

Name: \_\_\_\_\_ Period: \_\_\_\_\_ Date: \_\_\_\_\_

Ms. Randall Regents Chemistry (compliments of Mr. Palermo)

## Organic Chemistry Inquiry: Naming Organic Compounds

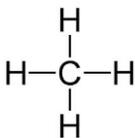
### Background:

Up to this point, the nomenclature you have been studying in this series of activities has been for what are known as *inorganic compounds*; that is, by definition, they do not contain both Carbon and Hydrogen (ex. CO<sub>2</sub>)

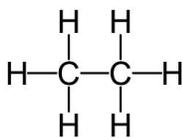
**Organic compounds**, on the other hand, are characterized by the fact that they contain **Carbon and Hydrogen**. The carbon atoms are connected to each other to form the backbone of a molecule. The term “organic” finds its roots in the fact that these compounds were first identified as those that make up the components of living organisms (tissues, enzymes, etc.).

Organic compounds are sometimes generically referred to as hydrocarbons, due to their containing carbon and hydrogen only. (this term is especially applicable to the petroleum industry, where most of the compounds are of this type). Other types of organic compounds contain elements such as oxygen, sulfur, etc, which have a wide range of effects on their properties. This activity deals only with hydrocarbons (organic compounds containing carbon, hydrogen).

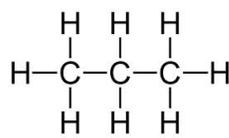
### Model 1:



*methane*



*ethane*



*propane*

1. Using model 1, how many bonds does Carbon always make in an organic compound?
2. The molecules above are called hydrocarbons. What are the only elements that hydrocarbons possess?
3. Using model 1, draw a compound containing 4 carbons.

**READ THIS!!!!**

Organic compounds that only have **single bonds** are called **saturated hydrocarbons**. This is because they are "saturated" with Hydrogen; meaning that they contain the maximum number of hydrogen bonded to the carbon chain. Organic compounds that contain a **double or triple bond** are referred to as **unsaturated**.

**Model 2:** This is taken from Table Q in the reference table.

**Table Q**  
**Homologous Series of Hydrocarbons**

Name	General Formula	Examples	
		Name	Structural Formula
alkanes	$C_nH_{2n+2}$	ethane	<pre>  H   H         H-C---C-H           H   H</pre>
alkenes	$C_nH_{2n}$	ethene	<pre>  H     H    \   /     C=C    /   \   H     H</pre>
alkynes	$C_nH_{2n-2}$	ethyne	$H-C\equiv C-H$

**Note:**  $n$  = number of carbon atoms

1. What is the name of the series of saturated hydrocarbons that possess only single bonds?
2. What is the name of the series of unsaturated hydrocarbons that possess 1 double bond?
3. What is the name of the series of unsaturated hydrocarbons that possess 1 triple bond?
4. Using the general formula how many hydrogen's would a compound contain if it had 5 Carbons and only single bonds?
5. Using the general formula how many hydrogen's would a compound contain if it had 5 Carbons and a double bond?
6. Using the general formula how many hydrogen's would a compound contain if it had 5 Carbons and a triple bond?

## NAMING ORGANIC COMPOUNDS:

### Model 3:

Table P from the reference table shows the organic prefixes that correspond to how many carbon atoms a compound possesses.

**Table P**  
**Organic Prefixes**

Prefix	Number of Carbon Atoms
meth-	1
eth-	2
prop-	3
but-	4
pent-	5
hex-	6
hept-	7
oct-	8
non-	9
dec-	10

### NAMING ALKANES (saturated hydrocarbons)

- Looking back at model 1 which are all alkanes, what is similar about their names? What is different?
- Using model 2 and 3, what does the *eth-* in ethane tell you?
- Using models 2 and 3, determine the name of the following compounds:
  - $C_4H_{10}$
  - $C_5H_{12}$
  - $C_6H_{14}$
  - $C_7H_{16}$
- How many C's and H's do the following compounds contain:
  - octane
  - butane

### **NAMING ALKENES: (unsaturated hydrocarbons)**

1. Using model 2 and 3, what is different about the name of compounds containing a double bond versus a single bond?
2. Name the following alkenes:
  - a.  $C_4H_8$
  - b.  $C_5H_{10}$
  - c.  $C_6H_{12}$
  - d.  $C_7H_{14}$
3. If you are given the following molecular formulas:  $C_5H_{12}$  and  $C_5H_{10}$  how can you distinguish which is an alkane and which is an alkene?
4. Name the two compounds in question 3.

### **NAMING ALKYNES: (unsaturated hydrocarbons)**

1. Using model 2 and 3, what is different about the name of compounds containing a triple bond versus a single or double bond?
2. Name the following alkynes:
  - a.  $C_4H_6$
  - b.  $C_5H_8$
  - c.  $C_6H_{10}$
  - d.  $C_7H_{12}$
3. Which compound is an alkyne?  $C_9H_{18}$  or  $C_9H_{16}$