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Reg. No. :

Name :

Second Semester M.Sc. Degree Examination, September 2014

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) Starting from S_4N_4 , how will you prepare S_2N_2 and $(SN)_x$?
(b) What is 'inorganic graphite' ? How does it differ from graphite ?
(c) How will you prepare P_4S_7 ? Give its structure.
2. (a) What are term symbols ? Derive the term symbols for Mn(II) and Fe(II).
(b) What is vibronic coupling ? Explain.
(c) Name two calibrants used in Gony method.
3. (a) List the important criteria based on which amorphous and crystalline solids can be distinguished.
(b) Explain the binding forces in molecular and metallic crystals. Give examples.
(c) What are colour centres ? How are they formed ?
4. (a) Lanthanide ions form strong bonds with ligands containing most electronegative donor atoms. Why ?
(b) Explain the basic differences between 4f and 5f orbitals.
(c) Actinides form much more stable complexes than lanthanides. Why ?
5. (a) How does classical free electron theory explain the electrical conductivity of metals ?
(b) What is doping ? Explain with an example.
(c) Illustrate the use of semiconductors as photovoltaic cells.

(10×2 = 20 Marks)



SECTION – B

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

6. (a) Give a brief account of linear phosphazines with special reference to their preparation and uses.
(b) How is diborane prepared? Give its structure and bonding.
7. (a) What are Racah parameters? Calculate the Racah parameters for an octahedral Co(II) complex with $\gamma_1 = 7,150 \text{ cm}^{-1}$, $\gamma_2 = 15,200 \text{ cm}^{-1}$ and $\gamma_3 = 19,300 \text{ cm}^{-1}$.
(b) What is meant by spin-only value of magnetic moment? Calculate the spin-only value of magnetic moment for $[\text{V}(\text{H}_2\text{O})_6]^{3+}$ ion. Is there any orbital contribution for this ion? Why?
8. (a) Using suitable examples, explain the close packed structures BCC and FCC.
(b) What are spinels and inverse spinels? Using suitable examples, explain their structures, special properties and uses.
9. (a) What is lanthanide contraction? Explain its cause and consequences.
(b) Write a short account of beach sands of Kerala with special reference to their occurrence, compositions and uses.
10. (a) How are semiconductors classified into n-type and p-type? Explain their special properties and uses.
(b) What is photoconductivity? Explain with examples. What are the importance of such materials?
(5×5 = 25 Marks)

SECTION – C

Answer any three questions. Each question carries 10 Marks.

11. Using specific examples, discuss the synthesis, structure and bonding of metalboranes and metallocarboranes.
12. What are charge-transfer transitions? Describe their types and characteristics. How do they differ from d-d transitions? Why?
13. Discuss the principle and procedure of rotating crystal method used for crystal structure studies. Mention its merits and demerits over the other methods.
14. Write notes on :
 - (i) Magnetic properties of lanthanides and actinides.
 - (ii) Principle and procedure of separation of actinides by solvent extraction method.
15. Discuss briefly the salient features of band theory of solids. How was it refined? What are its merits over free electron theory?
(3×10 = 30 Marks)