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Course Code: CHM 102 Course Title: General Chemistry II

**ASSIGNMENT SOLUTIONS**

**Question 1**

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



Fragment at m/z =105  
Step1- if the mass of the molecular ion is odd it contains at least one nitrogen N= 14 atoms   
105-14=91  
Step2- determine max NC’S  
= 7.5 ?  
Sep3- add enough H’s to make up the rest of the mad  
7×12=84  
1×14=14  
105-(84+14) =7  
7H’S gives   
(2n+2-7)/2= 2(7.5) +2-7/2 =5.25  
Step4- add an O atom   
 - Azocine  
 Pyran-3-carbonitrile  
 = 5.5 ~ 6

Other formula include;

– 2-Phenylethyl

1. What are the importance of organic compounds?

* Organic compounds such as methane is used mainly as fuel.
* In agriculture, low concentrations of ethene are used to hasten the ripening of fruits.
* Organic compounds such as ethanol is sometimes used as an anti-freeze in automobile reactors.
* Esters are used in perfumes and cosmetics, and as artificial flavouring for foods.
* Ethene is used in making synthetic rubber and many important plastics such as poly(ethene), polystyrene, polyvinylchloride(pvc).

1. Differences between homocyclic compounds and heterocyclic compounds

Organic compounds are widely classified into two sections based on their carbon framework, namely open-chain compounds, and closed chain or cyclic compounds. Open chain compounds are again subdivided into two groups; unbranched chain and branched chain compounds. Closed chain or cyclic compounds are also subdivided into two groups; homocyclic and heterocyclic compounds. 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 **heteroatoms**. Usually, the rings of these compounds consist of a larger portion of carbon. The most common heteroatoms present in heterocyclic compounds include nitrogen, sulphur, and oxygen. Heterocyclic compounds can be either aromatic or aliphatic.

**Question 2**

1. Retardation Factor,  **=**

For Distance moved in 2.4cm,

For Distance moved in 5.6cm,

For Distance moved in 8.9cm,

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*

*Compound B –* *Unsaturated compound i.e. Alkene .*

1. *2, 4-Dinitrophenylhydrazine* test is employed for the qualitative test for [carbonyl groups](https://en.wikipedia.org/wiki/Carbonyl_group" \o "Carbonyl group) associated with ***[aldehydes](https://en.wikipedia.org/wiki/Aldehyde" \o "Aldehyde) and [ketones](https://en.wikipedia.org/wiki/Ketone" \o "Ketone).***  
   *2,4-Dinitrophenylhydrazine* is the [chemical compound](https://en.wikipedia.org/wiki/Chemical_compound" \o "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" \o "Carbonyl group) associated with [aldehydes](https://en.wikipedia.org/wiki/Aldehyde" \o "Aldehyde) and [ketones](https://en.wikipedia.org/wiki/Ketone" \o "Ketone). *2, 4-Dinitrophenylhydrazine* can be used to qualitatively [detect](https://en.wikipedia.org/wiki/Chemical_test" \o "Chemical test) the carbonyl functionality of a [ketone](https://en.wikipedia.org/wiki/Ketone" \o "Ketone) or [aldehyde](https://en.wikipedia.org/wiki/Aldehyde" \o "Aldehyde) functional group. A positive test is signaled by the formation of a yellow, orange or red [precipitate](https://en.wikipedia.org/wiki/Precipitate" \o "Precipitate) (known as a [dinitrophenylhydrazone](https://en.wikipedia.org/w/index.php?title=Dinitrophenylhydrazone&action=edit&redlink=1" \o "Dinitrophenylhydrazone (page does not exist))). If the carbonyl compound is **aromatic**, then the precipitate will be red; if **aliphatic**, then the precipitate will have a more yellow color.
2. List 7 functional groups of organic compounds giving two examples of each group?

|  |  |  |
| --- | --- | --- |
| Functional Group | General Formula | Examples |
| Alkanoic Acid | R-COOH | – Ethanoic Acid  Butanoic Acid |
| Alkanol | R-OH | Methanol  Ethanol |
| Alkyl-Halide | RX  (**X** includes the halides such as Fluorine, Chlorine, and Bromine etc.) | Chloromethane  Bromopropane |
| Alkanal | R-COH | Ethanal  Propanal |
| Esters | R | Methylpropanoate  Ethylbutanoate |
| Ketones/Alkanones | R | Propan-2-one  Ethanone |
| Amides |  | – Acetamide  Propanamide |