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St Aloysius College (Autonomous)

Mangaluru

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

April- 2019

ORGANIC SYNTHETIC METHODS

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

PART - A

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

a) Explain the selectivity or lack of it during catalytic hydrogenation reaction using metal and hydrogen.

b) Write mechanism of Birch reduction reaction.

c) How is peracids prepared? Compare the reactivity of substituted peracids for the epoxidation of alkenes.

d) Write the reagents used for allylic and benzylic halogenations. Explain their synthetic importance.

e) Describe the synthetic application of Robinson annulation reaction.

f) Explain the role of catalyst during Friedel Crafts reaction.

g) Write the importance of functional group interconversion in organic synthesis. Justify your answer by taking suitable example.

h) What is the criteria used to choose a protecting group from multiple options?

PART – B

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

UNIT – I

2.a) i) Differentiate the reduction reaction of alkene and carbonyl compounds.

ii) Write the synthetic applications of $LiAlH_4$ and $NaBH_4$. Comment on their differential reactivity. **(4)**

b) i) Write the mechanism of Birch reduction.

ii) Write a note on Wolf-Kishner reduction reaction and give its mechanism. **(4)**

c) Discuss the stereochemistry of reduction with $LiAlH_4$. **(4)**

3.a) Describe the reduction of nitro compounds by the following: $Pd\text{-}C/H_2$ and $LiAlH_4$. **(4)**

b) How is diimide prepared? Write their synthetic applications highlighting and stereochemistry and mechanism. **(4)**

c) Describe the mechanism of homogeneous catalytic hydrogenation using Ru-catlyst. **(4)**

UNIT – II

4.a) Describe the application of chromium based oxidation reactions in organic synthesis. How is selectivity improved with modified chromium reagents? **(4)**

Contd...2

b) How is osmium tetroxide useful as an oxidant? Write mechanism of oxidation reaction. What are the limitations of this reagent? (4)

c) Write the mechanism of addition of bromine to symmetrical and unsymmetrical alkenes. Comment on the major products formed. (4)

5.a) Describe the applications of manganese based oxidants used in organic synthesis. Explain the selectivity of such reagents using different substrates. (4)

b) Write the mechanism of ozonolysis of an alkene. Write the product of ozonolysis of 3-methyl – 2-pentene and cyclohexene. (4)

c) Write the synthetic application of t-butyl hydroperoxide. Explain how it is used in enantioselective epoxidation reactions. (4)

UNIT – III

6.a) Explain the factors affecting the rate of Diels-Alder reaction. Write two applications of Diels Alder reactions. (4)

b) Discuss the strategy employed for the synthesis of 7-methoxy tetralone. (4)

c) Explain the synthetic scheme for penicillin – V. (4)

7.a) i) Differentiate chemoselectivity from stereoselectivity using an example.

ii) Explain Thorpe condensation reaction. (4)

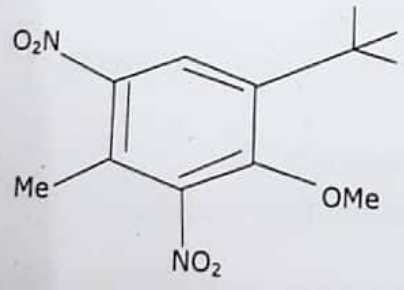
b) Provide the synthetic scheme for cubane. (4)

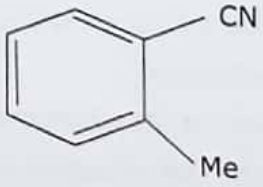
c) Illustrate the following statement by selecting two examples and also suggest mechanism for one of the reaction.

Statement-Carbon-carbon bond reactions are useful synthetically. (4)

UNIT - IV

8.a) Suggest retrosynthetic schemes for the following:





(4)

b) i) What is 1,3-diX relationship? Explain with an example.

ii) Give the retrosynthetic strategy for benzocaine. (4)

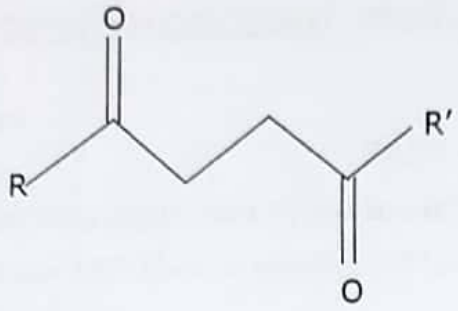
c) i) Explain the terms synthon and synthetic equivalents using suitable example.

ii) Provide the retrosynthetic scheme for phenacetin. (4)

9.a) i) Suggest a reagent for the protection of carbonyl compounds. Write the protection and deprotection reactions.

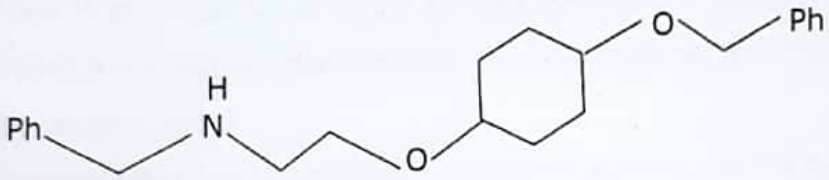
Contd...3

ii) Suggest suitable retrosynthetic strategy for following 1,4-difunctional compound.



(4)

b) Predict all the possible disconnections and suggest a synthetic scheme for the following molecule. Describe the rationale of your chosen synthetic method.



(4)

c) Provide the retrosynthetic analysis of 4-hydroxy-4-methylpentanone. (4)

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

April- 2019

SPECTROSCOPIC METHODS OF ANALYSIS

Time: 3 Hours Max. Marks: 70

PART - A

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

a) How many ESR lines are expected for methyl radical? Sketch the spectrum for the same.

b) Among the following which elements do not produce Auger spectrum and why?

i) N ii) H_2 iii) C iv) He

c) How is atomization of liquid sample achieved in inductively coupled plasma?

d) What is ionization interference? How is it corrected in atomic absorption determinations?

e) Justify that phosphorescence spectrum always occurs at longer wavelength than that of fluorescence spectrum.

f) Give the structure of any two fluorimetric reagents and mention its use.

g) How are nephelometry and turbidimetry similar and different?

h) Illustrate the use of Debye-Scherrer method of x-ray diffraction in the determination of d.

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 term nuclear quadruple coupling constant. Calculate NQR transition frequencies for a nuclens with $I = {}^5/_2$ assuming $\eta = 0$. **(5)**

b) What is meant by isomer shift? Explain isomer shift for Fe^{2+}, Fe^{+3}, Sn^{2+} & Sn^{4+} ions. **(4)**

c) Predict the Mossbauer spectrum of $[Fe(CN)_6]^4$ and explain the spectrum. **(3)**

3.a) Give an account of hyperfine splitting in ESR. Sketch and interpret the spectrum of 1, 4-benzosemiquinone and deuterium atom. **(5)**

b) Discuss the following. **(4)**

i) Auger effect

ii) g-value and its determination in ESR spectroscopy

c) Draw energy level diagram and calculate transition frequencies for nucleus having $I = {}^3/_2$ assuming $\eta = 0$ in NQR spectroscopy. **(3)**

Contd...2

UNIT – II

4.a) How is hollow cathode lamp different from electrodeless discharge lamp in Atomic Absorption Spectrophotometer? Explain their mode of working. (5)

b) Describe the excitation sources of plasma emission spectroscopy. (4)

c) What are the factors that influence the intensity of emitted radiation in a flame photometer? Explain. (3)

5.a) Total consumption burner lowers that sensitivity, whereas, premix burner provides higher sensitivity. Why? Explain their role in atomic absorption determinations. (5)

b) Discuss the following interferences of flame photometric determinations. (4)

i) Spectral interferences

ii) Chemical interferences

c) What are the differences between atomic absorption spectroscopy and flame emission spectroscopy? (3)

UNIT - III

6.a) Explain the different components of fluorescence spectrometer with block diagram. (5)

b) Discuss the utility of fluorimetry in the determination of Vitamin B_1 and Vitamin B_2. (4)

c) How do the pH and dissolved oxygen affect fluorescence and phosphorescence? (3)

7.a) Explain the following methods of deactivation of excited molecules with the help of Jablonski diagram. (5)

i) Vibrational relaxation

ii) Intersystem crossing

b) What is fluorescence quenching? Discuss the types of it. (4)

c) Deduce an expression for the relation between phosphorescence intensity and concentration. Draw a typical curve representing it. (3)

UNIT – IV

8.a) How the choice is made between nephelometry and turbidimetry. Explain the factors affecting both the techniques. (5)

b) Describe the rotating crystal method of x-ray diffraction. (4)

c) Discuss the use of optical rotator dispersion in quantitative analysis. (3)

9.a) Give an account of the following. (5)

i) octant rule

ii) circular dichroism

b) Sketch a block diagram of x-ray absorptiometer and explain its mode of working. (4)

c) Give an account of the acid calatyzed mutarotation of glucose. (3)

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St Aloysius College (Autonomous)
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Semester IV - P.G. Examination - M.Sc. Analytical Chemistry
April - 2019

CHEMISTRY OF POLYMERS AND NATURAL PRODUCTS

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

PART - A

1) Answer any FIVE sub divisions of the following **(5×2=10)**

a) Write the structure of the repeating unit for each of the following polymer:
   i) Poly (ethylene terephtholate)
   ii) Teflon
   iii) Nylon 6,6
   iv) polypropylene

b) Calculate the degree of polymerisation of Nylon-6, 6 with a molecular weight of $1x10^4$g/mole.

c) Among polyethylene and polystyrene, which polymer exhibits a higher Tg value? Why?

d) Sketch the characteristic DSC curve of a semicrystalline polymer sample and mention the various features.

e) What happens when cinchonine is oxidized with chromic acid?

f) Reserpic acid gives γ- lactone on heating with acetic anhydride. What does it indicate?

g) Formulate the following reaction

$\alpha - pinene \xrightarrow{cold.aq.KMnO_4} ? \xrightarrow{CrO_3}$ ketocarboxylic acid

h) How morphine is converted into morphol and morphenol?

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 use of GPC in isolation and purification of polymers. **(5)**

   b) With a suitable example, write the mechanism of ionic polymerisation. **(4)**

   c) Give an account of viscoelastic behaviour of polymers. **(3)**

3. a) Describe fractional precipitation of polymers. **(5)**

   b) Explain how the structure of a polymer influences the following properties. **(4)**

   i) tensile strength ii) crystallinity

   c) Solution viscosity measurement give an idea about the size and shape of polymer molecules in solution. Justify. **(3)**

Contd.2

UNIT - II

4. a) Explain osomometric method of determination of molecular weight of a polymer. (4)

b) How do you correlate that the glass transition temperature, crystallinity and melting point of a polymer with the structure of that polymer? Give suitable example. (4)

c) Outline the principle of visocometric method of determination of molecular weight of polymers. (4)

5. a) Discuss differential thermal analysis technique in polymer characterization. (4)

b) Explain the procedure for determining Tg employing DSC technique. (4)

c) Give an account of mechanical properties of polymers. (4)

UNIT - III

6. a) Describe the synthesis of Papaverine. (4)

b) When heated with dilute hydrochloric acid, thebaine rapidly undergoes rearrangement to Thebenine. Write down the mechanism involved in this conversion. (4)

c) Convert ethyl quininate to (I)-quinine. (4)

7. a) Suggest the suitable steps for the synthesis of reserpine from tryptamine. (4)

b) Outline the reactions that indicate (4)

i) Presence of methylenedioxy group in papaverine.
ii) Attachment of -CHOH group directly to the benzene ring in adrenaline

c) Discuss the evidences that led to the determination of structure of nicotine. (4)

UNIT - IV

8. a) Sketch the synthesis of Farnesol. (4)

b) Give evidences for the presence of cyclobutane ring in α-Pinene. (4)

c) Account for the position of hydroxyl and acid group in Abietic acid. (4)

9. a) Discuss how the structure of santonin was established by degradation studies. (4)

b) Formulate the steps involved in the synthesis of zingiberene. (4)

c) Give the evidences for the presence and position of the conjugated system in zingiberene. (4)

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St Aloysius College (Autonomous)
Mangaluru
Semester IV – P.G. Examination – M.Sc. Analytical Chemistry
April- 2019
APPLIED ANALYSIS AND AUTOMATION

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

PART - A

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

a) Name the different types of catalysis with examples.

b) Mention any four types of methods to identify the reaction rate.

c) Explain enzyme specificity.

d) What are the factors affecting dispersion?

e) Mention the chemical components of snake venom.

f) What is milk adulteration? How does it affect health?

g) Explain quality acceptance.

h) Define ISO and its importance in pharma industry.

i) Mention the importance of quality assurance in food industry.

PART - B

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

UNIT – I

2.a) Give an account of second order reaction and its importance. **(7)**

b) Explain the determination of LDH enzyme in blood samples. Why it is important? **(7)**

3.a) Discuss about catalyzed reactions with suitable examples. **(7)**

b) Mention the steps involved in the determination of iodide and cobalt in biological samples. **(7)**

UNIT – II

4.a) Give the significance and the importance of BUN analyzers. **(8)**

b) Explain the determination of lead and mercury in biological material **(6)**

5.a) Discuss the advantages and disadvantages of automated systems. **(8)**

b) Explain the analysis of fat contents and minerals in milk and butter. **(6)**

UNIT - III

6.a) Give an account of ISO14001 and laws related to quality control in general industries. **(7)**

b) Explain the steps involved in quality control role in the production and the finished products in pharma industries. **(7)**

7.a) Explain in detail the importance of quality assurance and ISO/IEC 17025. **(7)**

b) Explain the case study analysis of role of quality control in fertilizer and pharmaceutical industries. **(7)**

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St Aloysius College (Autonomous)

Mangaluru

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

April- 2018

ORGANIC SYNTHETIC METHODS

Time: 3 Hours Max. Marks: 70

PART - A

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

a) Illustrate the use of PtO_2 in catalytic hydrogenation reactions.

b) Distinguish Wolf-Kishner reduction from Clemmensen reduction.

c) Give an account of halogenations of carbonyl compounds.

d) Explain how is S and Se useful in carrying out dyhydrogenation reactions.

e) Describe the limitation of Friedel Crafts reaction.

f) Justify the following statement using an example;
Protecting groups may be necessary for multistep organic synthesis.

g) Write a short note on 1,3-dipolar cycloaddition reactions.

h) Retrosynthetic analysis may provide multiple options. What criteria one may adopt to select most suitable synthetic route?

PART – B

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

UNIT – I

2.a) Give an account of selective reducing agents for functional groups esters, carbonyl and alkenes. (4)

b) Describe the mechanism hydrogenation reactions using Rh complexes. (4)

c) How is diborane prepared? What are hindered boranes? Write the general mechanism of reduction of alkenes using borane reagents. (4)

3.a) Describe the reduction reactions of organic substrates under the following conditions and comment on their selectivity.
$Pd\text{-}H_2$; $Pd\text{-}BaSO_4$; $Pd\text{-}CaCO_3$. (4)

b) Describe the synthetic applications of diimide based reagents. (4)

c) How is LAH prepared? Describe the mechanism of reduction of carbonyl compounds using LAH. Write a note on other hydrides used as reducing agents commenting on their selectivity. (4)

UNIT – II

4.a) Describe the preparation and application of the following;
i) Jones reagent
ii) O_sO_4 (4)

b) How is lead tetraacetate useful as an oxidant? Write the reaction mechanism. Mention the limitations of this reagent. (4)

c) Describe the reagents used to achieve benzylic and allylic brominations. (4)

Contd...2

5.a) Explain the selectivity or lack of it for the following oxidants; $KMnO_4$; MnO_2. Highlight the substrates and the reaction conditions used for such reactions. (4)

b) What is ozonolysis reaction? Write the product of ozonolysis of cyclohexene. Give the reaction mechanism. (4)

c) Write the synthetic applications of periodic acid providing suitable reaction mechanism. (4)

UNIT – III

6.a) Give a brief account of Ring cleaving reactions. (4)

b) Describe the synthetic methods used for the preparation of cubane. (4)

c) Explain the structural aspects of biotin. Write its importance. (4)

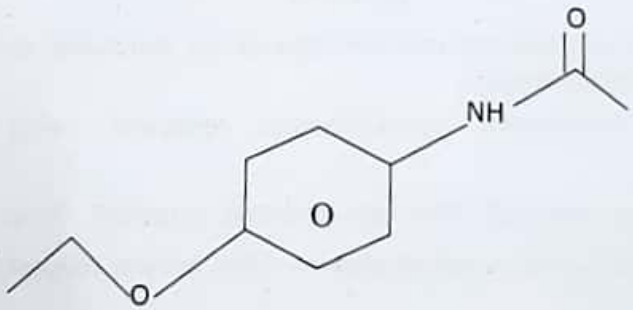
7.a) i) Explain stereo selective reaction using an example.
ii) Explain Retro Diels-Alder reaction. (4)

b) Write a note on Arndt-Eistert homologation and Dickman cyclization reaction. (4)

c) Illustrate the following statement by selecting two examples and suggest mechanism for one of the reaction.
Reactions involving C-C bond formation are useful systematically. (4)

UNIT - IV

8.a) Suggest retrosynthetic schemes for the following. Rationalize your pick among the methods providing suitable reasons.



(4)

b) i) What is 1,3-diX relationship? Explain with an example.
ii) Provide synthetic route for bezocaine using retrosynthetic strategy. (4)

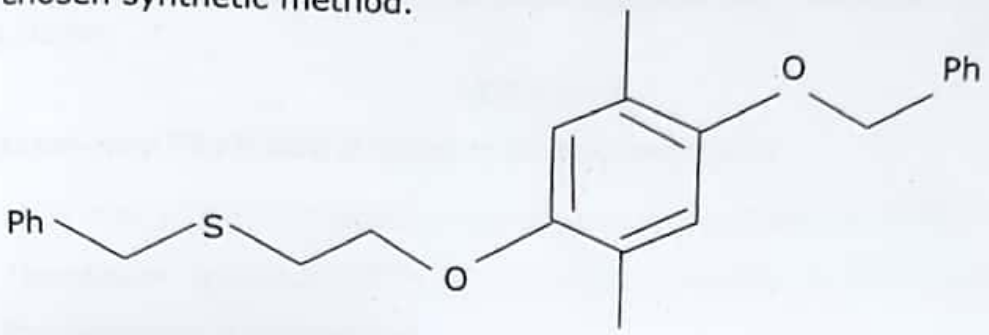
c) i) Why do we use synthetic equivalents when planning an organic synthesis though it might enhance the number of steps?
ii) Provide the retrosynthetic scheme for the for the following:

(4)

Contd...3

9.a) Discuss the general methods for the protection and deprotection of carbonyl and alcoholic groups. (4)

b) Predict all the possible disconnections and suggest a synthetic scheme for the following molecule. Describe the rationale of your chosen synthetic method.



(4)

c) Provide the retrosynthetic analysis of 6-methoxy indole-3-acetic acid. (4)

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Semester IV - P.G. Examination - M.Sc. Analytical Chemistry
April - 2018

SPECTROSCOPIC METHODS OF ANALYSIS

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

PART - A

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

a) How many lines expected in spectrum of naphthalene anion?

b) Mossbauer spectrum of Fe $(CO)_5$ shows a doublet at liquid dinitrogen temperature. Give reason.

c) Total consumption burner lowers the sensitivity, where as premix burner provides higher sensitivity in atomic absorption spectroscopy why?

d) How is concentration of metal determined by Flame photometer?

e) Luminescent radiation is of higher wavelength than that of exciting radiation. Why?

f) What is the relation between fluorescence intensity and concentration?

g) Differentiate between i) K_α & K_β ii) L_α & L_β x-ray lines.

h) What is cotton effect? Plot absorption curves for the positive and negative cotton effects.

PART - B

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

UNIT - I

2. a) Discuss how photoelectron spectroscopic technique is used to study the valence and core electron binding energy of an atom in a molecule. **(5)**

b) Explain the ESR spectrum of $[Mn(H_2O)_6]^{2+}$ on the basis of Kramer's degeneracy. **(4)**

c) Calculate the NQR transition frequency for the nucleus in an axially symmetric field with $I=3/2$. **(3)**

3. a) Discuss the following aspects of Mossbauer spectroscopy. **(5)**
i) Isomer shift ii) Quadrupole interactions.

b) Draw the energy level diagram and calculate various Quadrupolar energies for a nucleus with $I = 1$, assuming $\eta = 0$. how many transitions are expected? **(4)**

c) Sketch and interpret the ESR spectrum of $(SO_3)_2 NO^-$ anion. **(3)**

UNIT - II

4. a) Explain the instrumentation of Flame photometer. **(5)**

b) What are spectral and ionization interferences? How are these corrected in Flame photometer? Explain. **(4)**

c) Explain the process of atomization in inductively coupled plasma. **(3)**

Contd.2

5. a) Explain the mode of working of following components of atomic absorption spectrophotometer. (5)

   i) Carbon atomizer ii) amplifies

   b) Discuss how lead in petrol is determined in atomic absorption spectroscopy. (4)

   c) What are the advantages of Atomic Absorption Spectroscopy over Flame emission spectroscopy? (3)

UNIT - III

6. a) With the help of energy level diagram, explain the following methods of deactivation of excited molecules. (5)

   i) Vibrational relaxation ii) Internal conversation

   b) Explain the effect of structure on fluorescence and phospherescence with suitable examples. (4)

   c) Compare and contrast fluorimetry with phosphorimetry. (3)

7. a) Sketch a neat block diagram of filter fluorimeter and explain its mode of working. (5)

   b) How do the following factors affect fluorescence and phosphorescence ? (4)

   i) concentration ii) Temperature & viscosity

   c) Explain de-excitation of molecules by intersystem crossing. Justify that it leads to phosphorescence. (3)

UNIT - IV

8. a) Describe the non-dispersive X-ray absorption method. (5)

   b) What are the effects of concentration and wavelength of radiation on turbidimetry & nephelometry? Explain in detail. (4)

   c) Define specific rotation and explain how is it calculated. (3)

9. a) Explain Debye- Scherrer method of x-ray diffraction. How is it used in the determination of d. (5)

   b) What is octant rule? Illustrate it taking 3-methyl cyclohexanone as an example. (4)

   c) Draw and explain turbidimetric titration curves. Give an example of such titration. (3)

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Semester IV - P.G. Examination - M.Sc. Analytical Chemistry
April - 2018

CHEMISTRY OF POLYMERS AND NATURAL PRODUCTS

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

PART - A

1) Answer any FIVE sub divisions of the following **(5×2=10)**

a) Differentiate between chain growth and step growth polymerization.

b) Calculate the average molecular weight of a polystrene sample with average degree of polymerisation of 1000.

c) Tq and Tm of polystyrene are higher than HDPE. PVC has still higher Tg and Tm Why?

d) Compare the basis between TGA and DTA.

e) What is the use of Emble degradation in alkaloid chemistry?

f) Piperonylic acid contains methylenedioxy group. Prove the statement.

g) Explain by means of structural formulae the following reactions.

Zingiberene $\xrightarrow[acetylenedicarboxylkate]{Dimethyl}$ product $\xrightarrow{pyrolysis}$?

h) State special isoprene rule. Identify the isoprene units in Abietic acid.

PART - B

Answer any FIVE of the following choosing at least one full question from each unit. **(12x5=60)**

UNIT - I

2. a) Give the classification of polymers with examples for each class. **(4)**

b) A protein sample consists of an equimolar mixture of haemoglobin (M=15.5 kg/mole) ribonuclease (M=13.7 kg/mole) and myoglobin (M=17.2 kg/mole). Calculate the number average and mass average masses. **(4)**

c) What is crystallinity of a polymer? What are the requirements for the crystallinity of a polymer. **(4)**

3. a) Explain chain growth polymerization. **(4)**

b) Show that the weight average molar mass is generally twice the number average molar mass using polydispersity index. **(4)**

c) Discuss the Flory-Huggins theory of polymer dissolution. **(4)**

Contd.2

UNIT - II

4. a) Explain the experimental procedure of determination by molecular weight of polymers by viscometric technique. (4)

b) Define Glass transition temperature. Discuss the structural factors that influence the Tg. (4)

c) Discuss the method of vapour phase osmometry, in the determination of polymer molecular weight. (4)

5. a) Explain differential scanning calorimetric technique of characterisation of polymers. (4)

b) Outline the principle of end -group analysis in determination of molecular weight of polymers. (4)

c) Explain the mechanical properties of polymers with suitable examples. (4)

UNIT - III

6. a) Explain the use of Hofmann's degradation in the determination of structure of an alkaloid. (4)

b) Outline the various reactions that lead to the structure of Papaverine. (4)

c) Give the synthesis of piperine. (4)

7. a) In brief explain how the following products are obtained from morphine. (4)

i) Morphol ii) methyl morphol iii) Morphenol

iv) Methylmorphenol

b) How is the structure of meroquinene established? (4)

c) Outline the synthesis of ephedrine. (4)

UNIT - IV

8. a) Indicate the reagents that are used to bring about the following conversions: (4)

Pinene glycol → Pinonic acid → pinic acid → is norpinic acid.

Give the structures of all these compounds.

b) How do you deduce the positions of the following in abietic acid? (4)

i) methyl groups ii) double bonds

c) Outline the synthesis of camphors. (4)

9. a) How do you fix up the positions of three double bonds in zingiberene ? Write the absolute configuration of it. (4)

b) Enumerate the evidences in support of the structure of Santonin. (4)

c) Write the synthesis of menthol. (4)

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St Aloysius College (Autonomous)

Mangaluru

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

April- 2018

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 the significance of half life?

b) Mention the importance of enzyme specificity.

c) List out differences between automatic and automated system.

d) What are the differences between COD and BOD?

e) Explain quality assurance.

f) Mention the types of ISO.

g) Define order of reaction and its importance.

h) Explain any four disadvantages of organophosphates.

i) What is the importance of QA and QC in pharma industry?

PART - B

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

UNIT – I

2.a) Discuss determination of reaction rate by conductivity method. (3)

b) Give an account of micro determination of selenium in complex mixture. (4)

c) What are the uses of enzyme catalysis? Give example. (4)

d) What is Pseudo first order reaction? (3)

3.a) Discuss the determinants of LDH enzyme. (4)

b) Discuss any two methods for determination of reaction rates. (4)

c) Derive integral form of I^{st} order reaction. (3)

d) Explain analysis of multicomponent reaction. (3)

UNIT – II

4.a) Explain segmented flow method. (4)

b) Briefly explain working of automatic elemental analyzer. (3)

c) Write a note on discrete method. (4)

d) Explain milk adulteration. (3)

5.a) Give an account of ammonia analyzer. (3)

b) Explain flow injections analysis. (4)

c) Give methods for the determination of moisture and ash in food samples. (4)

d) Explain compositions of milk and milk products. (3)

Contd...2

UNIT - III

6.a) Mention the procedures for quality acceptance. (3)

b) Discuss cost aspects of quality decisions. (3)

c) Explain current trends in quality control. (4)

d) Write a note on ISO 17025 series. (4)

7.a) Discuss ISO 14001 series and its application to pharma industry. (4)

b) Explain laws related to quality control in Indian context. (4)

c) Explain quality control in raw materials and finished products. (3)

d) Mention the importance of quality aspects of specification. (3)

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