

Total No. of Printed Pages—7

4 SEM TDC CHMH (CBCS) C 8

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(June/July)

CHEMISTRY

(Core)

Paper : C-8

(Inorganic Chemistry)

Full Marks : 53

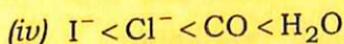
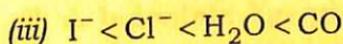
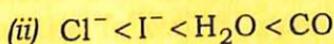
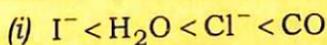
Pass Marks : 21

Time : 3 hours

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

1. Select the correct answer : 1×6=6

(a) The increasing order of the strength of the ligands I^- , CO , Cl^- and H_2O in the spectrochemical series is



- (b) Which of the following has the highest lability?
- (i) SF_6
 - (ii) $[\text{PF}_5]^-$
 - (iii) $[\text{SiF}_6]^{2-}$
 - (iv) $[\text{AlF}_6]^{3-}$
- (c) In the complex $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$, the metal ion has
- (i) d^1 -configuration
 - (ii) d^2 -configuration
 - (iii) d^3 -configuration
 - (iv) d^5 -configuration
- (d) The common oxidation state shown by transition elements is
- (i) +2
 - (ii) +3
 - (iii) +4
 - (iv) +5
- (e) The number of $4f$ -electron in lanthanum is
- (i) 0
 - (ii) 1
 - (iii) 2
 - (iv) 5

(f) Non-heme iron protein is

(i) myoglobin

(ii) haemoglobin

(iii) cytochrome P450

(iv) hemerythrin

UNIT—I

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

(a) What are labile and inert complexes?

Give examples.

$1 + 1 = 2$

(b) Write the IUPAC names of the following compounds :

$1 + 1 = 2$

(i) $[\text{Co}(\text{NH}_3)_5\text{SCN}]\text{Cl}_2$

(ii) $\text{K}_3[\text{Co}(\text{CN})_5\text{NO}]$

(c) Write the formula of the following compounds :

$1 + 1 = 2$

(i) Dichlorobis(triphenylphosphine)

palladium (II)

(ii) Potassium pentachloronitrido-

osmate (VI)

(d) Write the name and formula of each of the following types of ligand :

$1 + 1 = 2$

(i) A bidentate ligand with one acidic and one neutral donor

(ii) A tridentate ligand with three neutral donors

3. Answer any two questions : 3×2=6

(a) What do you mean by crystal field stabilization energy (CFSE)? Calculate CFSE for each of the following octahedral systems in Dq units :

$$1+1+1=3$$

(i) d^5 -high spin

(ii) d^6 -low spin

(b) $[\text{Ni}(\text{CO})_4]$ is tetrahedral while $[\text{Ni}(\text{CN})_4]^{2-}$ ion is square planar. Explain in the light of valence bond theory. $1\frac{1}{2}+1\frac{1}{2}=3$

(c) Define stereoisomerism. Discuss the stereoisomerism exhibited by the complex ion $[\text{Co}(\text{en})_2\text{Cl}_2]^+$. 1+2=3

4. Answer any two questions : 4×2=8

(a) What is the basis of crystal field theory? Draw the splitting patterns for octahedral, tetrahedral and square planar complexes in a crystal field.

$$1+3=4$$

(b) On the basis of CFT, calculate the spin only magnetic moment value (μ_s) for $[\text{Fe}(\text{CN})_6]^{3-}$ and $[\text{FeF}_6]^{3-}$ ions. 2+2=4

- (c) For the $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$ ion, the mean pairing energy (P) is found to be 23500 cm^{-1} . The magnitude of Δ_0 is 13900 cm^{-1} . Calculate the CFSE for the complex in both high spin and low spin states. 2+2=4

UNIT—II

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

(a) Give reasons—

(i) Ti^{4+} ion is more stable than Ti^{3+} ion;

(ii) *d*-block elements show variable oxidation states. 1½+1½=3

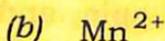
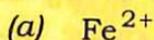
(b) The decrease in the radius of elements Na ($Z = 11$) to Cl ($Z = 17$) is 0.55 \AA , while the decrease for Sc ($Z = 21$) to Zn ($Z = 30$) is only 0.13 \AA .

Explain the above data. 3

(c) Explain the Latimer and Bsworth diagram to account the stability of various oxidation states and e.m.f. 3

(d) Write all possible oxidation states exhibited by the elements of the first row transition series. 3

6. Find out the numbers of unpaired electrons and calculate the spin only magnetic moment value for the following ions : $2+2=4$



UNIT—III

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

(a) What are the consequences of lanthanide contraction?

(b) Sm^{2+} is a good reducing agent and Ce^{4+} is a good oxidizing agent. Explain.

(c) What are the problems in the separation of lanthanides from one another?

UNIT—IV

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

(a) What is the essential element present in haemoglobin? How does it help in oxygen transport and storage? $1+3=4$

(7)

(b) Explain the role of sodium and potassium ions in biological system. $2+2=4$

(c) How does lead harm the human body?
How can lead poisoning be prevented? $2+2=4$
