

BACHELOR ENGINEERING IN FOOD TECHNOLOGY AND BIO-CHEMICAL ENGINEERING
EXAMINATION, 2017

(1st Year, 2nd Semester, Exam)

ORGANIC CHEMISTRY

Time: Three hours ; Full Marks: 100

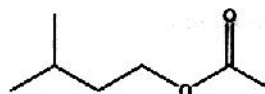
Attempt Q.1 and any two from the rest

Q.1. Attempt any twenty

3×20

i) Give IUPAC names of the following compounds

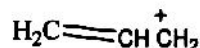
a) $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CHO}$, b) $\text{CH}_3\text{COOCOCHCH}_3$ c)



ii) Which one between n-butane and 1,2-dichloroethane has higher percentage of gauche conformation in equilibrium in vapour state.

iii) Show the symmetry elements present in a) Cis-1,3-dimethyl cyclobutane and b) chloroform

iv) Arrange the following carbonium ions in order of increasing stability, and give your reasons.



v) Draw only the geometrical isomeric forms of monobromopropenes.

vi) Define R_f value in thin layer chromatography (TLC)

vii) Draw the energy profiles for the catalytic hydrogenation of cis- and trans-but-2-enes.

viii) Which one is entropically more favourable-intra or intermolecular H-bonding. Explain.

ix) Give approximate alcohol percentage of beer, wine and spirit.

x) Is it possible to prepare spirit directly by fermentation using yeast? If not, how can you prepare such liquor?

xi) Acetylinic hydrogen is acidic. Explain and demonstrate with suitable reaction.

xii) Draw the structure of amino acids which absorb light in UV- region.

xiii) Thermodynamic stability of a molecule is different than its chemical stability. Explain with suitable example.

xiv) Which of the following would be most and least hydrolysed with NaOH and why?

a) MeCO_2Me , b) $\text{Me}_2\text{CHCO}_2\text{Me}$, c) MeCO_2Bu^t

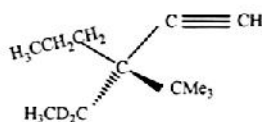
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xv) The bromination of acetone is catalysed by acids and the rate is independent with respect to bromine. Discuss the statement.

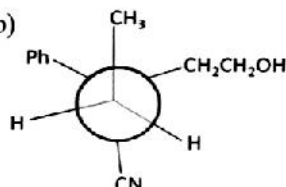
xvi) Write down the Sawhorse formula of Erythro form of 2R,3S-3-bromo-2-butanol and threo form of 2R,3R-3-bromo-2-butanol.

xvii) Assign R/S descriptors to the stereocenter present in the following compounds

a)



b)



xviii) Define the term 'spectroscopy'? What is the effect of ultra-violet or visible light on the organic compound?

xix) What kind of molecular process associated with IR-spectrum and X-ray.

xx) Phenanthrene and p-chloro aniline are dissolved in Chloroform and TLC is done with mobile phase using mixture of petroleum ether and benzene. Compare the R_f values.

xxi) Melting point of stearic and oleic acid is different although they contain same number of carbon atoms. Why?

xxii) What is Tollen's reagent? State one of its applications.

xxiii) Draw the orbital picture of $\text{CH}_3\text{CH}=\text{C}=\text{CHCl}$. Indicate the state of hybridization of each carbon atom.

xxiv) How will you distinguish acetaldehyde from formaldehyde?

Q.2 .i) Water, dil HCl, dil NaOH, dil NaHCO_3 are given as a solvent in the laboratory. Mention the solubility of the following compounds (attempt any four) in each of the above solvent. Give reason in support of your answer.

a) Succinic acid, b) p-Toluidiene, c) Resorcinol, d) Benzoic acid, e) Benzil, f) β -naphthol 8

ii) How can you chemically detect the amide group of benzamide? Give reactions. 3

iii) How can you chemically detect the primary aromatic amino group of p-toluidiene?

Give reactions. 3

iv) Mention three different non-nitrogenous functional groups which are commonly present in organic compounds. Mention the name and formula of reagents which can be used to detect these three functional groups in laboratory. 2×3

Q.3. i) Explain the primary kinetic isotope effect with suitable example. 4

ii) Arrange with justification the following compounds in increasing order of their basicity, in aqueous solution and in chlorobenzene

n-butyl amine, di-n-butyl amine and tri-n-butyl amine

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iii) 1-bromocyclohepta-2,4,6-triene (tropylium bromide) and benzyl bromide are isomeric, but only tropylium bromide is highly soluble in water yielding bromide ion in solution.

Explain.

3

iv) Arrange with justification the following compounds in order of increasing pKa values.

4

Benzoic acid, 2-hydroxy benzoic acid, 4-hydroxy benzoic acid and 2,6-dihydroxy benzoic acid.

v) Which one in each of the following pairs is more stable and why?

2 × 2.5

a) cyclopropenyl cation and cyclopropyl cation

b) Formate and acetate

Q4.i) Draw the energy diagram for the conformations of n-butane arising out of rotation around C(2)-C(3) bond and label maxima, minima with appropriate conformation in Newman projection formula.

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ii) An optically pure sample of (R)-2-butanol shows a specific rotation of -13.6° . What relative molar proportion of (S)-2-butanol and (R)-2-butanol would give a specific rotation $+6.8^\circ$?

3

iii) The observed dipole moment of meso form of Stilbene dichloride is 1.27D, but dipole moment for dl pair is 2.75D. Explain with reason.

3

iv) Can you compare the stabilities of pent-1-ene, cis and trans-pent-2-enes and 3-methyl-but-1-ene by measuring their heat of hydrogenation? If not, why not? What method could you use?

3

v) How can you separate protein and lipid using silica packed column, hexane and acetonitrile.

4

vi) What is an emulsifier? Give an example of food emulsifier.

2