

Total No. of Printed Pages—7

**4 SEM TDC CHMH (CBCS) C 8**

**2024**

( May/June )

**CHEMISTRY**

( Core )

Paper : C-8

**( Inorganic Chemistry )**

Full Marks : 53

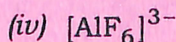
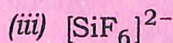
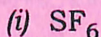
Pass Marks : 21

Time : 3 hours

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

1. Select the correct answer : 1×6=6

(a) Which of the following has the highest  
lability?



( 2 )

(b) The CFSE for the  $d^3$ -ion in strong crystal field is

(i) 4 Dq

(ii) 8 Dq

(iii) 12 Dq

(iv) 16 Dq

(c) The metal present in carbonic anhydrase is

(i) Mg

(ii) Fe

(iii) Zn

(iv) Co

(d) If ingested, cadmium accumulates in

(i) liver

(ii) kidney

(iii) bone

(iv) muscles

( 3 )

(e) In the complex  $[\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ , the metal ion has configuration

(i)  $d^1$

(ii)  $d^2$

(iii)  $d^9$

(iv)  $d^4$

(f) The number of 4f-electrons in lanthanum is

(i) 0

(ii) 1

(iii) 2

(iv) 5

UNIT—I

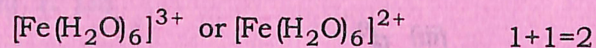
2. Answer the following questions : 2×4=8

(a) What are labile and inert complexes? Give examples. 2

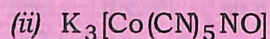
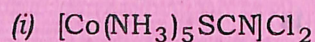
(b) Define crystal field stabilization energy. Find CFSE for strong field  $d^5$  complex. 1+1=2

( 4 )

- (c) Arrange the ligands  $I^-$ ,  $CO$ ,  $Cl^-$ ,  $CN^-$  and  $H_2O$  in the increasing order of the strength as given in spectrochemical series. Which of the following complexes has larger  $\Delta_0$  value?



- (d) Write IUPAC names of the following compounds : 1+1=2



3. Answer any *two* questions : 3×2=6

- (a) What are ionization isomerism, linkage isomerism and coordination isomerism in coordination complexes? Explain with examples. 1×3=3

- (b) Define stereoisomerism in complexes. Discuss the stereoisomerism exhibited by the complex ion,  $[Co(en)_2(NH_3)_2]^{3+}$ . 1+2=3

- (c) Write three basic postulates of valence bond theory (VBT) in complexes. 3

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4. Answer any *two* questions : 4×2=8

- (a) Discuss the crystal field splitting in the complex  $[Fe(CN)_6]^{4-}$ . Calculate its spin only magnetic moment and crystal field stabilization energy. 2+2=4

- (b) For the  $[Cr(H_2O)_6]^{2+}$  ion, the mean pairing energy ( $P$ ) is found to be  $23500\text{ cm}^{-1}$ . The magnitude of  $\Delta_0$  is  $13900\text{ cm}^{-1}$ . Calculate the CFSE for the complex in both high-spin state and low-spin state. 2+2=4

- (c) Why is there no case of high-spin and low-spin for a  $d^8$  system ( $Ni^{2+}$ )? Explain in the light of VBT citing examples. 4

#### UNIT—II

5. Answer any *three* questions : 3×3=9

- (a) Give reasons—  
(i) why Zn, Cd, Hg are not regarded as true transition elements;  
(ii) why  $[Ti(H_2O)_6]^{3+}$  ion is violet.  $1\frac{1}{2}+1\frac{1}{2}=3$

- (b) Explain the Latimer and Ebsworth diagram to account the stability of various oxidation states and e.m.f. 3

( 6 )

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

(d) Give reasons for the following :  $1\frac{1}{2}+1\frac{1}{2}=3$

(i)  $\text{Ti}^{4+}$  ion is more stable than  $\text{Ti}^{3+}$  ion.

(ii)  $[\text{CoF}_6]^{3-}$  is paramagnetic.

6. Find the number of unpaired electrons and calculate the spin-only magnetic moment in the following complexes :  $2+2=4$

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

(ii)  $[\text{Co}(\text{CN})_6]^{3-}$

#### UNIT—III

7. Answer any two questions :  $2 \times 2 = 4$

(a) What are the consequences of lanthanide contraction?

(b) "Cerium is the only lanthanide which is stable in (+4) oxidation state." Justify the statement.

(c)  $\text{Sm}^{2+}$  is a good reducing agent and  $\text{Ce}^{4+}$  is a good oxidizing agent. Explain.

( 7 )

#### UNIT—IV

8. Answer any two questions :  $4 \times 2 = 8$

(a) Discuss the structure and function of carboxypeptidase.  $2+2=4$

(b) Draw the structure of haemoglobin. How does it help in oxygen transport?  $2+2=4$

(c) Discuss the poisoning effect of Hg in human body. How can it be treated?  $3+1=4$

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