# M.Sc. CHEMISTRY
# THIRD SEMESTER
# INORGANIC CHEMISTRY-III
# MSC-302

**Duration: 3 Hrs.** **Marks: 70**

PART : A (OBJECTIVE) = 20
PART : B (DESCRIPTIVE) = 50

## [ PART-B : Descriptive ]

**Duration: 2 Hrs. 40 Mins.** **Marks: 50**

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

1. (a) Discuss the Iron-Sulphur clusters in ferredoxins. (5+5=10)
   (b) Explain the use of Organometallic compounds in Hydroformylation reaction.

2. Discuss the synthesis and structure of Ferrocene. (2+8=10)

3. (a) What are the main strategies adopted by chemists to synthesizes Metal Alkyls? (5+5=10)
   (b) Write briefly about preparation and use of Silicone.

4. (a) Write the mechanism of acid hydrolysis reaction when the inert ligand is a pi-donor. (5+5=10)
   (b) Explain the Dewar- Chatt - Duncanson model for explanation of the structure of Metal Olefins. What are the factors that determine back bonding from metal to olefin and how does it affect olefin structure?

5. (a) Discuss metal excess defect by giving one example and mention the consequences. (5+5=10)
   (b) What is intrinsic semiconduction? A compound $A_xB_y$ has a cubic structure with A atoms occupying all corners of the cube as well as all the face centre positions. B atoms occupying the tetrahedral voids. Find the value of x and y.

6. (a) Discuss the symmetry elements found in crystalline solids with figures. (5+5=10)
   (b) What is called base hydrolysis reaction? Explain the mechanism of base hydrolysis reaction.

7. (a) Explain the uses of trans effect. (4+6=10)
   (b) What are the differences between electron transfer mechanisms? Explain with examples.

8. (a) Write short notes on nitrogen fixation. (5+5=10)
   (b) Write the differences between photosystem -I and photosystem-II.

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## [ PART-A : Objective ]

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

1. The compound used in stereospecific polymerization of alkene to form synthetic rubber is:
   a. Tetraethyl Lead
   b. Alkyl Lithium compounds
   c. Aluminum Alkyls, $Al_2Me_6$
   d. Grignard Reagent

2. Cross linked Silicone polymer are produced from hydrolysis of:
   a. $Me_3SiCl$
   b. $Me_2SiCl_2$
   c. $MeSiCl_3$
   d. $SiCl_4$

3. Human disaster at Minimata, Japan is caused by:
   a. Lithium alkyls
   b. Potassium Cyanide
   c. Tetraethyl Mercury
   d. Methyl Mercury ion

4. The structure of $H_2Os_6CO)_{18}$ is:
   a. Closo-
   b. Nido-
   c. Arachno-
   d. Hypho-

5. The molecular fragment CH is isolobal with:
   a. $(CO)_4$ Co
   b. $(CO)_3$ Cr
   c. $(CO)_3$ Co
   d. $(CO)_3$ Ni

6. Which one of the following is most stable?
   a. $Fe(CO)_3$ (NO)
   b. $Fe(CO)_2(NO)_3$
   c. $Fe(CO)(NO)_4$
   d. $Fe(CO)_2(NO)_2$

7. Stereoregular polypropylene is called:
   a. Isotactic-polymer
   b. Atactic polymer
   c. Syndiotactic polymer
   d. Oligomer

8. The oxygen of coordinated CO is susceptible to:
   a. Nucleophilic attack
   b. Electrophilic attack
   c. Mesomeric attack
   d. Inductive attack

9. How many atoms are there in an element packed in FCC structure?
   a. 1
   b. 2
   c. 4
   d. 8

10. A crystal has the lattice parameters $a \neq b \neq c$ and $\alpha=\beta=\gamma=90^o$. The crystal system is:
    a. Tetragonal
    b. Monoclinic
    c. Cubic
    d. Orthorhombic

11. When Frenkel defects are created in an otherwise perfect ionic crystal, the density of the crystal:
    a. Increases.
    b. Decreases.
    c. Remains same.
    d. First increases then decreases.

12. When crystals of NaCl are heated in the presence of Na vapour, they turn yellow due to:
    a. Schottky defects
    b. Frenkel defects
    c. F-centeres
    d. Intrinsic defect

13. For the reaction
    $[Fe(CN)_6]^{4-} + [Mo(CN)_8]^{3-} \rightarrow [Fe(CN)_6]^{3-} + [Mo(CN)_8]^{2-}$
    a. Inner sphere reaction.
    b. Outer sphere reaction.
    c. Induced electron transfer reaction.
    d. None of the above.

14. The reaction of $[PtCl_4]^{2-}$ with $NH_3$ gives:
    a. $[PtCl_4(NH_3)_2]^{2-}$ b. $[PtCl_4(NH_3)_2]^-$
    c. trans$[PtCl_4(NH_3)]^{2-}$ d. Cis-$[PtCl_2(NH_3)_2]$

15. Reduction of $[CoCl(NH_3)_5]^{2+}$ by $[Cr(H_2O)_6]^{2+}$ is via:
    a. Inner sphere mechanism.
    b. Quater sphere mechanism.
    c. Both (a) and (b).
    d. None of the above.

16. The reaction between $[Fe(CN)_6]^{3-}$ and $[Cr(NH_3)_5H_2O]^{2+}$ following an inner sphere mechanism the possible intermediate is:
    a. $[Cr(NH_3)_5OH\text{-}Fe(CN)_5]$
    b. $[Cr(NH_3)_5NC\text{-}Fe(CN)_5]^-$
    c. $[Cr(NH_3)_4(OH)_2NC\text{-}Fe(CN)_5]$
    d. $[Cr(NH_3)_5CN\text{-}Fe(CN)_5]^-$

17. Iron sulphur clusters in biological systems are:
    a. Proton transfer
    b. Atom transfer
    c. Group transfer
    d. Electron transfer

18. Nitrogen enzyme contains:
    a. Fe-S protein
    b. Mo-Fe-S protein
    c. Both (a) and (b)
    d. None of the above

19. Ferritin and transferring are:
    a. Hydrolysis.
    b. Metal storage and structural proteins.
    c. Electron carriers.
    d. Metal sensors.

20. Vitamin $B_{12}$ in an example of:
    a. Hydrolysis
    b. Oxidoreductases
    c. Isomerases and Synthases
    d. Siderophore

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# UNIVERSITY OF SCIENCE & TECHNOLOGY, MEGHALAYA

**[PART (A) : OBJECTIVE]**

**Duration : 20 Minutes**

| Serial no. of the main Answer sheet |
|---|
| |

**Course :** .....

**Semester :** ..... **Roll No :** .....

**Enrollment No :** ..... **Course code :** .....

**Course Title :** .....

**Session :** 2017-18 **Date :** .....

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**Instructions / Guidelines**

- The paper contains twenty (20) / ten (10) questions.
- Students shall tick (✓) the correct answer.
- No marks shall be given for overwrite / erasing.
- Students have to submit the Objective Part (Part-A) to the invigilator just after completion of the allotted time from the starting of examination.

| Full Marks | Marks Obtained |
|---|---|
| 20 | |

*Scrutinizer's Signature* *Examiner's Signature* *Invigilator's Signature*