

May 2023

**B.Sc. (Chemistry) VI Semester  
Inorganic Chemistry-IV (BCH-601)**

Time : 3 Hours]

[Max. Marks : 75

*Instructions :*

1. *It is compulsory to answer all the questions (1.5 marks each) of Part-A in short.*
2. *Answer any four questions from Part-B in detail.*
3. *Different sub-parts of a question are to be attempted adjacent to each other.*

**PART-A**

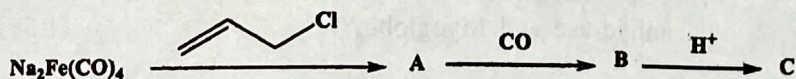
1. (a) Using 18 electron rule, Find the value of 'n' in the  $\text{Cr}(\eta^3\text{-C}_5\text{H}_5)(\text{CO})_n\text{CH}_3$  complex. (1.5)
- (b) What is Bohr Effect? (1.5)
- (c) Draw the tetrameric structure of  $\text{CH}_3\text{Li}$ . (1.5)
- (d) What is cis-platin? (1.5)
- (e) What is zeise's salt? How will you prepare zeise's salt in laboratory, write chemical reaction only. (1.5)
- (f) Draw the structure of  $\text{Ru}_3(\text{CO})_{12}$ . (1.5)
- (g) Define solubility product. (1.5)
- (h) What metals are found in Carboxypeptidase, Carbonic anhydrase and Myoglobin? (1.5)

- (i) Write any *one* synthetic method for ferrocene. (1.5)  
 (j) V-C bond length in  $\text{NaV}(\text{CO})_6$  and  $\text{V}(\text{CO})_6$  are 1.93 Å and 2 Å respectively. Explain the behaviour. (1.5)

### PART-B

2. (a) (i) Draw the active site/structure of Hemoglobin. (5)  
 (ii) Write a short note on trialkyl aluminium (dimer). (5)
- (b) In a homogenous catalytic reaction 1 mole substrate and 1 micromole of catalyst produces 1 millimole of product in 10 seconds. Calculate the turn over number (TON) and turn over frequency (TOF). (5)
3. (a) The solubility of calcium fluoride (molecular weight 78) is  $1.95 \times 10^{-2}$  gram per litre at 25°C. What is its solubility product? Will its solubility be more, less or the same in 0.01 molar solution of calcium chloride (molecular weight 111)? and Why? (5)
- (b) What is Wilkinson catalyst? Explain the alkene hydrogenation catalytic cycle by Wilkinson catalyst and why ethylene does not undergo hydrogenation by Wilkinson catalysis. (10)
4. What are Metal Carbonyls? Explain the sigma and pi bonding in metal carbonyls and also discuss the factors affecting carbonyl frequencies. (15)

5. (a) Complete the following : (3)



- (b) What do you understand by interfering acids? How will you remove the borate, fluoride and phosphate from the given mixture by qualitative analysis? (12)
6. (a) Explain the toxicity due to Hg, Pb, Cd and As metal ions in details. (12)  
 (b) Show that Nitrosyl is bent or Linear in  $[(\eta^3\text{-C}_5\text{H}_5)\text{Ru}(\text{CO})_2\text{NO}]$ . (3)
7. (a) Determine the pH of a solution obtained by mixing equal volumes of 0.015 N  $\text{NH}_4\text{OH}$  and 0.15 N  $\text{NH}_4\text{NO}_3$  solutions. ( $K_b$  for  $\text{NH}_4\text{OH}$  is  $2 \times 10^{-5}$ ).  
 [Given that the value of  $\log 2$  is 0.3010]
- (b) Solid  $\text{Co}_2(\text{CO})_8$  (A) shows IR bands 1857, 1886, 2001, 2031, 2044, 2059, 2071 and 2112  $\text{cm}^{-1}$ . When it is dissolved in hexane the bands at 1857 and 1886  $\text{cm}^{-1}$  disappear to form B. Write structures of A and B with explanation.
- (c)  $[(\eta^2\text{-ethylene})_2\text{-Rh}(\mu\text{-Cl})]_2$  Dimeric complex of Rh has symmetrically bridging gp. The geometry around Rh is square planar, Calculate the B.O. and draw the structure. (5+5+5=15)