

6 SEM TDC CHMH (CBCS) C 13

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(June/July)

CHEMISTRY

(Core)

Paper : C-13

(Inorganic Chemistry)

Full Marks : 53

Pass Marks : 21

Time : 3 hours

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

1. Choose the correct answer from the following : 1×7=7

(a) In the complex $(\sigma\text{-C}_3\text{H}_5)\text{Re}(\text{CO})_5$, the allyl group is

(i) monohapto ligand

(ii) dihapto ligand

(iii) trihapto ligand

(iv) pentahapto ligand

(b) The stretching wave number of CO molecule is 2143 cm^{-1} . The C—O stretching wave number of CO in $\text{Ni}(\text{CO})_4$ is

(i) 2060 cm^{-1}

(ii) 2160 cm^{-1}

(iii) 2260 cm^{-1}

(iv) 2243 cm^{-1}

(c) Which of the following complexes does not obey $18 e^-$ rule?

(i) $\text{Fe}(\eta_5\text{-C}_5\text{H}_5)_2$

(ii) $\text{Cr}(\eta_3\text{-C}_5\text{H}_5)_2$

(iii) $\text{Co}_2(\text{CO})_8$

(iv) $\text{Fe}(\text{CO})_4 \text{PPh}_3$

(d) Which of the following has minimum *trans*-effect?

(i) C_2H_4

(ii) NO_2^-

(iii) NH_3

(iv) Br^-

- (e) Which of the following combinations of basic radicals belongs to group IV?
- (i) Zn, Co, Ni
 - (ii) Zn, Co, Mg
 - (iii) Zn, Ni, Hg
 - (iv) Mn, Ni, Pb
- (f) What is the chemical form of the precipitates of group V?
- (i) Chloride
 - (ii) Sulphide
 - (iii) Hydroxide
 - (iv) Carbonate
- (g) Which of the following complexes is called Wilkinson's catalyst?
- (i) $\text{RhCl}(\text{PPh}_3)_3$
 - (ii) $\text{Ir}(\text{CO})\text{Cl}(\text{PPh}_3)_2$
 - (iii) $\text{HCo}(\text{CO})_4$
 - (iv) $\text{Zr}(\text{CH}_3)\text{ClPh}_2$

2. Answer any five from the following questions : 2×5=10

- (a) How does a precipitation occur in solution during salt analysis? Why is H_2S passed in acidic medium for the precipitation of group II basic radicals?

1+1=2

- (b) Give an example of reaction in which HCo(CO)_4 is used as catalyst. 2
- (c) What is *trans*-effect? Write down the *trans*-series. 1+1=2
- (d) Give one method of preparation of each of the following : 2
- (i) Zeise's salt
 - (ii) Ferrocene
- (e) Assuming 18-electron rule is valid, find the number of metal-metal bonds in metal carbonyls $\text{Fe}_3(\text{CO})_{12}$ and $\text{Co}_4(\text{CO})_{12}$. 2
- (f) What are labile and inert complexes? Explain with examples. 2

UNIT—I

3. Answer any two from the following questions : $3 \times 2 = 6$

- (a) What is common-ion effect? Discuss the application of common-ion effect in the qualitative analysis of inorganic salt. 1+2=3

(b) Explain why concentrated HCl is used in the flame test for basic radicals. Whether flame test can be done for a salt having Cu^{2+} ion in presence of BO_3^{3-} acid radicals? $1\frac{1}{2}+1\frac{1}{2}=3$

(c) What is solubility product? Explain why during the precipitation of group III NH_4OH is added in presence of NH_4Cl . $1+2=3$

UNIT—II

4. Answer any four from the following questions : $3 \times 4 = 12$

(a) Outline the synthesis of a low nuclearity carbonyl cluster. Discuss the structure of the cluster. $1+2=3$

(b) Draw the MO energy level diagram of CO molecule and discuss its π -accepting ability. $2+1=3$

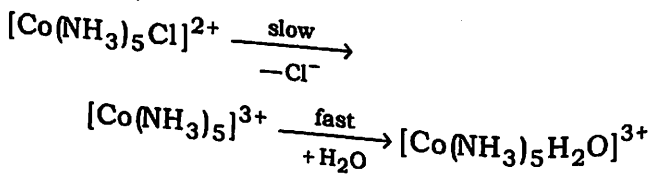
(c) What is 18-electron rule? How is 18-electron rule helpful in determining the number of metal-metal bonds in metal carbonyl compounds? $1+2=3$

- (d) Discuss the structure and bonding in Zeise's salt. 3
- (e) Discuss the role of triethyl aluminium in the polymerization of ethane. 3
- (f) Discuss the bonding in ferrocene with the help of MOT. 3

UNIT—III

5. Answer any four from the following questions : 3×4=12

- (a) Discuss the mechanism of the following reaction : 3



- (b) A thermodynamically stable complex may not be kinetically stable. Explain. 3

- (c) Discuss the effects of the following factors on the rate of hydrolysis of octahedral complex : 1½×2=3

- (i) Charge on the substrate
- (ii) Steric effect

- (d) Starting from $[\text{PtCl}_4]^{2-}$ and other ligands, outline the synthesis of *cis*- and *trans*- $[\text{PtCl}_2(\text{NH}_3)(\text{NO}_2)]$. 3
- (e) Discuss the base hydrolysis reaction of a cobalt complex. 3

UNIT—IV

6. Answer any *two* from the following questions : $3 \times 2 = 6$
- (a) Give the reaction path of the hydrogenation of olefin with the help of Wilkinson's catalyst. 3
- (b) Discuss the route of hydroformylation reaction catalyzed by $\text{HCo}(\text{CO})_4$. Mention the oxidation and insertion steps during the course of the reaction. $2 + 1 = 3$
- (c) Discuss Wacker process of oxidation of ethylene. 3
