

Roll No. ....

Total Pages : 4

**GSM/D-20**

**922**

**INORGANIC CHEMISTRY**

Paper - VIII - CH-201

*Time allowed : 3 Hours*

*Maximum Marks : 32*

**Note :** Attempt **five** questions in all, selecting two questions from each unit. Question No. 1 is compulsory.

**Compulsory Questions**

1. (i) Out of  $\text{Cu}_2\text{Cl}_2$  and  $\text{CuCl}_2$  which is more stable and why ?
- (ii) Give the number of unpaired electrons in  $\text{Cr}^{+3}$  and  $\text{Co}^{+2}$ .
- (iii) Write IUPAC name of  $\text{Na}[\text{Co}(\text{CN})_4]$ .
- (iv) What is the oxidation state of cobalt in  $[\text{Co}(\text{NH}_3)_3(\text{H}_2\text{O})_2\text{Cl}]^{+2}$ .
- (v) Give the example of amphoteric solvent.
- (vi) Which out of  $\text{NH}_3$  or  $\text{H}_2\text{O}$  undergoes more autoionization ?
- (vii) What EAN rule ?
- (viii) Draw the structure of  $[\text{Co}(\text{EDTA})]$ . 1×8

## UNIT-I

2. (a) Iron is a transition element but sodium is not. Explain. 2
- (b) 4s-Subshell is filled prior to 3d but on ionisation, 4s-electrons are removed first. Explain. 2
- (c)  $\text{Cu}^{+2}$  ions are coloured and paramagnetic while  $\text{Zn}^{+2}$  ions are colourless and diamagnetic Explain why ? 2
3. (a) Calculate in Bohr magneton the expected spin magnetic moment for the following ions:
  - (i)  $\text{Fe}^{+3}$  (ii)  $\text{Ni}^{+2}$  2
- (b) Why do transition elements in zero and lower oxidation state form complexes with weak ligands like CO, NO or  $\text{PR}_3$  ? 2
- (c) Write the stereochemistry of following complexes : 2
  - (i)  $[\text{Ag}(\text{CN})_2]$  (ii)  $\text{Ni}(\text{CO})_4$  2
4. (a) Consider the Latimer diagram for  $\text{Tl}^+$ . 3

$$\begin{array}{ccccc}
 \text{Tl}^{+3} & \xrightarrow{+1.26} & \text{Tl}^+ & \xrightarrow{-0.34} & \text{Tl} \\
 | & & & & \uparrow \\
 & & & +0.73 & 
 \end{array}$$
  - (i) Construct a frost diagram.
  - (ii) Predict the stability or unstability of  $\text{Tl}^+$ .

- (b) Write the names and symbols of members of second and third transition series belonging to Fe, Co and Ni groups. 3
5. (a) Draw polymeric structure of  $\text{CuCl}_2$ . 2
- (b) Which should be a better Oxidising agent :  $\text{Co}^{+2}$  or  $\text{Co}^{+3}$  in water. Explain why ? 3
- (c) Name a transition metal which is liquid at room temperature. Give reason. 3

## UNIT-II

6. Write IUPAC names of the following : 3
- (i) 
$$[(\text{NH}_3)_4 \text{Co} \begin{array}{c} \nearrow \text{NH}_2 \\ \searrow \text{NO}_2 \end{array} \text{Co}(\text{NH}_3)_4](\text{NO}_3)_4$$
- (ii)  $\text{K}_2[\text{Fe}(\text{CN})_5\text{NO}]$
- (iii)  $[\text{Cr}(\text{NH}_3)_6] [\text{Co}(\text{CN})_6]$
- (b) What is oxidation state and coordination number of the metal ion and the geometrical arrangement of ligands in the complex  $\text{K}_4[\text{Ni}(\text{CN})_4]$ . 3
7. (a) What are chelates ? Discuss the factors which affect the stability of chelates. 2
- (b) Write : 2
- (i) Linkage isomer of  $[\text{Cu}(\text{NH}_3)_5\text{ONO}]\text{Cl}_2$
- (ii) Coordination isomer of  $[\text{Cu}(\text{NH}_3)_4] [\text{PtCl}_4]$ .

- (c) Calculate EAN of central atom in : 2  
 $\text{Fe}(\text{CO})_5$  and  $[\text{Cr}(\text{NH}_3)_6]^{+3}$ .
8. (a) How do the following solutes behave in liq  $\text{SO}_2$  (as an acid or a base) ? 2  
 (i)  $\text{SO}(\text{SCN})_2$                       (ii)  $\text{CaSO}_3$
- (b) Discuss self ionisation of liq.  $\text{SO}_2$  as non-aqueous solvent. What are the most effective acids and bases of this solvent system. Give reactions. 3
- (c)  $\text{HgI}_2 + \text{KI} \xrightarrow{\text{liquid SO}_2} ?$  1
9. (a) Explain why : 2×2  
 (i) Acitamide behaves as a weak base in aqueous solution but shows acidic properties in liquid  $\text{NH}_3$ .
- (ii) Na metal solution in liquid  $\text{NH}_3$  is blue in colour, paramagnetic and highly reducing in nature. 2
- (b) Complete the following reactions in liquid  $\text{NH}_3$  2  
 (i)  $\text{SO}_2 \text{ Cl}_2 + 4\text{NH}_3 \longrightarrow$   
 (ii)  $\text{BCl}_3 \longrightarrow$