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Section 1

1. Following the rule of 13 which states that the formula of a compound is a multiple n of 13 i.e. the molar mass of CH, plus a remainder r.

 CnHn+r

For heteroatoms e.g

For O, add O and subtract CH4

For N, add N and subtract CH2 e.t.c

Therefore,

 105 = 8.0769 = 8 remainder 1

 13

Using CnHn+r,

Formula is C8H9

Due to the odd number of H atoms, it is reasonable to add an N atom and subtract CH2

 That is, C7H7N

Or add an O atom and subtract CH4

That is, C7H5O

Or add an N2 molecule and subtract C2H4

That is C6H5N2

Or add both N and O atoms and subtract C2H6

That is, C6H3NO

C7H7N = (12×7) + (1×7) + 14 = 105

C7H5O = (12×7) + (1×5) + 16 = 105

C6H5N2 = (12×6) + (1×5) + (14×2) = 105

C6H3NO = (12×6) + (1×3) +14 + 16 = 105

b) Importance of Organic Compounds

1. In nucleic acids: Nucleic acids are essential biopolymers for all life forms. They are composed of many elements mainly coal and hydrogen, although there are also oxygen atoms in their sugars.
2. In carbohydrates: A carbohydrate is a biological molecule consisting of carbon, hydrogen and oxygen. They play an important role in living organisms.
3. In proteins: Proteins are composed of chains of organic molecules called amino acids.
4. Hydrocarbons: Hydrocarbons are organic compounds that are made up entirely of hydrogen and carbon. Hydrocarbons are the primary source of energy for most civilizations today.
5. In lipids: A lipid is a term used to define substances of biological origin that are soluble in solvents. The main functions of lipids include storing energy and acting as a structural component of cell membranes.
6. Organic compounds are also used for the production of clothes.

c) Difference between homocyclic and heterocyclic compounds include:

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| S/N | HOMOCYCLIC COMPOUNDS | HETEROCYCLIC COMPOUNDS |
| 1. | The ring in homocyclic compounds contains only one type of atom. | The rings in heterocyclic compounds contain at least two different types of atoms including carbon. |
| 2. | Homocyclic compounds have 100% carbon atoms in their ring. | Heterocyclic compounds have mainly carbon and in addition, heteroatoms like nitrogen, oxygen, and sulphur are found in their ring.  |
| 3. | They constitute two sub-divisions, Alicyclic homocyclic compounds and Aromatic homocyclic compounds.  | They constitute two sub-divisions, Alicyclic heterocyclic compounds and Aromatic heterocyclic compounds. |
| 4. | Example include phenol, toluene, naphthalene and anthracene. | Examples include furan, pyrrole, pyridine, piperidine and tetrahydrofuran.  |
| 5. | Rings contains atoms of the same element. | Rings contains atoms of different elements. |

Section 2

1. Retardation factor Rf = Distance travelled by substance

 Distance travelled by solvent front

Rf1 = 2.4 cm =0.197

 12.2 cm

Rf2 = 5.6 cm = 0.459

 12.2 cm

Rf3 = 8.9 cm = 0.730

 12.2 cm

1. A- Aldehydes

B- Alkenes

1. 2,4-Dinitrophenylhydrazine test is employed for Aldehydes and Ketones
2.

|  |  |
| --- | --- |
| Functional Group | Examples |
| -OH | Ethanol(C2H5OH) , Butanol (C4H9OH) |
| -C**=**O | Propanone(C3H6O) , Butanone(C4H8O) |
| -NH2 | Dimethylamine((CH3)2NH) , Trimethylamine(C3H9N) |
| -COH | Ethanal(C2H4O) , Isobutyl aldehyde(C4H8O) |
| -COOH | Ethanoic acid(CH3COOH) , Butanoic acid(C4H8OH) |
| C=C | Ethene(C2H4) , Butene(C4H8) |
| RH | Ethane(C2H6) , Butane(C4H10) |