M.Sc. CHEMISTRY FOURTH SEMESTER INORGANIC CHEMISTRY-V (INORGANIC POLYMERS & ORGANOMETALLICS) MSC-403 B

(Use separate answer scripts for Objective & Descriptive)

Duration: 3 hrs. Full Marks: 70

(PART-A: Objective)

Time: 20 min. Marks: 20

Choose the correct answer from the following:

1x20 = 20

- 1. Grubbs metathesis catalysts have
 - a. Poor tolerance to functional groups
- b. Tolerance to functional groupd. None of the above
- c. No effect of functional groups
- 2. Oxidative addition can occur when a complex behaves as
 - a. Lewis acid

- b. Lewis base
- c. Both as Lewis acid and base
- d. Bronstead acid
- 3. The number of ¹HNMR signal at 80 °C, for η^{1} -Cp in $(\eta^{1}$ -Cp) $(\eta^{5}$ -Cp)Fe(CO)₂ is
 - a. one c. three

b. two d. four

- c. three
- **4.** The CO stretching frequency of Ni(CO)₄, Co(CO)₄ and Fe(CO)₄² respectively are
 - a. 2060, 1890 and 1790 cm⁻¹

b. 2060, 1790 and 1890 cm⁻¹

c. 1790, 1890 and 2060 cm⁻¹

- d. 1790, 2060 and 1890 cm⁻¹
- 5. The CH fragment is Isolobal with the
 - a. Fragment- d9-ML3

- b. Fragment- d8-ML3
- c. Fragment- d¹¹-ML₃

 d. Fragment- d⁻-ML₃
- 6. The structure of the compound [(Cl)₃ W(μ -Cl)₃ W(Cl)₃] is
 - a. Face sharing bio-octahedral
- b. Edge sharing bio-octahedral
- c. Corner sharing bio-octahedral
- d. None of the above
- 7. The number of unpaired electron in U(C₈H₈)₂ is
 - a. one

- b. two d. four
- c. three
- 8. In the hydroformylation reaction, the intermediate $CH_3CH_2CH_2Co(CO)_3$
 - a. Forms an acyl intermediate CH₃CH₂CH₂COC₀(CO)₃.
 - b. Forms an adduct with olefin reactant.
 - c. Forms an adduct with H2.
 - d. Eliminate Propane.
- 9. Match the following items of Row I with the appropriate item in Row II.

Row I: Wilkinson's catalysts(P), Whacker Catalysts(Q), Monsanto Catalyst (R), Hydroformylation catalysts (S):

Row II: Co₂(CO)₈ (i), {Rh(CO)₂I₂]- (ii), PdCl₂/CuCl₂(iii), RhCl(PPh₃) ₃(iv)

a. P=i, Q=ii, R=iii, S= iv

b. P= iv, Q=iii, R= ii, S=i

c. P=iv, Q=iii, R= i, S=ii

d. P=iii, Q=vi, R=ii, S=i

10. Isotactic and Syndiotactic polypropylene are formed by catalysts having the respective b. C2 and Cs a. Cs and Co d. C2 and C2 c. Cs and Cs 11. In the Hydrogenation of alkene using [Rh(CO)(H)(PPh₃)₃] catalysts, addition of excess PPh3 wouldb. Decrease the rate of reaction a. Increase the rate of reaction c. Not influence the reaction d. Stop the reaction 12. A plastic material that maintains their shape upon extended period of strain or at high temperature is calledb. Duroplastic a. Thermoplastic d. Block polymer c. Elastomer 13. The structure of boron nitride is similar witha. Graphite b. Diamond c. C₆₀ d. None of the above 14. The examples of thermosetting polymer isa. LDP b. Backelite c. Polythene d. None of these 15. When borazene reacts with HCl then it givesb. B₃N₃H₆Cl₃ c. BaNaHoCla d. B₃N₃H₃Cl₃ 16. Which of the following is an organometallic polymer? b. Polythene a. Ferrocene c. PVC d. None of these 17. Hydrolysis of dimethyldicholosilane yield a. Linear polymer b. Condensation polymer c. Branched polymer d. None of these 18. Which of the following metal atom is involved in polymers of ferrocene? a. Co b. Ni c. Fe d. Zn 19. Metalloporphyrin ring bears substituted phenylene groupb. 3 a. 4 d. 5 c. 2 20. Co-ordination polymers are polymers havingb. Covalent bond a. Ionic bond c. Co- ordinate covalent bond d. None of these

PART-B: Descriptive

Time: 2 hrs. 40 min. Marks: 50

[Answer question no.1 & any four (4) from the rest]

5+5=10

5+5=10

5+5=10

10

10

6+4=10

5+5=10

1. a. Explain how with the help of ¹HNMR spectra it has been established that the fluxionality of $(\eta^1$ -Cp) $(\eta^5$ -Cp) Fe (CO) ² is 1, 2- rather than 1, 3-shifts.

b. Write the method of preparation of borazene.

2. a. Explain how Adams-Cotton mechanism of exchange was established for [CpFe (CO) 2]2 with ¹HNMR and ¹³C NMR study.

b. Explain the synthesis, bonding and applications of N-heterocyclic Carbene.

3. a. Explain the bonding in Cp_2MCl_2 complex and show why Cp_2MoCl_2 behaves as π -base and Cp_2TiCl_2 as π -acid.

b. Describe the Oxidative addition reaction.

4. Describe in details the types of Alkene Metathesis reactions and the mechanism of metathesis reactions.

 Explain the synthesis of Isotactic, Syndiotactic and Isotactic-atactic streoblock polypropylene polymers using various pre-catalysts of Zrcomplex and MAO.

6. Explain the chemical properties and structure of borazene.

7. What are silicone polymers? How it can be prepared? Write its application. 3+4+3=10

8. Explain the following:

i. Metalloporphyrin polymers.

ii. Co-facial phthalocyanine polymers.

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