Heading

Molecular Models Lab

# **Introduction**

# **Purpose** To understand difference between inorganic and organic matter.

**Discussion**

This lab deals with two categories of compounds and molecules: inorganic compounds and molecules verses organic molecules. Organic molecules contain BOTH the element carbon and hydrogen bonded together. All other compounds and molecules are called inorganic. Organic molecules tend to be very large, possessing characteristic properties that we will discuss later in the course. Inorganic compounds/molecules tend to be quite small.

Organic Molecules can be broken down into two main categories: 1) hydrocarbons: composed of carbon and hydrogen atoms only, 2) organic molecules containing other elements such as oxygen, nitrogen and sulfur. We will focus on hydrocarbons and oxygen containing organic molecules in this lab. Organic molecules are more common than all other compounds combined. The most popular organic molecules include fats, proteins, carbohydrates and vitamins. Chemicals used for medicines include hormones, sulfa drugs, cortisone, tranquillizers, pain killers, etc.

Hydrocarbons are the most abundant organic molecules. They contain only the elements carbon and hydrogen. There are three categories of hydrocarbons: 1) saturated, containing all single covalent bonds between atoms, 2) unsaturated, containing at least 1 double or triple covalent bond in the molecule, and 3) aromatic, containing carbon atoms bonded into “rings” or geometric shapes.

Oxygen containing organic molecules are the next most abundant organic molecules after hydrocarbons. They can be classified into several categories: 1) alcohols, used for disinfectants, beverage, solvents, 2) carboxylic acids, used in medicines, foods (vinegar), 3) ethers, used as anesthetics, 4) esters, found in foods, and scents, 5) aldehydes and 6) ketones.

**Materials**: Colored Pencils Molecular Model Kits Reference Tables

**Procedures**:

1. Refer to the table of Inorganic & Organic molecules on the next page.
2. Each lab group will build:
3. ALL of the inorganic molecule from the first column of the table,
4. ALL of the organic molecules in the second column and
5. ALL of the organic molecules from the third column of the table.
6. Complete the Calculations & Data Tables supplied as your calculations and data sheet.
7. Use colored pencils for all your drawings.
8. Use the following color code:

C black (4 holes) O red (2 holes)

H white (1 hole) Cl green (1 hole)

N blue (3-4 holes)

TABLE of Inorganic & Organic Molecules

Inorganic Molecules Organic Molecules (2nd & 3rd Columns)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Name | Formula |  | Name | Formula |  | Name | Formula |
| Water | H2O |  | Ethane | CH3CH3 |  | Ethyl Alcohol | CH3CH2OH |
| Carbon Dioxide | CO2 |  | Ethene | CH2CH2 |  | Ethanoic Acid (Vinegar) | CH3COOH |
| Ammonia | NH3 |  | Ethyne Acetylene | C2H2 |  | Dimethyl Ether | CH3OCH3 |
| Nitrogen | N2 |  | Benzene | C6H6 |  | Methyl Ethanoate | CH3OOCCH3 |

## Calculations and Data

1. Complete the table supplied as your calculations and data sheet.
2. Use the **shorter, fatter “bonds”** for the majority molecules.
3. If the elements do not seem to go together, they may need a double or triple bond. In these cases, use the longer, thinner, flexible plastic “bonds.”
4. Take a picture of your molecules with labels.

## Conclusions and Questions

1. Define the terms “inorganic” and “organic.” Give one example of an inorganic molecule and one example of an organic molecule.
2. Define a “hydrocarbon.”
3. What is the difference between a saturated hydrocarbon and an unsaturated hydrocarbon? Give one example of each.
4. Alcohols, ethers, carboxylic acids, and esters all contain what three elements?

Inorganic Molecules

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Molecular Formula | Structural Formula | 3-D sketch in Color |
| Water |  |  |  |
| Carbon Dioxide |  |  |  |
| Ammonia |  |  |  |
| Nitrogen |  |  |  |

Organic Molecules (2nd Column)

|  |  |  |
| --- | --- | --- |
| Name | Formula | Structural Formula |
| Ethane |  |  |
| Ethene |  |  |
| Ethyne Acetylene |  |  |
| Benzene |  |  |

Organic Molecules (3rd Column)

|  |  |  |
| --- | --- | --- |
| Name | Formula | Structural Formula |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

## Conclusions and Questions

1. Define the terms “inorganic” and “organic.” Give one example of an inorganic molecule and one example of an organic molecule.

2. Define a “hydrocarbon.”

3. What is the difference between a saturated hydrocarbon and an unsaturated hydrocarbon? Give one example of each.

4. Alcohols, ethers, carboxylic acids, and esters all contain what three elements?