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

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

(ii) $[Fe(H_2O)_6]^{2+}$

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

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

(d) Which of the following is paramagnetic?

(i) $Fe(CO)_5$

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

(iii) $[Co(NH_3)_6]^{3+}$

(iv) $[Fe(NH_3)_6]^{2+}$

(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) $Na_3[Co(CN)_5NO]$

(ii) $[(NH_3)_5Co—NH_2—Co(NH_3)_5]Cl_3$

(d) Draw the structures of all possible isomers of $[Co(en)_3]^{3+}$ ion. 2

3. Answer any *two* questions : 3×2=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 $[Fe(H_2O)_6]^{2+}$. Calculate its spin only magnetic moment. 2+1=3

(c) Determine the structure of $[Ni(CN)_4]^{2-}$ in the light of valence bond theory. Discuss its magnetic property. 2+1=3

4. Answer any *two* questions : 4×2=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 : 3×3=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. 1½+1½=3

(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) $[Cr(H_2O)_6]^{3+}$

(b) $[Mn(CN)_6]^{4-}$

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

(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

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