

**ORGANIC HYDROCARBONS - REVIEW****ESSENTIALS: Know, Understand, and Be Able To...**

- Organic compounds contain carbon atoms, which bond to one another to form a variety of structures.
- Organic compounds are named using the IUPAC system.
- Unsaturated organic compounds contain at least one double or triple covalent bond.
- In a double covalent bond, two pairs of electrons are shared between two atoms; in a triple bond, three pairs are shared.
- Isomers are molecules that have the same molecular formula, but different structural formulas and different physical and chemical properties as a result.
- Hydrocarbons tend to be nonpolar molecules. Vander Waals forces are the weak attractive forces between nonpolar molecules. The attraction increases with increasing molecular mass, resulting in higher melting/boiling points.
- Hydrocarbons tend to be nonpolar molecules. Therefore they tend to be insoluble in water, but soluble in other nonpolar solvents like lamp oil (hexane).
- Classify an organic compound based on its structural, condensed structural, or molecular formula.
- Draw structural formulas for alkanes, alkenes, and alkynes (containing a maximum of ten carbon atoms), when given the IUPAC name.
- Recognize the difference between saturated and unsaturated hydrocarbons, when given a structural or molecular formula.
- Recognize isomers when given structural formulas.

**EXCAVATE**

- Assignments

**ENVISION**

- Moodle Assignment

**EVALUATE**

- Quiz
- Quiz Corrections

# Assignment: Review of Hydrocarbons



The purpose of this assignment is to get the atomic concepts ideas from the first part of the year back in your head. It's a memory jogger!

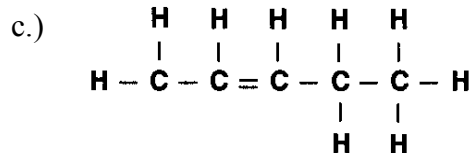
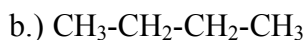
## You Should Be Able To Demonstrate Your Skills By:

### 1. Describe hydrocarbons

- What is a hydrocarbon?
- Where do hydrocarbons come from? How are they formed?
- What is fractional distillation?
- List 3 products made from hydrocarbons.
- Are hydrocarbons a renewable resource? Explain.

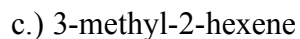
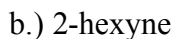
### 2. Classifying an organic compound based on its structural, condensed structural, or molecular formula.

**Demonstrate:** Identify the following as being either an alkane, alkene, or alkyne. Explain your decision.



### 2. Drawing structural formulas for alkanes, alkenes, and alkynes (containing a maximum of ten carbon atoms), when given the IUPAC name.

**Demonstrate:** Draw structural formulas for the following:



### 3. Recognizing the difference between saturated and unsaturated hydrocarbons, when given a structural or molecular formula.

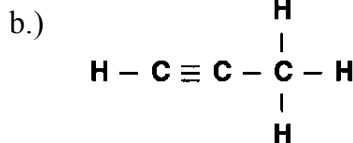
**Definition:** We first need to figure out/remember what "saturated" and "unsaturated" hydrocarbons are!

What is a saturated hydrocarbon "saturated" with? \_\_\_\_\_

What kind of carbon-carbon bond within the compound allows this? \_\_\_\_\_

Therefore, an unsaturated hydrocarbon contains what kind of bonds?

**Demonstrate:** Determine whether the following are saturated or unsaturated hydrocarbons.





## Hydrocarbon Review Ctd..

1. What is the maximum number of covalent bonds that can be formed by one carbon atom?

- 1
- 2
- 3
- 4

2. Which of the following hydrocarbons has the highest normal boiling point?

- butene
- ethene
- pentene
- propene

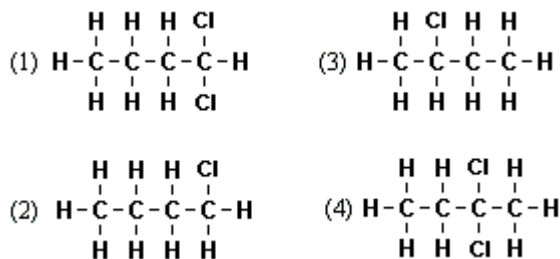
3. Which property is generally characteristic of an organic compound?

- low melting point
- high melting point
- soluble in polar solvents
- insoluble in nonpolar solvents

4. What is the general formula for the members of the alkene series?

- $C_nH_{2n}$
- $C_nH_{2n+2}$
- $C_nH_{2n-2}$
- $C_nH_{2n-6}$

5. What is the structural formula for 2-chlorobutane?



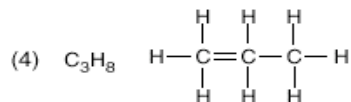
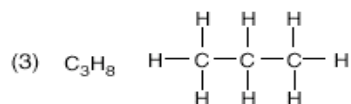
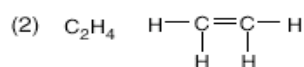
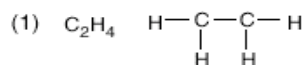
6. Which of the following hydrocarbons has the *lowest* normal boiling point?

- ethane
- propane
- butane
- pentane

7. Which compound is an isomer of pentane?

- butane
- propane
- methyl butane
- methyl propane

8. The empirical formula of a compound is  $CH_2$ . Which molecular formula is correctly paired with a structural formula for this compound?



9. In a molecule of  $CH_4$ , the hydrogen atoms are spatially orientated toward the corners of a regular

- pyramid
- tetrahedron
- square
- rectangle

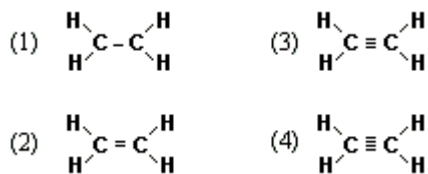
10. What is the total number of valence electrons in a carbon atom in the ground state?

- 6
- 2
- 12
- 4

11. Which element is present in all organic compounds?

- H
- He
- C
- Ca

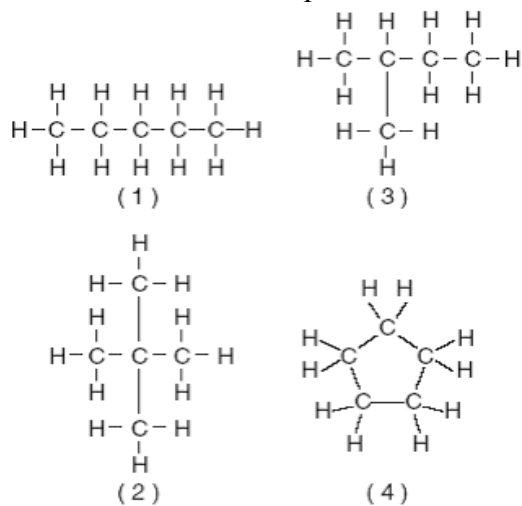
12. Which is the structural formula of ethene?



13. 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

14. Which structural formula represents a molecule that is *not* an isomer of pentane?



15. A molecule of ethane and a molecule of ethene both have the same

1. empirical formula
2. molecular formula
3. number of carbon atoms
4. number of hydrogen atoms

16. Which is the general formula for the alkane series of hydrocarbons?

1.  $\text{C}_n\text{H}_{2n+2}$
2.  $\text{C}_n\text{H}_{2n}$
3.  $\text{C}_n\text{H}_{2n-2}$
4.  $\text{C}_n\text{H}_{2n-6}$

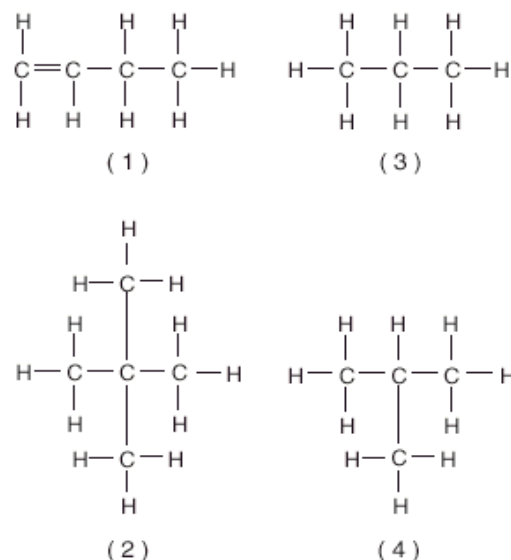
17. If a hydrocarbon molecule contains a triple bond, its IUPAC name ends in

1. "ane"
2. "ene"
3. "one"
4. "yne"

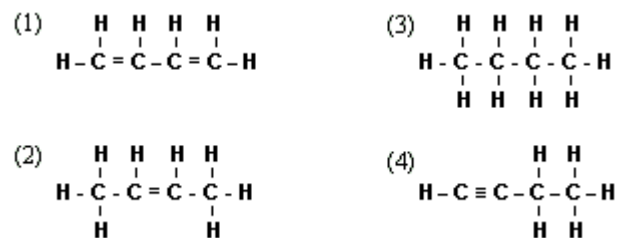
18. Which is a saturated hydrocarbon?

1. ethene
2. ethyne
3. propene
4. propane

19. Which formula is an isomer of butane?



20. Which structural formula represents a molecule of butane?



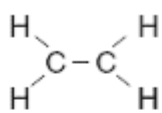
21. Which formula represents an alkene?

1.  $\text{CH}_4$
2.  $\text{C}_2\text{H}_2$
3.  $\text{C}_3\text{H}_6$
4.  $\text{C}_4\text{H}_{10}$

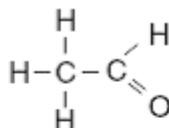
22. Which is the general formula for the alkyne series of hydrocarbons?

1.  $C_nH_{2n+2}$
2.  $C_nH_{2n}$
3.  $C_nH_{2n-2}$
4.  $C_nH_{2n-6}$

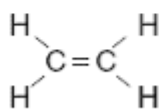
23. Which structural formula *correctly* represents a hydrocarbon molecule?



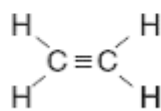
(1)



(3)



(2)



(4)

24. In which pair of hydrocarbons does each compound contain only one double bond per molecule?

1.  $C_2H_2$  and  $C_2H_6$
2.  $C_2H_2$  and  $C_3H_6$
3.  $C_4H_8$  and  $C_2H_4$
4.  $C_6H_6$  and  $C_7H_8$

25. Ethane is a member of the hydrocarbon series with the general formula

1.  $C_nH_{2n+2}$
2.  $C_nH_{2n}$
3.  $C_nH_{2n-2}$
4.  $C_nH_{2n-6}$

26. Which sequence represents a portion of a homologous series of hydrocarbons?

1.  $C_2H_2$ ,  $C_2H_4$ ,  $C_2H_6$
2.  $C_2H_2$ ,  $C_3H_4$ ,  $C_6H_6$
3.  $C_2H_4$ ,  $C_3H_4$ ,  $C_4H_4$
4.  $C_2H_4$ ,  $C_3H_6$ ,  $C_4H_8$

27. The compound  $C_4H_{10}$  belongs to the series of hydrocarbons with the general formula

1.  $C_nH_{2n}$
2.  $C_nH_{2n+2}$
3.  $C_nH_{2n-2}$
4.  $C_nH_{2n-6}$

28. Which hydrocarbon is a member of the alkane series?

