

**63/1 (SEM-4) CHM HC 4086 (CC 8)**

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**CHEMISTRY**

Paper : CC 8

**( Inorganic Chemistry—III )**

Full Marks : 60

Time : 3 hours

*The figures in the margin indicate full marks  
for the questions*

1. Choose the correct answer : 1×5=5

(a) Which one of the following is not an example of bidentate ligand?

(i) Ethylene diamine

(ii) Dimethylglyoximate ion

(iii) Oxalate ion

(iv) EDTA

(b) Which of the following sets of elements is not a part of the same Group?

(i) Mn, Tc, Re

(ii) Fe, Ru, Os

(iii) Cr, Nb, Ta

(iv) Co, Rh, Ir

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- (c) Which one of the following is the wrong statement?
- (i) The common oxidation state of lanthanoids is +3.
  - (ii)  $\text{La}^{3+}$  and  $\text{Lu}^{3+}$  ions are paramagnetic in nature.
  - (iii) The ions  $\text{La}^{3+}$ ,  $\text{Lu}^{3+}$  and  $\text{Gd}^{3+}$  are colourless.
  - (iv)  $\text{La}(\text{OH})_3$  is more basic than  $\text{Lu}(\text{OH})_3$ .
- (d) Which of the following is important for functioning of chlorophyll?
- (i)  $\text{Mg}^{2+}$
  - (ii)  $\text{Fe}^{2+}$
  - (iii)  $\text{Zn}^{2+}$
  - (iv)  $\text{Co}^{2+}$
- (e) Which of the following ligands does the largest crystal field splitting with the same central metal ion?
- (i)  $\text{C}_5\text{H}_5\text{N}$
  - (ii)  $\text{NH}_3$
  - (iii)  $\text{NO}_2^-$
  - (iv) en

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2. Answer the following questions : 2×5=10
- (a) Differentiate between coordination complexes and double salt.
  - (b) Why are second ionization energies of Cr and Cu exceptionally high?
  - (c) "Zr and Hf generally display the same properties." Explain why.
  - (d) "Actinoids form oxocations but lanthanoids do not." Why?
  - (e) What happens when Fe-Porphyrin complex without polypeptide chain comes in contact with  $\text{O}_2$ ?
3. Answer any five of the following questions : 5×5=25
- (a) Write a note on Jahn-Teller effect in  $\text{Cu}^{2+}$  complexes.
  - (b) Name different kinds of isomerism possible in coordination complexes with one example of each.
  - (c) Discuss the toxic effect of Hg and Cd in different biological functions.
  - (d) "Anhydrous  $\text{CuSO}_4$  is white but hydrated  $\text{CuSO}_4$  is blue in colour." Explain why.

- (e) Discuss the structure of  $\text{Fe}_3\text{O}_4$  with the help of CFT.
- (f) "The  $f-f$  transition in lanthanoids is well-defined but the  $f-f$  transition in actinoids is not." Explain.
- (g) Describe the ion-exchange method for the separation of lanthanoids.

4. Answer any *two* of the following questions :

10×2=20

- (a) What is crystal field theory? How does this theory differ from valence bond theory? How does the theory account for the paramagnetic and diamagnetic nature of the  $[\text{CoF}_6]^{3-}$  and  $[\text{Co}(\text{NH}_3)_6]^{3+}$  respectively?
- (b) What do you mean by ionization energy? How does ionization energy of transition elements vary with increase in atomic number? Explain the slow increase rate of ionization energies along a period.
- (c) Explain the terms 'cooperativity effect' and 'Bohr effect'. How can cooperativity effect be explained in haemoglobin?

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