NAME: ALAO BOLAJI WILLIAMS

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DEPARTMENT: MEDICINE AND SURGERY

COLLEGE: MEDICINE AND HEALTH SCIENCES

QUESTION 1

1. Suggest the possible formulas for a molecular ion (m/z) of 105.
2. What are the importance of organic compounds?
3. Differentiate between homocyclic and heterocyclic compounds

QUESTION 2

1. If the distance of the solvent front is 12.2cm.Then 2.4cm, 5.6cm and 8.9cm are distances of the different bands respectively. Calculate the Retardation factor of the available bands.
2. Two organic compounds were labeled A and B. A gave a positive test result (dark grey precipitate) to Tollens test and B decolorizes Bromine Water. Suggest the family to which these organic compounds belong.
3. 2, 4-dinitrophenylhydrazine test is employed for \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
4. List 7 functional groups of organic compounds giving to two examples of each group.

 SOLUTION 1

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

N = 14 amu 105 – 14 = 91

Determine max number of C’s

91/12 = 7.5 C7NH?

Add enough H’s to make up the rest of the mass.

C7NH? 7 H’s gives C7NH7.

7 x 12 = 84 (2(7.5) + 2 – 7)/2 = 5

1 x 14 = 14

105 – (84 + 14) = 7

Add an O atom.

(2(6.5) + 2 – 3)/2 = 6

**C7NH7 ⇒ C6NOH3**

* Medicine: Medicine is the prime store of organic compounds. Though not all but many medicines are made of organic substances. Like antibiotics, anticancer drugs, painkillers, anti-depressant, anesthetics etc.
* Food: Food materials are solely made of carbon compounds viz. carbohydrates (CHO), proteins (NH2-CH-COOH), and fats (CH-COO-CH). Even vitamins are organic in nature. Study of the requirement of body for various purposes like pregnancy, disease condition, body fitness etc. experts’ advice use of vitamins (FOLIC acid in pregnancy), fat (minimize in heart diseases) and (protein rich diet for body building).Among beverages alcohol is an organic substance
* **Cleansing agents:** In industries and labs, organic solvents are widely used to clear off impurities. For example in drug extraction from plants, the fatty matter from the pulp is removed using petroleum ether. Thus organic chemistry through its knowledge of polarity, solubility, partition factors uses solvents to separate components for better use.
* Sterilizing agents: Most of the sterilizing agents and disinfectants like phenol, formaldehyde etc. are carbon compounds. Due to their properties like solubility, pH they can kill microbes and even human body cells. These kill the bacteria and other microbes due to either dissolving the microbe cell wall or damaging the protein layer etc. Their efficiency is enhanced by making small tweaks in the chemistry. Besides these solvents there are gases like ethylene oxide which are used for sterilization of drugs and manufactured substances.
* **Analytic substances**: Most substances we use like drugs, pesticides etc., are analyzed qualitatively and quantitatively using different types of titrations, chromatography techniques, and spectrophotometry.  Here the reagent use like acids or bases or oxidative reductive species is organic in nature. Further the end point indicator in titrate are developed by organic chemistry.
* Valuables: Diamonds, graphite, petroleum. Interestingly the carbon compounds are found to be highly valuable, durable and hardest in the world.
* Diamond and graphite are both pure carbon alone compound without any other elements inside. They are both highly used and expensive. Their properties are studies in organic chemistry. Petroleum is the other most valued resources on the earth for fuels needs in the world. These petroleum products are further diversified for various uses. And petroleum is one of the factors which influence the world economy.
* Clothes: - Cotton, Silk, Wool, Nylon, Rayon, Dacron, etc.
* Fuels: - coal, Wood, Natural gas, Petrol, etc.
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| **Homocyclic organic compounds** | **Heterocyclic organic compounds** |
| Homocyclic compounds contain atoms of the same element bonded to each other forming a ring. | Heterocyclic compounds contain atoms of at least two different elements bonded to each other forming a ring. |
| They have 100% carbon atom within the ring. | They have mainly carbon and in addition heterogeneous atom such as nitrogen, oxygen etc. |
| Divided into Alicyclic homocyclic and Aromatic homocyclic. Some examples of homocyclic compounds include benzene, [cyclohexane](http://pediaa.com/difference-between-hexane-and-cyclohexane/), [toluene](http://pediaa.com/difference-between-toluene-and-benzene/#Toluene), cyclohexanol, Phenol, Toluene, etc. | Divided into Alicyclic heterocyclic and Aromatic heterocyclic Some examples of heterocyclic compounds include pyran (contain oxygen), azocine (contain carbon and nitrogen), thiocane (contain carbon and sulfur), pyridine Furan, Pyrroles |
| The ring of a homocyclic compound contains atoms of the same element | The ring of a heterocyclic compound contains atoms of different elements |

 SOLUTION 2

1. Rf = $ \frac{\left(distance moved by substance\right)}{\left(distance moved by the solvent front\right)}$

$$distance moved by solvent front=12.2 cm$$

$distances moved by substances=$ 2.4cm, 5.6cm and 8.9cm

1. Rf =$ \frac{2.4cm }{12.2cm} $= 0.1967
2. Rf =$ \frac{5.6cm}{12.2cm} $= 0.4590
3. Rf =$ \frac{8.9cm}{12.2cm} $= 0.7295
* **Aldehyde** is positive to Tollen’s test.
* **Alkene** decolorizes Bromine water.
1. 2, 4-dinitrophenylhydrazine test is employed for **carbonyl group associated with ketones and aldehydes.**

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| **Functional groups** | **Examples** |
| Alkane

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 | Methane, butane, etc. |
| Alkene  | Ethene, butene , etc.  |
| Alkynes  | Ethyne, hexyne, etc. |
| Esters  | Ethylethanoate, propyl ethanoate, etc. |
| Aldehyde  | Heptanal, methanal, etc. |
| Ketones  | Propanone, butanone, etc. |
| Ethers  | Ethoxyethane, phenoxybenzene, etc. |