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17/SC105/001 CHM 10
MICROBIOLOGY

Assignment

1 (a) Possible formulars for a molecular ion of 105

i) Suppose the compound contains Carbon (C), Hydrogen (H), Nitrogen (N) and Oxygen (O) in the form $C_xH_yNO_2$

∴ the atomic mass of C_xH_yN
= 105 − (atomic mass of NO_2)
= 105 − (14 + (16×2)) = 105 − (14 + 32)
= 105 − 46
= 59

→ Find how many carbon atom is obtainable

∴ $\frac{59}{12} = 4.9$ ∴ $x = 4$

$4 \times 12 = 48$

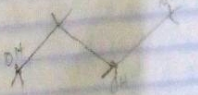
$59 - 48 = 11$ ∴ $y = 11$

Hence $C_xH_yNO_2 = C_4H_{11}NO_2$

Calculate the (H) Cindex of Hydrogen Deficiency

$IHD = \frac{(2\times4)+2-11+1}{2} = \frac{0}{2} = 0$

∴ the structure is as shown below



$C_4H_{11}NO_2$

ii) Suppose the compound is in the form $C_xH_yNO_3$

∴ the atomic mass of C_xH_y
= 105 - (atomic mass of NO_2)
= 105 - (14 + (16 × 3)) = 105 - (14 + 48)
= 105 - 62 = 43

Find how many carbon atoms are in 43

$\frac{43}{12} = 3.58$ ∴ $x = 3$

3 × 12 = 36

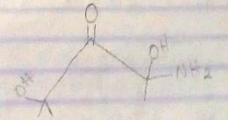
43 - 36 = 7 ∴ $y = 7$

Hence $C_xH_yNO_3$ = $C_3H_7NO_3$

Calculate the IHD (Index of Hydrogen Deficiency)

$IHD = \frac{(2 \times 3) + 2 - 7 + 1}{2} = \frac{2}{2} = 1$

∴ the structure is as shown below



$C_3H_7NO_3$

(iii) Suppose the compound is in the form C_xH_yN

∴ the atomic mass of C_xH_y
= 105 - (mass of N)
= 105 - 14 = 91

Find how many carbon atoms are in 91

$\frac{91}{12} = 7.58$ ∴ $x = 7$

7 × 12 = 84

91 - 84 = 7 ∴ $y = 7$

Hence C_xH_yN = C_7H_7N (or $C_6H_5NH_2$)

Hence

Possible formulars for a molecular ion (m/z) of 105 are

i) $C_4H_{11}NO_2$

ii) $C_3H_7NO_3$

iii) C_7H_7N Cor $C_6H_5NH_2$

1(b) Importance of organic compounds

A Proteins create the structural parts of cells that are later built into the tissues and organs that make up the entire body of an organism.

B Carbohydrate which consists of carbon, hydrogen and oxygen, provides life forms with the energy needed to maintain cellular function.

C Crude fuel is refined in gasoline, propane, diesel kerosene and natural gas so cars and heating systems can work.

D Alcohols include chemicals like ethanol and isopropanol. These are used as antiseptics and ethanol is a staple of the beverage industry.

E Aspirin, one of the oldest commercial drugs, contains Carboxylic acid. Carboxylic acid include a wide variety of chemicals including pharmaceuticals.

F Organic molecules make up a large portion of the human diet and are found in all food consumed by an individual.

G Protein is important in a diet to provide a source of amino acids for the body.

H Hydrocarbons are organic compounds that are made up of hydrogen and carbon. They are the primary source of energy for most civilizations.

I Organic compounds cause depletion of the atmosphere.

J Nucleotide forms the amino acid and DNA.

c. Differences between homocyclic and heterocyclic compounds.

i. Heterocyclic Compound	Homocyclic compounds
The atoms present in the ring has ~~more than~~ one or more atoms other than carbon, that is, carbon and other elements are present in at least one of the rings.	Atoms of the ring are ~~of~~ the same element.

Number 2

a) Retardation factor

$$= \frac{\text{distance travelled by centre of spots}}{\text{distance travelled by the solvent front}}$$

-> For 2.4cm

$$\text{Retardation factor} = \frac{2.4\text{cm}}{12.2\text{cm}}$$

$$= 0.197$$

-> For 5.6cm

$$\text{Retardation factor} = \frac{5.6\text{cm}}{12.2\text{cm}}$$

$$= 0.459$$

-> For 8.9cm

$$\text{Retardation factor} = \frac{8.9\text{cm}}{12.2\text{cm}}$$

$$= 0.73$$

Hence

The retardation factor of the available bands are 0.197, 0.459 and 0.73

2 b) A belongs to the Aldehyde group

B belongs to the Alkene group

c) 2,4- Dinitrophenylhydrazine test is employed for Aldehyde and ketone group

d) Functional groups of Organic Compounds with examples

	Functional groups	Examples
i	$-OH$ (Alkanol)	Ethanol, isopropanol
ii	$-OR$ (Ether)	Ethoxyethane, Phenoxybenzene
iii	$-CHO$ (Aldehyde)	Formaldehyde (methanal), Acetaldehyde (ethanal)
iv	$-\overset{\overset{O}{\|}}{C}-$ (Ketone)	ethyl acetone, Pentan-2-one
v	$-\overset{\overset{O}{\|}}{C}-OH$ (Carboxylic acid)	acetic acid (ethanoic acid), oxalic acid (ethanedioic acid)
vi	$-\overset{\overset{O}{\|}}{C}-OR$ (Esters)	ethyl propanoate, Propyl methanoate
vii	$-NH_2$ (Amine)	trimethylamine, Aniline