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St Aloysius College (Autonomous)
Mangaluru

Semester IV – P.G. Examination – M.Sc. Analytical Chemistry
May - 2024

ORGANIC SYNTHETIC METHODS

Time: 3 Hours

Max. Marks: 70

PART - A

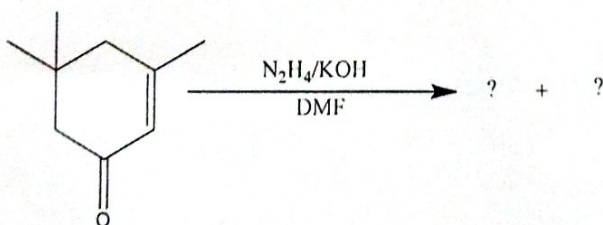
1. Answer any **FIVE** questions of the following: (5x2=10)
- How do transition metal catalysts participate in homogenous catalysis reactions?
 - What is acyloin condensation? Give an example.
 - Give Curtius rearrangement.
 - Explain the mechanism of the reaction of peracid with keto compound.
 - Describe the structure of Penicillin -V.
 - Write any two carbon-carbon single bond forming reactions.
 - Perform the retrosynthetic analysis of phenacetin.
 - Discuss any two basic principles in disconnection approach.

PART - B

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

UNIT - I

- Explain the role of sodium borohydride as a reducing agent in organic chemistry. (4)
 - What is heterogenous catalysis? Discuss the catalysts used in it. (4)
 - Outline the bimolecular reduction of esters. (4)
- Predict the product with the mechanism for the following and also mention the name of the reaction: (4)



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- Compare and contrast the reactivity of sodium borohydride with lithium aluminum hydride. Provide examples. (4)
 - Write a note on reduction using diimide. (4)

UNIT - II

- Describe the importance of Pinacol-Pinacolone rearrangement. (4)
 - Explain the mechanism of oxidation of aldehydes by SeO_2 . (4)
 - Discuss the mechanism of Neber rearrangement. (4)

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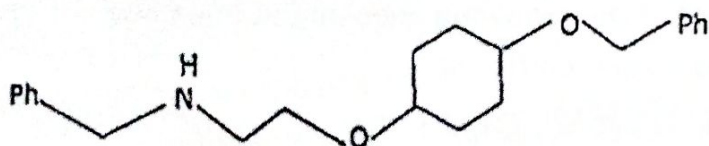
- 5.a) Explain Demaynov rearrangement. (4)
 b) Propose a suitable mechanism for the oxidation of aromatic side chain by KMnO_4 . (4)
 c) Outline the application of HIO_4 in organic synthesis. (4)

UNIT - III

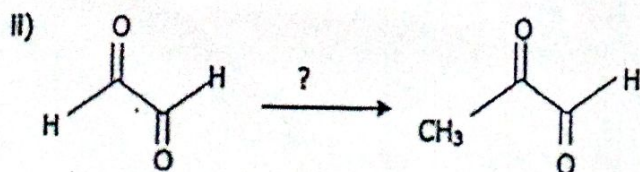
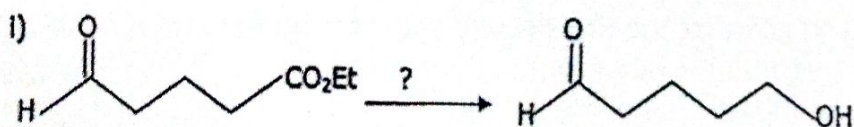
- 6.a) Explain the mechanism of 6-Methoxy-1-tetralone. (4)
 b) Write a note on Thorpe condensation. (4)
 c) Explain the mechanism of Robinson annulations. (4)
- 7.a) Describe 1,3-dipolar cycloaddition reaction with mechanism. (4)
 b) Write a note on Suzuki coupling reaction. (4)
 c) Explain the mechanism of Arndt-Eistert reaction with mechanism. (4)

UNIT - IV

- 8.a) Provide all the possible disconnections and suggest a synthetic scheme for the following molecule. Describe the rationale of your chosen synthetic method. (4)



- b) Suggest any two reagents for the protection of carbonyl compounds. Write the protection and deprotection reactions. (4)
 c) What is FGI? What is its importance in synthesis? Explain with examples. (4)
- 9.a) Give one group and two group C-C disconnections with suitable examples. (4)
 b) Suggest retrosynthetic schemes for chlorobenzide and 2,4-dichloro phenoxy acetic acid. (4)
 c) Explain the conversion: (4)



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SPECTROSCOPIC METHODS OF ANALYSIS

Time: 3 Hours

Max. Marks: 70

PART - A

1. Answer any **FIVE** questions of the following: (5x2=10)
- What is Auger effect?
 - What are the factors affecting g-values in ESR spectroscopy?
 - What are two key factors that influence the precision of AAS measurements for trace element analysis?
 - Discuss the significance of the detector in atomic absorption spectroscopy.
 - Differentiate between steady-state and time-resolved fluorimetry techniques in one sentence.
 - What is a typical application of phosphorimetric analysis in forensic science?
 - How are nephelometry and fluorimetry different?
 - Explain the application of optical rotation method in the determination of rate constant.

PART - B

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

UNIT - I

- Explain the principle behind Auger Spectroscopy. (4)
 - Examine the importance of hyperfine couplings in electron paramagnetic resonance (EPR) spectroscopy, and illustrate their significance through relevant examples. (4)
 - Explain the shifts in energies due to chemical forces in photoelectron spectroscopy. (4)
- Describe the theory behind the NQR spectroscopy and mention any two applications of NQR spectroscopy. (4)
 - Describe the methodology employed by Mössbauer spectroscopy to differentiate between Fe^{+2} and Fe^{+3} compounds. Discuss the characteristic features of their Mössbauer spectra and how they relate to oxidation states. (4)
 - Discuss the following aspects of Mössbauer Spectroscopy: (4)
 - Chemical Isomer Shift
 - Mössbauer Nuclide.

UNIT - II

- 4.a) Analyze the influence of flame background in atomic absorption spectroscopy, considering its sources, effects on measurement accuracy, and methods to mitigate interference. (4)
- b) Explain in detail devices commonly used for the formation of an atomic vapor in atomic spectroscopy techniques, highlighting their principles of operation and applications. (4)
- c) Write a note on ICP spectroscopy. (4)
- 5.a) What are the advantages and limitations of using premix burners in atomic absorption spectroscopy compared to total consumption burners? (4)
- b) Write a note on applications of AAS. (4)
- c) Briefly describe the instrumentation of flame photometry. (4)

UNIT - III

- 6.a) Evaluate the role of concentration on fluorescence and phosphorescence intensity. Discuss how changes in concentration can lead to quenching. (4)
- b) Compare and contrast filter fluorimeters and spectrofluorimeters, detailing their instrumentation, operational principles, and applications. (4)
- c) Write a note on instruments used in phosphorimetry. (4)
- 7.a) Describe the types of condensed systems studied using photoacoustic spectroscopy (PAS), including liquids, solids, and colloidal suspensions. (4)
- b) Explain the concept of intersystem crossing and its role in determining the quantum yield of phosphorescence. Discuss how the rate of intersystem crossing influences the population of triplet states and subsequent phosphorescent emission. (4)
- c) Explain the principle of chemiluminescence. (4)

UNIT - IV

- 8.a) Explain the instrumentation of single crystal XRD? (4)
- b) Give an account of interaction of x-ray with matter. (4)
- c) Explain the effects of concentration and particle size of suspension on nephelometry and turbidimetry. (4)
- 9.a) Describe the principle and applications of X-ray absorption. (4)
- b) How do you relate scattering of light with turbidimetry (4)
- c) Write a note on Octant rule by taking a suitable example. (4)

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CHEMISTRY OF POLYMERS AND NATURAL PRODUCTS

Time: 3 Hours

Max. Marks: 70

PART - A

1. **Answer any FIVE questions of the following:** (5x2=10)
- What is the tensile strength of a polymer?
 - What are linear and branched polymers?
 - Write any two differences between glass transition temperature and melting point temperature.
 - Write the principle of end group analysis.
 - How is glycolysis important in the biogenesis of natural products?
 - What are the various groups of opium derived alkaloids? Give any examples to each group
 - Define pericyclic reactions.
 - 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 full question from each unit: (5x12=60)

UNIT - I

- Discuss Gradient elution technique with a schematic representation. (4)
 - Write the mechanism of free radical polymerization. (4)
 - Give the comparative account of step growth and chain growth polymerisation. (4)
- Discuss Polydispersity and molecular weight distribution in polymers. (4)
 - With a neat diagram, compare crystalline and amorphous polymers. (4)
 - Describe emulsion polymerization technique. (4)

UNIT - II

- Explain calendaring and film casting techniques. (4)
 - Describe sedimentation method of determination of molecular weight of polymer (4)
 - Elucidate the use of DSC technique in polymer characterisation. (4)
- Discuss the blow moulding method of polymer processing. (4)
 - Discuss the injection moulding method of polymer processing. (4)
 - Discuss the technique of reinforcement in polymers with an example. (4)

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UNIT - III

- 6.a) Illustrate the total synthesis of Menthol. What are the important reagents and reactions involved? (4)
- 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 abietic acid? (4)
- b) Outline the total synthesis of α -Pinene. (4)
- c) Illustrate the total synthesis of Papaverine. (4)

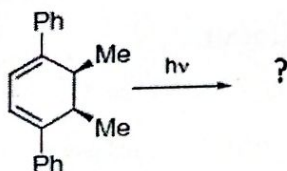
UNIT - IV

- 8.a) Describe the suprafacial and antarafacial sigmatropic rearrangement of hydrogen and carbon moiety. (4)
- b) How FMO analysis can be used to study Diels-Alder reaction? (4)
- c) With suitable rearrangement reaction, predict the most favourable product of allyl vinyl ether. (4)

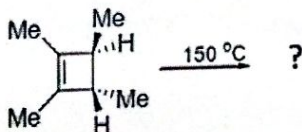
- 9.a) Detail Cope rearrangement. Explain the regio and stereo specificity involved. (4)

- b) Predict the products and explain. (4)

i)

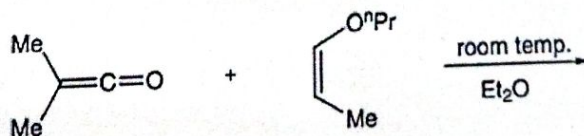


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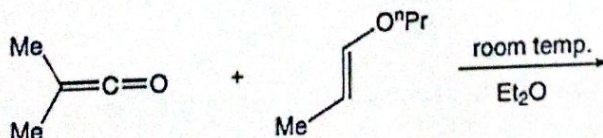


- c) Predict the products for these reactions and explain the salient features of Ketene reactions. (4)

i)



ii)



St Aloysius College (Autonomous)**Mangaluru****Semester IV – P.G. Examination - M.Sc. Analytical Chemistry****May - 2024****APPLIED ANALYSIS AND AUTOMATION****Time: 3 Hours****Max. Marks: 70****PART – A**

1. Answer any **SEVEN** questions of the following: (7x2=14)
- Define reaction stoichiometry and provide an example illustrating its significance in chemical reactions.
 - Explain the concept of a rate law and its significance in understanding the kinetics of chemical reactions.
 - Mention two differences between automated and automatic systems.
 - Write the significance of segmented flow analysis.
 - Explain the difference between quality control and quality assurance in the context of pharmaceutical production.
 - Explain why quality control is crucial at each stage of the manufacturing process, from raw materials to finished products.
 - Describe the process of multicomponent analysis in kinetic methods.
 - List the minerals present in milk.
 - Describe the role of quality control in petrochemical industries.

PART – B

Answer any **FOUR** of the following choosing at least one (4x14=56)
full question from each unit:

UNIT – I

- Discuss in detail potentiometric and spectrophotometric methods to determine rate of a reaction. (4)
 - How do you determine sGPT in human samples? (5)
 - Derive Michaelis-Menten equation and give the rates at $K_M=[S]$ and $K_M \gg [S]$. (5)
- Explain the half-life and isolation methods to determine order of a reaction. (4)
 - Discuss about enzyme specificity and effects of pH and Temperature etc. (5)
 - Explain Logarithmic Extra Polation method. (5)

UNIT – II

- 4.a) Discuss the principle of automated glucose analyser. (4)
- b) Give the methods of determination of moisture and ash content in food samples. (5)
- c) Discuss the working principle of centrifugal fast scan analyser. (5)
- 5.a) Discuss the identification of arsenic in the biological sample. (4)
- b) Explain Methylene blue test carried out in dairy industry. (5)
- c) Write the source of cyanide poisoning and its symptoms. (5)

UNIT – III

- 6.a) Describe the key elements of a product specification in the context of quality assurance. (4)
- b) Design a quality control plan for a pharmaceutical company manufacturing tablets. Include specific tests and parameters to be monitored during different stages of production, from raw material evaluation to finished product testing (5)
- c) Provide an overview of acts such as the Drugs and Cosmetics Act, 1940, and the Pharmacy Act, 1948, highlighting their key provisions and objectives. (5)
- 7.a) Discuss various methods of sampling in case of pharma industries. (4)
- b) Compare and contrast ISO 14001 and ISO/IEC 17025 with ISO 9001 in terms of their focus and application. (5)
- c) Discuss quality control in raw materials, in process and finished product in pharma industries. (5)
