PH 581.4   Reg. No. :

St Aloysius College (Autonomous)
Mangaluru
Semester IV – P.G. Examination – M.Sc. Chemistry
May - 2024
ORGANIC SYNTHETIC METHODS

Time: 3 Hours   Max. Marks: 70

PART - A

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

   a) How do transition metal catalysts participate in homogenous catalysis reactions?

   b) What is acyloin condensation? Give an example.

   c) Give Cutrius rearrangement.

   d) Explain the mechanism of the reaction of peracid with keto compound.

   e) Describe the structure of Penicillin –V.

   f) Write any two carbon-carbon single bond forming reactions.

   g) Perform the retrosynthetic analysis of phenacetin.

   h) Discuss any two basic principles in disconnection approach.

PART - B

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

UNIT – I

2.a) Explain the role of sodium borohydride as a reducing agent in organic chemistry.   (4)

   b) What is heterogenous catalysis? Discuss the catalysts used in it.   (4)

   c) Outline the bimolecular reduction of esters.   (4)

3.a) Predict the product with the mechanism for the following and also   (4)
   mention the name of the reaction:

$$\xrightarrow[\text{DMF}]{N_2H_4/KOH} \quad ? \ + \ ?$$
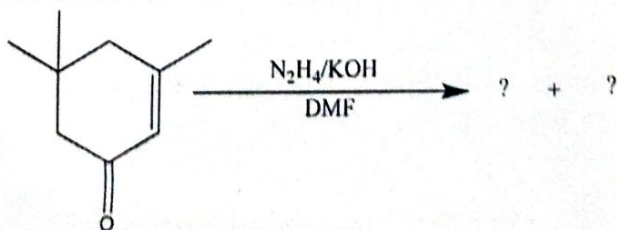
   b) Compare and contrast the reactivity of sodium borohydride with lithium (4)
   aluminum hydride. Provide examples.

   c) Write a note on reduction using diimide.   (4)

UNIT – II

4.a) Describe the importance of Pinacol-Pinacolone rearrangement.   (4)

   b) Explain the mechanism of oxidation of aldehydes by SeO_2.   (4)

   c) Discuss the mechanism of Neber rearrangement.   (4)

5.a) Explain Demaynov rearrangement. (4)

b) Propose a suitable mechanism for the oxidation of aromatic side chain (4)
by KMnO$_4$.

c) Outline the application of HIO$_4$ in organic synthesis. (4)

UNIT - III

6.a) Explain the mechanism of 6-Methoxy-1-tetralone. (4)

b) Write a note on Thorpe condensation. (4)

c) Explain the mechanism of Robinson annulations. (4)

7.a) Describe 1,3-dipolar cycloaddition reaction with mechanism. (4)

b) Write a note on Suzuki coupling reaction. (4)

c) Explain the mechanism of Arndt-Eistert reaction with mechanism. (4)

UNIT – IV

8.a) Provide all the possible disconnections and suggest a synthetic scheme (4)
for the following molecule. Describe the rationale of your chosen
synthetic method.
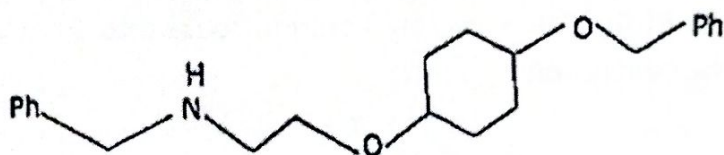
b) Suggest any two reagents for the protection of carbonyl compounds. (4)
Write the protection and deprotection reactions.

c) What is FGI? What is its importance in synthesis? Explain with (4)
examples.

9.a) Give one group and two group C-C disconnections with suitable (4)
examples.

b) Suggest retrosynthetic schemes for chlorobenzide and 2,4-dichloro (4)
phenoxy acetic acid.

c) Explain the conversion: (4)
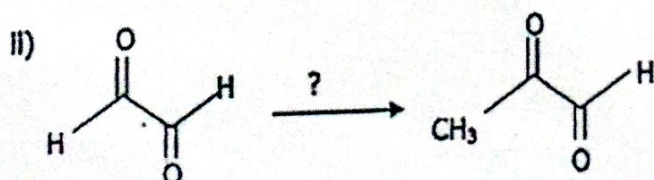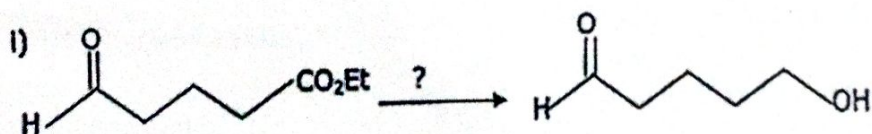
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St Aloysius College (Autonomous)

Mangaluru

Semester IV – P.G. Examination – M.Sc. Chemistry

May - 2024

RADIATION AND PHOTOCHEMISTRY

Time: 3 Hours   **Max. Marks: 70**

PART - A

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

a) Explain the proportional counters.

b) What is gamma emission?

c) Explain chemical equilibrium exchange reactions for D_2O.

d) Give two major applications of radiochromatography.

e) What is natural radiative life time of the atoms or molecules?

f) What is the use of flash spectroscopic technique in photochemistry?

g) Using Jablonski diagram, represent the pathways leading to Phosphorescence.

h) Write the relationship between intensity of fluorescence and concentration and explain the terms.

PART - B

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

UNIT – I

2.a) Derive an expression for the growth of a radioactive daughter nucleus in   (4)
the following disintegration series. $1 \rightarrow 2 \rightarrow 3$ Deduce the conditions for
transient and secular equilibrium.

b) Briefly explain the principle and instrumentation of Breeder reactor.   (4)

c) Write a note on Si(Li) semiconductor detectors.   (4)

3.a) Write a note on NaI(Tl) scintillation detector.   (4)

b) Write a note on liquid drop model and mention its merits and limitations   (4)

c) Explain the factors that influence the Nuclear stability.   (4)

UNIT – II

4.a) Write a note on radioactive waste management.   (4)

b) Explain the methods used in the production of radioisotopes with suitable   (4)
examples.

c) Explain the utility of radioisotopes in tracing solubility of sparingly soluble   (4)
salts.

5.a) Compare and contrast acute and chronic radiation exposure, including their long-term effects. (4)

  b) Explain the medical applications of radioisotopes. (4)

  c) Define LET, Rad, Roentgen, and G-value in radiation physics and discuss their significance in radiation dosimetry. (4)

UNIT - III

6.a) Discuss in detail the reasons for high ϕ with a suitable example. (4)

  b) Define solvatochromism. Explain the Hypsochromic shift by taking an example. (4)

  c) Discuss the acidity constant of electronically excited molecules. (4)

7.a) Differentiate between thermal and photochemical reactions. (4)

  b) State Frank-Condon principle. Explain the shapes of absorption bands based on this principle. (4)

  c) Write the schematic representation of Actinometry and explain the parts. (4)

UNIT – IV

8.a) Explain photoisomerization and photo dissociation reactions by taking suitable example for each. (4)

  b) Derive the kinetics of unimolecular photochemical processes. (4)

  c) Explain fluorescence and phosphorescence phenomena shown by the molecules. Give their applications. (4)

9.a) Explain in detail the quenching of fluorescence. (4)

  b) Discuss the following: (4)

    i. Solar energy utilization   ii. Water splitting reactions

  c) Write a note on rotating-can phosphoroscope with the schematic representation. (4)

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PH 583.4   Reg. No. :

St Aloysius College (Autonomous)
Mangaluru
Semester IV – P.G. Examination – M.Sc. Chemistry
May - 2024
CHEMISTRY OF POLYMERS AND NATURAL PRODUCTS

Time: 3 Hours   Max. Marks: 70

PART - A

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

   a) What is the tensile strength of a polymer?

   b) What are linear and branched polymers?

   c) Write any two differences between glass transition temperature and melting point temperature.

   d) Write the principle of end group analysis.

   e) How is glycolysis important in the biogenesis of natural products?

   f) What are the various groups of opium derived alkaloids? Give any examples to each group

   g) Define pericyclic reactions.

   h) What is an ene reaction? How is it similar to Diels-Alder reaction?

PART - B

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

UNIT – I

2.a) Discuss Gradient elution technique with a schematic representation.   (4)

 b) Write the mechanism of free radical polymerization.   (4)

 c) Give the comparative account of step growth and chain growth polymerisation.   (4)

3.a) Discuss Polydispersity and molecular weight distribution in polymers.   (4)

 b) With a neat diagram, compare crystalline and amorphous polymers.   (4)

 c) Describe emulsion polymerization technique.   (4)

UNIT – II

4.a) Explain calendaring and film casting techniques.   (4)

 b) Describe sedimentation method of determination of molecular weight of polymer   (4)

 c) Elucidate the use of DSC technique in polymer characterisation.   (4)

5.a) Discuss the blow moulding method of polymer processing.   (4)

 b) Discuss the injection moulding method of polymer processing.   (4)

 c) Discuss the technique of reinforcement in polymers with an example.   (4)

UNIT - III

6.a) Illustrate the total synthesis of Menthol. What are the important   **(4)**
reagents and reactions involved?

  b) Explain the biogenesis and precursors of alkaloids.   **(4)**

  c) What are the steps involved in the total synthesis of Morphine?   **(4)**

7.a) What are the various methods used in the structural elucidation of   **(4)**
abietic acid?

  b) Outline the total synthesis of a-Pinene.   **(4)**

 c) Illustrate the total synthesis of Papaverine.   **(4)**

UNIT – IV

8.a) Describe the suprafacial and antarafacial sigmatropic rearrangement   **(4)**
of hydrogen and carbon moeity.

  b) How FMO analysis can be used to study Diels-Alder reaction?   **(4)**

  c) With suitable rearrangement reaction, predict the most favourable   **(4)**
product of allyl vinyl ether.

9.a) Detail Cope rearrangement. Explain the regio and stereo specificity   **(4)**
involved.

  b) Predict the products and explain.   **(4)**
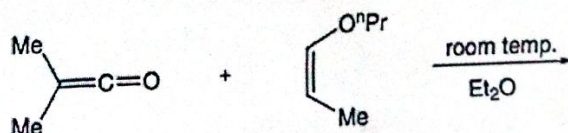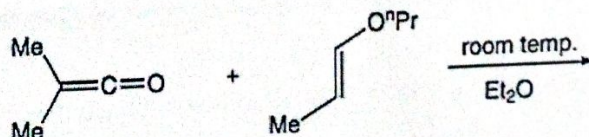
    i)
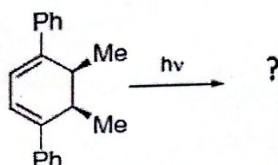
    ii)
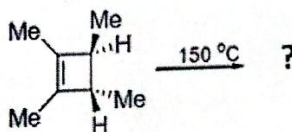
  c) Predict the products for these reactions and explain the salient   **(4)**
features of Ketene reactions.

    i)

    ii)

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Semester IV – P.G Examination – M.Sc. Chemistry
May - 2024
SOLID STATE AND NANO CHEMISTRY

Max. Marks: 70

Time: 3 Hours

PART - A

(7x2=14)

1. Answer any **SEVEN** questions of the following:

a) Define 'Unit cell' and 'Space lattice'.

b) Write the Wierl equation and give its significance.

c) Define systematic absences. Give its importance in X-ray diffraction studies.

d) What are stoichiometric and non-stoichiometric defects? Give an example for each.

e) Differentiate between ionic and electronic conduction.

f) Define Hall Effect.

g) What is meant by drying of gels? Give its importance.

h) How do you synthesize nano materials by co precipitation method?

i) Define nano dimensions. Give examples.

PART – B

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

(4x14=56)

UNIT- I

2. a) What are the factors affecting the intensities of diffracted X-rays? (4)

b) Explain the low energy electron diffraction technique and mention any two applications. (5)

c) Describe the Debye-Scherrer method of diffraction technique with a neat schematic diagram. (5)

3. a) Write a short note on calculation of number of particles in a cubic unit cell. (4)

b) Discuss the Weisenberg method for determining the structure of solids. (5)

c) Write a note on generation of X-rays. (5)

UNIT- II

4. a) Explain the precursor method of solid synthesis with an example. (4)

b) Discuss the thermodynamics of Schottky defect formation in solids. (5)

c) Describe the non-stoichiometry in FeO. (5)

Contd...2

5. a) Elaborate the formation of p-n junction. Discuss reverse and forward
   biasing. (4)

   b) Discuss the zoning and skull melting techniques of crystal growth. (5)

   c) Differentiate between piezoelectric and pyroelectric properties of solids. (5)

UNIT- III

6. a) Define self-assembly. Explain the sol-gel process of synthesizing
   nanomaterials. (4)

   b) Elaborate the application of nanomaterials in the field of medicine and
   catalysis. (5)

   c) What are carbon nanotubes? Discuss their application. (5)

7. a) Describe the formation of xerogels and aerogels. Give their applications. (4)

   b) Write a note on smart materials. (5)

   c) Describe the hydrothermal synthesis of nanoparticles. (5)

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