Date:

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BENGALURU-27

B.Sc. INORGANIC CHEMISTRY-VI SEMESTER

SEMESTER EXAMINATION: APRIL 2022

(Examination conducted in July 2022)

CH 6115 – INORGANIC CHEMISTRY

Time- 2 ½ hrs **Max Marks-70**

This question paper contains **three** printed pages and **three** parts

(Periodic table is provided at the end of question paper)

PART A

Answer any **six** from the following questions. **(2 X 6 = 12)**

1. In the complex $[M(CO)_4]$, what is the oxidation state and coordination number of the element 'M'?
2. What do you mean by ambidentate ligand? Give one example.
3. What type of isomerism is shown by the complex $[Pt(NH_3)_4][PtCl_4]$?
4. Name the metal present in the structure of hemoglobin.
5. Which is the most common oxidation state of actinides?
6. Why is Zn^{2+} colourless?
7. Write the general electronic configuration of f-block elements.
8. Name the ore from which uranium is extracted.

PART B

Answer any **eight** from the following questions. **(6 x 8 = 48)**

9. (a) What do you mean by lanthanide contraction? Mention any one of its consequences.
   (b) Write the IUPAC nomenclature for the following coordination complexes. **(3+3)**
   i) $[CoCl_3(NH_3)_3]$ ii) $[Co(en)_3]Cl_3$ (iii) $[Cr(H_2O)_6]Cl_3$

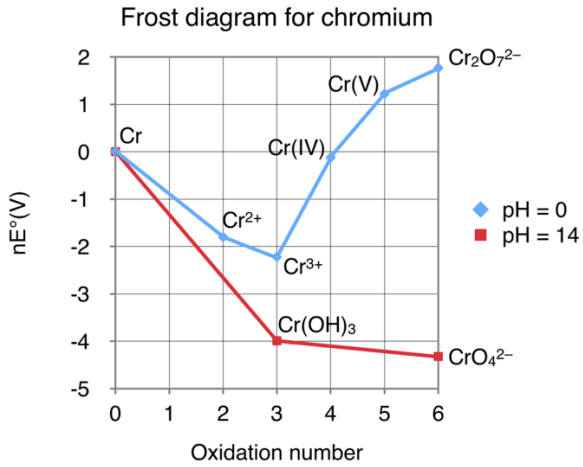
10. (a) Draw the orbital overlap diagram to show the bonding in metal carbonyls. What is meant by synergic effect?
    (b) Among the complexes $[Cr(NH_3)_6]^{3+}$ and $[CrF_6]^{3-}$, which would absorb in longer wavelength region of visible spectrum? Give reason in support of your answer. (Hint: NH_3 is stronger field ligand than F^-). **(3+3)**

11. (a) Give any two differences between hemoglobin and myoglobin.
    (b) Write one importance for each of following metals in our body.
    (i) calcium (ii) sodium **(3+3)**

12. (a) What are the factors affecting the crystal field splitting (10 Dq) of coordination complexes.
(b) Using valence bond theory, show that the complex $[CoF_6]^{3-}$ is paramagnetic in nature. **(3+3)**

13. (a) Draw a labelled energy level diagram for crystal field splitting pattern for octahedral complexes.
b) Give any two limitations of valence bond theory of coordination compounds. **(3+3)**

14. (a) What is Ellingham diagram? Give one application.
(b) Given below is the Frost diagram of chromium.
(i) Identify the most stable and unstable species of chromium.
(ii) What are the disproportionation products of Cr^{4+}? **(3+3)**



15. (a) Give any three points of difference between d-block and f-block elements.
(b) Write the composition of Ziegler-Natta catalyst. Mention its application. **(3+3)**

16. (a) Draw the structure of cis and trans isomers for the complex, $[Cr(NH_3)_4Cl_2]^+$.
(b) What is effective atomic number (EAN)? Calculate EAN of the complex, $[Ni(NH_3)_6]^{2+}$. **(3+3)**

17. (a) Give an example each for the following ligands.
(i) monodentate (ii) bidentate (iii) hexadentate
(b) Write the expression used to obtain magnetic moment value of transition metal complexes. Explain the terms involved. **(3+3)**

18. (a) Calculate the valence electron count of Cr in the complex, $Cr(CO)_6$.
(b) Draw the structure of following compounds.
(i) $Ni(CO)_4$ (ii) $Fe(\eta^5\text{-}C_5H_5)_2$ **(3+3)**

PART-C

Answer any **two** of the following questions**.** **(5 x 2 = 10)**

19. $CoCl_3.6NH_3$ gives three chloride ions in the solution. Write the formula of this coordination compound. Give the primary and secondary valency of this complex.
20. A complex of Fe^{2+} ion is diamagnetic. Is it octahedral or tetrahedral? Justify your answer.

21. Answer the following questions based on given Latimer diagram.

$$ClO_4^- \xrightarrow{1.2\ V} ClO_3^- \xrightarrow{1.2\ V} ClO_2 \xrightarrow{1.2\ V} HClO_2 \xrightarrow{1.7\ V} HClO \xrightarrow{1.6\ V} Cl_2 \xrightarrow{1.4\ V} Cl^-$$

(a) Identify the strongest oxidizing and reducing agent.
(b) What are the products of disproportionation of $HClO_2$?
(c) Predict the feasibility of the reaction moving from HClO to Cl_2. **(2+2+1)**

x----------End of questions----------x