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5. a) Explain the effect of temperature on the electrical conductance of :
   i) Metals and
   ii) Semiconductors. Give reasons.
   b) What is the principle of zone refining ?
   c) What is photoconductivity ? Explain with an example.

SECTION – B

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

6. a) How polythiazyl is synthesized ? Explain its structure. Why it is considered as a one dimentional conductor ?
   b) Explain the synthesis of $P_3N_3Cl_6$. Is it aromatic ? Compare Craig-Paddock and Dewar models of the bonding in phosphazenes.

7. a) What are Orgel diagrams ? Discuss the Orgel diagram for d^7 and d^9 configurations in tetrahedral and octahedral fields.
   b) Explain the following terms :
   i) Temperature independent magnetism
   ii) Spin cross over in metal complexes.

8. a) Explain the difference between spinel and inverse spinel structures.
   b) Discuss the structures of wurtzite, fluorite and nickel arsenide.

9. a) Describe the extraction of thorium.
   b) Discuss the spectral and magnetic properties of actinides. Compare this with that of lanthanides.

10. a) With a suitable energy level diagram, show how a p-n junction works as a rectifier.
   b) Discuss free electron theory of solids.

SECTION – C

Answer **any three** questions and **each** question carries **10** marks.

11. How borazine is synthesized ? Is it aromatic ? Compare the properties of borazine and benzene.

12. Discuss Gouy method for the determination of magnetic moments of metal complexes.

13. Discuss the principle and procedure of powder X-ray diffraction studies. What are the merits and demerits of this method ?

14. Describe the various components present in monazite, ilmenite, zircon and siliminite present in the beach sands of Kerala.

15. On the basis of band theory, explain the classification of solids into insulators, conductors and semiconductors.
