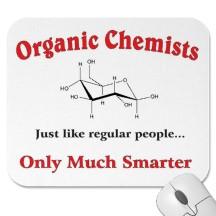
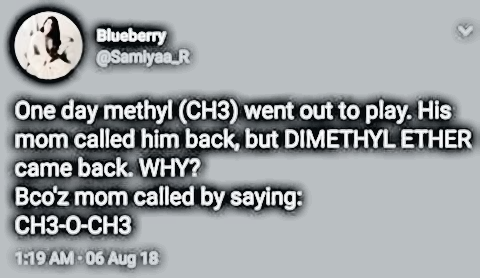
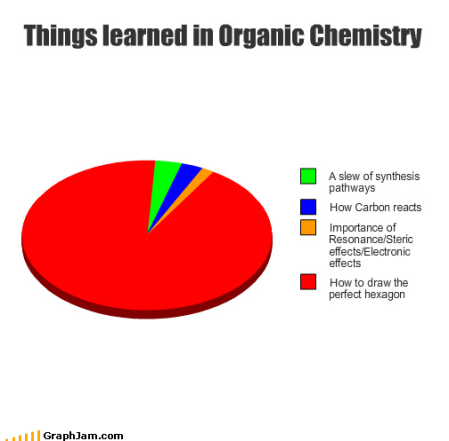
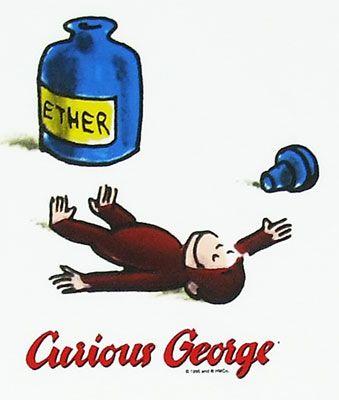
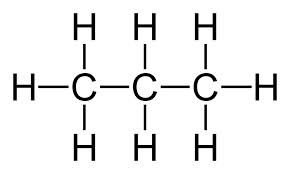
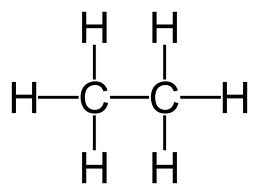
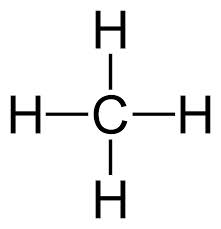
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**Organic Compounds and Hydrocarbons** Think Tank Questions

The Stock System and IUPAC nomenclature has been used to name Inorganic compounds, which by definition compounds that do not contain primarily Carbon and Hydrogen (example: NaCl). **Organic compounds** contain **Carbon** as a primary element in the composition of the molecule. 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.). Many organic compounds are 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). However, other types of organic compounds also include elements such as oxygen, sulfur, and nitrogen, which have a wide range of effects on their properties. This activity is designed to address only simple hydrocarbons.

***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 carbon atoms.

Organic compounds that only have **single bonds** are called **saturated** hydrocarbons. This is because they contain the maximum number of hydrogen atoms bonded to the carbon chain. Organic compounds that contain a **double or triple bond** are referred to as **unsaturated.**  Look at Table Q of your reference tables.

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 atoms would a compound contain if it had 5 Carbon atoms and only single bonds?
5. Using the general formula how many hydrogen atoms would a compound contain if it had 5 Carbon atoms and a double bond?
6. Using the general formula how many hydrogen atoms would a compound contain if it had 5 Carbon atoms and a triple bond?

Look at Table P of your reference tables.

**NAMING ALKANES (saturated hydrocarbons)**

1. For all alkanes, what is similar about their names (look at Model 1)? What is different?
2. What does the *eth-* in ethane tell you?

12. Determine the name of the following compounds:

a. C4H10 b. C5H12 c. C6H14 d. C7H16

13. How many C atoms and H atoms do the following compounds contain?

a. octane b. nonane

**NAMING ALKENES (unsaturated hydrocarbons)**

1. What is different about the name of compounds containing a double bond versus a single bond?
2. Name the following alkenes:

a. C4H8 b. C5H10 c. C6H12 d. C7H14

1. If you are given the following molecular formulas: C5H12 and C5H10 how can you distinguish which is an alkane and which is an alkene?
2. Name the two compounds in question 16.

**NAMING ALKYNES (unsaturated hydrocarbons)**

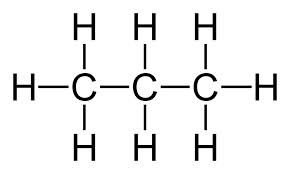
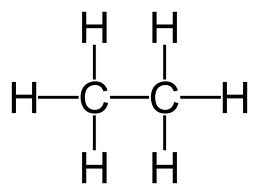
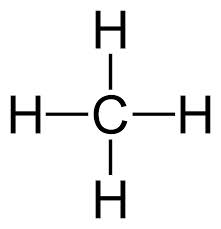
1. What is different about the name of compounds containing a triple bond versus a single or double bond?
2. Name the following alkynes:

a. C4H6 b. C5H8 c. C6H10 d. C7H12

20. Which compound is an alkyne? C9H18 orC9H16

Structural formulas show the arrangement of the atoms within the molecules as far as which atoms are bonded to which and whether single, double or triple bonds are used.

***MODEL 2:* Structural formulas for alkanes**

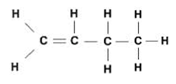
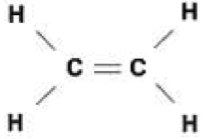
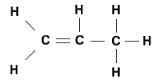


*methane ethane propane*

1. Using model 2 above, draw the structural formula for the following alkanes.
2. C4H10  b. C5H12 c. C6H14

1. Name the compounds in question 21. 

***MODEL 3:* Structural Formulas for Alkenes**

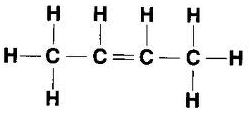


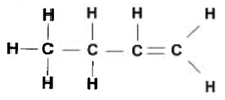
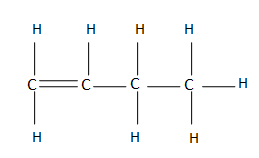


1. Based upon model 3 and your knowledge of alkenes, why does the compound methene not exist?
2. Why do the carbon atoms with the double bond contain 2 less Hydrogen atoms than carbon atoms that contain a single bond?
3. Using model 3 above, draw the structural formula for the following alkenes. (Refer to table P and Q in your reference table). Then name the compounds you drew.

a. C5H10  b. C6H12 c. C7H14

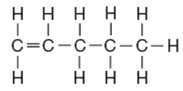
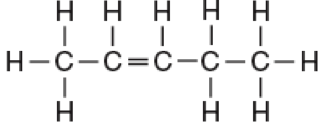
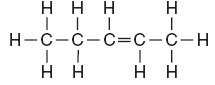
When naming alkenes you must give the location of the double bond in the name when there are more than 3 carbon atoms in the compound. You do this by numbering the carbon atoms and stating which number carbon the double bond is on. You can number the carbon atoms from left to right or right to left whichever gives the double bond the lowest possible numbered location. This is because compounds are not stationary in the “real world” and are therefore constantly moving. See Model 4.

***MODEL 4:*** 



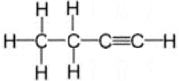
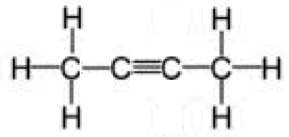
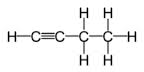
*1-butene 2-butene 1-butene*

1. Why is the third compound in model 4 not called 3-butene?
2. Referring to the models, name following compounds:



Drawing structural formulas for alkynes is exactly the same as alkenes except they contain a triple bond instead of a double bond. 

***MODEL 5: Structural Formulas for alkynes***

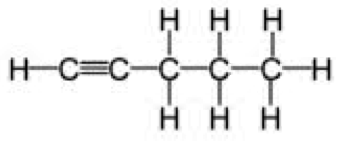


*1-butyne 2-butyne 1-butyne*

1. Why do the carbons with the triple bond contain no bonded hydrogen atoms?
2. Using model 5 above, draw the structural formula for the following alkynes. Then name the compounds you drew.

a. C5H8  b. C6H10 c. C7H12

1. Name the following compounds:



31. Draw the structural formula for the following compounds:

a. C8H16 b. C4H6

c. 2-hexene d. 2-heptyne

e. 3-hexene f. 1-heptyne

32. Which of the above hydrocarbons are parts of the same homologous series (family)?

Isomers are two compounds with the same molecular formula (CnHn) but a different structural formula (how it is drawn). Therefore, isomers have different properties and names.

33. Which of the above hydrocarbons are isomers?

**Hydrocarbons** Check Your Understanding

1. How many carbon atoms are in each compound?
   1. Methane \_\_\_\_
   2. Ethane \_\_\_\_
   3. Ethene \_\_\_\_
   4. Pentane \_\_\_\_
   5. Propene \_\_\_\_
   6. Hexane \_\_\_\_
   7. Ethyne \_\_\_\_
   8. Propane \_\_\_\_
   9. Heptane \_\_\_\_
   10. Octane \_\_\_\_
   11. Decane \_\_\_\_
   12. Butyne \_\_\_\_
   13. Butane \_\_\_\_
   14. Propyne \_\_\_\_
   15. Butene \_\_\_\_
2. For each compound fill in each blank:

Number of Carbon atoms Series Formula

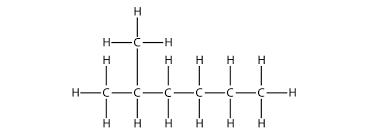
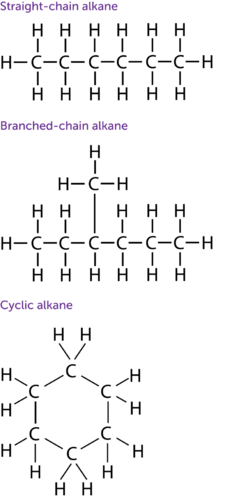
* 1. Methane \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  2. Butane \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  3. Propyne \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  4. Pentane \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  5. Octane \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  6. Heptene \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  7. Propene \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  8. Butyne \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  9. Decane \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  10. Nonane \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  11. Heptane \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  12. Ethyne \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  13. Hexyne \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  14. Ethane \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  15. Propane \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  16. Decene \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  17. Octyne \_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. How many times does carbon bond and why?
2. For each of the following, draw the structural formula and then name the compound.
   1. C2H6 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. C5H10 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. C6H12 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. C7H12 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   5. C9H20 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   6. C2H2 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   7. C8H16 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   8. C4H8 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   9. C10H18 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   10. C5H8 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   11. C6H14 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   12. C9H16 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. For each of the following use tables P and Q to determine the name.
   1. CH4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   2. C10H20 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   3. C3H4 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   4. C8H18 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   5. C5H12 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   6. C9H18 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   7. C2H6 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   8. C4H6 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   9. C7H16 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
   10. C6H12 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Create a rule to determine an easy way to find the homologous series to which a compound belongs.

**Branched and Cyclic Hydrocarbons** Think Tank Problems

1. What element bonds four times, often to atoms of itself, in branches and rings? \_\_\_\_\_\_\_\_\_\_\_\_\_
2. The prefix “cyclo” means cyclic or in a circle. If a hydrocarbon has this prefix, the carbon atoms are arranged in a circle rather than one chain. Attempt to draw the following cyclic hydrocarbons:
   1. Cyclobutane c. Cyclohexene
   2. Cyclopentane d. Cyclobutene
3. Smaller chains of hydrocarbons can branch off from larger chains as shown below. Notice the name identifies the smaller chain first and then the larger chain.

**2-methyl hexane 3-methyl hexane**

* 1. What do the numbers before the name represent?
  2. What would 1-methyl hexane look like? Draw it.
  3. What really is the name of 1-methylhexane?
  4. What would 4-methyl hexane look like? Draw it.
  5. Once the teacher shows you the models of each of these examples, which two structures are the same?
  6. What are the rules for naming branched hydrocarbons?

**Branched and Cyclic Hydrocarbons** Check your Understanding

1. Draw the following cyclic compounds:

**Cyclopentene 1, 3 Cyclohexadiene 1, 4 Cyclooctadiene**

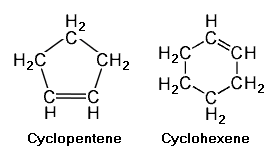
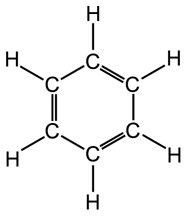
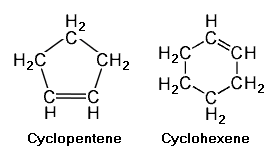
**1, 3 Cycloheptadiene 1, 3, 5 Cyclohexatriene Benzene**

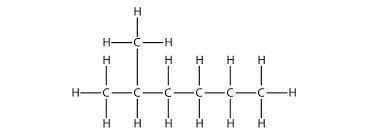
1. Draw the following branched hydrocarbons:

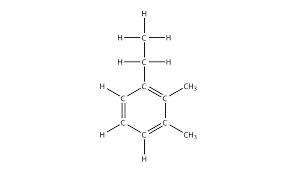
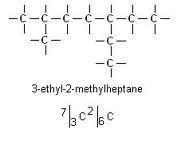
**2-methyl butane 3-ethyl hexane**

**2, 3-dimethyl pentane 4-methyl, 3-ethyl 1-octyne**

1. Name the following compounds:

**  **



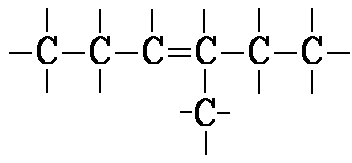
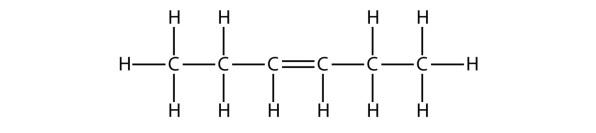
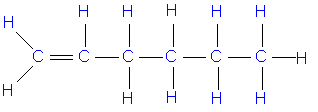
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**Isomers** Think Tank Problems

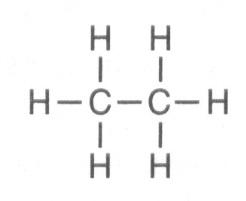
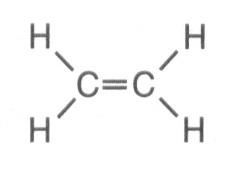
1. Record the Structural formula, molecular formula, and condensed formula for the following:

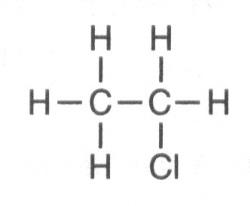
| **Name** | **Structural:** Draw the molecule | **Molecular:** Count the total C&H | **Condensed:** Don’t draw the H just count them on each C |
| --- | --- | --- | --- |
| 2, 3-dimethyl butane |  |  |  |
| 2, 2-dimethyl butane |  |  |  |
| 2-heptyne |  |  |  |
| 3-hexene |  |  |  |
| 2-methyl  1-pentene |  |  |  |

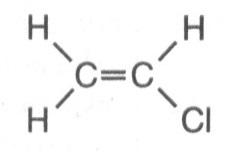
1. Which of the above have the same molecular formula? These are known as **isomers** because they have the same number of each of the elements but a different structure which gives them different names and properties.
2. Draw 2-heptyne.
3. Draw an isomer of 2-heptyne.
4. Give the name of your isomer.
5. Name the following and identify the isomers.

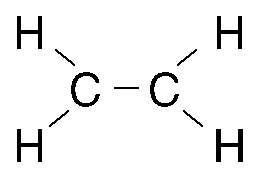
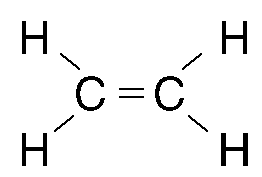
**Hydrocarbons** Check your Understanding

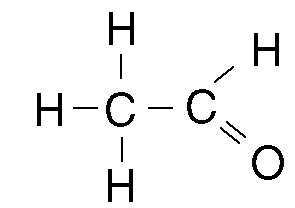
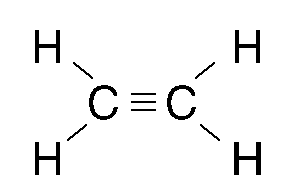
1. Which formula represents an unsaturated hydrocarbon?
   1. C)



* 1. D)

1. Which organic compound is a saturated hydrocarbon?
   1. ethyne C) ethene
   2. ethanol D) ethane
2. Which formula represents a hydrocarbon?
   1. CH3CH2CH2CHO C) CH3CH2CH2COOH
   2. CH3CH2CH2CH3 D) CH3CH2COOCH3
3. Which structural formula *correctly* represents a hydrocarbon molecule?

A)  B) 

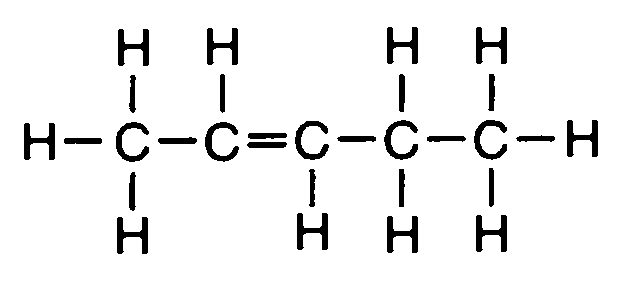
C)  D) 

1. In saturated hydrocarbons, carbon atoms are bonded to each other by
   1. single covalent bonds, only
   2. double covalent bonds, only
   3. alternating single and double covalent bonds
   4. alternating double and triple covalent bonds
2. What is the general formula for the members of the alkane series?
   1. C*n*H2*n* C) C*n*H2*n*+2
   2. C*n*H2*n–*2 D) C*n*H2*n–*6
3. In which group could the hydrocarbons all belong to the same alkene series?

A) C2H2, C2H4, C2H6 C) C2H4, C2H6, C3H6

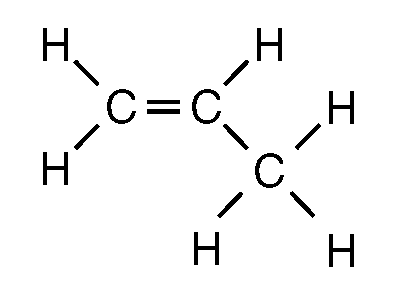
B) C2H2, C2H4, C4H8 D) C2H4, C3H6, C4H8

1. A molecule of butane and a molecule of 2-butene both have the same total number of
   1. carbon atoms C) hydrogen atoms
   2. single bonds D) double bonds
2. A double carbon-carbon bond is found in a molecule of
   1. pentane C) pentene
   2. pentyne D) pentanol
3. The multiple covalent bond in a molecule of 1-butene is a
   1. double covalent bond that has 6 shared electrons
   2. double covalent bond that has 4 shared electrons
   3. triple covalent bond that has 6 shared electrons
   4. triple covalent bond that has 4 shared electrons
4. Given the formula:



What is the IUPAC name of this compound?

1. 2-pentene C) 2-pentyne
2. 2-butene D) 2-butyne
3. Given the structural formula:



What is the IUPAC name of this compound?

* 1. propane C) propene
  2. propanone D) propanal

1. What is the correct formula for butene?
   1. C4H4 C) C4H6
   2. C4H8 D) C4H10
2. Which general formula represents the homologous series of hydrocarbons that includes the compound l-heptyne?
   1. CnH2n-6 C) CnH2n-2
   2. CnH2n D) CnH2n+2
3. Which compound is an unsaturated hydrocarbon?
   1. hexanal C) hexane
   2. hexanoic acid D) hexyne
4. Given the structural formula:

What is the total number of electrons shared in the bond between the two C?

A) 6 B)2 C) 3 D) 4

1. Which formula represents propyne?
   1. C3H4 C) C3H6
   2. C5H8 D) C5H10
2. What is the name of a compound that has the molecular formula C6H6?
   1. butane C) butene
   2. benzene D) butyne
3. Two substances have different physical and chemical properties. Both substances have molecules that contain two carbon atoms, one oxygen atom, and six hydrogen atoms. These two substances must be
   1. isomers of each other
   2. isotopes of each other

C) the same compound

D) the same hydrocarbon

1. The three isomers of pentane have different
   1. formula masses
   2. molecular formulas
   3. empirical formulas
   4. structural formulas
2. Molecules of 1-bromopropane and 2-bromopropane differ in
   1. molecular formula
   2. structural formula
   3. number of carbon atoms per molecule
   4. number of bromine atoms per molecule 
3. Which compound is an isomer of pentane?
   1. butane C) propane
   2. methyl butane D) methyl propane
4. What is the maximum number of covalent bonds that can be formed by one carbon atom?

A) 1 B) 2 C) 3 D) 4

1. Atoms of which element can bond with each other to form ring and chain structures in compounds?
   1. C B) Ca C) H D) Na
2. Which element must be present in an organic compound?
   1. H B) C C) O D) N
3. Organic compounds that are non-polar and exhibit weak intermolecular forces have
   1. low vapor pressure
   2. low melting points
   3. high boiling points
   4. high electrical conductivity in solution
4. A characteristic of most organic compounds is that they
   1. have low melting points
   2. have high melting points
   3. are soluble in water
   4. conduct electricity when aqueous
5. In general, which property do organic compounds share?
   1. high melting point
   2. high electrical conductivity

C) readily soluble in water

D) slow reaction

**Functional Groups** Think Tank Questions

A **functional group** in an organic molecule is an atom or a group of atoms that replaces a hydrogen atom in a hydrocarbon.  These replacement groups are much more reactive than the hydrogen atom that was replaced.  They give the molecule its functionality, or its reactivity. Reference Table R is very helpful to name and draw the structure of organic molecules that contain a functional group. The table lists the class of compound, the functional group, the general formula and an example to help in the naming. The *R* and *R’* in the general formula stands for the hydrocarbon that makes up the rest of the molecule.

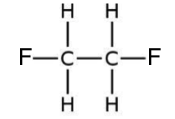
**Directions: *For each Model below, determine how the name is derived from the structural formula. Using table R in your reference table and the models, circle the functional group and name the compound.***

**MODEL 1: Halide or Halocarbon (group 17)**

Halides have a *halogen* (group 17 element) in place of a hydrogen atom. The name is derived by changing the ending of the halogen name to ***–o*** and adding it to the hydrocarbon name. A number is used to identify the carbon in the chain to which the halogen is attached.

| **Name** | **General Formula** | **Structural formula** | **Condensed formula** |
| --- | --- | --- | --- |
| *2-chloropropane* | Macintosh HD:Users:martinpalermoimac:Desktop:Screen Shot 2016-03-28 at 2.22.17 PM.png |  | CH3CHClCH3 |
| *1,2 dibromoethane* | Macintosh HD:Users:martinpalermoimac:Desktop:Screen Shot 2016-03-28 at 2.19.53 PM.png | CH2BrCH2Br |

Using Reference Table R and the model above, circle the functional group(s) then name the organic molecule.



Name:

**MODEL 2: Alcohols** (-OH group) = **-*ol*** ending

Alcohols have a hydroxyl group (-OH). Alcohols are named just like alkanes, but the **-e** at the end is replaced with an **-*ol*** ending**.**  You also need to put a number in front of the name, separated with a dash, to indicate which carbon atom the -OH group is attached. As always, use the smallest possible number.

| **Name** | **General Formula** | **Structural formula** | **Condensed formula** |
| --- | --- | --- | --- |
| *1-propanol* | Macintosh HD:Users:martinpalermoimac:Desktop:Screen Shot 2016-03-28 at 2.28.42 PM.png |  | CH3CH2CH2OH |
| *2-pentanol* | 2pentanol | CH3CHOHCH2CH2CH2CH3 |
| *3-pentanol* | 3pentanol | CH3CH2CHOHCH2CH2CH3 |



Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

***MODEL 3: Ethers*** *(-O-)*

*Ethers have an oxygen bonded between two hydrocarbon chains. In an ether, the carbon chain on each side of the –o– is named separately with a –yl ending then the word* ***ether****. The hydrocarbon chains* ***should*** *be named in alphabetical order (except for the \*\* below.)*

| **Name** | **General Formula** | **Structural formula** | **Condensed formula** |
| --- | --- | --- | --- |
| *\*\*\*methyl ethyl ether* | Macintosh HD:Users:martinpalermoimac:Desktop:Screen Shot 2016-03-28 at 2.33.12 PM.png | Macintosh HD:Users:martinpalermoimac:Desktop:Screen Shot 2016-03-22 at 8.28.13 PM.png | CH3OCH2CH3 |
| *dimethyl ether* | Macintosh HD:Users:martinpalermoimac:Desktop:Screen Shot 2016-03-22 at 8.28.05 PM.png | CH3OCH3 |
| *diethyl ether* | Macintosh HD:Users:martinpalermoimac:Desktop:Screen Shot 2016-03-22 at 8.28.22 PM.png | CH3CH2OCH2CH3 |

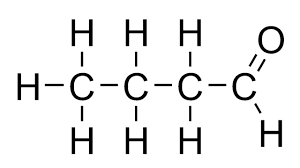
**\*\*\*\*The *R* and *R’* in the general formula stands for the hydrocarbon that makes up the rest of the molecule. Notice that there are hydrocarbons on both sides of the oxygen atom.**

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**MODEL 4: Aldehydes** (–CHO group) = **-*al*** ending

An aldehyde is an organic molecule that has an oxygen atom double bonded to the **end** carbon of the carbon chain. An aldehyde is named like an alkane except with an **-*al* ending**.  Since the **CHO** must be on the terminal #1 carbon atom, the position of the CHO is *not specified* in the name (no number).

| **Name** | **General Formula** | **Structural formula** | **Condensed formula** |
| --- | --- | --- | --- |
| *propanal* | Macintosh HD:Users:martinpalermoimac:Desktop:Screen Shot 2016-03-28 at 2.40.58 PM.png |  | CH3CH2CHO |
| *ethanal* | ethanal | CH3CHO |
| *pentanal* |  | CH3CH2CH2CH2CHO |

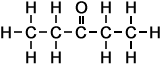


Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**MODEL 5: Ketones** = ***-one*** ending

Ketones are very similar to aldehydes.  Aldehydes and ketones with the same number of carbons are isomers. The only difference is that the *C=O in a ketone is in the middle of a chain and* ***not on the end*** ***carbon***.  To name a ketone, use the **-*one* ending** and specify the position of the C=O with a number at the beginning of the name.

| **Name** | **General Formula** | **Structural formula** | **Condensed formula** |
| --- | --- | --- | --- |
| *2-pentanone* | Macintosh HD:Users:martinpalermoimac:Desktop:Screen Shot 2016-03-28 at 2.45.14 PM.png | 2pentanone | CH3COCH2CH2CH3 |
| *propanone* | acetone | CH3COCH3 |
| *butanone* | butanone | CH3COCH2CH3 |

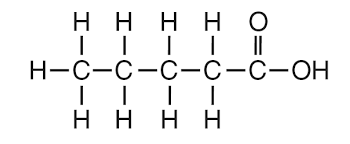


Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**MODEL 6: Organic Acids** ( –COOH group)

Organic acids have a carboxyl group at the end of the carbon chain. The acidic H is attached to the oxygen in the carboxyl group. To name an acid, change the end of the hydrocarbon to –***oic acid***. No number is needed because the functional group is at the ***end*** of the carbon chain.

| **Name** | **General Formula** | **Structural formula** | **Condensed formula** |
| --- | --- | --- | --- |
| *propanoic acid* | Macintosh HD:Users:martinpalermoimac:Desktop:Screen Shot 2016-03-28 at 2.46.45 PM.png |  | O  ||  CH3CH2C-OH  *(or* CH3CH2COOH) |
| *ethanoic acid* |  | O  ||  CH3C-OH    (or CH3COOH) |
| *butanoic acid* | Macintosh HD:Users:martinpalermoimac:Desktop:Screen Shot 2016-03-27 at 7.10.07 PM.png | O  ||  CH3CH2CH2C-OH  (or CH3CH2CH2COOH) |

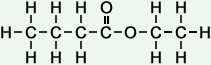


Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**MODEL 7: Esters** (–COO– group)

Esters are named first with the side bonded to oxygen with a ***–yl*** ending. The second part of the name comes from the side bonded to C=O with the ending ***–oate***.

| **Name** | **General Formula** | **Structural formula** | **Condensed formula** |
| --- | --- | --- | --- |
| *methyl propanoate* | Macintosh HD:Users:martinpalermoimac:Desktop:Screen Shot 2016-03-28 at 2.59.32 PM.png | http://www.ivyroses.com/Chemistry/Organic/molecules/methyl-esters/methyl-propanoate.gif | O  ||  CH3CH2COCH3 |
| *ethyl propanoate* | http://www.ivyroses.com/Chemistry/Organic/molecules/ethyl-esters/ethyl-propanoate.gif | O  ||  CH3CH2COCH2CH3 |

 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**MODEL 8: Amines** (-N- group)

To name an amine, drop the end ***–e*** in the hydrocarbon name and replace it with -***amine***. Be sure to number the carbon in the chain to which the -NH2 group is attached.

| **Name** | **General Formula** | **Structural formula** | **Condensed formula** |
| --- | --- | --- | --- |
| *1-propanamine* | Macintosh HD:Users:martinpalermoimac:Desktop:Screen Shot 2016-03-28 at 3.19.12 PM.png | Macintosh HD:Users:martinpalermoimac:Desktop:amine1a.gif | CH3CH2CH2NH2 |
| *ethanamine* | http://www.ivyroses.com/Chemistry/Organic/molecules/amines/ethylamine.gif | CH3CH2NH2 |

Circle the functional group then name the organic molecule.

https://chemistry.boisestate.edu/richardbanks/organic/nomenclature/amine1.gif

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**O**

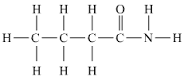
**||**

**MODEL 9: Amides** (–C–NH2 group)

To name amides, replace the –e in the name of the hydrocarbon with –amide. No number is needed as the functional group is at the end of the hydrocarbon chain.

| **Name** | **General Formula** | **Structural formula** | **Condensed formula** |
| --- | --- | --- | --- |
| *propanamide* | Macintosh HD:Users:martinpalermoimac:Desktop:Screen Shot 2016-03-28 at 3.29.02 PM.png |  | O  ||  CH3CH2C-NH2 |
| *ethanamide* | http://docs.exdat.com/data/235/234358/234358_html_m57c90e0f.gif | O  ||  CH3C-NH2 |

Circle the functional group then name the organic molecule.

 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Functional Groups Naming** Check you Understanding

For each of the following identify the functional group and then name the compound using table R.

| Functional Group: \_\_\_\_\_\_\_\_\_\_\_\_\_  Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Functional Group: \_\_\_\_\_\_\_\_\_\_\_\_\_  Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Functional Group: \_\_\_\_\_\_\_\_\_\_\_\_\_  Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| --- | --- | --- |
| Functional Group: \_\_\_\_\_\_\_\_\_\_\_\_\_  Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Functional Group: \_\_\_\_\_\_\_\_\_\_\_\_\_  Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Functional Group: \_\_\_\_\_\_\_\_\_\_\_\_\_  Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Functional Group: \_\_\_\_\_\_\_\_\_\_\_\_\_  Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Functional Group: \_\_\_\_\_\_\_\_\_\_\_\_\_  Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Functional Group: \_\_\_\_\_\_\_\_\_\_\_\_\_  Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |
| Functional Group: \_\_\_\_\_\_\_\_\_\_\_\_\_  Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Functional Group: \_\_\_\_\_\_\_\_\_\_\_\_\_  Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | Functional Group: \_\_\_\_\_\_\_\_\_\_\_\_\_  Name : \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

**Functional Groups Structure** Check your Understanding

Directions: Identify the class of organic compounds to which each of the following belongs. Draw and name the compound using the IUPAC system (Table R).

CH3COOH CH3CH2COOCH3

CH3COCH3 CH3CH2COOH

CH3CH2OH CH3OCH3

CH3CH2OCH3 CH3CH2COCH3

CH3CH2CHO CH3CH2CH2CONH2

Directions: Draw the structural formula and provide the condensed- formula for each of the following.

butanoic acid methyl methanoate

methanal 3-pentanol

**Functional Groups Formulas** Check Your Understanding

For the following compounds, determine the family and draw the compound:

| **Name** | **Functional Group** | **Structural Formula** | **Condensed Formula** | **Empirical Formula** |
| --- | --- | --- | --- | --- |
| Butanoic acid |  |  |  |  |
| Methanal |  |  |  |  |
| Butanamide |  |  |  |  |
| 3-iodo octane |  |  |  |  |
| Methyl pentanoate |  |  |  |  |
| Ethanol |  |  |  |  |
| 2-heptanone |  |  |  |  |
| Diethyl ether |  |  |  |  |
| 2-pentanol |  |  |  |  |
| Ethanoic acid |  |  |  |  |
| 2-propanamine |  |  |  |  |
| Hexanal |  |  |  |  |
| Ethyl methanoate |  |  |  |  |

**Organic Reactions** Think Tank Questions

Organic reactions have their own set of classifications that have some overlap from the initial reaction types known as synthesis, decomposition, single and double replacement. Match the reaction below to the description provided.

1. C13H28 🡪 C8H18 + C2H4 + C3H6
2. C3H8 + 5O2 🡪 3CO2 + 4H2O
3. C3H6 + I2 🡪 C3H6I2
4. C6H12O6🡪 C2H5OH +CO2
5. n(CH2CH2) 🡪 (CH2CH2)n
6. C2H6 + Cl2 🡪 C2H5Cl + HCl
7. g. C3H6COOH + C2H5OH 🡪 C3H6COOC2H5 + H2
8. (C17H35COO)3C3H5 + 3 NaOH 🡪 C3H5(OH)3 + 3C17H35COONa

\_\_\_\_\_ 1. Addition: Similar to synthesis, an **alkene or alkyne** breaks bonds to **add** in H or halogen.

\_\_\_\_\_ 2. Substitution: Similar to single replacement, an **alkane** removes H atom to **replace** with halogen.

\_\_\_\_\_ 3. Cracking: Similar to decomposition, a hydrocarbon **breaks** into small fragments.

\_\_\_\_\_ 4. Combustion: A hydrocarbon is burned in **oxygen** to produce **carbon dioxide** and **water**.

\_\_\_\_\_ 5. Fermentation: Sugar is decomposed (in the presence of a catalyst) to form **alcohol**.

\_\_\_\_\_ 6. Esterification: **Acids** and **alcohols** react to form **esters** that smell great.

\_\_\_\_\_ 7. Polymerization: Small carbon chains link together to form long carbon chains where **n** may

represent 100+ molecules.

\_\_\_\_\_ 8. Saponification: **Large fat** molecules react with bases like sodium hydroxide to form **soap**. The

soap is an ionic compound containing a metal cation and a large nonpolar anion.

1. Explain the difference(s) between addition and substitution reactions.
2. Explain how cracking is similar to decomposition reactions.
3. Humans are “combustion engines.” Explain this in terms of combustion reactions' reactants and products.
4. Examples of polymers include rubber, nylon (fabric), teflon (pans), kevlar (bullet proof vests), and other synthetic materials. What does the prefix “poly” mean and how does the amount of electrons in a polymer influence its intermolecular forces of attraction?
5. In the movie *Fight Club*, they steal fat from a liposuction factory to create their own soaps.
   1. What process would be used to do this?
   2. What other organic compound could be added to the soap to make it fragrant?

**Organic Reactions** Check Your Understanding

**Name the reaction:**

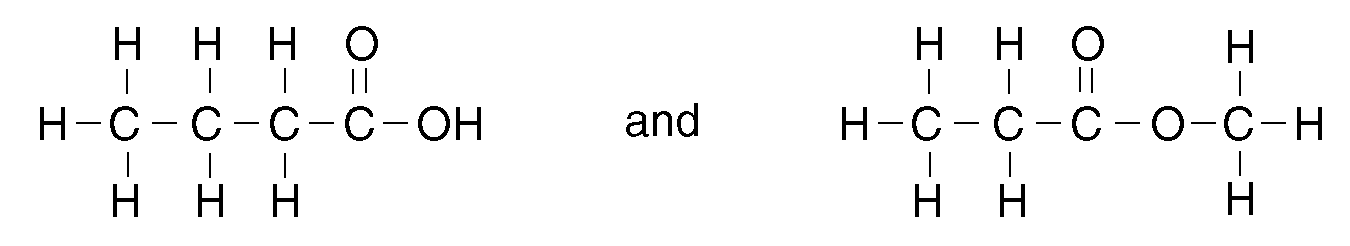
1. A saturated alkane reacts with fluorine \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. Small alkene chains connect to form larger alkane chains \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. Sugar is decomposed to form an alcohol \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Large hydrocarbons are heated and break into smaller fragments \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. An unsaturated hydrocarbon reacts with bromine \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. An alcohol and an organic acid are reacted \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. A base is added to a fat molecule to form a soap \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. Hydrocarbons are burned in the presence of oxygen \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. Another name for hydrogenation\* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. Another name for halogenation\* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Draw all organic reactants and products. Then name and give the formula for the missing substance in the reaction. Give the reaction type.**

1. C2H4 + F2 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Rxn: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. C3H6 + H2 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Rxn: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. C2H6 + Cl2 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ + HCl Rxn: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. C4H10 + Br2 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ + HBr Rxn: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
5. CH4 + O2 🡪 \_\_\_\_\_\_ + H2O Rxn: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
6. C3H8 + O2 🡪 CO2 + \_\_\_\_\_\_ Rxn: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
7. C6H12O6 🡪 2CO2 + 2\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Rxn: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
8. C8H18 🡪 C6H12 + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Rxn: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
9. C2H5OH + C3H7COOH 🡪 H2O + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Rxn: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
10. C3H7OH + C2H5COOH 🡪 H2O + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Rxn: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
11. C5H10 + F2 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Rxn: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
12. C5H12 + F2 🡪 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Rxn: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
13. (C17H35COO)3C3H5 + 3\_\_\_\_\_\_\_\_\_ 🡪 C3H5(OH)3 + 3C17H35COONa Rxn: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Organic** Check Your Understanding

1. Given the structural formulas for two organic compounds:



The differences in their physical and chemical properties are primarily due to their different

* 1. number of hydrogen atoms
  2. number of carbon atoms

C) molecular masses

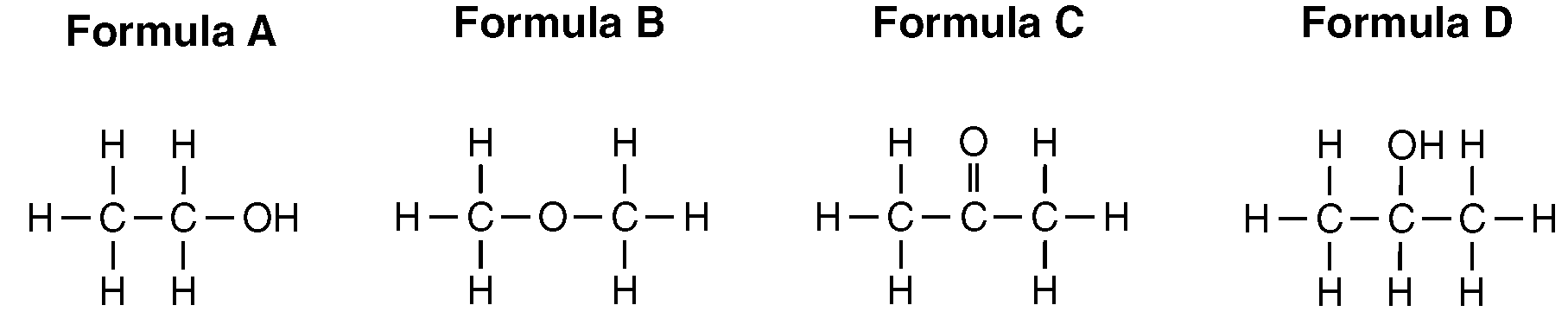
D) functional groups

1. Organic compounds that are essentially non-polar and exhibit weak intermolecular forces have
   1. low vapor pressure
   2. high electrical conductivity in solution

C) low melting points

D) high boiling points

1. Given the structural formulas:



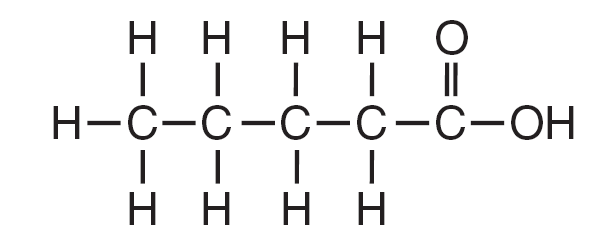
Which two formulas represent compounds that are isomers of each other?

* 1. *B* and *D* C) *A* and *B*
  2. *A* and *C* D) *C* and *D*

1. Which compound is an isomer of CH3CH2OH?
   1. CH3COOH C) CH3CH2CH3
   2. CH3COCH3 D) CH3OCH3
2. What is the total number of carbon atoms in a molecule of ethanoic acid?

A) 1 B) 2 C) 3 D) 4

1. Given the structural formula:

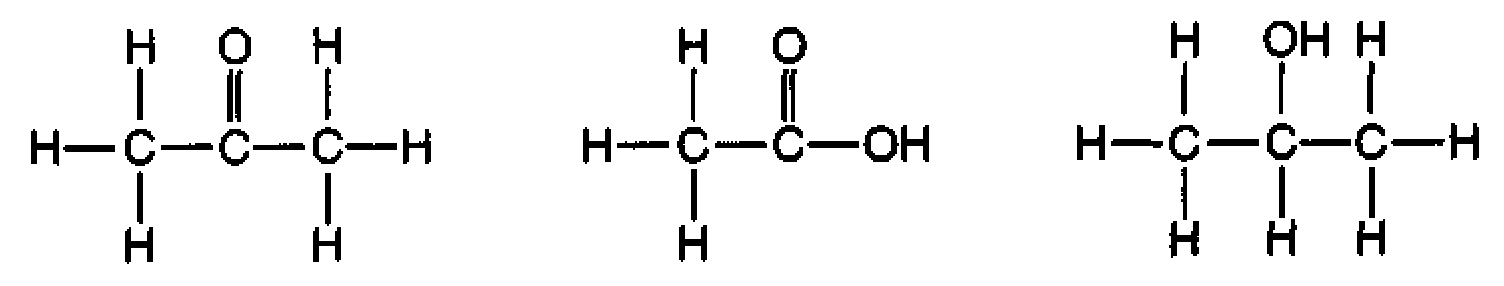


What is the IUPAC name of this compound?

* 1. methyl pentanoate C) pentanol

B) pentanal D) pentanoic acid

1. Given the three organic structural formulas shown below:



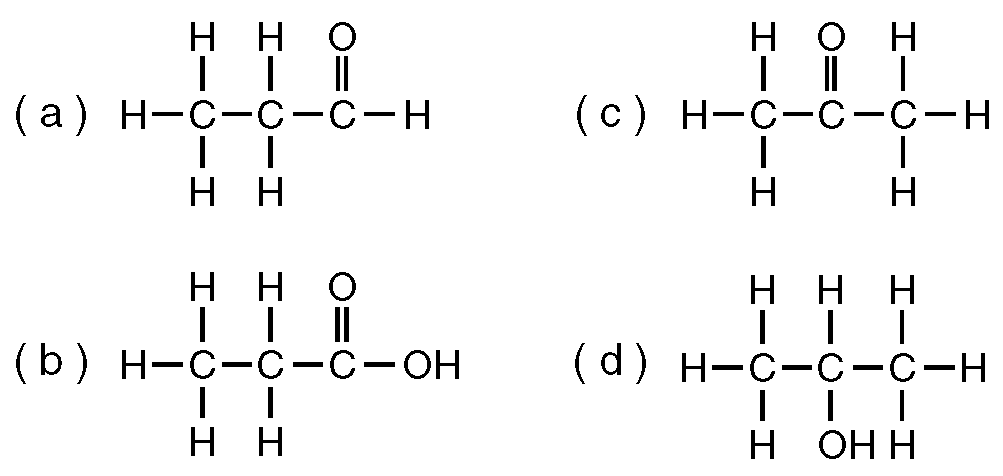
Which organic compound classes are represented by these structural formulas, as shown from left to right?

* 1. ketone, aldehyde, alcohol
  2. ester, organic acid, ketone

C) ketone, organic acid, alcohol

D) ester, aldehyde, organic acid

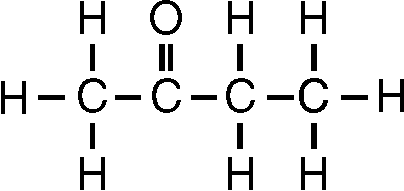
1. Which of these compounds has chemical properties most similar to the chemical properties of ethanoic acid?
   1. C3H7COOH C) C2H5COOC2H5
   2. C2H5OH D) C2H5OC2H5
2. Which compound is an alcohol?
   1. methanol C) butane
   2. ethyne D) propanal
3. Given the formulas of four organic compounds:



Which pair below contains an alcohol and an acid?

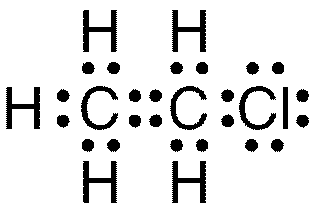
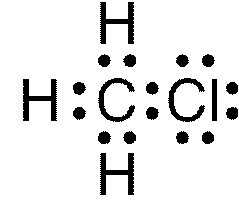
* 1. *a* and *b* C) *c* and *d*
  2. *a* and *c* D) *b* and *d*

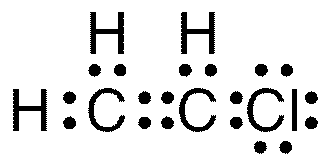
1. What is the IUPAC name for the compound that has the condensed structural formula CH3CH2CH2CHO?
   1. propanol C) butanal
   2. propanal D) butanol
2. The organic compound represented by the condensed structural formula CH3CH2CH2CHO is classified as an
   1. ether C) alcohol
   2. ester D) aldehyde
3. What is the IUPAC name of the compound with the following structural formula?



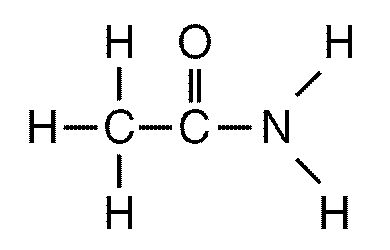
* 1. propanone C) butanone
  2. butanal D) propanal

1. Which Lewis electron-dot diagram represents chloroethene?

A)  C) 

B)  D) 

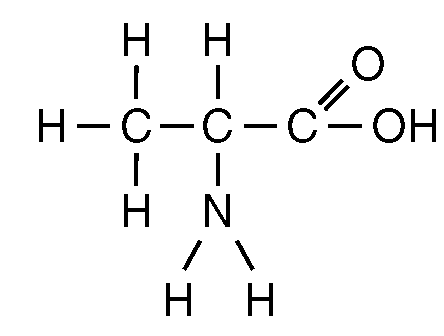
1. Given the structural formula:



This compound is classified as an

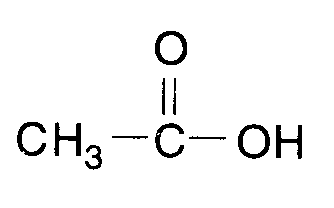
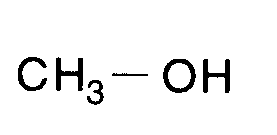
* 1. aldehyde C) alcohol
  2. amide D) amine

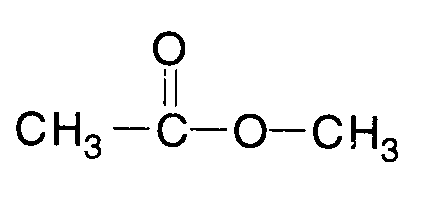
1. Given the structural formula:

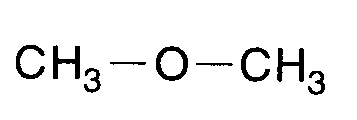


This structural formula represents a molecule of

1. a ketone C) an aldehyde
2. an ester D) an amino acid
3. Which formula represents an ether?

A)  C) 

B) D)



1. Given the balanced equation for an organic reaction:

C2H2 + 2Cl2 🡪 C2H2Cl4

This reaction is best classified as

* 1. fermentation C) esterification
  2. substitution D) addition

1. Given the incomplete equation representing an organic addition reaction:

X(g) + Cl2(g) 🡪 XCl2(g)

Which compound could be represented by X?

* 1. C3H8 C) C4H10
  2. CH4 D) C2H4

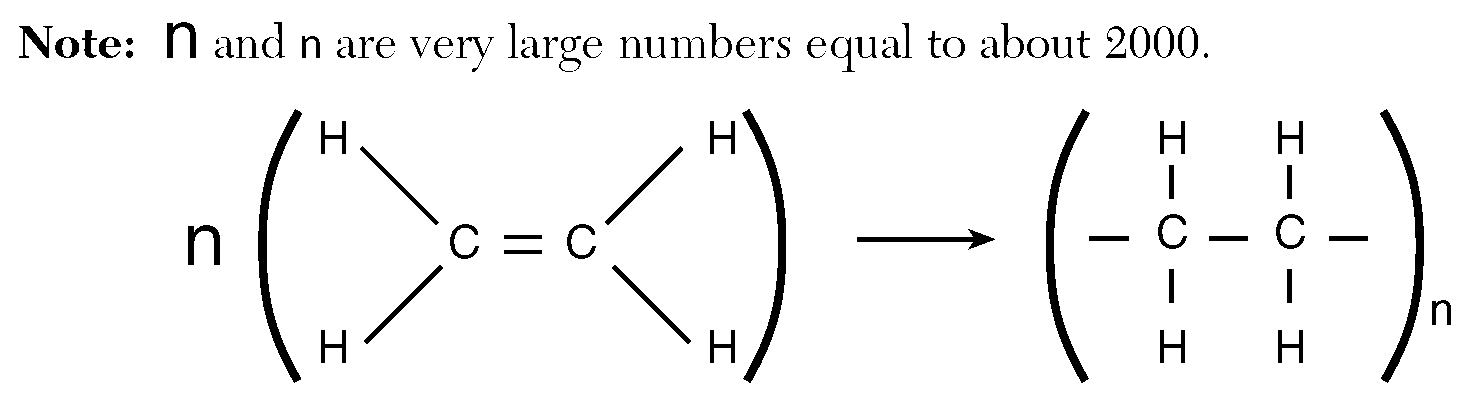
1. Given the equation:

CH4 + Br2 🡪 CH3Br + HBr

Which type of reaction does this equation represent?

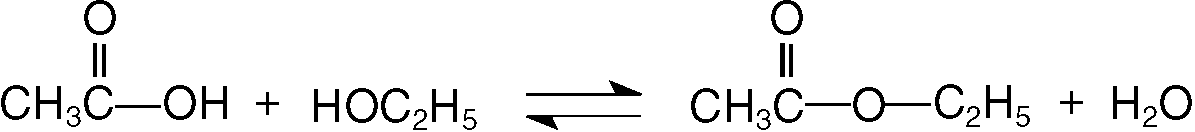
* 1. substitution C) polymerization
  2. addition D) hydrogenation

1. Which organic reaction produces rubber and plastics?
   1. polymerization C) fermentation
   2. esterification D) saponification
2. Which type of reaction is represented by the equation below?



* 1. saponification C) esterification
  2. fermentation D) polymerization

1. Given the reaction:

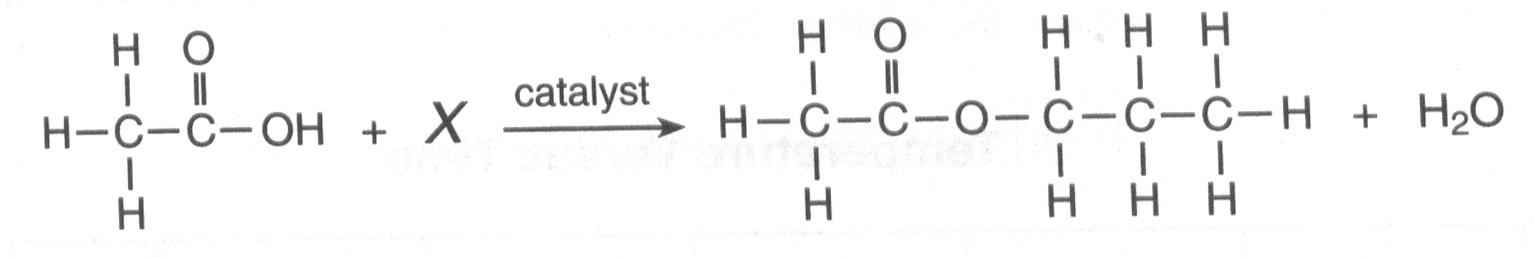


This reaction is an example of

* 1. hydrogenation C) fermentation
  2. saponification D) esterification

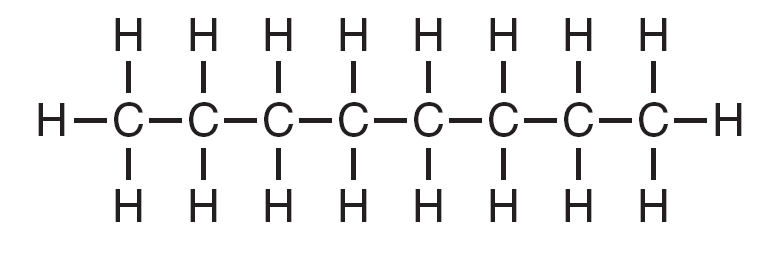
1. When butane burns in an excess of oxygen, the principal products are
   1. CO and H2O C) CO2 and H2O
   2. CO2 and H2 D) CO and H2
2. In which reaction is soap a product?
   1. saponification C) polymerization
   2. addition D) substitution
3. What are the two main products of a fermentation reaction?
   1. ethanol and water
   2. ethanol and carbon dioxide
   3. sugar and water
   4. sugar and carbon dioxide
4. Base your answer to the following question on the information below.

The incomplete equation below represents an esterification reaction. The alcohol reactant is represented by X.



Draw the structural formula for the alcohol represented by X.

1. A gasoline engine burns gasoline in the presence of excess oxygen to form carbon dioxide and water. The main components of gasoline are isomers of octane. A structural formula of octane is shown below.



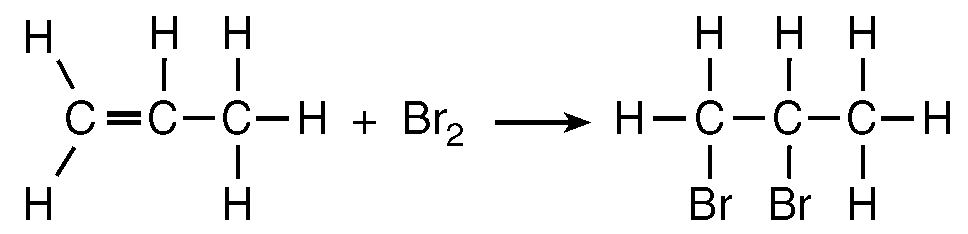
Draw a structural formula for 2,2,4-trimethylpentane.

**Base your answers to questions 29 and 30 on the information below.**

Many esters have distinctive odors, which lead to their widespread use as artificial flavorings and fragrances. For example, methyl butanoate has an odor like pineapple and ethyl methanoate has an odor like raspberry.

1. What is a chemical name for the alcohol that reacts with methanoic acid to produce the ester that has an odor like raspberry?
2. Draw a structural formula for the ester that has an odor like pineapple.

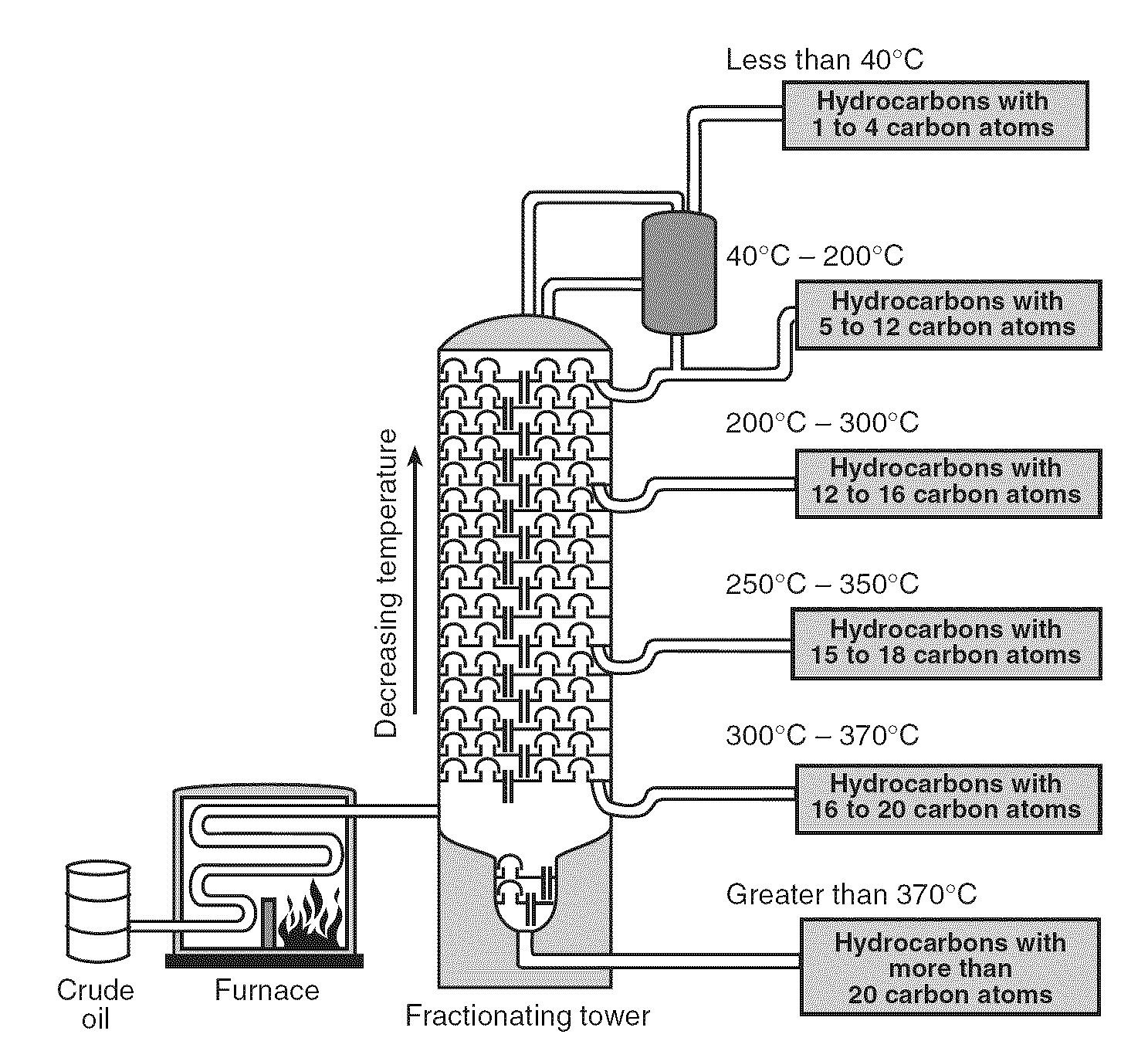
**Base your answers to questions 31 through 33 on the equation below, which represents an organic compound reacting with bromine.**



1. What is the gram-formula mass of the product in this reaction?
2. What type of organic reaction is represented by this equation?
3. What is the IUPAC name for the organic compound that reacts with Br2?

**Base your answers to questions 34 through 37 on the information and diagram below and on your knowledge of chemistry.**

Crude oil is a mixture of many hydrocarbons that have different numbers of carbon atoms. The use of a fractionating tower allows the separation of this mixture based on the boiling points of the hydrocarbons. To begin the separation process, the crude oil is heated to about 400°C in a furnace, causing many of the hydrocarbons of the crude oil to vaporize. The vaporized mixture is pumped into a fractionating tower that is usually more than 30 meters tall. The temperature of the tower is highest at the bottom. As vaporized samples of hydrocarbons travel up the tower, they cool and condense. The liquid hydrocarbons are collected on trays and removed from the tower. The diagram below illustrates the fractional distillation of the crude oil and the temperature ranges in which the different hydrocarbons condense.



1. How many hydrogen atoms are present in one molecule of octane?
2. Write an IUPAC name of *one* saturated hydrocarbon that leaves the fractionating tower at *less than* 40°C.
3. Describe the relationship between the strength of the intermolecular forces and the number of carbon atoms in the different hydrocarbon molecules.
4. State the trend between the boiling point of the hydrocarbons contained in the crude oil and the number of carbon atoms in these molecules.

**Base your answers to questions 38 and 39 on the information below. Given the reaction between 1-butene and chlorine gas:**

C4H8 + Cl2 🡪 C4H8Cl2

1. Draw the structural formula of the product 1,2-dichlorobutane
2. Which type of chemical reaction is represented by this equation?

**Base your answers to questions 40 and 41 on the information below.**

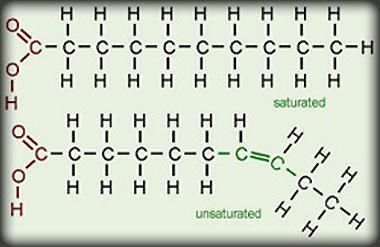
Diethyl ether is widely used as a solvent.

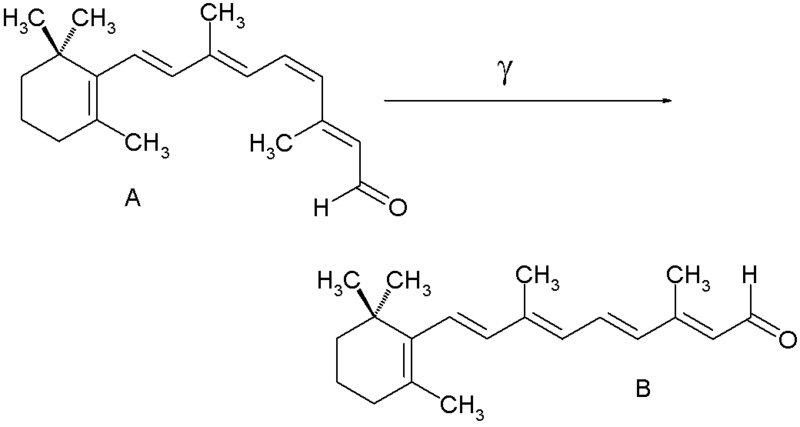
1. In the space provided draw the structural formula for diethyl ether.
2. Draw the structural formula for an alcohol that is an isomer of diethyl ether.
3. How is the bonding between carbon atoms different in unsaturated hydrocarbons and saturated hydrocarbons?

**Organic Review**

|  | **Key Idea Question** | **Justify your answer**  **with an explanation or calculation.** | **Confidence Level** |
| --- | --- | --- | --- |
| 1 | Which of the following is a general formula for alkanes?   1. CnH2n-2 c. CnH2n+2 2. CnH2n |  | Pre-discussion:  Post discussion: |
| 2 | Which is true about isomers?   1. Same formula & properties. 2. Different formula & properties. 3. Same formula, different properties. 4. Different formula, same properties. |  | Pre-discussion:  Post discussion: |
| 3 | Which of the following is a saturated hydrocarbon?   1. C3H8 c. C4H8O 2. C2H4 d. C5H11OH |  | Pre-discussion:  Post discussion: |
| 4 | Which can undergo substitution?   1. CH4 c. C3H6 2. C2H4 d. C4H6 |  | Pre-discussion:  Post discussion: |
| 5 | Which is a product of fermentation?   1. C2H5OH c. C2H5O 2. CH3COOH d. CH3COOCH3 |  | Pre-discussion:  Post discussion: |
| 6 | Draw an isomer of ethanol. |  | Pre-discussion:  Post discussion: |
| 7 | Draw the Lewis dot diagram of Ethanoic Acid. |  | Pre-discussion:  Post discussion: |
| 8 | Explain in terms of forces of attraction, why alcohols have higher boiling points than alkanes. |  | Pre-discussion:  Post discussion: |
| 9 | Determine the homologous series to which octane belongs. |  | Pre-discussion:  Post discussion: |
| 10 | What are the products of the combustion of propane in oxygen gas? |  | Pre-discussion:  Post discussion: |

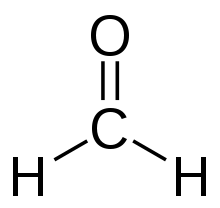
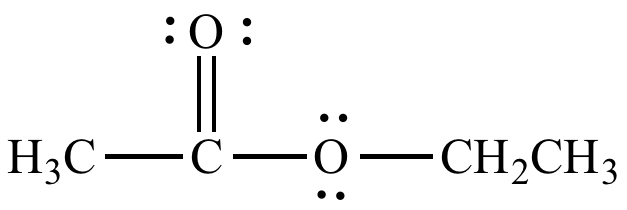
**Common Sense Chemistry Review**

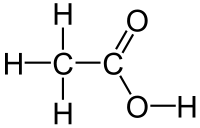
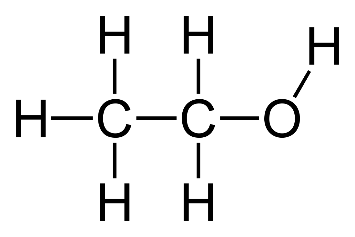
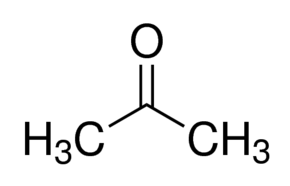


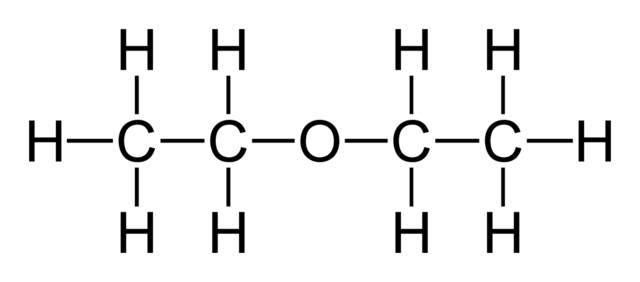
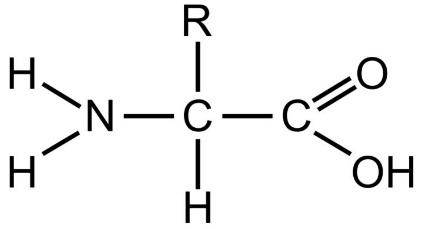
1. Examples of foods containing a high proportion of saturated fat include animal fat products such as cream, cheese, butter, other whole milk dairy products and fatty meats which also contain dietary cholesterol. Certain vegetable products have high saturated fat content, such as coconut oil and palm kernel oil. Many prepared foods are high in saturated fat content, such as pizza, dairy desserts, and sausage. Saturated fats tend to have higher melting points than their corresponding unsaturated fats, leading to the popular understanding that saturated fats tend to be solids at room temperatures, while unsaturated fats tend to be liquid at room temperature with varying degrees of viscosity (meaning both saturated and unsaturated fats are found to be liquid at body temperature). In cellular metabolism, unsaturated fat molecules contain somewhat less energy (i.e., fewer calories) than an equivalent amount of saturated fat.
   1. What is the major chemical difference between saturated and unsaturated fats or molecules?
   2. What is a polyunsaturated fat?
2. Pharmaceutical chemists have found that very small changes in certain drugs have been found to be more effective in treating diseases. Some structures transform their own bonds to create isomers of themselves. Explain why these two structures are isomers, and not the same exact molecule.
3. Polyethylene is used in plastic bags and boxes. What is its IUPAC name and what type of reaction can it under go: addition or substitution?

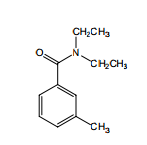
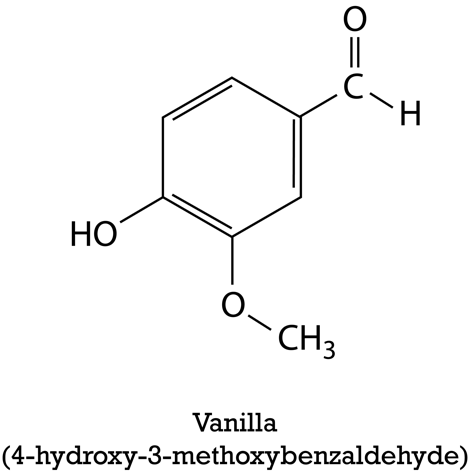
http://www.chemgapedia.de/vsengine/media/vsc/en/ch/12/oc/alkene/polymere_werkstoffe/ethengiff.gif

1. For each, circle the functional group and label. For the non-benzene structures, give the chemical name. Any isomers?
   1. Found in wines, liquors, and beer.
   2. Used in soaps and fragrances.
   3. Used as a local anesthetic.
   4. Makes up proteins.
   5. Found naturally in spices.
   6. Vinegar’s primary component.
   7. Used to preserve specimens.
   8. Nail polish remover.
   9. Used in bug sprays to keep bugs away.

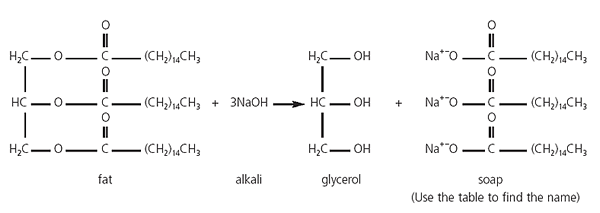
 

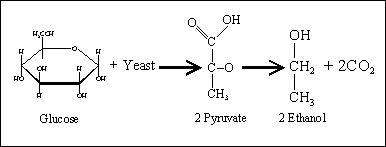
 

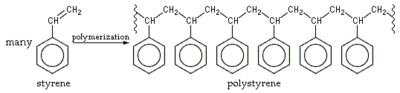
1. Name that reaction!
   1. In fight club, Norton’s character created soap on his hand using the fatty part of his hand and a strong basic solution.



* 1. Wineries out east use cold moldy grapes to create wine.



* 1. Polystyrene is used in Styrofoam cups at Dunkin Donuts.



* 1. Petroleum oils are drilled from the earth and separated into smaller compounds we use in our daily lives such as methane, propane, butane, and octane.

