

PH 581.4

St Aloysius College (Autonomous)

Reg. No:

Mangaluru
Semester IV - P.G. Examination - M.Sc. Chemistry

July - 2022

ORGANIC SYNTHETIC METHODS

Time: 3 Hours

Max. Marks: 70

- PART - A** (5x2=10)
1. Answer any Five sub-divisions of the following:
- What is homogeneous catalytic hydrogenation? Give an example.
 - Illustrate any two synthetic applications of reductive amination reaction.
 - Illustrate the ozonolysis reaction of a terminal alkene.
 - Give an example for benzylic and allylic halogenation reactions.
 - What is Retro Diel's Alder reaction? Give an example.
 - Write any two oxidative ring cleavage reactions.
 - What are synthons and synthetic equivalents? Give suitable examples.
 - Give an example each for amino and hydroxy protecting reagents. Write the corresponding reactions.

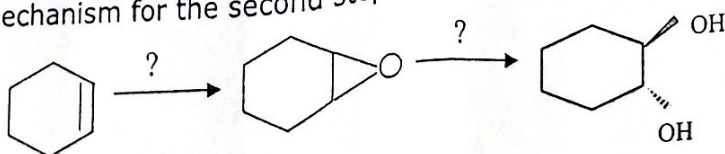
- PART - B** (5x12=60)
- Answer any FIVE of the following choosing at least one full question from each unit:

UNIT- I

- Illustrate the stereoselectivity in metal hydride reduction reactions of carbonyl compounds. (4)
 - Discuss the mechanism of Birch reduction and discuss the effect of electron donating and withdrawing groups. (4)
 - Give the synthesis any two diborane based reducing agents. Mention their synthetic applications. (4)
- With suitable examples, discuss the solvent effects in catalytic hydrogenation reactions. (4)
 - Explain the following. (4)
 - Wolf-Kishner reduction
 - Clemmensen reduction
 - Write a note on reduction reactions in biological systems. (4)

UNIT- II

- With suitable examples, explain the applications of lead tetraacetate in oxidation reactions. (4)
 - Write a note on dehydrogenation reactions with S and Pt. (4)
 - Suggest suitable reagents for the following conversion and give the mechanism for the second step.



(4)

5. a) Discuss the application of chromium based reagents in the oxidation of alcohols. (4)
- b) Give a general synthetic method for per acids. Explain their synthetic applications. (4)
- c) Describe the synthetic methods used for preparation of cubane. (4)

UNIT- III

6. a) What are 1,3-dipolar cycloaddition reactions? Illustrate their application in the formation of five membered heterocyclic systems. (4)
- b) Explain stereo selective reaction using an example. (4)
- c) Outline the synthesis of 6-methoxy-1-tetralones. (4)
7. a) Discuss the synthetic applications of Thorpe condensation and Carbene insertion reactions. (4)
- b) Outline the synthesis biotin. (4)
- c) Explain the mechanism of Dieckmann cyclization reaction. (4)

UNIT- IV

8. a) With suitable examples, explain the importance of protection and deprotection reactions in organic reactions. (4)
- b) Explain two group C-C disconnections with suitable examples. (4)
- c) Perform the retrosynthetic analysis of benzocaine and phenacetin. (4)
9. a) With a suitable example, explain the importance of functional group interconversion in retrosynthetic analysis. (4)
- b) Give an example each for carboxylic acid and carbonyl group protection reagents. Write the corresponding protection and deprotection reactions. (4)
- c) Perform the retrosynthetic analysis.
- a) 2-methyl-6-methoxy indole 3-acetic acid (4)
- b) 6-methyl quinoline.

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St Aloysius College (Autonomous)
Mangaluru
Semester IV – P.G. Examination – M.Sc. Chemistry

July - 2022

RADIATION AND PHOTOCHEMISTRY

Time: 3 Hours

Max. Marks: 70

PART - A

1. Answer any **FIVE** sub-divisions of the following: (5x2=10)
- a) Define natural and artificial radioactivity with suitable examples.
 - b) What is meant by half-life of a radioactive element? Give its significance.
 - c) Write the importance of radiation protection.
 - d) Differentiate between radiation and photochemistry.
 - e) State and explain Frank-Condon principle.
 - f) Define quantum yield and give its significance.
 - g) Write the selection rules for radiative and radiationless electronic transitions.
 - h) Write the relationship between intensity of fluorescence and concentration. Give its significance.

PART - B

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

UNIT- I

2. a) Describe the assay of radioactive isotopes using Scintillation detectors. What are its advantages over Semiconductor radiation detectors. (5)
- b) Compare nuclear fission and nuclear fusion reactions with suitable examples. (4)
- c) Write a short note on breeder reactors. (3)
3. a) Explain the Liquid Drop Model of an atomic nucleus. Compare it with the Shell Model. (5)
- b) Discuss the basic features and components of nuclear power reactors. (4)
- c) Elaborate the conditions of radioactive equilibrium. (3)

UNIT - II

4. a) Discuss the solvent extraction method of radiochemical separation. Give its advantages. (4)
- b) Explain the Medical and Agricultural applications of radioisotopes. (4)
- c) Elaborate the radiation chemistry of water. (4)

5. a) Describe the methods of handling and disposal of radioactive wastes. (4)
b) Write a note on production of radioisotopes and labelled compounds by bombardment. (4)
c) Describe radiometric titration with examples. (4)
- UNIT-III**
6. a) Compare thermochemical and photochemical processes. (4)
b) Explain the experimental method to determine the quantum yield in a photochemical reaction (4)
c) Describe the acidity constants of electronically excited molecules. (4)
7. a) State and explain the rules for electronic transitions between two energy states. (4)
b) Explain the study of excited states by flash photolysis experiment. (3)
c) Discuss the effect of solute-solvent interactions on absorption and emission spectra. (5)
- UNIT - IV**
8. a) Explain the fluorescence and phosphorescence phenomena shown by the molecules. Give their applications. (4)
b) Write a note on photochemical quenching techniques. (3)
c) Derive the kinetics of unimolecular photochemical processes. (5)
9. a) Define photosensitised reactions. Explain photo dissociation and photo isomerisation reactions with specific examples. (4)
b) Discuss the following: (4)
(i) solar energy utilization (ii) Water splitting
c) Describe the instrumentation of fluorimetric analysis with a neat schematic diagram. (4)

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

July - 2022

CHEMISTRY OF POLYMERS AND NATURAL PRODUCTS

Time: 3 Hours

Max. Marks: 70

PART - A1. Answer any **FIVE** sub-divisions of the following:

(5x2=10)

- a) What is an addition polymer? Give an example.
- b) Crystalline polymers exhibit higher chemical resistance. Justify
- c) Amorphous polymers do not have sharp melting points. Give reason.
- d) What is the role of plasticizer as additive in polymers?
- e) How do you estimate hydroxyl group in alkaloids using Zerewitinoff's method?
- f) Highlight the limitation of isoprene rule and what is the only information that is obtained from this rule?
- g) Explain Embde's method for degradation.
- h) Give the synthesis of adrenaline.

PART - BAnswer any **FIVE** of the following choosing at least one full question from each unit:

(5x12=60)

UNIT - I

2.
 - a) Explain the mechanism of free-radical polymerization. (4)
 - b) Describe the principle and experimental setup of gel permeation chromatography. (4)
 - c) Explain crystallinity requirements for crystallisability of polymers. (4)
3.
 - a) Explain the process of chain-growth polymerization with suitable example. (4)
 - b) Describe the fractional precipitation process of polymers. (4)
 - c) Explain the thermodynamics of polymer dissolution. (4)

UNIT - II

4.
 - a) Explain sedimentation method for determination of molecular weight of polymer. (4)
 - b) List out four factors affecting the T_g. (4)
 - c) With neat diagram, compare crystalline and amorphous polymers. (4)
5.
 - a) How to determine the molecular weight of polymer using viscosity method? (4)
 - b) What makes DSC analysis different from TGA? Illustrate DSC instrumentation. (4)
 - c) Compare the different methods for measuring molecular weight. (4)

6. a) Account for the point of attachment between quinuclidine nucleus and quinoline nucleus in quinine. (4)
- b) Explain the synthesis of papaverine and elucidate its structure. (4)
- c) Account for the presence of phenanthrene nucleus and ether linkage in morphine. (4)
7. a) Describe the general methods for structural determination of alkaloids. (4)
- b) Establish the synthetic conversion of cinchotoxine to cinchonine. (4)
- c) Illustrate the total synthesis of piperine from methyl-2-buteonate. (4)
- UNIT - IV**
8. a) Write the synthetic routes to understand the structural elucidation of abietic acid. (4)
- b) Which terpenoid is synthesized by rearrangement reactions? Give details. (4)
- c) Formulate the chemical synthesis of menthol. (4)
9. a) How spectroscopy is used for structural elucidation of terpenoids? (4)
- b) Schematically prove that geraniol is an E-isomer with respect to the double bond. (4)
- c) Give the synthesis of α -pinene. (4)

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

July - 2022

SOLID STATE AND NANO CHEMISTRY

Max. Marks: 70

Time: 3 Hours

PART - A

(7x2=14)

1. Answer any **SEVEN** sub-divisions of the following:
- List the factors affecting X-ray intensities.
 - Calculate the Miller Indices of the plane which intercepts on X and Y -axes at (a,0,0), (0,a,0) and parallel to Z-axis.
 - An X-ray profile of gold nanoparticle was recorded with Cu K α radiation which showed diffraction peak at 2θ value of 45° with the width at half maxima of 1.2 mm. Calculate the crystallite size of gold particles. (Given: Wavelength of Cu K α = 0.15406 nm; $k = 0.94$; $\cos 45 = 0.7071$).
 - Differentiate between stoichiometric and non-stoichiometric defects.
 - What are pyroelectric materials? Give an example.
 - What type of materials are formed using flame fusion technique? Name the chemical powder employed in this technique.
 - Mention the principle involved in the synthesis of nanoparticles by hydrothermal synthesis.
 - What are smart materials? List out their properties.
 - What are Xerogels and Aerogels?

PART - B

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

(4x14=56)

UNIT- I

- With the help of neat schematics, explain the production of X-rays using Coolidge tube. (5)
 - Discuss the principle and application of Laue method in the analysis of crystalline structure of substances. (5)
 - Write a note on electron diffraction in gaseous and liquid samples. (4)
- Derive Bragg's equation. (4)
 - Illustrate the principle and applications of low energy electron diffraction in the analysis of structure of surfaces. (4)
 - Elaborate Weissenberg method of structure determination of solids. (3)
 - Explain the types of close packing in crystals. (3)

Contd...2

4. a) Explain the structure of FeO and the influence of defects on the properties of FeO. (4)
b) Discuss the thermodynamics of Schottky defect in solids. (5)
c) What is Hall effect? Enumerate the theory and its applications. (5)
5. a) Briefly explain the principle and methodology involved in chemical vapour deposition method. (4)
b) Describe the pulling and flame fusion method of crystal growth. (4)
c) Write short notes on :
i) Schottky defects and ii) Hopping semiconductors (6)
6. a) Explain the principle, mechanism and procedure involved in the synthesis of nanoparticles by electrodeposition method. Also mention the advantages of this method. (5)
b) With suitable examples, explain the advantages and applications of nanoparticles in nanomedicine. (5)
c) What are peptization reactions? Explain the advantages with suitable examples. (4)
7. a) Elaborate the Sol-gel process of nanomaterial synthesis. (4)
b) Discuss the role of size and shape of nanomaterials on the properties of nanomaterials. (4)
c) Explain the preparation, properties and applications of chemical nanocomposites (3)
d) What is spintronics?. Explain the advantages and applications of nanomaterials in spintronics. (3)

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