Register Number:
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ST. JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE-27
B.Sc. CHEMISTRY – VI SEMESTER
SEMESTER EXAMINATION: APRIL 2020
CH 6115: INORGANIC CHEMISTRY

Time- 2½ hrs **Max Marks- 70**

This paper contains **two** printed pages and **three** parts.

Atomic Number	21	22	23	24	25	26	27	28	29	30
Elements	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn

PART A

Answer any **SIX** of the following questions. **6×2 = 12**

1) Transition metals and their compounds are potential catalysts. Give reasons.
2) Calculate the EAN of Fe in $[Fe(C_2O_4)_3]^{3-}$.
3) Draw the structure of $[Zn(EDTA)]^{2-}$.
4) What is Monsanto acetic acid process? Write the formula of the catalyst used in this process.
5) Give any two general applications of trace metals in human body.
6) Explain why some lanthanides exhibit stable +2 or +4 oxidation states in addition to the characteristic +3 oxidation state.
7) Name an important ore of uranium. Give its composition.
8) What is disproportionation? Give an example.

PART B

Answer any **EIGHT** of the following questions. **8×6 = 48**

9) Both $[Fe(CN)_6]^{3-}$and $[FeF_6]^{3-}$ are octahedral complexes. $[Fe(CN)_6]^{3-}$ has a magnetic moment corresponding to one unpaired electron whereas $[FeF_6]^{3-}$ has a magnetic moment corresponding to 5 unpaired electrons. Explain using Valence Bond Theory.
10) Draw the d- orbital electronic arrangements in (i) the high spin and (ii) the low spin octahedral complexes of Co^{2+}. Calculate (i) the CFSE of high spin octahedral Co^{2+} complex and (ii) the magnetic moment of the low spin octahedral Co^{2+} complex.

11) Give the basic postulates of Crystal Field Theory. Explain the interaction of d- orbitals with ligands in an octahedral complex. Draw the d-orbital splitting pattern in an octahedral ligand field.

12) a) Give the IUPAC names of the following complexes:

i) $[Co(NH_3)_3(NO_2)_3]$

ii) $Na[Cr(EDTA)]$

iii) $[Ni(en)_2(H_2O)_2]\ SO_4$

b) $[Cu(NH_3)_6]^{2+}$ is deep blue coloured whereas $[CuCl_4]^{2-}$ is yellow coloured eventhough both contain Cu^{2+} ion. Account for this difference in colour qualitatively. (3+3)

13) a) What is ionization isomerism? Illustrate with an example.

b) Draw structures of all the stereoisomers of $[CoCl_2(en)_2]^+$. (3+3)

14) Draw the structures of (i) $Co_2(CO)_8$ and (ii) ferrocene. Calculate the valence electron count in each of them.

15) a) Draw the orbital overlap picture of bonding in transition metal carbonyls.

b) Explain how the lanthanide ions differ from transition metal ions in their magnetic properties. (3+3)

16) Explain how individual lanthanide ions are separated from one another using ion-exchange method.

17) Draw the structure of a haem unit. Discuss the mechanism of cooperativity of binding of oxygen to haemoglobin.

18) What is Ellingham's diagram? Explain why Metal→ Metal oxide lines slope upwards whereas C→ CO line slopes downwards in this diagram.

PART C

Answer any**TWO** of the following questions. **2×5 = 10**

19) True or false: "The magnetic moment measurement cannot distinguish between the square planar and tetrahedral complexes of Cu(II)." Give an explanation for your answer based on valence bond theory.

20) a) $[Ir(H_2O)_6]^{2+}$ and $[IrF_6]^{3-}$ approximately possess the same 10Dq values. Give reason.

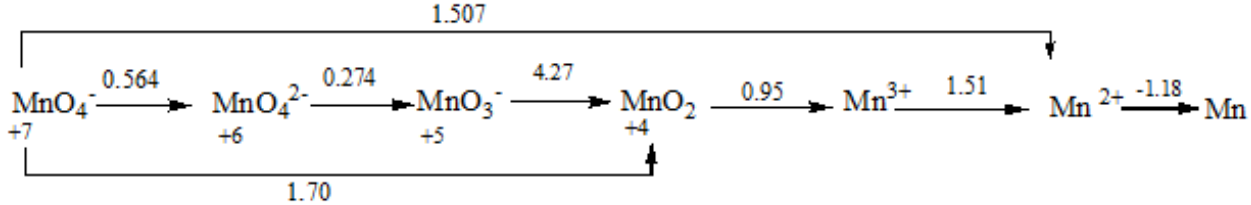
b) A complex of composition $PtCl_4.5NH_3$ has a molar conductance value corresponding to four ions in aqueous solution. Write its correct formula. (3+2)

21) Based on the given Latimer diagram answer the following questions:

i) Identify two species that undergo disproportionation.

ii) Calculate the E^o value for the reduction from MnO_4^{2-} to MnO_2.

iii) Write the ionic equation for the reduction of MnO_2 to Mn^{3+}.



Latimer diagram for a series of manganese species in acidic solution

-- End of questions--

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