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**DEPARTMENT: CIVIL ENGINEERING**

**COURSE: CHE102**

**QUESTION 1**

1. Suggest possible formulas for a molecular ion (m/z) of 105

SOLUTION

Step 1

If the mass of the molecular ion is odd it contains at least one nitrogen N= 14 atoms

105-14

=91

Step 2

Determine the max NC’S

91÷12

=7.5

Step 3

Add enough H’s to make up the rest of the max

7×12=84
1×14=14
105-(84+14) =7
7H’S gives $C\_{7}NH\_{7}$
(2n+2-7)/2= 2(7.5) +2-7/2 =5.25

Step 4

Add an o atom

$C\_{7}NH\_{9 }\rightarrow C\_{6}H\_{3}NO$

2(6.5) + (2-3) ÷ 2

=6

Other formula include:$ C\_{8}H\_{9}$ – 2-Phenylethyl.

1. What is the importance of organic compounds?

Organic compounds play an important role in our daily activities. There is hardly any walk of life
where we do not need the organic compounds. The food that we eat is essentially a mixture of
organic compounds. The changes which the food undergoes in our bodies are organic chemical reactions. The clothes that we wear whether of cotton or synthetic fibre all are organic in character. The soap, cosmetics, perfume, oils, plastics, explosives, rubber, dyestuffs, paper, insecticides, etc., are all organic compounds. In the medicinal field, organic compounds are indispensable. Antibiotics, sulpha drugs, alkaloids, aspirin, iodoform, etc., are organic compounds. There is hardly any industry which is not dependent on organic compounds. The following list clearly illustrates the importance of organic compounds.

* Medicines: Penicillin, Streptomycin, Chloromycetin, Sulphadiazine, Morphine, Aspirin, Iodoform, Cocaine, etc.
* Fuels: coal, Wood, Natural gas, Petrol, etc.
* Household and other common article: soaps, Cosmetics, Perfumes, Detergents, paper, Rubber, Plastics, Leather, Resins, Inks, Paints, Varnishes, Photographic films, etc.
* Foods: Carbohydrate, Proteins, Fats, vitamins, Enzymes, etc.
* Explosives: Nitroglycerine, Nitrocellulose, T.N.B, T. N.T, etc.
* Clothes: Cotton, Silk, Wool, Nylon, Rayon, Dacron, etc.
1. Difference between homocyclic compound and heterocyclic compound

The **key difference** between homocyclic compounds and heterocyclic compounds is that in homocyclic compounds, **the ring of homocyclic compounds is made up carbon atoms only, whereas that of heterocyclic compounds is made up of more than one kind of atoms.
*Homocyclic compounds*** are also known as ***carbocyclic compounds***or***isocyclic compounds*** as their rings are formed with only one type of atoms, mainly carbon. Homocyclic compounds can be further classified into alicyclic compounds and arenas or [aromatic compounds](http://www.differencebetween.com/difference-between-aromatic-and-vs-aliphatic/).
***Heterocyclic compounds*** are the cyclic compounds in which the rings contain at least two different types of atoms (including a carbon atom). The atoms other than the carbon atoms present in the ring are known as **heteroatom**. Usually, the rings of these compounds consist of a larger portion of carbon. The most common heteroatom present in heterocyclic compounds include nitrogen, sulphur, and oxygen. Heterocyclic compounds can be either aromatic or aliphatic.

**QUESTION 2**

1. Retardation Factor,$R\_{f}$ **=** $\frac{Distance moved by substance}{Distance moved by the solvent front}$

For Distance moved in 2.4cm, $R\_{f}=\frac{2.4}{12.2}=0.197\~ 0.20$

For Distance moved in 5.6cm, $R\_{f}=\frac{5.6}{12.2 }=0.459 \~ 0.50$

For Distance moved in 8.9cm, $R\_{f}= \frac{8.9}{12.2}=0.729 \~ 0.73$

1. Two organic compounds were labelled A and B. A gave a positive test result (dark grey precipitate) to Tollen’s test and B decolorizes Bromine water. Suggest the family to which these organic compounds belong.

*Compound A – Aldehydes, Ketones and Terminal Alkynes*

*Compound B –Unsaturated compound i.e. Alkene (Alkynes does not react with bromine water)*

1. *2, 4-Dinitrophenylhydrazine* test is employed for the qualitative test for [carbonyl groups](https://en.wikipedia.org/wiki/Carbonyl_group) associated with [***aldehydes***](https://en.wikipedia.org/wiki/Aldehyde) ***and*** [***ketones***](https://en.wikipedia.org/wiki/Ketone)***.***
*2,4-Dinitrophenylhydrazine*is the [chemical compound](https://en.wikipedia.org/wiki/Chemical_compound) C6H3(NO2)2NHNH2. *2,4-Dinitrophenylhydrazine* is a red to orange solid. 2, 4-Dinitrophenylhydrazine is commercially available usually as a wet powder and is often used to qualitatively test for [carbonyl groups](https://en.wikipedia.org/wiki/Carbonyl_group) associated with [aldehydes](https://en.wikipedia.org/wiki/Aldehyde) and [ketones](https://en.wikipedia.org/wiki/Ketone). *2, 4-Dinitrophenylhydrazine* can be used to qualitatively [detect](https://en.wikipedia.org/wiki/Chemical_test) the carbonyl functionality of a [ketone](https://en.wikipedia.org/wiki/Ketone) or [aldehyde](https://en.wikipedia.org/wiki/Aldehyde) functional group. A positive test is signalled by the formation of a yellow, orange or red [precipitate](https://en.wikipedia.org/wiki/Precipitate) (known as a [dinitrophenylhydrazone](https://en.wikipedia.org/w/index.php?title=Dinitrophenylhydrazone&action=edit&redlink=1)). If the carbonyl compound is **aromatic**, then the precipitate will be red; if **aliphatic**, then the precipitate will have a more yellow colour.
2. List 7 functional groups of organic compounds giving two examples of each group?

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| FUNCTIONAL GROUP | ORGANIC FORMULA | EXAMPLES |
| Alkyl halidesAlkanolAlkanoic acidAmidesEstersAlkanalsAlkanones/Ketones | R-X Where x=Cl,F,Br,IR-OHR-COOHR-CONH2R-COOR’R-COHR-C=OR’ | C2H5B: bromoethaneC5H11Cl: chloropentaneC2H5OH: ethanolC8H17OH: octanolC3H7COOH: butanoic acidCH3COOH: ethanoic acid$CH\_{3}CONH\_{2}$– Acetamide$C\_{2}H\_{5}CONH\_{2}- $Propanamide$C\_{2}H\_{5}COOCH\_{3 }– $Methylpropanoate$C\_{3}H\_{7}COOC\_{2}H\_{5 }–$ Ethylbutanoate$CH\_{3}COH- $Ethanal$C\_{2}H\_{5}COH- $Propanal C2H5COCH3—Butan-2-oneCH3COCH3—Propan-2-one |