

CHOICE BASED FOURTH SEMESTER M.Sc. CHEMISTRY DEGREE EXAMINATION  
AUGUST 2021

ORGANOMETALLIC AND BIOINORGANIC CHEMISTRY

Duration: 3 Hours

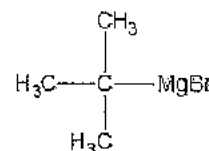
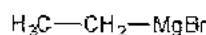
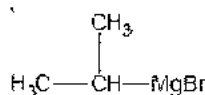
Max Marks: 70

PART - A

1. Answer any TEN of the following :

(10×2= 20 Marks)

- What are the requirements for  $\beta$ -hydride elimination?
- Explain the structure of Zeise's salt.
- Arrange the following in the increasing order of their stability and justify your answer.



- What are organocerium compound ? Give examples.
- What is Carbonylation ? Which catalyst is used in Monsanto acetic acid process ?
- What are Grignard reagents? Give examples.
- What is the driving force for the ions to move across membrane ? Explain in brief .
- What is metalloenzyme cofactor ?
- What do you mean by Gated and Non- Gated channel Proteins?
- What are the functions of Iron – Sulphur proteins?
- Account for the amino acids coordinated with Fe atoms in hemerythrin.
- How lead is toxic to human body?

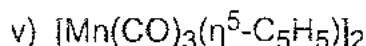
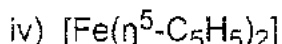
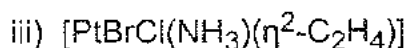
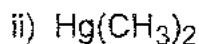
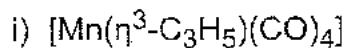
PART - B

Answer any Five questions selecting at least one question from each unit

(5×10=50 Marks)

UNIT - I

2. a) Write the names of the following organometallic compounds on the basis of IUPAC rules.



b) Explain the structure and bonding in metal nitrosyls. (5+5)

3. a) What are organometallic compounds? How are they classified?

b) Write a note on structure and bonding in metal carbonyls. (6+4)

UNIT - II

4. a) Describe catalytic cycle of wacker process.

b) What is the role of co-catalyst used in Wacker process? How is co-catalyst regenerated?

c) What is Oxo process? What are the disadvantages of cobalt based catalyst used in this process? (4+3+3)

5. a) What are the criteria's for organometallic compound to be a catalyst?

b) Explain oxidative addition with an example.

c) Distinguish between oxidative addition and reductive elimination. (4+3+3)

UNIT - III

6. a) Explain the structural features and biological functions of cytochrome P450.

b) Describe the role of catalase in biological process. (5+5)

7. a) Explain the structure and features of Vitamin B12 coenzyme.

b) Discuss the biochemical function of Vitamin B12. (5+5)

UNIT - IV

8. a) Explain the structure of ferritin and illustrate its functions.

b) Write a note on heme proteins and oxygen transport. (5+5)

9. a) Write a note on  $\text{O}_2$  and  $\text{CO}_2$  transport by hemoglobin.

b) Describe the structure and biological function of transferrin. (5+5)

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## CHOICE BASED FOURTH SEMESTER M.Sc. CHEMISTRY DEGREE EXAMINATION

AUGUST 2021

## SYNTHETIC METHODS IN ORGANIC CHEMISTRY

Duration: 3 Hours

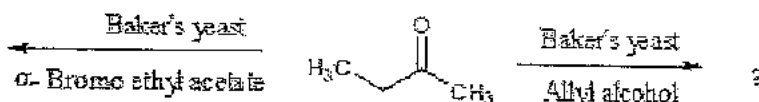
Max Marks: 70

## PART - A

1. Answer any TEN of the following :

(10×2= 20 Marks)

a). Complete the following:

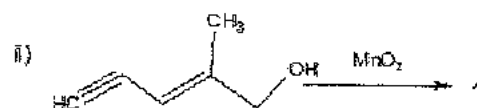
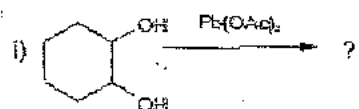


b). What are the characteristic features of PTC?

c). How is DCC prepared? Give any two of its applications.

d). Give an example for the halogenation of carbonyl compounds.

e). Complete the following:



f). How periodic acid is used to identify the presence of vicinal hydroxyl groups?

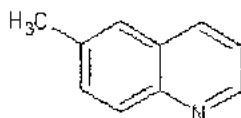
g). Give an example for Wolff- Kishner reduction

h). Give an example for heterogeneous catalytic hydrogenation.

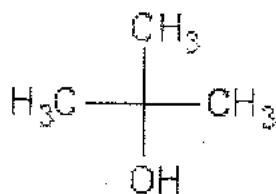
i). Give an example for reduction with arene sulphonyl derivative of hydrazine.

j). Give an example for a synthon and its synthetic equivalent.

k). Perform the retrosynthetic analysis of the following:



1). Perform the retrosynthetic analysis of the following :



### PART - B

Answer any Five questions selecting at least one question from each unit (5×10= 50 Marks)

#### UNIT - I

2. a) Discuss the following with SeO<sub>2</sub> i) allylic oxidation ii) oxidation of alkynes  
b) Give an account of application of crown ethers as phase transfer catalysts.

(6+4)

3. a) Explain the synthetic applications of lithium diisopropyl amide.

- b) Discuss the applications of DDQ in organic synthesis

(6+4)

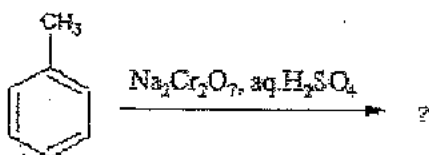
#### UNIT - II

4. a) Write a note on the following:

i) Jones oxidation ii) Etard reaction

- b) Predict the products and propose the mechanism :

(6+4)



5. a) Explain the applications of Osmium tetroxide in oxidation reactions. Comment on the merits and demerits of these reagents.

- b) Explain Baeyer-Villiger oxidation. Give its synthetic importance.

(6+4)

#### UNIT - III

6. a) What are homogeneous catalytic hydrogenation? Write its mechanism for reduction of alkenes with Wilkinson's catalyst.

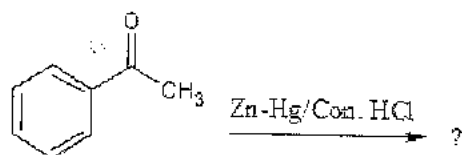
- b) Discuss the synthetic application of sodium borohydride in organic synthesis taking suitable examples

(5+5)

7. a) Describe the applications of  $\text{LiAlH}_4$  in organic synthesis.

b) Predict the product and outline the mechanism for the following:

(6+4)



#### UNIT - IV

8. a) Illustrate the C-X disconnection approach for the synthesis of 1,1 and 1,2--difunctionalised compounds.

b) Explain retrosynthetic analysis of benzocaine. Illustrate its synthesis.

(6+4)

9. a) What is chemoselectivity? Suggest a synthetic scheme for Juvabione.

b) Outline the principle of protection of carbonyl and carboxyl group.

(6+4)

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## CHOICE BASED FOURTH SEMESTER M.Sc. CHEMISTRY DEGREE EXAMINATION

AUGUST 2021

## PHYSICAL CHEMISTRY THEORY-III

Duration:3 Hours

Max Marks:70

## PART - A

1. Answer any TEN of the following :

(10×2= 20 Marks)

- a). How does ionic mobility affect the conductance ?
- b). What is Walden rule ? Explain in brief .
- c). How does viscosity affect the mobility of ions ?
- d). What is the importance of photovoltaic cell?
- e). What is the relation between transference number and liquid junction potential?
- f). What is electroplating ? Mention its importance .
- g). What are inner Helmholtz plane and outer Helmholtz plane in an Electrical double layer?
- h). What do you mean by cyclic voltammetry?
- i). What are the advantages of secondary cell over primary cell?
- j). What are the advantages of the Linear polarization method of measuring corrosion rate?
- k). Anodic coatings are preferred over cathodic coatings: Justify
- l). How does the overvoltage of hydrogen affect corrosion?

## PART - B

Answer any Five questions selecting at least one question from each unit (5×10= 50 Marks)

### UNIT - I

2. a) What is equivalent conductance ? Mention any 5 application of conductance measurements and explain it.  
b) The resistance of 0.01M solution of an acetic acid was found to be 210Ω at 25°C. Calculate (i) the molar conductance of the solution  
(ii) degree of dissociation of the acid .

Given: cell constant =  $0.88 \text{ cm}^{-1}$ , molar conductance of acid at infinite dilution

$(\lambda^\circ = 390.7 \times 10^{-4} \text{ Sm}^2/\text{mol}$  at 25°C. (6+4)

3. a) Explain electrokinetic phenomena - Electrophoresis with the help of diagram.  
b) Discuss Born model for ionic solvent interaction? (5+5)

### UNIT - II

4. a) Derive Nernst - Planck equation for membrane potential.  
b) Explain the need of Nernst equation to understand the concept of ion transport across the membrane. (6+4)
5. a) What is p-n junction ? Explain the formation of p-n junction.  
b) Distinguish between p type and n type semiconductors.  
c) Discuss the industrial applications of semiconductors.

(4+3+3)

### UNIT - III

6. a) Discuss advantages and disadvantages of fuel cell over normal energy conversion devices.  
b) Explain the principle and working of  $\text{H}_2\text{-O}_2$  fuel cell. (5+5)
7. a) Draw and explain typical polarogram.  
b) Enumerate the advantages and disadvantages of DME .  
c) Explain the principle of voltammetry. (4+3+3)

### UNIT - IV

8. a) Explain the following methods of corrosion control  
i) Cathodic protection ii) Mixed inhibitors  
b) What are the merits and demerits of anodic protection (6+4)
9. Explain the factors affecting corrosion rate. (10)

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**CHOICE BASED FOURTH SEMESTER M.Sc. CHEMISTRY DEGREE EXAMINATION**  
**AUGUST 2021**

**POLYMER AND SOLID STATE CHEMISTRY**

**Duration: 3 Hours**

**Max Marks: 70**

**PART - A**

**1. Answer any TEN of the following :**

**(10×2= 20 Marks)**

- a). If the value of  $\alpha$  and  $K$  are 0.5 and  $1 \times 10^{-2} \text{ cm}^3 \text{ g}^{-1}$  respectively. What is the average molecular weight of the polymer whose intrinsic viscosity is 150cc/g.
- b). Give the principle of membrane osmometric method of determination of molecular weight of a polymer.
- c). Outline the principle of sedimentation velocity method of determination of the polymer molecular weight.
- d). Give the equation for kinetic chain length for free radical polymerisation.
- e). Give examples of initiators used for free radical polymerisation.
- f). Differentiate between Nylon 6,6 and Nylon 6,10.
- g). Classify the following spinel compounds,  $\text{Fe}_3\text{O}_4$  and  $\text{CoFe}_2\text{O}_4$ .
- h). How does electronegativity affects glass formation?
- i). What are Cooper pairs?
- j). What kind of materials can be used as crucibles for solid state reactions?
- k). Mention any two differences between x-ray diffraction and electron diffraction.
- l). Give the significance of 'Systematic Absences' in x-ray diffraction pattern.



## PART - B

Answer any Five questions selecting at least one question from each unit (5×10= 50 Marks)

### UNIT - I

2. a) Outline the principle and working of Gel permeation chromatography.  
b) Explain the polymer fractionation by partial dissolution method. (6+4)
3. a) Explain the classification of polymers based on intermolecular forces and mode of synthesis.  
b) Explain the following terms with examples i) PDI ii) DP  
c) Write the structural formula of monomer units of polystyrene, Nylon 66, PMMA. (4+3+3)

### UNIT - II

4. a) Explain the mechanism of free radical copolymerisation.  
b) Explain the kinetics of ionic copolymerization. (6+4)
5. a) Explain the kinetics of acid-catalyzed polycondensation reaction.  
b) Outline the important features of condensation reaction.  
c) Give the reaction of formation of polyester. (4+3+3)

### UNIT - III

6. a) Write a note on Assumptions of Classical and Quantum free electron theory and comment on their merits and demerits.  
b) Describe forward biased p-n and junction and Reverse biased p-n junction using appropriate diagrams. (6+4)
7. a) Write a short notes on the following  
i) Pyro electric property ii) Piezoelectric property  
b) Write a note on properties and applications of Ferroelectric materials.  
c) Comment on the applications of Hall Effect. (4+3+3)

### UNIT - IV

8. a) Explain how Zirconia is prepared through Skull melting.  
b) Write a note on Cathodic deposition and Anodic Oxidation with examples.  
c) How do you prepare thin films using Cathode Sputtering? (4+3+3)
9. a) i) Derive an expression for Bragg's condition.  
ii) For NaCl, first order maxima for (100), (110) and (111) planes are obtained as 5.9, 8.4 and 5.2 respectively. Which crystal structure is followed by NaCl?  
b) Explain how Laue's method is used for the determination of crystal structure? (5+5)

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