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1. a) Step 1 – If the mass of the molecular ion is odd it contains at least one N.

N =14amu, 105-14=91

Step 2 – Determine maximum numbers of C’s

$$\frac{91}{12}=7.5$$

Since the whole number is before the decimal point without approximating, it implies that the formula will be in the form ***C7NHm*** where m is the number of moles of hydrogen.

Therefore, m= 105-((12x7) + (1x14))

 =105-(84+14)

 =105-98

 =7

IHD=$ \frac{2n+2-m}{2}$ where n is the number of moles of carbon.

 = $\frac{ 2\left(7.5\right)+2-7}{2}$

 = $\frac{15+2-7}{2}$

 = $\frac{10}{2}$

 = 5

**Hence the first formula is C7NH7 and IHD=5**

Repeating the same procedure but instead introducing oxygen:

O=16, 105-(16+14) =75

Dividing by 12 in order to determine the maximum number of carbon atoms,

$$\frac{75}{12}=6.25$$

Our new formula is in the form C6NOHm.

m=105-((12x6) +14+16)

 =105-(72+30)

 =105-102

 = 3

IHD= $\frac{2n+2-m}{2}$

 = $\frac{2\left(6.25\right)+2-3}{2}$

 = $\frac{11.5}{2}$

 = 5.75

**Hence the second formula is C6NOH3 and IHD=5.75**

b) Organic compounds play an important role in our daily activities. It is needed in all areas of life. This includes:-

i)The food we eat is as a result of mixture of various organic compounds( carbohydrate, proteins, fats, vitamins, enzymes, etc.).

ii) The clothes we wear whether of Cotton, Silk, Wool, Nylon, Rayon, Dacron, etc., are all organic in character.

iii) The soaps, cosmetics, plastics, explosives, etc. are all organic compounds.

iv) Fuels such as coal, wood, natural gas, petrol, etc. are all organic compounds.

v) It is used for treatment in the medical field. It is indispensible. Some of them are: antibiotics, sulpha drugs, alkaloids, aspirin, Iodoform, etc.

c)

|  |  |
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|  **Homocyclic Compounds**  |  **Heterocyclic Compounds** |
| i)Have atoms of the same element as ring members | Have atoms of different elements as ring members including carbon atoms. |
| ii) Rings contain atoms of the same element. | Rings contain atoms of different elements. |
| iii) Contains atom of the same element bonded o each other forming a ring. | Contains atoms of at least two different elements bonded to each other forming a ring. |
| iv)Examples: benzene, cyclohexane, toluene, cyclohexanol, etc. | Examples: pyran, azocine, thiocane, etc. |

1. a) Retardation factor ($R\_{f}$) = $\frac{Distance moved by substance}{Distance moved by solvent front}$

 Solvent front= 12.2cm, 1st substance=2.4cm, 2nd substance= 5.6cm, 3rd substance= 8.9cm

 $R\_{f1}=\frac{2.4cm}{12.2cm}=0.2$

 $R\_{f2}=\frac{5.6cm}{12.2cm}=0.5$

 $R\_{f3}= \frac{8.9cm}{12.2cm}=0.7$

 b) Organic compound A- an Aldehyde

 Organic compound B- an Alkene

 c) Aldehydes and Ketones

 di) Alkanes- ethane, methane

 ii) Alkenes- pentene, benzene

 iii) Alkanols- propanol, ethanol

 iv) Amines- ethylamine, pentylamine

 v) Alkynes- ethyne, propyne

 vi) Acid- ethanoic acid, propanoic acid

 vii) Alkyl- pentyl, hexyl

 viii) Aldehyde- ethanal, butanal