

4 SEM TDC CHMH (CBCS) C 8

2025

(May/June)

CHEMISTRY

(Core)

Paper : C-8



(Inorganic Chemistry)

Full Marks : 53

Pass Marks : 21

Time : 3 hours

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

1. Select the correct answer : 1×6=6

(a) The common oxidation state of lanthanides is

(i) +2

(ii) +3

(iii) +4

(iv) Both +2 and +4

(2)

(b) Which of the following does not belong to lanthanides?

(i) Am

(ii) Pm

(iii) Sm

(iv) Tm

(c) Which of the following is labile?

(i) $[\text{Fe}(\text{CN})_6]^{3-}$

(ii) $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$

(iii) $[\text{Cr}(\text{CN})_6]^{3-}$

(iv) $[\text{Mn}(\text{CN})_6]^{4-}$

(d) Which of the following is paramagnetic?

(i) $\text{Fe}(\text{CO})_5$

(ii) $[\text{Ni}(\text{CN})_4]^{2-}$

(iii) $[\text{Co}(\text{NH}_3)_6]^{3+}$

(iv) $[\text{Fe}(\text{NH}_3)_6]^{2+}$

(3)

(e) The oxidation state of Fe in haemoglobin is

(i) 0

(ii) +2

(iii) +3

(iv) None of the above

(f) Japanese itai-itai disease is caused by the poisoning of

(i) Pb

(ii) Cd

(iii) Hg

(iv) As

UNIT—I

2. Answer the following questions : 2×4=8

(a) Write the name and formula of each of the following types of ligand : 1+1=2

(i) One asymmetric bidentate ligand

(ii) One hexadentate ligand

- (b) What is spectrochemical series? Write one application of the spectrochemical series. $1+1=2$
- (c) Write the IUPAC names of the following compounds : $1+1=2$
- (i) $\text{Na}_3[\text{Co}(\text{CN})_5\text{NO}]$
- (ii) $[(\text{NH}_3)_5\text{Co}-\text{NH}_2-\text{Co}(\text{NH}_3)_5]\text{Cl}_3$
- (d) Draw the structures of all possible isomers of $[\text{Co}(\text{en})_3]^{3+}$ ion. 2
3. Answer any two questions : $3 \times 2 = 6$
- (a) On the basis of crystal field theory, explain the splitting of d -orbitals in an octahedral complex. 3
- (b) Show the crystal field splitting of $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$. Calculate its spin only magnetic moment. $2+1=3$
- (c) Determine the structure of $[\text{Ni}(\text{CN})_4]^{2-}$ in the light of valence bond theory. Discuss its magnetic property. $2+1=3$
4. Answer any two questions : $4 \times 2 = 8$
- (a) (i) What are chelating ligands? Discuss with a suitable example.
- (ii) Give the structural formulae of the following compounds : $2+2=4$
- Pentaammineazidocobalt (III) sulphate and Tetrafluoro oxochromate (IV) ion



- (b) What do you mean by CFSE (Crystal Field Stabilization Energy)? Calculate CFSE for the following octahedral systems : $1+1+1+1=4$
- (i) d^3
- (ii) d^5 high-spin
- (iii) d^6 low-spin
- (c) (i) Explain ambidentate and macrocyclic ligands with suitable example. 2
- (ii) Explain why tetrahedral complexes are generally high-spin. 2

UNIT—II

5. Answer any three questions : $3 \times 3 = 9$
- (a) Write any three differences between first and second transition series elements. 3
- (b) Give reasons why (i) Sc^{3+} is more stable than Sc^{2+} and (ii) transition elements exhibit colour. Explain with example. $1\frac{1}{2}+1\frac{1}{2}=3$

(6)

- (c) Give three applications of Latimer diagram. 3
- (d) Explain the stability of various oxidation states of transition metals in terms of their e.m.f. values. What is Latimer diagram? 2+1=3
6. Find the number of unpaired electrons and calculate spin only magnetic moment in the following complexes : 2×2=4
- (a) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$
- (b) $[\text{Mn}(\text{CN})_6]^{4-}$

UNIT—III

7. Answer any two questions : 2×2=4
- (a) What do you mean by lanthanide contraction?
- (b) Eu and Yb exhibit +2 oxidation state. Explain.
- (c) Give any two differences between lanthanides and actinides.

UNIT—IV

8. Answer any two questions : 4×2=8
- (a) Discuss the structure and function of carbonic anhydrase. 2+2=4

(7)

- (b) What is sodium-potassium ion pump? Discuss its biological roles. 1+3=4
- (c) Write a note on mercury poisoning. How can it be treated? 2+2=4

