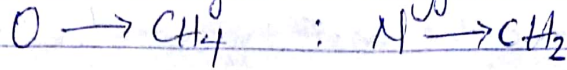


QUESTION 1.

a. $m/z = 105$

$C_nH_n : 105/13 \quad [13: C \rightarrow 12 + H \rightarrow 1]$
 $= 8 R 1$

Since it is an odd m/z value, it indicates the presence of one Nitrogen or Oxygen.



(i) $m/z = 105 : C_8H_9$

$\text{IHD for } C_8H_9 = \frac{2(8)+2-9}{2}$
 $= 4.5$

$\therefore C_8H_9$ is not a possible molecular formula because IHD is not a whole number.

ii. $C_8H_9 - CH_2 + N = C_7H_7N$.

$\text{IHD for } C_7H_7N = \frac{2(7)+2-7+1}{2}$

$\therefore \text{IHD} = 5$

\therefore It is a possible molecular formula.

(iii) $C_8H_9 - 2CH_2 + 2N = C_6H_5N_2$.

$\text{IHD for } C_6H_5N_2 = \frac{2(6)+2-5+2}{2}$

$\therefore \text{IHD} = 5.5$

\therefore It is not a possible molecular formula as IHD is not a whole number.

(iv) $C_8H_9 - 3CH_2 + 3N = C_5H_3N_3$.

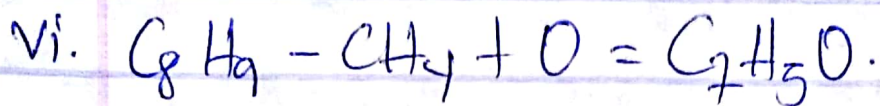
$\text{IHD for } C_5H_3N_3 = \frac{2(5)+2-3+3}{2}$

$\therefore \text{IHD} = 6$

\therefore It is a possible molecular formula.

v. $C_8H_9 - CH_2 - CH_3 + N + O = C_6H_5NO$. $\text{IHD} = \frac{12+2-3+1-1}{2}$

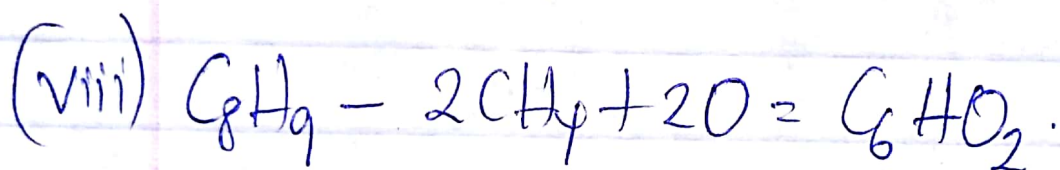
\therefore It can't be a possible molecular formula $= 5.5$



$$IHD = \frac{2(7) + 2 - 5 - 1}{2} = 10/2$$

$$\therefore IHD = 5.$$

$\therefore A$ is a possible molecular formula.



$$IHD = \frac{2(6) + 2 - 1 - 2 \cdot 2}{2} = 11/2$$

$$\therefore IHD = 5.5.$$

$\therefore A$ is not a possible molecular formula.

IHD: Index of Hydrogen deficiency.

∴ The possible formulas for molecular ion (m/z) of 105 are: (i) C_7H_7N & (ii) $C_5H_3N_3$ & (iii) C_7H_5O

b. Importance of Organic Compounds.

- (i) Organic compounds are components of nucleic acids, as nucleic acids are the most important of all biomolecules.
- (ii) Organic compounds are found in carbohydrates; Carbohydrates play an important role in living organisms.
- (iii) Organic molecules make up a large portion of the human diet and are found in all food consumed by an individual.
- (iv) Organic compounds are found in proteins; Proteins are composed of chains of organic molecules called Amino acids.
- (v) Organic compounds are found in valuables like Diamond, graphite, petroleum, Hydrocarbons.
- (vi) Organic compounds play an important role in our everyday lives.

c. Homocyclic Compounds

- (i) Homocyclic compounds are cyclic compounds having atoms of the same element as ring members.
- (ii) Contains atoms of the same element bonded to each other forming a ring.
- (iii) Ring contains atoms of the same element.
- (iv) Eg Cyclohexane, Tetraene, Benzene.

Heterocyclic Compounds.

- Heterocyclic compounds are cyclic compounds having atoms of the different elements as ring members including Carbon atoms.
- (ii) Contain atoms of at least two different elements bonded to each other forming a ring.
 - (iii) Ring contains atoms of different elements.
 - (iv) Eg Pyran, Azocane, Thiocane.

Question Two.

2a $R_f = \frac{\text{distance moved by substance / band}}{\text{distance moved by solvent front}}$

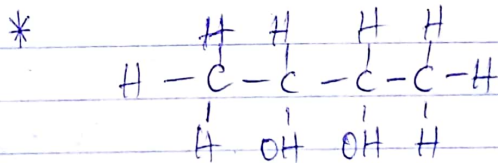
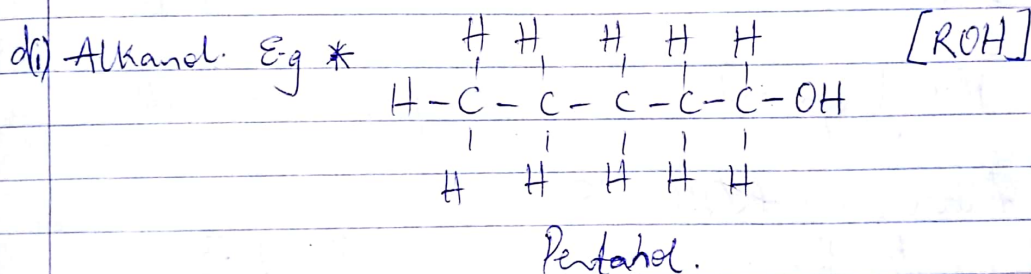
(i) For 2.4cm; $R_f = \frac{2.4 \text{ cm}}{12.2 \text{ cm}}$
 $\therefore R_f = \underline{0.1967}$

(ii) For 5.6cm; $R_f = \frac{5.6 \text{ cm}}{12.2 \text{ cm}}$
 $\therefore R_f = \underline{0.4590}$

(iii) For 8.9cm; $R_f = \frac{8.9 \text{ cm}}{12.2 \text{ cm}}$
 $\therefore R_f = \underline{0.7295}$

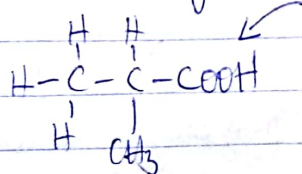
b. A \longrightarrow Aldehyde
 B \longrightarrow ~~Alkene~~ Alkene

c. Test for Ketones and Aldehydes.

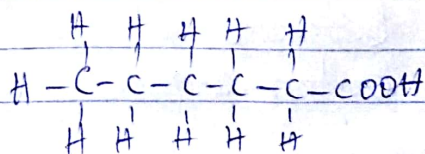


Butan-2,3-diol.

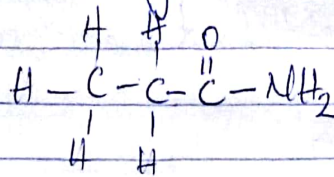
(ii) Alkanoic acid. Eg * 2-methylpropanoic acid $[\text{RCOOH}]$



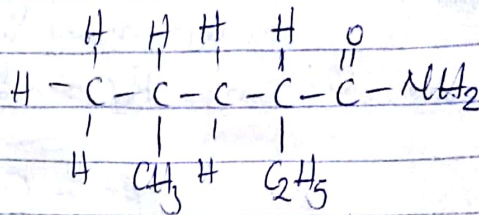
* Hexanoic acid



(iii) Amides. E.g. $RCONH_2$

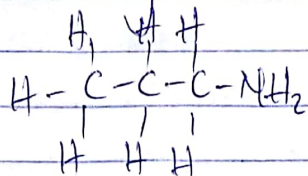


Propanamide

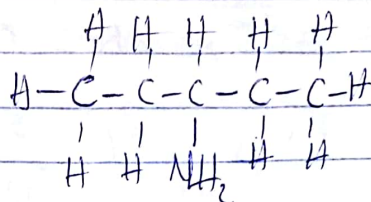


2-ethyl-4-methyl-pentanamide.

(iv) Amine. E.g. RNH_2

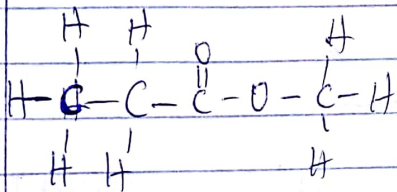


~~Propanamine~~ Propanamine

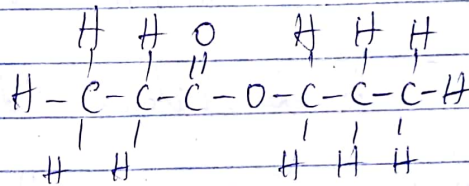


3-aminopentane

(v) Ester. E.g. ~~$RCOR'$~~ $RCOOR'$

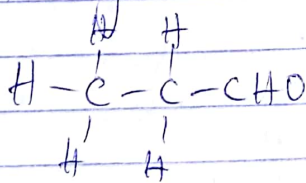


Methylpropanoate

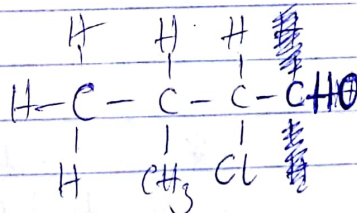


propylpropanoate

(vi) Aldehyde. $RCHO$. E.g.

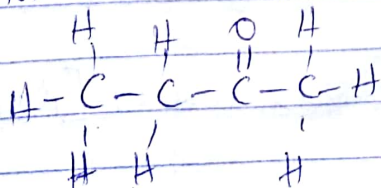


Propanal

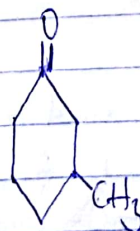


2-chloro-3-methylbutanal

(vii) Alkanone. $RCOR'$



~~Butan-2-one~~
Butan-2-one



3-methylcyclohexanone.