

4 SEM TDC CHMH (CBCS) C 8

2023

(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) Common oxidation state of lanthanides
is

(i) + 2

(ii) + 3

(iii) + 4

(iv) both + 2 and + 4

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(Turn Over)

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

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(Continued)

(3)

(e) The high-spin configuration of Mn(III) ion in octahedral field is

- (i) $t_{2g}^3 e_g^2$
- (ii) $t_{2g}^3 e_g^1$
- (iii) $t_{2g}^4 e_g^0$
- (iv) $t_{2g}^2 e_g^2$

(f) The oxidation state of Fe in haemoglobin is

- (i) 0
- (ii) +2
- (iii) +3
- (iv) None of the above

UNIT—I

2. Answer the following questions : $2 \times 4 = 8$

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

- (i) One asymmetric bidentate ligand
- (ii) One hexadentate ligand

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(4)

(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



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

(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

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(Continued)

(5)

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

Tetrafluoro oxochromate (IV) ion

(b) What do you mean by CFSE (crystal field stabilisation 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) Define inert and labile complexes. Explain why $[\text{Fe}(\text{H}_2\text{O})_6]^{2+}$ is labile but $[\text{Fe}(\text{CN})_6]^{4-}$ is inert. 2+2=4

UNIT—II

5. Answer any three questions : 3×3=9

(a) Write any three differences between first and second transition series elements. 3

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(Turn Over)



(6)

- (b) Give reasons why (i) Sc^{3+} is more stable than Sc^{2+} and (ii) transition elements exhibit colour. Explain with example.

$1\frac{1}{2} + 1\frac{1}{2} = 3$

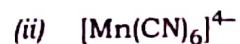
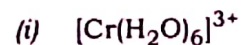
- (c) Give three applications of Latimer diagram.

- (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 :

$2 + 2 = 4$



UNIT—III

7. Answer any two questions :

$2 \times 2 = 4$

- (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.

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(7)

UNIT—IV

8. Answer any two questions :

$4 \times 2 = 8$

- (a) Discuss the structure and function of carbonic anhydrase.
- (b) What is sodium-potassium ion pump? Discuss its biological roles.
- (c) Write a note on mercury poisoning. How can it be treated?

$2 + 2 = 4$

$1 + 3 = 4$

$2 + 2 = 4$

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