

**B.Sc. DEGREE END SEMESTER EXAMINATION - MARCH 2025****SEMESTER 6 : CHEMISTRY****COURSE : 19U6CRCHE09 ; INORGANIC CHEMISTRY***(For Regular 2022 Admission and Supplementary 2021/2020/2019 Admissions)*

Time : Three Hours

Max. Marks: 60

**PART A****Answer All (1 mark each)**

1. How many unpaired electrons are there in the complex  $[\text{Ru}(\text{H}_2\text{O})_6]^{2+}$ .
2. How many  $\text{Cs}^+$  and  $\text{Cl}^-$  ions are there in each  $\text{CsCl}$  unit cell?
3. Which of the following ions is colorless, a)  $\text{Lu}^{3+}$  or b)  $\text{Eu}^{3+}$
4. What are pseudohalogens?
5. What is Caro's acid?
6. Give an example of closocarboranes.
7. Name the coordination compound  $[\text{Cr}(\text{H}_2\text{O})_5(\text{SCN})]\text{Cl}_2$  according to IUPAC system of nomenclature.
8. What are called Berthollide compound?

**(1 x 8 = 8)****PART B****Answer any 6 (2 marks each)**

9. Give the structure of peroxy acids of sulfur?
10. Why are Cr, Mo and W hard metals while Zn, Cd and Hg are not very hard metals?
11. Explain why crystal defects are sometimes called thermodynamic defects.
12. Comment on the optical activity of  $[\text{Cr}(\text{ox})_3]^{3+}$  and  $\text{cis-}[\text{CoCl}_2(\text{en})_2]^+$
13. Calculate the number of Zinc ions and sulphide ions in a unit cell of  $\text{ZnS}$ .
14. In  $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ , the axial Cu-O bonds are longer than equatorial Cu-O bonds, Why?
15. Arrange the following oxo acids in the increasing order of their acid strengths;  $\text{HClO}_4$ ,  $\text{HClO}_3$ ,  $\text{HClO}_2$ ,  $\text{HClO}$ .
16. Differentiate between high spin and low spin complexes with examples.

**(2 x 6 = 12)****PART C****Answer any 4 (5 marks each)**

17. Explain in detail about stoichiometric defects in crystals.
18. Discuss in detail about the separation of lanthanides by ion exchange method.
19. Explain why non-stoichiometric  $\text{NaCl}$  is yellow and non-stoichiometric  $\text{ZnO}$  is yellow.
20. Explain the different kinds of structural isomerism exhibited by coordination complexes.
21.  $[\text{Co}(\text{NH}_3)_6]^{3+}$  is diamagnetic complex and  $[\text{CoF}_6]^{3-}$  is a paramagnetic complex. Substantiate the above statement using Valence bond theory. Classify the above-mentioned complexes into inner orbital and outer orbital complexes.
22. Why transition elements show a tendency to form a large number of complexes?

**(5 x 4 = 20)**

**PART D**

**Answer any 2 (10 marks each)**

23. Briefly explain a) super acids b) crown ethers c) interhalogen compound d) oxy acids of halogen.
24. How would you define a transition element? List the properties associated with transition elements.
25. What are the salient features of Valence bond theory for bonding in complexes? Explain the structure and magnetic properties of (i)  $[\text{Ni}(\text{CN})_4]^{2-}$  and (ii)  $[\text{Cr}(\text{NH}_3)_6]^{3+}$  using valence bond theory.
26. Explain the salient aspects of molecular orbital theory. Describe the MO diagram of  $[\text{CoF}_6]^{3-}$  and predicts its magnetic behavior.

**(10 x 2 = 20)**