

PH 581.4

Reg. No. :

--	--	--	--	--	--	--	--

**St Aloysius College (Autonomous),  
Mangaluru**

**Semester IV- P.G Examination – M.Sc. Chemistry  
May/June - 2023**

**ORGANIC SYNTHETIC METHODS**

Time: 3 Hours

Max. Marks: 70

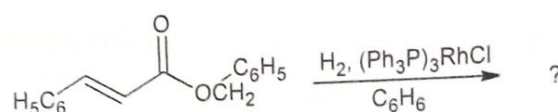
ST. ALOYSIUS COLLEGE  
PG LIBRARY  
MANGALORE-575 003

**PART - A**

(5x2=10)

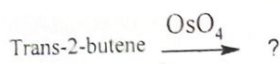
1. Answer any Five sub-divisions of the following:

a) Complete the following reaction:



b) Explain Birch reduction, with an example.

c) Write the product in the following:



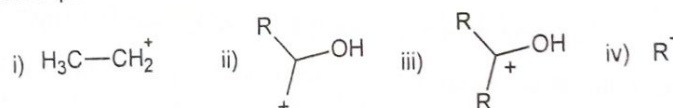
d) Ozonolysis is used for the structural elucidation of unknown organic compounds.

Justify.

e) What are Heck reaction? Give example.

f) Give any one reaction yielding products with new C-C double bonds.

g) Give synthetic equivalents to following synthons:



h) Explain the term functional group addition with suitable examples.

**PART - B**

Answer any FIVE of the following choosing at least one full question from each unit:

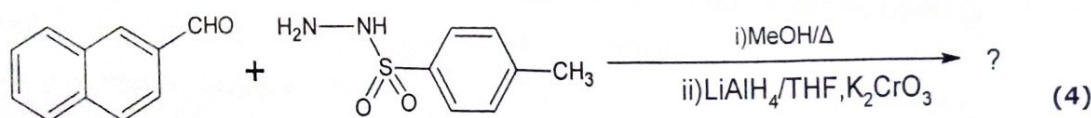
(5x12=60)

**UNIT- I**

2. a) What is hydrogenolysis? Explain taking suitable example. (4)

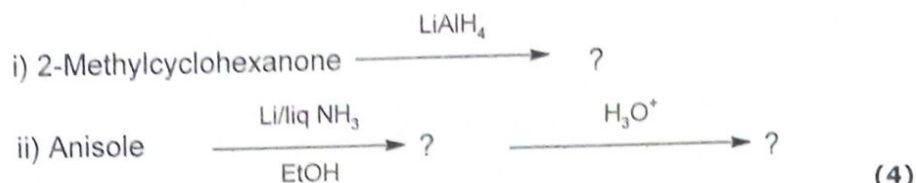
b) What is Clemmenson reduction? Discuss the mechanism taking suitable example. (4)

c) Predict the products in the following and outline the mechanism.



## PH 581.4

3. a) Discuss the mechanism and stereochemistry of heterogenous catalytic hydrogenation. (4)
- b) Predict the products formed in the following reactions and outline their mechanisms.



- c) Write briefly on the synthetic applications of Wolf-Kishner reduction. (4)

## UNIT- II

4. a) Propose the suitable mechanism for the oxidation of cyclohexanol using acidic  $\text{K}_2\text{Cr}_2\text{O}_7$ . (4)
- b) Discuss the oxidation of monohydric alcohols with lead tetra acetate. (4)
- c) Explain the mechanism of Beckmann rearrangement. (4)
5. a) Explain Baeyer-Villiger oxidation. Give its synthetic importance. (4)
- b) Explain the oxidation of vicinal diols with  $\text{HIO}_4$  and give its mechanism. (4)
- c) Write a note on Benzil- Benzilic acid rearrangement. (4)

## UNIT- III

6. a) What is ene reaction? Discuss its synthetic applications. (4)
- b) Write a note on Robinson annulation. (4)
- c) Discuss the chemical synthesis of cubane. (4)
7. a) Write a note on carbene insertion reaction and its use in organic synthesis. (4)
- b) Explain the following reactions: i) Dickmann cyclization ii) Suzuki coupling reaction (4)
- c) Illustrate the synthesis of Penicillin-V. (4)

## UNIT- IV

8. a) Illustrate one group disconnection with suitable examples. (4)
- b) Write a note on the protecting groups for carboxyl functional group. (4)
- c) Discuss the retrosynthetic analysis of the Phenacitin. (4)
9. a) Explain retrosynthetic analysis of Benzocaine Illustrate its synthesis. (4)
- b) Illustrate the C-X disconnection approach for the synthesis of 1,3-difunctionalised compounds. (4)
- c) Discuss two group C-C disconnection with suitable example. (4)

\*\*\*\*\*

**St Aloysius College (Autonomous)**  
**Mangaluru**  
**Semester IV – P.G. Examination - M.Sc. Chemistry**  
**May/June – 2023**

**RADIATION AND PHOTOCHEMISTRY**

Time: 3 Hours

Max. Marks: 70

**PART - A**

ST. ALOYSIUS COLLEGE  
 PG Library  
 MANGALORE-575 003

1. Answer any **FIVE** sub-divisions. (5x2=10)
- Illustrate Nuclear Fusion reaction with an example.
  - State the advantages of using high purity Germanium detector (HPGe).
  - Differentiate between a power reactor and a breeder reactor.
  - Define 'radiation dose'. Mention the unit of measurement of dose.
  - Photochemical reaction between  $H_2$  and  $Cl_2$  is an example for high quantum yield reaction. Justify.
  - Explain the functioning of uranyl oxalate actinometer.
  - Using Jablonski diagram, represent the pathways leading to phosphorescence.
  - State Frank Condon Principle.

**PART - B**

Answer any **FIVE** of the following choosing at least one full question from each unit: (5x12=60)

**UNIT - I**

- Give a comparative account of liquid drop and shell models of nuclear stability. (6)
  - Discuss the theory of emission of  $\alpha$  particles. (6)
- Discuss the role of the various components of a Power Reactor. (4)
  - Discuss the kinetics of a radioactive decay process. (4)
  - Discuss the principle and working of a GM counter. (4)

**UNIT - II**

- Discuss the principle of isotope dilution analysis. (4)
  - Discuss the application of radioisotopes in medicine. (4)
  - Outline the principle of  $^{14}C$  dating. (4)
- Write a note on chemical dosimetry. (4)
  - Discuss the working principle of Pulse radiolysis technique. (4)
  - Write a note on radiation units. (4)

**Contd...2**

**UNIT - III**

6. a) Sketch the experimental set up for determination of quantum yield and explain the method. (6)
- b) Explain the effect of solute-solvent interactions on the electronic spectra of molecules. (6)
7. a) Outline the principle of the method to determine the excited state acidity constant of acids. (6)
- b) In polyatomic molecules, the fluorescence spectrum and absorption spectrum have mirror image relationship. Justify. (3)
- c) Certain reaction absorbs  $4 \times 10^{16}$  quanta of light/sec. On irradiation for 20mins, 0.008 mole of reactant is found to have reacted. Find out the quantum yield. (3)

**UNIT - IV**

8. a) Give a comparative account of measurement of fluorescence and phosphorescence. (6)
- b) Give detailed account of photochemical rearrangement and isomerization reactions. (6)
9. a) Discuss the kinetics of unimolecular photophysical reactions. (6)
- b) Explain the factors affecting fluorescence quenching. (3)
- c) Discuss the photochemical water splitting reaction. (3)

\*\*\*\*\*

**St Aloysius College (Autonomous)**  
**Mangaluru**

**Semester IV – P.G. Examination – M.Sc. Chemistry**  
**May/June - 2023**

**CHEMISTRY OF POLYMERS AND NATURAL PRODUCTS**

Time: 3 Hours

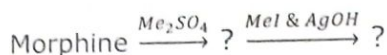
Max. Marks: 70

ST. ALOYSIUS COLLEGE  
PG LIBRARY  
MANGALORE-575 002

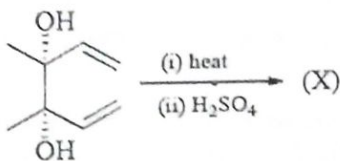
**PART - A**

1. Answer any **FIVE** sub divisions of the following: (5x2=10)

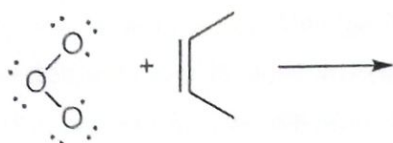
- How do you separate a mixture of solutes having a wide range of retention factors?
- Arrange in the increasing order of tensile strength based on linear, branched and network structures and justify the arrangement.
- Differentiate between intrinsic viscosity and relative viscosity. Which viscosity method is more suitable to calculate the molecular weight of polymer?
- Thermal characterisation of polymers is important. Justify.
- Predict the products



- Classify terpenoids and highlight the limitation of isoprene rule.
- Predict the product (X)



- Predict the product



**PART - B**

Answer any **FIVE** of the following choosing at least one full question from each unit: (5x12=60)

**UNIT - I**

- Explain with suitable example, the chain growth polymerization. (4)
- Define polymer fractionation. Explain in detail fractional precipitation technique. (4)
- A polypropylene  $[-\text{CH}_2-\text{CH}(\text{CH}_3)-]$  sample contains the following composition.

Degree of polymerization	300	700	800
% of composition	25	35	40

Calculate  $\bar{M}_n$  &  $\bar{M}_w$  of polypropylene sample by neglecting the end groups. (4)

- 3.a) Differentiate between suspension and emulsion polymerization. (4)  
Mention any two limitations of each technique. (4)
- b) Discuss the mechanism of ring opening metathesis polymerisation. (4)
- c) Which among the linear and network polymers have highest crystallinity? Explain the effects of crystallinity on the properties of polymers. (4)

#### UNIT - II

- 4.a) Explain ultracentrifugation method of determination of molecular weight of polymer. (4)
- b) Whether Tg of a polymer is exothermic or endothermic process in DSC thermogram? List out any three factors affecting the Tg of polymers. (4)
- c) Discuss the technique of reinforcement in polymers with an example. (4)
- 5.a) Describe osmometry method of determination of molecular weight of polymer. (4)
- b) Why TGA is recommended before DSC analysis. Discuss the instrumentation setup of TGA. (4)
- c) Natural rubbers cannot be used directly for manufacturing tyres. Elaborate the statement with reason and explain the solution with mechanism. (4)

#### UNIT - III

- 6.a) Account for the point of attachment between quinuclidine nucleus and quinoline nucleus in quinine. (4)
- b) Explain the biogenesis and precursors of alkaloids. (4)
- c) Write the isolation and synthetic route for the synthesis of Menthol. (4)
- 7.a) Formulate the stereospecific synthesis of Papaverine. (4)
- b) Describe the isolation and structure elucidation of alkaloids. (4)
- c) Discuss how spectroscopy is used for structural elucidation of terpenoids. (4)

#### UNIT - IV

- 8.a) Classify pericyclic reactions. (4)
- b) How FMO analysis can be used to study Diels-Alder reaction? (4)
- c) Explain cheletropic reactions with suitable example. (4)
- 9.a) Describe using suitable example suprafacial and antarafacial sigmatropic rearrangement of hydrogen. (4)
- b) Sketch and explain the correlation diagram of electrocyclic reaction when polyene has  $4n$  electrons. (4)
- c) With suitable rearrangement reaction predict the most favourable product of allyl vinyl ether. (4)

\*\*\*\*\*

**St Aloysius College (Autonomous)**  
**Mangaluru**  
**Semester IV – P.G. Examination – M.Sc. Chemistry**  
**May / June - 2023**

**SOLID STATE AND NANO CHEMISTRY**

Time: 3 Hours

ST. ALOYSIUS COLLEGE

PG LIBRARY

MANGALORE-575 005

**PART - A**

Max. Marks: 70

1. Answer any **SEVEN** sub divisions of the following: (7×2=14)
- The second order reflections of X-rays from (100) planes of NaCl occurs at  $\theta = 29.3^\circ$ . If the wavelength used is  $1.54 \text{ \AA}$ . Calculate the distance between two successive (100) planes in NaCl.
  - What is meant by systematic absences in XRD?
  - State Wierl equation and define the terms involved.
  - What are the differences between intrinsic and extrinsic semiconductors?
  - What are hopping semiconductors?
  - Differentiate between perfect and imperfect crystals?
  - What are nano catalysts?
  - Give an account on xerogels.
  - What are the advantages of bottom-up synthesis methods?

**PART - B**

Answer any **FOUR** of the following choosing at least one (4×14=56) full question from each unit:

**UNIT – I**

- Explain Laue method for X-ray diffraction by crystals. (4)
  - Derive an expression for scattering angle. (4)
  - Describe rotating crystal method in detail. (3)
  - What are the factors affecting X-ray intensities. (3)
- Derive Bragg's equation. (5)
  - The X-ray powder diffraction pattern of a material obtained for the first order reflection using radiation of wavelength  $1.54 \text{ \AA}$  exhibits the following peaks at  $2\theta$  values:  $25^\circ, 32^\circ, 45^\circ, 57^\circ, 67^\circ, 75^\circ$ . Assuming a cubic structure for the material, index the first six reflections. The atomic weight of the material is  $55.845 \text{ g/mol}$ . Calculate the unit cell parameters and density of the material. (Assume the atomic weight of the material as Fe:  $55.845 \text{ g/mol}$ ) (K=55) (5)
  - Explain Low Energy Electron Diffraction (LEED) technique in the determination of solid surface. (4)

**UNIT - II**

- 4.a) Discuss the flame fusion and pulling methods of crystal growth. (5)
- b) Write short notes on (5)
- i) Hall effect
  - ii) Pyroelectric materials
- c) Explain any two physical methods of preparation of thin films. (4)
- 5.a) Depict the nonstoichiometric structures of TiO and UO<sub>2</sub>. (5)
- b) Explain the phenomenon of ferroelectricity. Mention the applications of Ferroelectric materials. (5)
- c) Explain the thermodynamics of Schottky defect. (4)

**UNIT - III**

- 6.a) Explain chemical vapor deposition and electrodeposition synthesis of nanomaterials. (4)
- b) Discuss the importance of size and shape dependence of material properties at nanoscale. (4)
- c) Explain why the materials change their behavior at nano level. (3)
- d) Write explanatory note on smart materials. (3)
- 7.a) Explain the sol-gel method of nanomaterial synthesis. (4)
- b) Write notes on (4)
- i) Co-precipitation
  - ii) Nanophotonics
- c) Explain in detail electrical and optical properties of nanostructured materials. (3)
- d) Discuss briefly on the applications of nanomaterials in medicine. (3)

\*\*\*\*\*