Reg. No. : ....

Name : ....

Second Semester M.Sc. Degree Examination, May 2020

Branch : Chemistry/Polymer Chemistry

CH/CL/CM/CA/PC 221 : INORGANIC CHEMISTRY – II

(Common for Chemistry (2016 Admission Onwards) and Polymer Chemistry (2018 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) Starting from S_4N_4, how will you prepare S_2N_2 and $(SN)_x$?

   (b) Discuss one method of preparation of $(NPCl)_3$.

   (c) How will you convert diborane to BCl_3 and B_2H_5Cl? Explain the conditions of the reactions.

2. (a) What are the selection rules of electronic transitions? Why do *d-d* transitions produce pale colour?

   (b) What are Pascal's constants? Explain their uses.

   (c) Differentiate ferromagnetism and anti-ferromagnetism in complexes.

3. (a) 5-fold axis of symmetry is non-existent in crystal systems. Why?

   (b) State Bragg's equation and explain the terms.

   (c) What is meant by stacking faults? Explain.

4. (a) How do '*f*' orbitals split in a cubic ligand field? Label the orbitals.

   (b) Give one application each of lanthanide and actinide compounds. Name the compounds.

   (c) What is zircon? Give its composition and use.

5. (a) How do changes in temperature affect the conductivity of metals and semiconductors?

   (b) What is superconductivity? Explain with an example.

   (c) Using examples, differentiate piezoelectric and inverse-piezoelectric effects.

(10 × 2 = 20 Marks)

SECTION B

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

6. (a) Give a brief account of linear phosphazines with special reference to their preparation, structures and uses.

   (b) What are '*Styx*' numbers? How do you explain the structure of B_4O_{10} on their basis?

7. (a) Write briefly on Tanabe-Sugano diagrams their construction and uses.

   (b) Explain the dependence of magnetic moments of complexes on temperature. What is TIP? Explain with examples.

8. (a) Using specific examples, illustrate the structures, bonding and properties of metallic and hydrogen bonded crystals.

   (b) What is meant by dislocations in crystals? Describe 'edge dislocation' and 'screw dislocation'.

9. (a) Account for the differences in the absorption spectra of lanthanides and actinides.

   (b) Discuss the important steps involved in the extraction of uranium.

10. (a) What are n-type and p-type semiconductors? Discuss their special properties and uses.

    (b) Explain the phenomena of photoelectric and photovoltaic effects. Enumerate the uses of such materials.

(5 × 5 = 25 Marks)

SECTION C

Answer any **three** questions, and each question carriers **10** marks.

11. Using specific examples, discuss the synthesis, structure and bonding of carboranes and metallocarboranes.

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

13. Write briefly on :

    (a) Reciprocal lattice concept.

    (b) Method of determination of enthalpy of formation of Frenkel defects in crystals.

14. What are the problems associated with the separation of lanthanides? Discuss the principle and procedure of separation of lanthanides by ion-exchange method.

15. What are the salient features of free electron theory? Discuss the draw backs of this theory. How are they rectified using quantum mechanics?

(3 × 10 = 30 Marks)

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