(Pages : 3) **E – 5120**

Reg. No. : .....

Name : .....

Second Semester M.Sc. Degree Examination, October 2018
Branch : Chemistry
CH/CL/CA/CM 221 : INORGANIC CHEMISTRY – II
(2016 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) Describe the structures of P_4S_7 and P_4S_{10}.
   b) Drive the possible 'styx' numbers for B_4H_{10}.
   c) On the basis of Wade's rule, predict the structure of $C_2B_9H_{13}$.

2. a) Ti^{3+} and Cu^{2+} have same terms and same number of bands but have different magnetic moments.
   b) Explain the increase and decrease in Δ_0 values for $[Fe(H_2O)_6]^{2+} = 10400\ cm^{-1}$; $[Fe(H_2O)_6]^{3+} = 13700\ cm^{-1}$; and $[Co(H_2O)_6]^{2+} = 9300\ cm^{-1}$; $[Co(H_2O)_6]^{3+} = 18200\ cm^{-1}$.
   c) The magnetic moment of $[Mn(CN)_6]^{3-}$ is 2.8 B.M. while the magnetic moment of $[MnBr_4]^{2-}$ is 5.9 B.M. What are the geometries of the complex ions ?

3. a) Why X-rays are used as diffraction gratings for crystal structure determination ?
   b) Calculate the Miller indices of a crystal plane which cut through the crystal axes at (2a, 3b, 2c).
   c) What is the difference between spinel and inverse spinel structures ?

4. a) Zr and Hf cannot be separated easily. Why ?

   b) Comment on the various oxidation states exhibited by lanthanides.

   c) How f orbitals split in a cubic crystal field ?

5. a) What do you mean by Brillouin zone ?

   b) Explain the effect of temperature on the electrical conductance of (i) metals and (ii) semiconductors. Give reasons.

   c) What are pyroelectrics ? Mention their applications. **(2×10=20 Marks)**

SECTION – B

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

6. a) How stock synthesized borazine ? Describe the synthesis of N-and B-substituted borazines. How borazine reacts with bromine ?

   b) How polythiazyl is synthesized ? Explain its structure. Why it is considered as a one dimensional conductor ?

7. a) How do Tanabe – Sugano diagrams differ from Orgel diagrams ? Draw Tanabe – Sugano diagaram for $[V(H_2O)_6]^{3+}$ and explain the electronic transitions.

   b) Discuss Gouy method for determination of magnetic moment of complexes.

8. a) Discuss with examples point, line and plane defects found in crystals.

   b) Discuss the salient features of covalent, metallic and hydrogen bonded crystals.

9. a) Why the separation of lanthanides is difficult ? Outline the different methods of separation of lanthanides.

   b) Discuss the oxidations states, spectral and magnetic properties of actinides.

10. a) Discuss free electron theory of solids.

    b) Discuss various methods of synthesis and purification of semiconducting materials. **(5×5=25 Marks)**

SECTION – C

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

11. What are carboranes ? How carboranes can be converted to metallacarboranes ? Describe the synthesis of metallacarboranes.

12. Explain the applications of magnetic susceptibility measurements for the study of structures of metal complexes.

13. Describe the structures of zinc blende, rutile, nickel arsenide and perosvskite.

14. Write an account of trans-uranium elements and their stabilities.

15. Discuss the band theory of solids and its application in the classification of materials into conductors, semiconductors and insulators ? **(10×3=30 Marks)**