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Reg. No:

St Aloysius College (Autonomous)

Mangaluru

Semester IV – P.G. Examination –M.Sc. Analytical 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:**
   a) What is homogeneous catalytic hydrogenation? Give an example.
   b) Illustrate any two synthetic applications of reductive amination reaction.
   c) Illustrate the ozonolysis reaction of a terminal alkene.
   d) Give an example for benzylic and allylic halogenation reactions.
   e) What is Retro Diel's Alder reaction? Give an example.
   f) Write any two oxidative ring cleavage reactions.
   g) What are synthons and synthetic equivalents? Give suitable examples.
   h) Give an example each for amino and hydroxy protecting reagents. Write the corresponding reactions.

PART – B

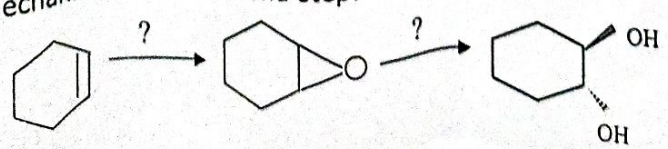
Answer any FIVE of the following choosing at least one full question from each unit: **(5x12=60)**

UNIT- I

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

UNIT- II

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



(4)

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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
      b) 6-methyl quinoline. (4)

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Semester IV – P.G. Examination –M.Sc. Analytical Chemistry
July - 2022
SPECTROSCOPIC METHODS OF ANALYSIS

Time: 3 Hours Max. Marks: 70

PART - A

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

a) What is core binding energy? How is it influenced by the oxidation states of an atom?

b) An ESR peak corresponding to ($g_{perpendicular}$) will be more intense than that for g_{11} ($g_{parallel}$). Justify.

c) How does flame temperature varies the emission intensity?

d) Write a note on plasma excitation sources.

e) Point out the light sources used for photoacoustic spectroscopy.

f) If intersystem crossing occurs during excitation in a sample what type of phenomenon occurs and why?

g) Write the principle of turbidimetric titration.

h) What is circular dichroism?

PART – B

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

UNIT- I

2. a) How can you differentiate KLL Auger process and double Auger process? (5)

b) Describe the two characteristics of a Mössbauer nuclide and explain how recoilless emission and resonant re-absorption of γ-rays can be achieved. (4)

c) The CH_2OH radical exhibits a triplet of 1:2:1 intensity whereas DCO radical shows 1:1:1 intensity in ESR spectroscopy. Explain. (3)

3. a) Give an account of the experimental technique involved in Mössbauer spectroscopy. (5)

b) Describe the theoretical aspects of ESR spectroscopy and explain hyperfine splitting. (4)

c) p-Chlorobenzyl chloride exhibits two peaks in the NQR spectrum whereas p-dichlorobenzene shows a single peak. Give reasons. (3)

UNIT - II

4. a) Distinguish between total consumption and premix burners. Sketch the neat labeled diagrams of the same. (5)

b) Explain the determination of sodium present in soil samples by flame photometery. (4)

c) Mention the relationship between AAS and FES. (3)

Contd...2

5. a) Discuss the role of temperature and organic solvents in atomic absorption spectroscopy. (5)

b) With suitable example explain the precision and accuracy of AAS and FES. (4)

c) Explain the ionization interferences in flame photometry. How that can be overcome? (3)

UNIT – III

6. a) What is delayed fluorescence? Explain using Jablonski diagram. (5)

b) Differentiate between fluorimetry and phosphorimetry. (4)

c) Explain the dependence of excitation wavelength for luminescence analysis. (3)

7. a) With a neat labelled diagram discuss the components of spectrofluorimeter. (5)

b) Describe the process of quenching during deactivation. (4)

c) List out the factors affecting fluorescence and phosphorescence. (3)

UNIT – IV

8. a) How is instrumentation of powder XRD different from single crystal XRD? (5)

b) Write the effect of following on nephelometry measurements

(i) Particle size (ii) Concentration (4)

c) Write a note on Octant rule by taking a suitable example. (3)

9. a) With a neat diagram of XRD explain the types of X-ray absorptions. (5)

b) Explain optical rotatory dispersion of enantiomers of *cis* and *trans* 10-methyl-2-decalones. (4)

c) How is nephelometry different from turbidimetry? Explain. (3)

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

July - 2022

CHEMISTRY OF POLYMERS AND NATURAL PRODUCTS

Time: 3 Hours

Max. Marks: 70

PART - A

1. **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 – B

Answer 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 Tg. (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)

Contd...2

UNIT – III

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. Analytical Chemistry

July - 2022

APPLIED ANALYSIS AND AUTOMATION

Time: 3 Hours

Max. Marks: 70

PART - A

1. **Answer any SEVEN sub-divisions of the following:** (7x2=14)

a) What is catalysis and Inhibition?

b) What is Enzyme Specificity?

c) Mention any four methods to identify the reaction rate.

d) List any two differences between COD and BOD analysis.

e) List the composition of milk. What are the factors influencing its composition?

f) Write the mechanism of action of cyanide poisoning.

g) Explain Quality acceptance.

h) Define quality assurance.

i) Mention the types and significance of ISO.

PART – B

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

UNIT- I

2. a) Discuss the determination of LDH enzyme. (5)

b) Write a note on enzyme catalysis with example. (4)

c) Give an account of second order reaction and its importance. (5)

3. a) Discuss about catalysed reactions with suitable examples. (5)

b) Discuss the major classes of enzymes with examples. (5)

c) Explain the determination of Iodide in the given sample. (4)

UNIT- II

4. a) Give the general method of determination of moisture and fat content in the food sample. (5)

b) Discuss the construction and working of an elemental analyser. (5)

c) Discuss flow injection analysis. (4)

5. a) Write the symptoms and mode of action of organophosphate poisoning. (5)

b) Explain Methylene blue test carried out in dairy industry. (5)

c) Discuss the principle of automated glucose analyser. (4)

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UNIT- III

6. a) Give an account of ISO14001 and laws related to quality control in Pharma industries. (5)
   b) Explain the current trends in quality control. (5)
   c) Give a comparative account of QA and QC with reference to pharma Industry. (4)

7. a) Write a detailed note on different aspects of specification. (5)
   b) Explain in detail the importance of quality assurance and ISO/IEC. (5)
   c) Give a detailed account of ISO 9001 series. (4)

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