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6 SEM TDC CHMH (CBCS) C 13

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(May)

CHEMISTRY

(Core)

Paper : C-13

**[Inorganic Chemistry
(Organometallic 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) The PO_4^{3-} group should be removed before proceeding to analysis is

- (i) group IV
- (ii) group V
- (iii) group III
- (iv) group II

(b) Which of the following combinations of basic radicals belongs to group V ?

(i) Zn, Co, Mg

(ii) Ba, Ca, Sr

(iii) Ca, Mg, Zn

(iv) Sr, Ca, Co

(c) Considering $(C_5H_5)Fe(CO)_2Cl$ is obeying the 18-electron rule, what is the hapticity of C_5H_5 group?

(i) 3

(ii) 1

(iii) 5

(iv) 2

(d) Which of the following complexes has the lowest value of stretching frequency in the IR spectrum?

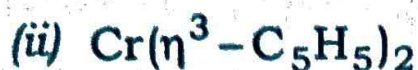
(i) $[Ti(CO)_6]^{2-}$

(ii) $[V(CO)_6]^-$

(iii) $[Mn(CO)_6]^+$

(iv) $[Cr(CO)_6]$

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



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



(g) Which of the following is used in hydroformylation of unsaturated hydrocarbons?



UNIT—I

2. (a) What is common-ion effect? Discuss the role of NH_4Cl in the precipitation of group III basic radicals. 1+2=3

Or

- (b) What is interfering radical? How do they interfere in the precipitation of basic radicals in a particular group? Establish with suitable example. 1+2=3

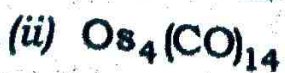
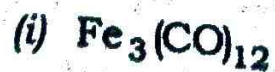
3. (a) What is soda extract? Discuss the chemistry of soda extract with suitable example. 1+3=4

- (b) Write down the basic radicals present in group IV and its group reagent. 1

UNIT—II

4. Answer any three of the following : 2×3=6

- (a) Assuming $18 e^-$ rule is being obeyed, calculate the number of metal-metal bonds in the following two complexes :



(b) Write down the structures of the following :



(c) Mention the conditions necessary for isolobality of two molecular fragments.

(d) Compare the reactivity of ferrocene with that of benzene.

5. Answer any *three* of the following : $3 \times 3 = 9$

(a) Write down any two methods of preparation of binuclear carbonyls with suitable examples. $1\frac{1}{2} + 1\frac{1}{2} = 3$

(b) Explain π -acceptor behaviour of CO in the light of MO diagram. 3

(c) What is Zeise's salt? Discuss its structure. $1 + 2 = 3$

(d) Ferrocene shows (i) metalation reaction and (ii) Mannich condensation. Establish with suitable examples. $1\frac{1}{2} + 1\frac{1}{2} = 3$

6. Write a short note on any *one* of the following :

2

(a) Ziegler-Natta catalyst

(b) Schlenk equilibrium

UNIT—III

7. Answer any *four* of the following : $3 \times 4 = 12$

(a) Discuss the associative mechanism of substitution in octahedral complex and show its reaction profile. $2+1=3$

(b) How does thermodynamic stability of complex differ from its kinetic stability? Explain. 3

(c) Explain *trans*-effect in square planar complexes with suitable examples. 3

(d) Discuss the effect of the following factors on the rate of aquation of a hexacoordinated complex : $1\frac{1}{2} + 1\frac{1}{2} = 3$

(i) Charge on the complex

(ii) Chelation

(e) Discuss the base hydrolysis reaction of a cobalt complex. 3

UNIT—IV

8. Discuss the mechanism of the following processes (any *three*) : 3×3=9

- (a) Alkene hydrogenation by Wilkinson's catalyst
- (b) Hydroformylation by cocatalyst
- (c) Wacker process
- (d) Fischer-Tropsch reaction
