

**COURSE: I MSC CHEMISTRY**

**SUB: INORGANIC CHEMISTRY-I**

**SUB.CODE:PCH702S**

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**UNIT-I**

**PART-A**

**I. Choose the best answer**

1. Which one of the following complexes exhibits chirality

(a)  $\text{Cr}(\text{Ox})_3^{3-}$  (b)  $\text{Cis-}[\text{PtCl}_2(\text{en})]$  (c)  $\text{Cis-}[\text{RhCl}_2(\text{NH}_3)_4]$  (d)  $\text{meso-}[\text{Co}(\text{NO}_2)_3(\text{triene})]$

2. Which type of isomerism is shown by  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]$

(a) Geometrical and ionization (b) optical and ionization (c) geometrical and optical (d) geometrical only

3.  $[\text{Co}(\text{en})_3]^{3+}$ ,  $[\text{Cr}(\text{C}_2\text{O}_4)_3]^{3-}$  and  $[\text{Co}(\text{en})_2(\text{C}_2\text{O}_4)]^+$ ,  $[\text{Cr}(\text{en})(\text{C}_2\text{O}_4)_2]^-$  is example for

a) Linkage isomers b) ligand isomers c) hydrate isomers d) co-ordinate isomers

4. How many isomers are possible theoretically for the following bridged binuclear planar complexes of  $\text{M}_2\text{a}_2\text{b}_4$  type?

a) Three b) two c) four d) five

**II. Fill in the blanks**

5.  $\text{Co}(\text{NH}_3)_5\text{ONO}]^{2+}$  and  $[\text{Co}(\text{NH}_3)_5\text{NO}_2]^{2+}$  is example for.....

6. Optical rotation as a function of wavelength is known as.....

**III. Match the following**

7.  $[\text{Cr}(\text{NH}_3)_4\text{Cl}_2]\text{Cl}$  ----

8.  $[\text{VF}_6]^{3-}$  ----

**IV. PART-B**

9. State cotton effect.

10. Show diagrammatically Cis and trans forms of  $[\text{Co}(\text{NH}_3)_4\text{Cl}_2]^+$

11. Explain the term polymerization isomerism with example.
12. Write about geometrical isomerism in four coordinated complexes.

## **V. PART-C**

13.i. Explain the following with examples.

a) Linkage isomerism and coordinate isomerism.

ii. Describe the geometrical isomerism exhibited by  $[Ma_3b_3]$  types

14 .a) With suitable example discuss optical isomerism in octahedral complexes

15. Explain the spectroscopic methods of assigning the absolute configuration of chiral complexes.

## **UNIT-II**

### **PART-A**

#### **I. Choose the correct answer**

1. CFSE value for weak field  $d^{10}$  octahedral complex is

- a) 0.6      b) zero      c) 0.8      d) 1.2

2. How many core carbon atoms are present in the simple unsubstituted porphyrin?

- a) 19      b) 20      c) 18      d) 21

3. CFSE value of  $[Mn(H_2O)_6]^{2+}$  is

- a) 0      b) -0.4      c) -0.6      d) -1.24

4. According to CFT, which one of the following is paramagnetic?

- a)  $[Fe(CN)_6]^{4-}$       b)  $[Fe(CN)_6]^{3-}$       c)  $Co(NH_3)_6^{3+}$       d)  $[Ni(CN)_4]^{2-}$

#### **II. Fill in the blanks**

5. The crystal field stabilization energy for high spin  $d^6$  system in Oh and Td field are..... and .....

6.  $d_{z^2}$  orbital is the linear combination of ..... and .....

### **III. Match the following**

7.  $[\text{Fe}(\text{CN})_6]^{4-}$

8.  $T_{2g}$  orbital in  $O_h$ --

### **IV. PART-B**

9. What are macrocyclic ligands? give two examples.

10.  $[\text{Fe}(\text{CN})_6]^{4-}$  is diamagnetic where as  $[\text{Fe}(\text{F})_6]^{3-}$  paramagnetic why?

11. What is spectrochemical series?

12. Write the structure and application of crown ethers.

13. Calculate the CFSE for  $d^4$  ions in low spin and high spin octahedral complex.

### **V. PART-C**

14.i) Sketch five d orbitals and label them. What is the degeneracy of the d orbital? How is the degeneracy lift up in octahedral and tetrahedral fields?

15. Explain the structure and stability of metal complexes of crown ethers.

16. Square planer  $d^8$  paramagnetic complexes are extremely rare. Explain this observation by CFT.

17. Draw the structure of corrin.

## **UNIT-III**

### **PART-A**

#### **I. Choose the correct answer**

1. Which one of the following is not a correct statement regarding stability of complexes?

a) The higher the value of K, the greater will be the stability of the complex.

b) Metal ion with large size form stable complex

c) Highly basic ligands form stable complexes

d) The stability of the complexes increases with number of chelate rings

2. Value of stepwise stability constant generally

a) increases      b) decreases      c) some time increases, some time decreases      d) none of these

3. Which one is the most stable complexes among the  $[\text{AgX}_2]^-$  series?

a)  $[\text{AgF}_2]^-$       b)  $[\text{AgBr}_2]^-$       c)  $[\text{AgCl}_2]^-$       d)  $[\text{AgI}_2]^-$

4. Among the following complexes, which one is most stable?

a)  $[\text{Cu}(\text{en})_2]^{2+}$       b)  $[\text{Cu}(\text{tren})]^{2+}$       c)  $[\text{Cu}(\text{penten})]^{2+}$       d)  $[\text{Cu}(\text{trien})]^{2+}$

### **II. Fill in the blanks**

5. Ethylene diamine complexes are more stable than tetramethyl ethylene diamine complexes due to.....

6. Thermodynamic stability is related to.....

### **III. Match the following**

7. Kinetic stability---

8.  $[\text{Fe}(\text{CN})_6]^{3-}$  ---

### **IV. PART-B**

9. Write the difference between thermodynamic and kinetic stability

10. Why do chelated complex are most stable than non-chelated complex?

11. What is stepwise formation constant?

12. Explain the chelate effect with example

### **V. PART-C**

13.i) how can the stability constant be measured by Bjerrum method?

ii) Explain the factors affecting the stability constant referring to nature of the metal ion

14. Explain the spectrometric and potentiometric method for the determination of stability constant

## UNIT-IV

### PART-A

#### I. Choose the correct answer

1. Which of the following is an example for closo structure borane?  
a)  $[B_2H_5]^{2-}$                       b)  $B_2H_6$                       c)  $B_5H_9$                       d)  $B_4H_{10}$
2. The structure of  $Co_4(CO)_{12}$  is  
a) Tetrahedron                      b) closed triangle                      c) square                      d) trigonal bipyramid
3.  $[C_2B_9H_{11}]^{2-}$  is example for..... carborane  
a) closo                      b) nido                      c) arachno                      d) none
4. How many bridged chloride(s) is/are present in  $[ReCl_{12}]^{3-}$   
a) 3                      b) 4                      c) 2                      d) 1

#### II. Fill in the blanks

5.  $Rh_6(CO)_6$  contains..... number of terminal carbonyls
6. The bond order of the metal-metal bond in  $[ReCl_8]^{2-}$  is

#### III. Match the following



#### IV. PART-B

1. Draw the structure the of  $Ir_4(CO)_{12}$
2. What is metal cluster?how are metal clusters classified?
3. Give the general ae of closo and nido boranes
4. Write the structure of  $[Re_2Cl_{12}]^{3-}$
5. What are arachno boranes?

## **V. PART-C**

6. i) Sketch the structure of  $B_5H_{11}$  and applying wade's rule calculate the number of electrons
- ii) Discuss the structure  $Fe_3(CO)_{12}$
7. Discuss the following (a) styx numbers (b) metallocarboranes
8. Explain the structure and bonding of  $[Re_2 C_{18}]^{2-}$

## **UNIT-V**

### **PART-A**

#### **I. Choose the correct answer**

1. Which of the following is a super conductor at very low temperature?  
a)  $S_4N_4$       b)  $S_4N_2$       c)  $S_4N_4 SO_3$       d)  $BF_3$
2. Which one of the following hetero poly acids has dawson structure?  
a)  $H_6P_2Mo_{18} O_{62}$       b)  $H_3PMo_{12}O_{40}$       c)  $H_4SiMo_{12}O_{40}$       d)  $H_3AsM_{12} O_{40}$
3.  $[Si O_4]^{4-}$  is.....  
a) orthosilicate      b) disilicate      c) trisilicate      d) tetrasilicate
4. How many octahedral are stacked in  $[V_{10}H_{28}]^{6-}$   
a) 12      b) 8      c) 9      d) 10

#### **II. Fill in the blanks**

5. The formula of polythiazyl is .....
6.  $S_2N_2$  chains have...shape

#### **III. Match the following**

Silicate----



#### **IV. PART-B**

1. What are heteropoly acids
2. Explain metasilicate anions
3. Discuss the structure of  $S_4N_4$
4. How do iso and heteropoly ions react with isocyanate?

**V. PART-C**

5. What are isopoly acids? Discuss the isopoly acids of molybdenum
6. i) what are silicate? Describe their properties  
ii) Describe the structure of  $[Mo_2C_{18}]^{2-}$
7. What are isopoly acids? Discuss the isopoly acids of molybdenum