

CHOICE BASED CREDIT SYSTEM

M.Sc. CHEMISTRY FOURTH SEMESTER DEGREE EXAMINATION MAY 2024

Organometallic and Bioinorganic Chemistry

Duration:3 Hours

Max Marks:70

PART - A

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

- a) Write any two exceptions to the 18 electron rule.
- b) What are the main differences between the Fischer and Schrock type carbenes?
- c) Draw the Molecular orbital diagram of cyclopentadienyls.
- d) What is an oxo process?
- e) What is the difference in the polymerisation of olefin with and without Ziegler-Natta catalyst?
- f) Wacker process can be used for the rapid synthesis of carbocycles. Justify the statement with reaction.
- g) What are metalloproteins? Explain with an example.
- h) Distinguish between essential and non essential metals with example.
- i) What is cyanocobalamin? Why Vitamin B12 is called as cyanocobalamin?
- j) Account for the amino acids coordinated with Fe atoms in hemerythrin.
- k) Give the biological functions of ceruloplasmin.
- l) What are the symptoms of Cu deficiency?

PART - B

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

UNIT - I

2. a) Write different preparation methods of organolithium compounds.
b) Explain the structure of Aluminium alkyls. (5+5)
3. a) Explain using MO of butadiene (i) the C2-C3 bond length increases whereas C1-C2 bond length shortens during the sigma donation whereas
(ii) The C1-C2 lengthens and C2-C3 shortens during back donation.
b) Give synthetic methods of alkene metal complexes. (6+4)

UNIT - II

4. a) Write a note on : i) Tebbe's reaction ii) Olefin metathesis
b) What are the different types of catalysis? (6+4)
5. a) Describe the mechanism of Hydrogenation of Alkenes using Wilkinsons catalyst.
b) Write the mechanism of hydroformylation using Cobalt catalyst. (5+5)

UNIT - III

6. a) Explain the function and enzymatic activity of catalases.
b) Describe the reaction and mechanism of action of alcoholdehydrogenase. (5+5)
7. a) Explain different types ion channel gating .
b) What do you mean by carrier proteins? List some of the important ionophores. (5+5)

UNIT - IV

8. a) Write a note on structure and functions of hemocyanin.
b) What are Iron – Sulphur proteins? Explain their structural features and biological roles. (5+5)
9. a) Describe the structural features of haemoglobin. Explain the roles of distal and proximal histidine in it.
b) Explain cooperativity effect in haemoglobin. (5+5)

CHOICE BASED CREDIT SYSTEM

M.Sc. FOURTH SEMESTER DEGREE EXAMINATION MAY 2024

Synthetic methods in Organic Chemistry

Duration:3 Hours

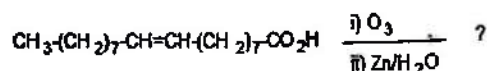
Max Marks:70

PART - A

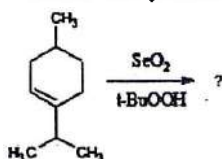
1. Answer any TEN of the following :

(10×2= 20 Marks)

a) Complete the following:

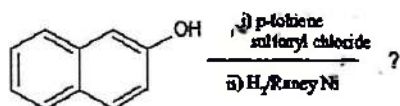


b) Predict the product in the following:

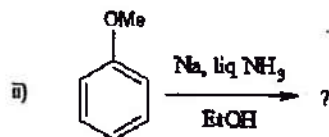
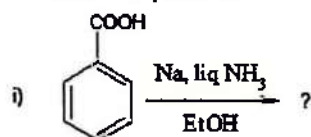


c) How is DDQ helpful in aromatization reactions?

d) Predict the products in the following:

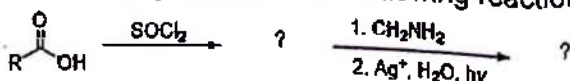


e) Predict the products in the following:



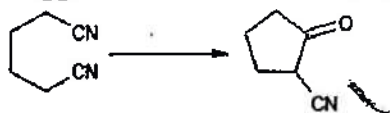
f) Mention the applications of Lithium aluminium hydride in organic synthesis.

g) Predict the products in the following reactions:

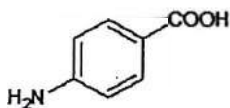


h) Write the structures of Biotin and Penicillin V.

- i) suggest suitable method for the following conversion:



- j) How do you protect carboxyl group?
k) Illustrate the retrosynthetic analysis of the following:



- l) Explain two group C-X disconnection taking acetal as an example.

PART - B

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

(5×10= 50 Marks)

UNIT - I

2. a) Explain the following with Lithium dialkyl cuprate:
i) Nucleophilic displacement of halides ii) conjugate addition reactions
b) Propose the suitable mechanism for the oxidation of cyclohexanol using acidic $K_2Cr_2O_7$. (6+4)
3. a) Explain the synthetic applications of lead tetra acetate in oxidation reactions.
b) Discuss any two applications of 1,3-dithianes in organic synthesis by proposing suitable mechanism.

UNIT - II

4. a) Discuss the mechanism of heterogenous catalytic hydrogenation. Give any two examples.
b) What is hydrogenolysis? Explain taking suitable example.
c) Write a note on Wolf-Kishner reduction. (4+3+3)
5. a) Explain the following with Wilkinson's catalyst:
i) reduction of alkene ii) decarbonylation
b) Write the synthetic applications of sodium borohydride in reduction reactions. (5+5)

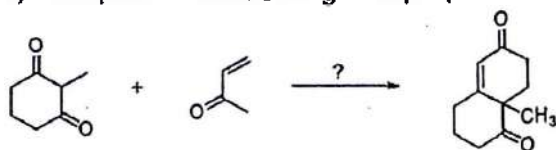
UNIT - III

6. a) Explain the mechanism of the following reactions:
i) Dieckmann cyclization ii) Wittig reaction
b) Outline the synthesis of Iswarane. (5+5)

7. a) Illustrate the synthesis of Cubane.

b) Complete the following and propose the mechanism:

(6+4)



UNIT - IV

8. a) Give two examples each for amine and hydroxyl protecting agents. Write their protection and deprotection reactions.

b) Discuss FGI taking suitable example.

(6+4)

9. a) Discuss one group C-C disconnection in carbonyl compounds and alcohols.

b) Perform RSA of 2-methyl-6-methoxyindole-3-acetic acid.

(6+4)

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M.Sc. CHEMISTRY FOURTH SEMESTER DEGREE EXAMINATION MAY 2024

Physical Chemistry II

Duration: 3 Hours

Max Marks: 70

PART - A

1. Answer any TEN of the following :

(10×2= 20 Marks)

- What is an ionic atmosphere?
- List different experimental methods for the determination of transference numbers.
- Calculate ionic strength of 0.25 molal K_2SO_4 solution.
- Mention the key parameters that can be explained from a Mott-Schottky plot.
- State two characteristics of the material used as an electrode for photoelectrocatalysis.
- How does the activity and surface area affect the performance of an electrocatalyst?
- Mention any two importance of electrochemical series.
- What is meant by diffused layer?
- Construct the polymer electrolyte fuel cell.
- Write any two functions of supporting electrolyte.
- Differentiate between normal and differential pulse polarography.
- Mention any two advantages and limitations of DC polarography.

PART - B

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

UNIT - I

- Explain Hittorf's theoretical device.
 - In the determination of transference numbers of HCl by moving boundary method a 0.10M solution of HCl was taken in a cell having uniform area of cross section of 1.25cm^2 . At the end of experiment the boundary moved by 7.5cm and 0.12g of silver was deposited on the cathode of silver coulometer. Calculate the transference numbers of ions of HCl. (5+5)

3. a) What is Zeta potential? Explain various factors which influence zeta potential?
b) What is electrokinetic phenomena? Explain electroosmosis in detail. (5+5)

UNIT - II

4. a) Explain the phenomenon of photoexcitation of electrons by absorption of light.
b) Describe the reaction pathway for electrodeposition of metals. (5+5)
5. a) Discuss the process of hydrogen evolution adsorbed on a metal surface.
b) Explain the formation of p-type and n-type semiconductors. (5+5)

UNIT - III

6. a) Describe the principle, construction and working of Carbon zinc cell.
b) Write a note on alkaline fuel cell. (5+5)
7. a) Describe the standard hydrogen electrode.
b) Explain the principle, construction and working of Nickel cadmium battery.(5+5)

UNIT - IV

8. a) Explain the types of electrodes used in cyclic voltammetry.
b) Write a note on amperometry. (5+5)
9. a) Write a note on the following terms in polarography:
i) Migration current ii) Diffusion current iii) limiting current
b) Discuss the advantages and disadvantages of dropping mercury electrode. (6+4)

CHOICE BASED CREDIT SYSTEM

M.Sc. CHEMISTRY FOURTH SEMESTER DEGREE EXAMINATION MAY 2024

Polymer and Solid State Chemistry

Duration:3 Hours

Max Marks:70

PART - A

1. Answer any SEVEN of the following : (2×7= 14)

- a) Outline the principle of size exclusion chromatography.
- b) Give the principle of membrane osmometric method of determination of molecular weight of a polymer.
- c) If the values of α 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?
- d) Give examples of initiators used for cationic polymerization.
- e) Give the rate equation for initiation and termination in anionic polymerisation.
- f) Write the overall polycondensation reaction between adipic acid and ethylene glycol.
- g) Differentiate between topotactic and epitactic reactions.
- h) What are the different X-ray diffraction techniques used in cahracterization of crystals?
- i) What is nucleation? what are the basic crystal growth method?

PART - B

Answer any Four questions selecting at least one question from each unit.

(14×4 = 56)

UNIT - I

- 2)
 - a) Describe the sedimentation velocity and equilibrium methods of determination of polymer molecular weights.
 - b) Explain in detail, the determination of molecular weight of the polymer by viscometric method. (7+7)
- 3)
 - a) Explain the classification of polymers.
 - b) Write a note on the following:
 - i) Degree of polymerisation
 - ii) Poly dispersity index (10+4)

UNIT - II

- 4) a) Explain the kinetics of free radical copolymerisation.
b) Evaluate the relation between the reactivity ratios and copolymerization behavior.
c) Write a note on the significance of Q-e scheme. (5+5+4)
- 5) a) Explain the structure, properties and applications of Teflon.
b) Outline the applications of polypropylene.
c) Write a note on low density polyethylene. (5+5+4)

UNIT - III

- 6) a) Write a note on electron diffraction technique.
b) List the applications of XPS.
c) Differentiate between XPS and UPS. (5+5+4)
- 7) a) Explain the symmetry elements present in SiO_4
b) Differentiate between Screw and Glide symmetry with examples.
c) Write the classification of Bravais lattices. (5+5+4)
