

**April 2025**  
**B.A./B.Sc.**  
**Fourth Semester**  
**CORE – 8**  
**CHEMISTRY**  
*Course Code: CHC 4.11*  
**(Inorganic Chemistry - III)**

Total Mark: 70  
Time: 3 hours

Pass Mark: 28

Answer five questions, taking one from each unit.

**UNIT-I**

1. (a) Write the formula of the following complexes: 1×3=3
  - (i) Diamminechloro (ethylenediamine) nitrito-N platinum (IV) chloride
  - (ii) Iron hexacyanoferrate (II)
  - (iii) Tetracarbonylnickel (0)
- (b) What are the important postulates of Werner's theory of coordination compounds? 6
- (c) Discuss in detail any two kinds of isomerism possible in coordination complexes. Give one example each. 2½+2½=5
2. (a)  $[\text{Co}(\text{NH}_3)_6]^{3+}$  is an inner orbital complex while  $[\text{CoF}_6]^{3-}$  is an outer orbital complex. Explain the reason and predict its magnetic behaviour. 5
- (b) Discuss the stereochemistry of coordination number 4 with examples. 4
- (c) What is geometrical isomerism? Give an example of a complex exhibiting geometrical isomerism. 1+4=5

**UNIT-II**

3. (a) Draw crystal field splitting diagram of d-orbitals in tetrahedral complexes. 2
- (b) On the basis of CFT, explain magnetic properties of 2×3=6
  - (i)  $[\text{CoF}_6]^{3-}$
  - (ii)  $[\text{Co}(\text{NH}_3)_6]^{3+}$

- (iii)  $[\text{Mn}(\text{H}_2\text{O})_6]^{2+}$
- (c) Find out which ion or ions have strong or weak or no Jahn-Teller distortion. 1½×4=6
- (i)  $\text{Cr}^{3+}$  (HS)
- (ii)  $\text{Fe}^{2+}$  (LS)
- (iii)  $\text{Co}^{2+}$  (HS)
- (iv)  $\text{Ti}^{3+}$  (LS)

4. (a) Calculate CFSE of the following: 2×4=8
- (i)  $d^4$  (Oh and HS)
- (ii)  $d^5$  (Oh and LS)
- (iii)  $d^6$  (tetrahedral and HS)
- (iv)  $d^7$  (Oh and HS)
- (b) Explain the factors affecting the magnitude of  $\Delta_0$ . 4
- (c) Give two important postulates of CFT. 2

### UNIT-III

5. (a) Define transition elements. Write a note on transition series. 1+3=4
- (b) Explain why the electronic configuration of Cr and Cu are anomalous. 2
- (c) Write notes on transition elements with respect to 2×2=4
- (i) magnetic properties
- (ii) oxidation states
- (d) Write the differences between first, second and third transition series. 4
6. (a) What are the various oxidation states of titanium and chromium? Give the most common oxidation state of titanium and chromium. 4
- (b) Write the electronic configuration of Sc and Fe. 2
- (at. no. 21 and 26).
- (c) What do you mean by crystal field splitting and d-d transition? 4
- (d) Write notes on transition elements with respect to 2×2=4
- (i) atomic and ionic radii
- (ii) complexes and the relative stability of their oxidation states

## UNIT-IV

7. (a) What are lanthanoids? Discuss the extraction of lanthanoids by ion exchange method. 1+4=5
- (b) Write short notes on the electronic configuration of actinoids. Write the name and electronic configuration of actinoids with atomic number 93 and 101. 3+2=5
- (c) Compare the spectral properties of lanthanoids and actinoids. 2+2=4
8. (a) Explain lanthanoid contraction and discuss its consequences. 2+3=5
- (b) Write short notes on the following: 2×2=4
- (i) Oxidation states of actinoids
- (ii) Colour of actinoids ions
- (c) Compare the complex formation tendencies of lanthanoids and actinoids. 3
- (d) Write any one method of preparation of  $UF_6$  and mention its uses. 2

## UNIT-V

9. (a) Mention excesses and deficiency of the following trace elements. 2×3=6
- (i) Zn
- (ii) Cu
- (iii) Mn
- (b) Explain the importance of  $Na^+/K^+$  pump. 4
- (c) What are the side effect of cisplatin? 4
10. (a) Describe the role of carbonic anhydrase in biological system. 5
- (b) Briefly discuss the toxicity of lead and mercury in biosystems. 4
- (c) Explain the role of iron and its applications in biosystem. 5
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