REV-01
BSC/01/05

2025/05

SET A

B.Sc. CHEMISTRY
SIXTH SEMESTER
INORGANIC CHEMISTRY IV
BSC – 601 [REPEAT] OLD COURSE
[USE OMR FOR OBJECTIVE PART]

Duration: 3 hrs. **Full Marks: 70**

Objective

Time: 30 min. **Marks: 20**

Choose the correct answer from the following: ***1×20=20***

1. Zeise's salt is
   a. Potassium platinum chlorate
   b. Potassium trichloro (ethylene) platinate (II)
   c. Platinum ethylene chloride
   d. None of the above

2. $Fe_2(CO)_9$ is prepared by
   a. Thermal decomposition of $Fe(CO)_5$
   b. Photolysis of $Fe(CO)_5$
   c. Reductive Carbonylation of $Fe(CO)_5$
   d. None of the above

3. Terminally bonded CO group absorbs at
   a. 2050-1900 cm^{-1}
   b. 1800-1700 cm^{-1}
   c. 1900-1800 cm^{-1}
   d. None of the above

4. The dimeric cyclopentadienyl rhodium has a
   a. Tetrahedral geometry
   b. Square planar geometry
   c. Trigonal bipyramidal geometry
   d. None of the above

5. Ferrocene is an organometallic compound because it
   a. has M-C bond
   b. is a metal alkyl
   c. behaves like a Grignard Reagent
   d. None of the above

6. Zieglar-Natta polymerization catalyst contains which metal?
   a. Zn
   b. B
   c. Sn
   d. Al

7. Which of the following act as fungicides and pesticides
   a. Organoaluminium compounds
   b. Organomagnesium compounds
   c. Organolithium compounds
   d. Organotin compounds

8. Which of the following compound react with carbon dioxide followed by dilute acid to give carboxylic acid?
   a. CH_3MgBr
   b. BuLi
   c. B_2H_6
   d. None of the above

9. $(C_5H_5)_2Be$ is called
   a. Boranocene
   b. Ferrocene
   c. Beryllocene
   d. None of the above

10. $B_2H_6 + 6\ C_2H_4 = 2B(C_2H_5)_3$ this reaction is called
    a. Polymerization reaction
    b. Wurtz coupling reaction
    c. Hydroboration reaction
    d. None of the above

11. The conditions for alkylation of ferrocene are
    a. 230 atm, 100 °C
    b. 200 atm, 150 °C
    c. 250 atm, 200 °C
    d. 200 atm, 80 °C

12. Reduction of nitro ferrocene to amino ferrocene is carried out by
    a. Pd/HCl
    b. BuLi
    c. $AlCl_3$
    d. HCHO/NaOH

13. The extent of M–C π bonding is highest
    a. Metal alkynyls
    b. Metal alkyls
    c. Metal aryls
    d. None of the above

14. Among the following, species expected to show fluxional behavior are
    a. IF_7
    b. NaCl
    c. $CoCl_6$
    d. H_2O

15. The IUPAC name of the Wilkinsons catalyst [RhCl(PPh3)3] is
    a. Chloro tris (tri phenyl phopshine) rhodium (I)
    b. Chlorotris (triphenylphosphine) rhodium (0)
    c. Chlotrotris (triphenylphosphine) rhodium (VI)
    d. Chlorotris (triphenylphosphine) rhodium (IV)

16. The correct increasing order of *trans*-effect of the following species is
    a. $CN^- > C_6H_5^- > Br^- > NH_3$
    b. $C_6H_5^- > Br^- > NH_3 > CN^-$
    c. $Br^- > NH_3 > CN^- > C_6H_5^-$
    d. $NH_3 > CN^- > C_6H_5^- > Br^-$

17. The sum of coordination number and oxidation number of the metal M in the complex $[M(en)_2(C_2O_4)]Cl$ (where *en* is ethylenediamine) is
    a. 8
    b. 6
    c. 9
    d. 4

18. Which of the following is not a condition of outer sphere reaction mechanism
    a. Both complexes should be in same spin
    b. The electron to be transferred in t_{2g} set of orbitals
    c. Both complexes should be in different spin
    d. It should require a little activation energy

19. Aquation through a square pyramidal intermediate always leads to
    a. Retention of geometry
    b. Inversion of configuration
    c. Racemisation
    d. None of the above

20. In coordination chemistry, the SN^1 CB (conjugate base) mechanism describes the pathway by which
    a. Many metal carbonyl complexes undergo substitution, that is, ligand exchange
    b. Many metal amine complexes undergo substitution, that is, ligand exchange
    c. Many metal nitrosyl complexes undergo substitution, that is, ligand exchange
    d. None of the above

-- --- --

Descriptive

Time : 2 hrs. 30 min. **Marks : 50**

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

1. **a.** What are the main features of the SN1(CB) mechanism for base hydrolysis? **3+3+2+2 =10**
   b. What is hapticity? Illustrate with suitable example.
   c. What is Grignard reagent and state two applications of it.
   d. Why metal alkynyl compounds are more stable than metal alkyl or aryl compounds?

2. **a.** Write the mechanism for Fridel Crafts alkylation of ferrocene. **3+3+2+2 =10**
   b. How is $Fe_2(CO)_9$ produced from Fe $(CO)_5$?
   c. Classify the following reactions:
   (i) $Hg(CH_3)_2 + 2Na = 2NaCH_3 + Hg$
   (ii) $2Al + 3H_2 + 6C_2H_4 = Al_2(C_2H_5)_6$
   d. How does ferrocene undergo Vilsmeir reaction?

3. **a.** Explain the conditions of outer sphere mechanism and inner sphere mechanism with chemical reaction. **5+5=10**
   b. Write synthesis of sodium, lithium and magnesium organometallic compounds.

4. **a.** What are the experimental observations fails to explain by SN^2 mechanism for base hydrolysis? Explain with chemical reaction. **3+3+4 =10**
   b. Give uses for organotin, organoaluminium and organo-magnesium compounds.
   c. Based on Electron Diffraction Studies, discuss the structure of $Ni(CO)_4$.

5. **a.** Show general methods of preparation for s and p block organometallic compounds with examples. **5+2+3 =10**
   b. Discuss the synthesis of cis & trans $[Pt(C_2H_4)(NH_3)Cl_2]$ and cis & trans $[Pt(NH_3)_2Cl_2]$
   c. Write the mechanism for Fridel Crafts alkylation of ferrocene.

6. a. What is Synergetic Effect? Illustrate taking example of a metal carbonyl. 3+4+3 =10

b. Why both SN^1 and SN^2 pathways of aquation predict that the rate of reaction depends only $[MA_5X]^{n+}$? Explain with chemical reactions.

c. Explain why ethylberylium is dimer but tertiarybutylberylium is a monomer.

7. a. Write two disadvantages of cobalt carbonyl catalyst in the hydroformylation reaction of propylene. 3+4+3 =10

b. What is Zeise's salt? How is it prepared? Discuss it structure.

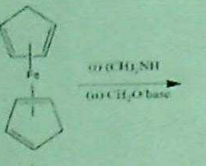
c. What are the experimental observations fails to explain by SN^2 mechanism for base hydrolysis? Explain with chemical reaction.

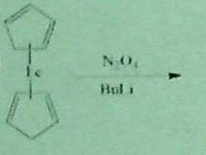
8. a. Give the mechanism of Wilkinson's catalyst. 3+3+3+1 =10

b. What is the geometry of $Fe(CO)_5$? How was it established?

c. How does ring substituted ferrocene reacts with acetic acid?

d. Complete the reaction:

(i) 

(ii) 

= = *** = =