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1a. Using the rule of 13, which states that the formula of a compound is a multiple ‘n’ of 13(the molar mass of CH) plus a remainder ‘r’. CnHn+r.

If you have heteroatoms, you adjust the formula; For O, add O and subtract CH4. For N, add N and subtract CH2.

So, 105 ÷ 13 = 8 remainder 1.

In CnHn+r = C8H8+1 = C8H9

The possible formulas for the molecular ion(m/z) of 105 are:

For O = C7H5O

For O2 = C6HO2

For N = C7H7N

For N2 = C6H5N2

For N3 = C5H3N3

For N4 = C4HN4

For NO = C6H3NO.

Therefore, the possible formulas are: C7H5O, C6HO2, C7H7N, C6H5N2, C5H3N3, C4HN4 and C6H3NO.

1b. **IMPORTANCE OF ORGANIC COMPOUNDS**

1. Crude Oil is refined in Gasoline, Propane, Diesel, Kerosene and Natural gas, so cars and heating systems can work.
2. Some organic compounds such as proteins, lipids and carbohydrates are necessary to maintain various biological processes.
3. Organic compounds can be used in the production of dyes for human consumption.
4. Most medicine used today, are a mixture of organic compounds.
5. Organic compounds create energy production in biological life, depletion of the atmosphere and release energy from hydrocarbon.
6. Organically raised animals are at a far lesser risk is becoming diseased and passing on the contamination to humans after they have been killed for consumption.
7. The food we eat are a mixture of organic compounds.

1c.

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| **HOMOCYCLIC COMPOUNDS** | **HETEROCYCLIC COMPOUNDS** |
| Homocyclic compounds are also known as carbocyclic compounds or isocyclic compounds, as their rings are formed with only one type of atom, mainly Carbon. Homocyclic compounds can be divided into: Alicyclic compounds and Aromatic compounds. | Heterocyclic compounds are the cyclic compounds in which the rings contain at least two different types of atoms. The atoms other than that of Carbon, in this ring are called Heteroatoms. |
| Examples are Benzene, Phenol, Cyclohexane. | Examples are Dyes, photo-chromes of films, Pesticides, antiviral medication and food additives. |

2a. Rf for the first band = Distance moved by substance ÷ Distance moved by solvent front

= 2.4cm ÷ 12.2cm =0.197

Rf for the second band = Distance moved by substance ÷ Distance moved by solvent front

= 5.6cm ÷ 12.2cm = 0.459

Rf for the third band = Distance moved by substance ÷ Distance moved by solvent front

= 8.9cm ÷ 12.2cm = 0.730

2b. The family of the organic compound A (which gave a positive test) is Aldehyde or Alkanal.

The family of organic compound B (which decolorizes Bromine water) is Ketone.

2c. 2,4-Dintrophenylhydrazine is used to testing Ketones and Aldehydes.

2d. **ALKANE (SINGLE BOND):** Methane and Pentane.

**ALKENE (DOUBLE BOUND):** Ethene and Propene.

**ALKYNE (TRIPLE BOND):** Propyne and Butyne.

**ALKYL HALIDES(ROH):** 3-Bromo hexane and Chloro butene.

**CARBOXYLIC ACID(COOH):** Propanoic acid and Pentanoic acid.

**ALCOHOL(-OH):** Propanol and Butanol.

**ETHER (ROR):** Di-ethyl-ether and methyl-ethyl-ether.