

Ms. Randall (compliments of Ms. Drury)

Regents Chemistry

Lab Activity: Homologs

Background: Organic chemistry is that branch of chemistry that deals with the structure, properties, and reactions of compounds that contain carbon. It is a highly creative science. Chemists in general and organic chemists in particular can create new molecules never before proposed which, if carefully designed, may have important properties for the betterment of the human experience. Beyond our bodies' DNA, peptides, proteins, and enzymes, organic compounds are all around us. They are central to the economic growth of the U.S., in industries such as the rubber, plastics, fuel, pharmaceutical, cosmetics, and detergent, coatings, dyestuffs, and agrichemicals industries. The very foundations of biochemistry, biotechnology, and medicine are built on organic compounds and their role in life processes. Mostly all of the modern, high tech materials in society are composed, at least in part, of organic compounds. Clearly, organic chemistry is critically important to our high standard of living. In chemistry, a homologous series is a series of organic compounds with a similar general formula, possessing similar chemical properties due to the presence of the same functional group, and shows a gradation in physical properties as a result of increase in molecular size and mass. In this activity, you will build and observe the homologous series of hydrocarbons.

Pre-Lab:

1. How many valence electrons does carbon have? How many times does it bond?
2. How many valence electrons does oxygen have? How many times can it bond?
3. How many valence electrons does hydrogen have? How many times does it bond?
4. *Define:*
 - organic molecule
 - Hydrocarbon
 - homologous series

Procedure: All drawings and naming are to be done in your lab notebook.

• Part One: Single Bonds

1. Make a model of CH_4 using the model kit.
2. Replace one hydrogen atom with a carbon atom and add additional hydrogen atoms until every bond of each carbon atom is filled. Draw and name this molecule with reference to tables P and Q.
3. Repeat step two until you have created 4 molecules.
4. Create 1 isomer of your fourth compound. Draw and name this molecule

• Part Two: Double Bonds

1. Make a model of C_2H_4 using the model kit.
2. Replace one hydrogen atom with a carbon atom and add additional hydrogen atoms until every bond of each carbon atom is filled. Draw and name this molecule with reference to tables P and Q.
3. Repeat step two until you have created 4 molecules.
4. Create 1 isomer of your fourth compound. Draw and name this molecule

• Part Three: Triple Bonds

1. Make a model of C_2H_2 using the model kit.
2. Replace one hydrogen atom with a carbon atom and add additional hydrogen atoms until every bond of each carbon atom is filled. Draw and name this molecule with reference to tables P and Q.
3. Repeat step two until you have created 4 molecules.
4. Create 1 isomer of your fourth compound. Draw and name this molecule

Analysis:

1. When constructing your first set of molecules, every time a carbon atom was added, how many hydrogen atoms were added? What is the general formula to represent the number of carbons and hydrogens in these compounds?
2. When constructing your second set of molecules, every time a carbon atom was added, how many hydrogen atoms were added? What is the general formula to represent the number of carbons and hydrogens in these compounds?
3. When constructing your third set of molecules, every time a carbon atom was added, how many hydrogen atoms were added? What is the general formula to represent the number of carbons and hydrogens in these compounds?
4. What is an isomer?

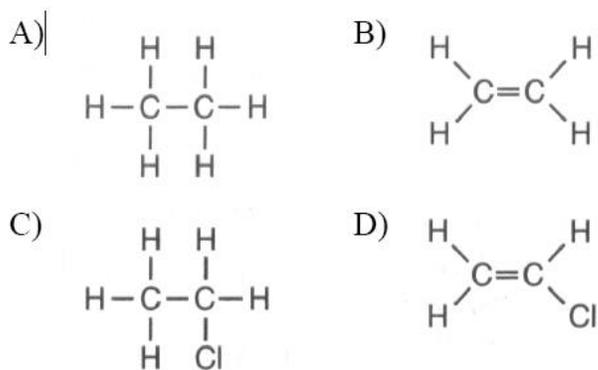
Ms. Randall
Regents Chemistry
Lab Conclusion: Homologs & Functional Groups

1. Write a paragraph summarizing what you have learned about the scientific concept of the lab from doing the lab. Back up your statement with details from your lab experience.

2. Which compound is a member of the same homologous series as C_3H_8 ?

- A) CH_4 B) C_4H_8 C) C_5H_8 D) C_5H_{10}

3. Which formula represents an unsaturated hydrocarbon?

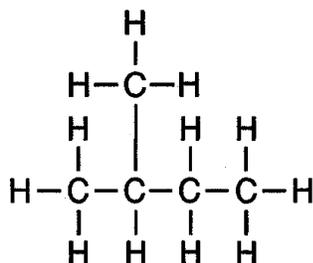


4. A straight-chain hydrocarbon that has only one double bond in each molecule has the general formula

- A) C_nH_{2n-6} B) C_nH_{2n-2}
C) C_nH_{2n} D) C_nH_{2n+2}

5. Base your answer to the following question on the information below.

The formula below represents a hydrocarbon



Identify the homologous series to which this hydrocarbon belongs.

