

Exam Code: 224703
(20)

Paper Code: 3209

Programme: Master of Science (Chemistry)
Semester-III

Course Title: Inorganic Chemistry-II

Course Code: MCHL-3081 ✓

Time Allowed: 3 Hours

Max Marks: 70

Note: -- Attempt Five Questions, selecting at least one each from Sections A, B, C and D. The fifth question may be attempted from any Section. Each question carries 14 marks. Students can use non-Programmable calculator.

SECTION -A

1. (a) Provide a brief explanation of the model complexes of (a) Iron and (b) Cobalt. (7)
(b) What do you mean by essential trace elements? Discuss four specific elements in detail? (7)
2. (a) Illustrate the structures of Myoglobin and Hemoglobin. Discuss their roles in biological systems. (7)
(b) What is DNA Polymerase, and what role does it play in DNA replication? (7)

SECTION-B

3. (a) How would you define the term "enzyme"? Additionally, elaborate their functions in biological systems? (7)
(b) Draw and discuss the structure of Vitamin B₁₂ along with its role in Biological system? (7)
4. (a) Explain briefly the structure and functioning of Chlorophyll. (7)
(b) Write a short note on Phosphoglucomutase (3.5)
(c) Define the process of kinases (3.5)

SECTION-C

5. (a) What is transferrin, and how does it function within biological systems? Explain its mechanism? (7)
(b) Compose a brief note on Biochemistry of iron (7)
6. (a) What is the main difference between CN⁻ and CO poisoning. (3.5)
(b) Briefly discuss the Biological N₂ fixation. Discuss in detail *in - vivo* and *in - vitro* nitrogen fixation. – (7)
(c) Write a note on:
(i) Ferredoxin
(ii) Rubredoxin (3.5)

SECTION-D

7. (a) What is the role of SODs in biological system. Draw and briefly describe the mechanism of Cu-Zn SODs. (7)
- (b) Explain the transport and regulation of calcium in living cell with the help of calcium pump. (7)
8. (a) Write a brief note on Chelate therapy? (5)
- (b) Antibiotics are important for treatment of various diseases but they also pose toxic effect, explain and also discuss toxic effect of antibiotics. (9)

Exam Code: 224703
(20)

Paper Code: 3210

Programme: Master of Science (Chemistry)
Semester-III

Course Title: Organic Synthesis

Course Code: MCHL-3082

Time Allowed: 3 Hours

Max Marks: 70

Note: - Attempt Five Questions, selecting at least one each from Sections A, B, C and D. The fifth question may be attempted from any Section. Each question carries 14 marks.

Students can use Non-programmable calculator.

SECTION-A

1. (a) Describe the mechanism involved in the Baeyer-villiger rearrangement. (7)
(b) Provide a detailed synthesis of fluorene and phenanthrene, and discuss their aromaticity, justifying your answer. (7)
2. (a) Discuss the Pinacol-pinacolone and Neber mechanism in detail using appropriate examples? (7)
(b) Explain the Favorskii rearrangement, including its mechanism. (7)

SECTION-B

3. (a) Describe three synthetic routes for furan. Compare the aromaticity of furan, thiophene, pyrrole, benzene and discuss their order of reactivity based on this aromatic character? (7)
(b) Outline the preparation methods for thiiranes and discuss their chemical properties? (7)
4. (a) Write the synthesis methods for thiepinines and thiazepines along with its chemical reactions? (7)
(b) Detail the dicarbonyl and Hantzsch synthesis of pyridine and explain why it has lower reactivity towards substitution reactions? (7)

SECTION-C

5. (a) Define Merrifield solid-phase peptide synthesis. Why are protecting groups used during this process? (7)
(b) Discuss osmium tetroxide catalyst and its various applications in detail. (7)
6. (a) What are phase transfer catalysts (PTCS)? Explain their mechanistic pathway and their importance in organic chemistry. (7)
(b) Provide a detailed explanation of the following reagents:
(i) Peterson's synthesis
(ii) Lithium aluminium hydride (7)

SECTION-D

7. (a) Describe the synthesis and structure of crown ethers and cryptands and explain how their structure influences host selectivity? (7)
(b) Explain the concepts of thermodynamic and kinetic selectivity in the context of supramolecular chemistry? (7)
8. (a) Discuss the various types of intermolecular forces found in supramolecular compounds. (7)
(b) Define cyclotrimeratrylene, explain in detail the synthetic route and applications in carrying out various synthesis? (7)

Exam Code: 224703

Paper Code: 3211

Programme: Master of Science (Chemistry) Semester III

Course Title: Surface and Polymer Chemistry

Course Code: MCHL-3083

Time: 3 Hrs.

Max. Marks: 70

Note: Attempt one question from each section and fifth question can be attempted from any section. Each question carries 14 marks. Students can use non-programmable calculator.

SECTION - A

1. (a) Derive an expression for vapour pressure of droplets (Kelvin equation).
(b) Write a short note on capillary action. (7, 7)
2. (a) Is adsorption an exothermic or endothermic process? Justify your answer thermodynamically.
(b) Define detergent action of soaps.
(c) What is the mathematical expression for Gibbs Adsorption isotherm? (3, 4, 7)

SECTION - B

3. (a) Derive an expression for phase separation model.
(b) Differentiate between emulsion and microemulsion. (7, 7)
4. (a) Outline the characteristic features of surface-active agents.
(b) Describe various factors affecting the CMC. (7, 7)

SECTION - C

5. (a) Describe light scattering method for the determination of molecular mass of a polymer.
(b) Explain the difference between the following by giving suitable example: -
 - Addition and condensation polymerization
 - Thermosetting and thermoplastic polymers (7, 7)

6. Explain (a) liquid crystal polymer
(b) Conducting polymer

(7, 7)

SECTION - D

7. Elaborate the following

- (a) Chain topology
- (b) Chain flexibility
- (c) Co-polymerization
- (d) T_m - T_g Relationship

(3.5 X 4 = 14)

8. (a) Give an account of glass transition temperature.

- (b) Highlight the physical properties of solid polymer with special emphasis on their crystalline, elastic and plastic nature.

(7, 7)

Exam Code: 224703

Paper Code: 3212

Programme: Master of Science (Chemistry) Semester III

Course Title: Photochemistry and Pericyclic Reactions

Course Code: MCHL-3084 ✓

Time: 3 Hrs.

Max. Marks: 70

Note: Attempt one question from each section and fifth question can be attempted from any section. Each question carries 14 marks. Use of non-programmable calculator is allowed.

Section A

Q1) a) What are correlation diagram? Draw correlation diagram for allyl cation and allyl anion system. (7)

(b) Discuss Woodward Hoffmann selection rules for sigmatropic carbon shift of order [1,3] with the help of orbital picture diagram. (7)

Q2) (a) Explain the Perturbation of Molecular Orbital (PMO) approach for thermal and photochemical conditions with the help of suitable example. (7)

(b) Discuss the concept of suprafacial and antarafacial interactions in cycloadditions with examples of (4+2) reactions. (7)

Section B

Q3) (a) Describe [1,3]-sigmatropic rearrangements and explain the concept of retention and inversion of configuration. (7)

(b) Explain Ene reactions and fluxional tautomerism by citing relevant examples. (7)

Q4) (a) What are electrocyclic reactions? Explain the conrotatory and disrotatory opening of 1,3 butadiene with orbital picture diagram. (7)

(b) Describe cheletropic reactions and aza-Cope rearrangement mechanisms. (7)

Section C

Q5. (a) Explain energy transfer mechanisms in photochemical processes. (7)

(b) Describe the effect of light intensity on the rate of photochemical reactions. (7)

Q6. (a) Classify photochemical reactions and describe photodissociation with examples. (7)

(b) Explain gas-phase photolysis and its kinetic characteristics. (7)

Section D

Q7. (a) Discuss intramolecular reactions of α,β -unsaturated and β,γ -unsaturated carbonyl compounds. (7)

(b) Explain intermolecular cycloaddition reactions leading to oxetane formation. (7)

Q8. (a) Describe the Photo-Fries rearrangement and its mechanism. (7)

(b) Explain the Barton reaction and photochemistry of vision in humans. (7)