

11. Citing example of electron transfer reaction involving azide and sulphocyanide ion, explain which of these is slower and why ?
12. What is meant by oxidative addition reactions ? Cite two examples of such reactions.
13. Electron transfer between  $[\text{Fe}(\text{CN})_6]^{3-}$  and  $[\text{Fe}(\text{CN})_6]^{4-}$  is much more faster than between  $[\text{Co}(\text{NH}_3)_6]^{2+}$  and  $[\text{Co}(\text{NH}_3)_6]^{3+}$  why ?
14. Give a brief account of metal carbonyls species with 17 electrons.
15. Demonstrate the relationship between stepwise and overall stability constant in coordination equilibria.
16. Cite an example of a complex depicting metal carbonyl scrambling along with mechanism.
17. Discuss how does Chelate effect affect the stability of complexes ?
18. Write down the possible structures of  $\text{Co}_2(\text{CO})_8$ .
19. Give a brief account of water exchange reaction of first transition series. 11×2=22

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Total No. of Pages : 4

**PC 13099-N**

**L-3/2111**

**REACTION MECHANISM OF TRANSITION METAL  
COMPLEXES—312**

**Semester—III**

Time Allowed : Three Hours]

[Maximum Marks : 55

**Note** :- The candidates are required to attempt *two* questions each from Sections A and B. Section C will be compulsory.

**SECTION—A**

1. (a) Highlight the influence of the leaving group on substitution reactions of :
  - (i) Square planar complexes
  - (ii) First transition series octahedral complexes. 4
- (b) With suitable example show that the rate law for base hydrolysis of octahedral cobalt amine complexes is  $K_{\text{obs}}[\text{complex}][\text{OH}^-]$ . Also provide evidences in its support. 4
2. (a) The observed rate law for the reaction  $\text{Pt L}_3\text{X} + \text{Y} \xrightarrow{\text{S}} \text{Pt L}_3\text{Y} + \text{X}$  is found to be  $\{K_s + K_y[\text{Y}]\} [\text{Pt L}_3\text{X}]$ . Write down the mechanism for the reaction and provide two evidences in support of the above rate law. 6

- (b) Propose an accepted mechanism for the reaction in aqueous medium :
- $$[\text{Co}(\text{NH}_3)_3\text{Cl}]^{2+} + \text{NO}_2^- \rightarrow [\text{Co}(\text{NH}_3)_3\text{NO}_2]^{2+} + \text{Cl}^- \quad 2$$
3. (a) Briefly explain the Marcus Hush theory in reference to outer sphere electron transfer reactions in octahedral complexes. Citing example highlight its importance. 4
- (b) Citing suitable example explain the stereochemical non rigidity observed in the organometallic compounds having Cyclic  $\pi$  -bonded polyene ligand. 4
4. Write informative notes on any *two* of the following :
- (i) Non complementary reactions.
- (ii) Reactions of octahedral complexes involving attack on the ligand.
- (iii) Reactions of binuclear carbonyl complexes. 8

#### SECTION—B

5. Give an account of the following reactions of organometallic compounds :
- (a) Insertion of carbon monoxide
- (b) Cleavage of C-H bonds. 4,4½
6. (a) What is meant by stability constant of a metal complex ? Describe the ion exchange method of determination of binary Stability Constants. 4

- (b) What are the favourable conditions a complex must possess in order to undergo reductive elimination reactions ? Give two examples of such reactions along with their mechanism. 4½
7. (a) Describe the Job's method of determination of binary Stability Constants. 4
- (b) Explain the potentiometric method of determination of stability constant of metal complexes. 4½
8. (a) How does the statistical effect help in the study of stability constant of a complex ? 4
- (b) Alkene inserts into M-H bond easily but not into M-R bond, while in case of CO insertion the situation are reversed, explain. 3
- (c) Differentiate between kinetic and thermodynamic stability of transition metal complexes sighting suitable examples. 1½

#### SECTION—C

9. Explain the lability/inertness of low and high spin octahedral complexes of  $\text{Mn}^{2+}$  ?
10. Predict which of the ligand would result in formation of more stable complex and why ?
- (i)  $\text{Cr}^{3+}$  with  $\text{NH}_3$  or  $\text{CO}$
- (ii)  $\text{Hg}^{2+}$  with  $(\text{C}_2\text{H}_5)_2\text{O}$  or  $(\text{C}_2\text{H}_5)_2\text{S}$ .