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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

(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 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 : $1 + 1 = 2$

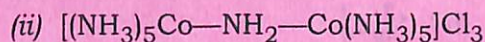
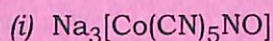
(i) One asymmetric bidentate ligand

(ii) One hexadentate ligand

(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

(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



(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

(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 : $2+2=4$

- (i) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$
(ii) $[\text{Mn}(\text{CN})_6]^{4-}$

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.

(7)

UNIT—IV

8. Answer any two questions : $4 \times 2 = 8$
- (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? $2+2=4$
