

CHOICE BASED CREDIT SYSTEM FOURTH SEMESTER M.Sc. DEGREE EXAMINATION,  
SEPTEMBER 2020

## M.Sc. CHEMISTRY

## ORGANOMETALLIC AND BIOINORGANIC CHEMISTRY

Time: 3 Hrs

Max. Marks: 70

## PART - A

I Answer any TEN of the following:

(2×10=20)

- Draw the structure and write IUPAC name of  $[\text{PdCl}(\eta^3\text{-C}_3\text{H}_5)]_2$ .
- Account for the "back bonding" in metal carbonyls.
- Give the electron counts in
  - $(\eta^1\text{-C}_3\text{H}_5)_2(\eta^3\text{-C}_3\text{H}_5)_2$  Ti and
  - $(\eta^6\text{-Cyclohepta-1,3,5-triene})(\text{CO})_3\text{Mo}$
- What is isomerisation reaction? Give example.
- What is oxoprocess? Give its industrial importance.
- Give any two synthetic applications of organo aluminium in organic synthesis.
- Mention any two essential and trace elements present in biological system.
- What is the role of carbonic anhydrase in biological process?
- What are ionophores? Give any two examples.
- What are the functions of myoglobin?
- What is chelation therapy? Explain with an example.
- Why is high concentration of copper toxic to the living system.

## PART B

Answer any FIVE questions selecting any ONE question from each unit

(10×5=50)

## UNIT - I

- Discuss the structure and bonding in Ferrocene.
  - Give any one method for the synthesis of bent and linear nitrosyls. Explain a spectroscopic method to distinguish between them. (5+5)
- Discuss the structure and bonding in metal-acetylene complexes.
  - Describe the structure and bonding in metal-olefin complexes. (5+5)

## UNIT - II

- Write a note on Fisher Tropsh reaction.
  - What is water – gas shift reaction? Explain the catalytic cycle for water-gas shift reaction. (5+5)
- Describe Wacker process with suitable example.
  - Discuss the usefulness of organolithium and organozinc compounds in synthetic chemistry. (5+5)

### UNIT – III

- 6) a) Explain the structural features and biological functions of cytochrome P-450.  
b) What is active transport of ions? Describe the mechanism of ion transport across the cell membranes. (5+5)
- 7) a) Describe the role of alcohol dehydrogenase and superoxide dismutase.  
b) Explain the biological functions of carboxy peptidase and vitamin B12 coenzyme. (5+5)

### UNIT – IV

- 8) a) Describe the structural features of haemoglobin. Explain the roles of distal and proximal histidine in it.  
b) Discuss the structural features of nitrogenase. Give the mechanism of nitrogen fixation by it. (5+5)
- 9) a) What are iron-sulphur proteins? Illustrate their structural features and biological roles.  
b) Write notes on the following.  
i) metals in medicine  
ii) synthetic oxygen carriers. (5+5)

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## CHOICE BASED CREDIT SYSTEM FOURTH SEMESTER M.Sc. DEGREE EXAMINATION

SEPTEMBER 2020

M.Sc. CHEMISTRY

## SYNTHETIC METHODS IN ORGANIC CHEMISTRY

Time: 3 Hrs

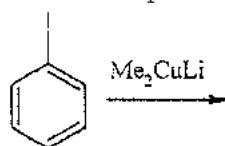
Max. Marks: 70

## PART - A

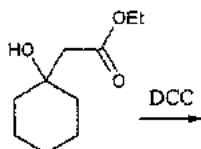
I Answer any TEN of the following

(2×10=20)

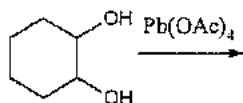
- a) Predict the product in the following



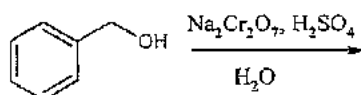
- b) Suggest a suitable product in the following



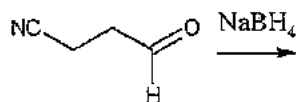
- c) Illustrate the use of Baker's yeast in organic synthesis.  
 d) Complete the following reaction



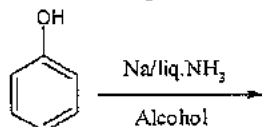
- e) Predict the product in the following



- f) Outline the synthetic application of N-bromosuccinimide.  
 g) Predict the product in the following



- h) Outline the mechanism of Wolf-Kishner reduction.  
 i) Predict the product in the following and give its mechanism



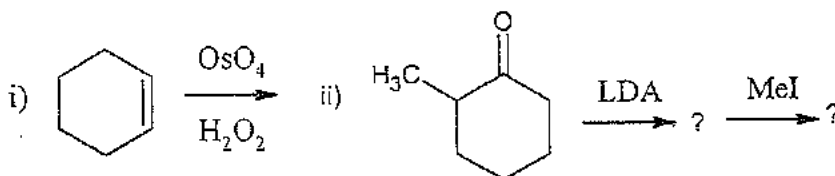
- j) Illustrate the terms: synthons and synthetic equivalents.  
 k) Explain the retrosynthesis of p-methoxy acetophenone.  
 l) Explain one group C-X disconnection taking suitable example.

PART B

Answer any FIVE questions selecting any ONE question from each unit. (10×5=50)

UNIT - I

- 2) a) Describe the synthetic uses of DDQ in organic synthesis.  
b) Explain briefly the use of the following reagents in organic synthesis.  
i) Trimethyl Silyl iodide (ii) SeO<sub>2</sub> (5+5)
- 3) a) Predict the products(s) and give the mechanism for the following reactions.



- b) Describe the use of Polyphosphoric acid and crown-ethers in organic synthesis. (5+5)

UNIT - II

- 4) a) Write a note on the following.  
i) Oxidation with Manganese salts. (ii) Allylic halogenation.  
b) Explain the oxidation of vicinal diols with HIO<sub>4</sub> and give its mechanism. (5+5)
- 5) a) Discuss the use of the following reagents in organic synthesis. Give mechanism in each case.  
i) Ozone (ii) Peracid  
b) Write a brief account of halogenation of Olefins and carbonyl compounds. (5+5)

UNIT - III

- 6) a) Write a brief account of Mechanism and stereo chemistry of catalytic hydrogenation.  
b) Describe the use of the following reagents in organic synthesis, outlining their mechanism.  
i) LiAlH<sub>4</sub> (ii) reduction with arene sulphonyl derivative of hydrazine. (5+5)
- 7) a) Explain the mechanisms of reduction of conjugated systems and carbonyl compounds.  
b) Write a note on catalysts and solvents employed during catalytic hydrogenation. (5+5)

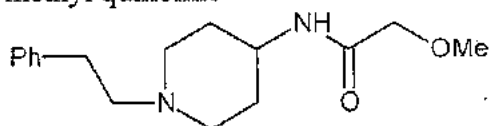
UNIT - IV

- 8) a) Describe basic principles and technologies used in disconnection approach.  
b) Outline the principle of protection of amino and carboxyl groups. (5+5)
- 9) a) Illustrate the synthetic scheme for Juvabione.

- b) Enumerate the retrosynthetic analysis of

i) 6-methyl quinoline

ii)



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(5+5)

CHOICE BASED CREDIT SYSTEM SECOND SEMESTER M.Sc. DEGREE EXAMINATION,  
SEPTEMBER 2020

## M.Sc. CHEMISTRY

## PHYSICAL CHEMISTRY THEORY III

Time: 3 Hrs

Max. Marks: 70

## PART - A

1) Answer any TEN of the following (2×10=20)

- a) Define Ionic strength. Calculate the ionic strength of the following  
(i) 0.25 molal  $K_2SO_4$  (ii) 0.2 molal  $BaCl_2$
- b) Explain the terms activity coefficient and mean ionic activity coefficient.
- c) Explain the function of photo cathode and photo anode in photogalvanic cells.
- d) Write the importance and consequences of electro growth of metals on electrodes.
- e) Distinguish between primary battery and secondary battery.
- f) Write Lippmann equation and explain how electrical capacitance arises in the electrode-electrolyte interface.
- g) Explain the electrochemical theory of corrosion.
- h) What is sacrificial anodic method. Give an example.
- i) What is the principle underlying amperometric titrations? Write advantages and disadvantages of it.
- j) Write the effect of light at semiconductor interface.
- k) What is zeta potential? How does it explain the stability of colloidal particles.
- l) Write half cell reactions for rusting of iron in the presence of oxygen.

## PART B

Answer any FIVE questions selecting any ONE question from each unit (10×5=50)

## UNIT - I

- 2) a) With the help of Hittorf's device show that fall in concentration around an electrode is proportional to the speed of the anion leaving that electrode.  
b) Discuss Walden's rule. Derive the Debye-Huckel limiting law. How can it be verified?  
c) Discuss origin of charge on colloidal particles. What is meant by electrical double layer? (4+3+3)
- 3) a) A solution containing 10.09g of  $CuSO_4$  in 189.9g of water was electrolyzed. After electrolysis, 275.4g of the solution around the anode was found to contain 15.4g of  $CuSO_4$  and 3.096g of silver was deposited in a coulometer placed in series. Calculate the Hittorf's numbers of  $Cu^{2+}$  and  $SO_4^{2-}$  ions.  
b) Calculate the mean ionic activity coefficient  $\gamma_{\pm}$  of (i) NaCl at a molality of 0.01M (ii)  $Na_2SO_4$  at a molality of 0.001M in aqueous solution at 25°C  
c) Describe electrophoresis and electro-osmosis. (4+3+3)

## UNIT - II

- 4) a) Explain how n-type & p-type semiconductors are working and discuss the importance of Mott-Schottky plot in semiconductor research.  
b) Discuss the electrochemical mechanism of Nervous system.  
c) Discuss the importance of oxidation-reduction and hydrogen evolution reactions. (4+3+3)

- 5) a) Explain the following  
(i) Semiconductor-electrolyte solution interface (ii) p-n junction  
b) Using Nernst-Planck equation, explain the determination of membrane potential?  
c) Explain the following  
(i) Liquid Junction Potentials (ii) Concentration cells (4+3+3)

## UNIT - III

- 6) a) Give an account of the Helmholtz-Perrin model of an electrified interface.  
b) Explain construction, working, advantages and disadvantages of lead storage battery?  
c) Plot Current Vs Potential diagram of polarogram, in the polarogram, explain the following.  
(i) Half wave potential (ii) Current Maxima and Maximum Suppressors  
(iii) Diffusion current. (4+3+3)
- 7) a) Explain the Gouy-Chapmann theory of diffuse double layer.  
b) Describe construction, working, advantages of polymer electrolyte membrane fuel cell.  
c) Describe the basic principles of cyclic voltametry. (4+3+3)

## UNIT - IV

- 8) a) Explain the following types of corrosion with examples.  
i) Differential aeration corrosion (ii) Pitting corrosion  
b) Using corrosion inhibitors (anodic and cathodic), how will you reduce the rate of corrosion? Give example in each case.  
c) Give reason:  
i) Ruptured tin coating on iron is disastrous than not having coating at all.  
ii) Anodic coating is preferred over cathodic coating. (4+3+3)
- 9) a) Write briefly any four factors influencing corrosion rate and explain Pilling-Bedworth rule.  
b) Discuss stress corrosion and explain the caustic embrittlement of steel.  
c) Using Tafel and EIS method, Explain the determination of rate of corrosion? (4+3+3)

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## M.Sc. CHEMISTRY

## POLYMER AND SOLID STATE CHEMISTRY

Time: 3 Hrs

Max. Marks: 70

## PART - A

I Answer any TEN of the following

(2×10=20)

- Define degree of polymerization. Calculate the average degree of polymerisation of a given sample of polypropylene with an average molecular weight of 40,000.
- Classify the polymers based on their structure. Give suitable examples.
- Calculate the  $\overline{M}_n$  and  $\overline{M}_w$  of a polymer sample having 50 molecules with M.W. of 1,00,000 and 100 molecules with M.W. of 50,000.
- Anionic polymerisation is known as living polymerisation. Justify.
- Give the structure of monomers employed for the preparation of PMMA and PP.
- Write the Alfrey-Price rate expression for copolymerisation and give its significance.
- Differentiate between intrinsic and extrinsic semiconductors with suitable examples.
- What are spinels and garnets? Give their applications.
- What are organic superconductors? Give examples.
- How do you relate nucleation & crystal growth?
- Give the significance of systematic absences in a x-ray diffraction pattern.
- Define Kirkendall effect.

## PART B

Answer any FIVE questions selecting any ONE question from each unit.

(10×5=50)

## UNIT - I

- Explain the membrane osmometry method of determination of molecular weight of polymers..
  - Give the types of average molecular weights of polymers. Describe the determination of polymer molecular weight by sedimentation velocity method. (5+5)
- Discuss the viscometric method of determination of molecular weight of polymers.
  - Differentiate between the fractional precipitation and partial dissolution techniques of polymer molecular weight determination. (5+5)

## UNIT - II

- Discuss the structure, applications & properties of (i) Nylon (ii) Teflon
  - Elaborate the free radical mechanism of addition polymerisation. (6+4)
- Explain the kinetics of non-catalysed condensation polymerisation.
  - Define copolymerisation. Write a short note on reactivity ratios and their effect on copolymerisation behaviour. (6+4)

### UNIT - III

- 6) a) Discuss the band theory of semiconductors. Explain the formation of p-n junction.  
b) Differentiate between type 1 and type 2 super-conductors. (6+4)
- 7) a) Write short notes on  
i) Pyro electric property (ii) Piezoelectric property  
b) Explain Hall effect.  
c) Discuss the thermodynamics of glass formation. (4+3+3)

### UNIT - IV

- 8) a) Explain the sol-gel method of crystal growth.  
b) Discuss the rotating and oscillating crystal methods of X-ray diffraction.  
c) Elaborate the Wagner's theory of solid state reactions. (3+4+3)
- 9) a) Differentiate between the electron and neutron diffraction techniques.  
b) Write a note on the chemical and electro-chemical methods of preparation of thin films. (6+4)

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