

**GSM/D-21****931****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 Question**

1. (i) Write electronic configuration of Cr.
- (ii) The complexes of  $\text{Cu}^{2+}$  ions are more stable than  $\text{Cu}^+$  ions due to ..... nuclear charge density.
- (iii) Which element in the first transition series has lowest melting and boiling points.
- (iv) Zn form  $\text{Zn}^{+2}$  ions and not  $\text{Zn}^{+3}$  ion. Explain why?
- (v) Fe is a transition elements but K is representative one. Discuss it.
- (vi) What is the oxidation state of Cobalt in  $[\text{Co}(\text{NH}_3)_3(\text{H}_2\text{O})_5\text{Cl}]^{+2}$ ?
- (vii) Give an example of amphoteric solvent.
- (viii) Give geometrical isomers of  $[\text{CoCl}_2(\text{en})_2]^+$ . 1×8=8

**UNIT-I**

2. (a) The complexes of first transition series are mainly high spin while those of second and third transition series are of low spin. Explain it. 2
- (b) Give the structure of  $\text{TiO}_2$ . 2
- (c) Discuss that ionisation energies of '3d' elements do not vary much with increasing atomic number. 2
3. (a) Why Cu, Ag, Au form most of the compounds in +2, +1, +3 oxidation states respectively? 2

- (b) Calculate in Bohr Magneton the expected magnetic moment of the following ions (spin magnetic moment) : 2
- (i)  $\text{Fe}^{+3}$  (ii)  $\text{Ni}^{+2}$
- (c) Why do Zr and Hf display similar properties? 2
4. (a) Which of the following will have higher value of electro negativity? Explain : 2
- Fe(II) or Fe(III)
- (b) Consider the Latimer diagram for  $\text{Tl}^+$  : 2
- $$\begin{array}{ccccc} \text{Tl}^{+3} & \xrightarrow{+1.26} & \text{Tl}^+ & \xrightarrow{-0.34} & \text{Tl} \\ & & & & \uparrow \\ & & & & +0.73 \\ & & & & \downarrow \\ & & & & \text{Tl} \end{array}$$
- (i) Construct a Frost diagram.
- (ii) Predict the stability or unstability of  $\text{Tl}^+$ .
- (b) Out of +2 and +4 oxidation states of Pt, which one is more stable and why? 2
5. (a) Why do transition elements in zero or low oxidation state form complexes with ligands like CO, NO,  $\text{PR}_3$  etc.? 2
- (b) Identify the following as platinum metals, coinage metals, ferrous metals with reasons : 2
- (i) Co (ii) Ru (iii) Cu.
- (c) What is the difference between an alloy and an interstitial compound? 2

## UNIT-II

6. (a) Write IUPAC names of the following : 2
- (i)  $[\text{Co}(\text{en})_2\text{Cl}_2]^+$  (ii)  $\text{K}_4[\text{Ni}(\text{CN})_4]$
- (b) Why do tetrahedral complexes not show geometrical isomerism? 2
- (c) Name the complex ion  $[\text{Co}(\text{NH}_3)_3(\text{H}_2\text{O})_2\text{Cl}]^{+2}$  and also show for this : 2
- (i) Oxidation state of cobalt
- (ii) Geometric arrangement of the ligands.

7. (a) What is EAN rule? Calculate EAN of central metal ion in : 2  
 (i)  $[\text{Cu}(\text{CN})_4]^{-3}$  (ii)  $\text{Fe}(\text{CO})_5$
- (b) What is Chelate? Explain with help of EDTA. 2
- (c) Discuss the structure of  $[\text{Cr}(\text{NH}_3)_6]^{+3}$  according to Valence Bond Theory. 2
8. (a) Complete the following reactions :  $1 \times 3 = 3$   
 (i)  $\text{HgI}_2 + \text{KNH}_2 \xrightarrow{\text{liq. NH}_3}$   
 (ii)  $\text{PCl}_5 + \text{SO}_2 \xrightarrow{\text{liq. SO}_2}$   
 (iii)  $\text{SO}_2\text{Cl}_2 + \text{NH}_3 \xrightarrow{\text{liq. NH}_3}$
- (b) How does NaCl behave in water? 1
- (c) Discuss complex formation reactions in liquid  $\text{NH}_3$ . 2
9. (a) Discuss autoionisation of liquid  $\text{SO}_2$  as a non-aqueous solvent. Explain acid-base neutralization reaction in liquid  $\text{SO}_2$ . 2
- (b) What is Solvolysis? Give example. 2
- (c) Sodium metal in liquid  $\text{NH}_3$  is blue and good reducing agent. Explain it. 2