



**TOPIC:** Properties of Hydrocarbons

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## OVERVIEW:

### Properties of Hydrocarbons

Any of a group of organic compounds with solely the atoms carbon (C) and hydrogen (H) constitutes a hydrocarbon (Hydrocarbon | Definition, Types, & Facts, n.d.). The hydrogen atoms bind to the carbon atoms in various ways to create the compound's structural framework. Hydrocarbons are used in transportation and everyday life. Petroleum is used for transportation, electricity generation, raw materials for making industrial chemicals, polymers, fibres, rubber, solvents, explosives, asphalt and road oil. The main components of petroleum are hydrocarbons. In addition, Gasoline, kerosene, lamp oil and furniture oil are all examples of hydrocarbons.

These substances have the molecular formula  $C_xH_y$ . Hydrocarbons can be found in plants and trees. For instance, carrots and green leaves contain the organic pigment carotenes. 98% of the components of natural crude rubber are hydrocarbons. Also, they have a lot of internal energy, which gives them significance.

Hydrocarbons were categorized by chemists as either aliphatic or aromatic. It was decided how to classify them based on their origin and characteristics. As a result, it was discovered that aromatic hydrocarbons contained chemicals that were a result of the chemical degradation of certain plant extracts, whereas aliphatic hydrocarbons were generated from the chemical breakdown of fats or oils. Today, however, we categorize hydrocarbons based on their structure rather than on their place of origin.

The physical properties of hydrocarbons; Nonpolar hydrocarbons have weak intermolecular forces (Higginbotham, n.d.). The weak intermolecular attractive forces that exist in them have an impact on their characteristics. They are often not very soluble in polar solvents, such as water, and have relatively low melting and boiling points. This indicates that they are

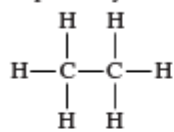
frequently at room temperature in gases or liquids. Alkenes and alkynes are unsaturated hydrocarbons with double and triple bonds, respectively, whereas alkanes are saturated hydrocarbons with just single bonds between carbon atoms.

Chemical properties; they are very reactive and go through many different chemical processes, such as combustion, oxidation, and addition processes. The process of burning hydrocarbons in the presence of oxygen to release carbon dioxide and water is known as combustion. In alkanes, alkynes, and alkenes, the amount of bound hydrogen decreases. This is mostly due to "self-bonding" or carbon catenation, which prevents the hydrocarbon from being completely saturated by the creation of double or triple bonds. Catenation is the ability of hydrocarbons to attach to themselves. With such capacities, they can produce more complicated compounds such as cyclohexane and, in rare cases, aromatic hydrocarbons such as benzene.

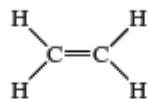
Hydrocarbon cracking is the process by which heavy organic molecules are broken down into lighter ones. This is performed by applying sufficient heat and pressure. Catalysts are sometimes employed to speed up the reaction. This method is critical in the commercial manufacturing of diesel fuel. Over 98 percent of natural crude rubber is a hydrocarbon polymer, a molecule that resembles a chain and is made up of several linked units. The sorts of chemical bonds that hold the atoms of a hydrocarbon's constituent molecules together have a significant role in determining its structure and chemical composition.

## Structures of representative hydrocarbons

aliphatic hydrocarbons



alkane

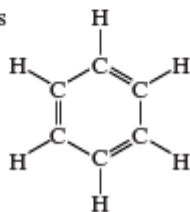


alkene



alkyne

aromatic hydrocarbons



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

Date: \_\_\_\_\_

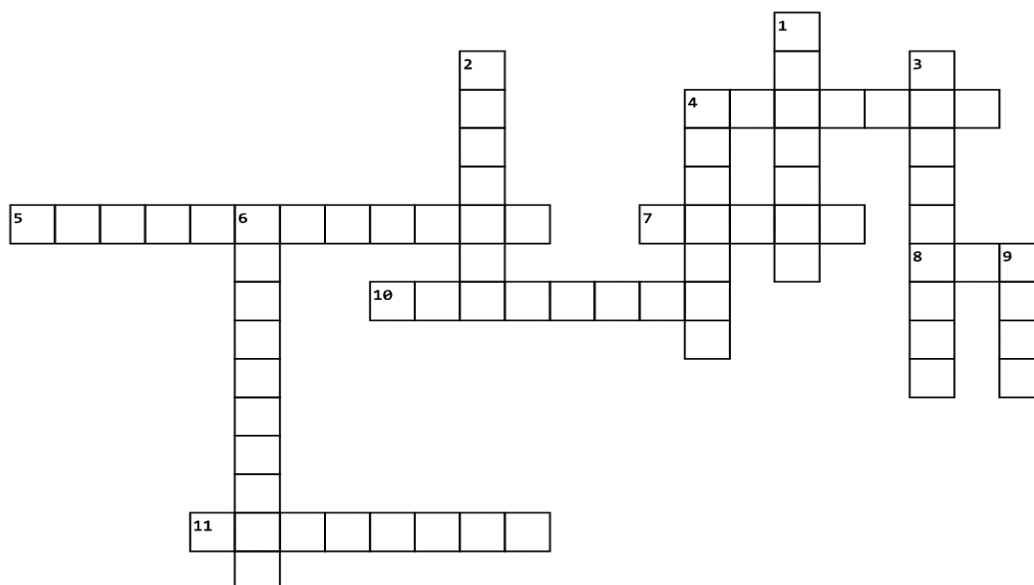
### ACTIVITY 1:

Read the Review info and fill out the crossword puzzle below.

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Hydrocarbons - Crossword Labs

## Hydrocarbons



#### Across

- 4. triple bonds
- 5. carbon and hydrogen atoms
- 7. Polar solvent
- 8. melting and boiling point
- 10. Example of a hydrocarbon
- 11. polarity of hydrocarbon

#### Down

- 1. double bonds
- 2. single bonds
- 3. transportation use
- 4. hydrocarbons with single bonds between carbon atoms
- 6. Burning of hydrocarbons
- 9. type of forces that exist in hydrocarbons

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

Date: \_\_\_\_\_

### ACTIVITY 2:

Using the review fill in the blanks with the words provided in the box below.

Saturated, Colour, Stability, Hydrocarbons, Carbon  
Dioxide, Cracking, Oxygen, Alkane, Synthesis, Benzene,  
Pressure, Self-bonding, Alkynes, Carbon

The following are the properties of hydrocarbons:

Hydrocarbons have no \_\_\_\_\_ and no odor.

They are burned with \_\_\_\_\_ producing \_\_\_\_\_ and water.

The \_\_\_\_\_ point of hydrocarbons increases as the number of carbons increases.

Because of their \_\_\_\_\_, alkanes are the least reactive hydrocarbons.

\_\_\_\_\_, Alkenes, \_\_\_\_\_ and Aromatic hydrocarbons are the 4 types of \_\_\_\_\_

Hydrocarbons are made up of the elements \_\_\_\_\_ and hydrogen.

Hydrocarbon \_\_\_\_\_ is the process by which heavy organic molecules are broken down into lighter molecules. This is accomplished by applying sufficient heat and \_\_\_\_\_.

carbon \_\_\_\_\_ or catenation that prevents the hydrocarbon from being completely  
by the formation of double or triple bonds

\_\_\_\_\_, one of the most basic aromatic hydrocarbons, is used in the \_\_\_\_\_ of many  
synthetic drugs.

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

Date: \_\_\_\_\_

**ACTIVITY 3:**

Create a model of a hydrocarbon with materials from your house showing the key structures.

This will help you to learn and understand hydrocarbons better. Put your creative skills to the

test, use colours to highlight and represent the carbon and hydrogen atoms. Example below:



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

Date: \_\_\_\_\_

#### ACTIVITY 4:

Select the best answer for each question below.

1. Hydrocarbons with only single covalent bonds are known as
  - A. Alkene
  - B. Alkyne
  - C. Alkane
  - D. Alcohol
2. Hydrocarbons are compounds that contain answer choices
  - A. Carbon and Nitrogen
  - B. Carbon and Hydrogen
  - C. Carbon, and Oxygen
  - D. Carbon, Oxygen, and Hydrogen
3. As the number of carbons increases in an alkane the melting point generally
  - A. Increases
  - B. Decrease
  - C. Stay the same
  - D. varies
4. Which of the following is not a type of hydrocarbon?
  - A. Alkene
  - B. Alkyne
  - C. Alkane
  - D. Alcohol
5. Which of the following is an example of alkene
  - A. Methane
  - B. Propene
  - C. Ethyne
  - D. Ethanol
6. Which of the following is an example of Alkyne
  - A. Methane
  - B. Propene
  - C. Ethyne
  - D. Ethanol



7. A hydrocarbon in which two carbon atom are joined by a double bond.

- A. Alkene
- B. Alkyne
- C. Alkane
- D. Ionic bond

8. Petroleum is a mixture of

- A. Hydrocarbon
- B. Salts
- C. Polymer
- D. Alcohol

## REFERENCES

Higginbotham, C. (n.d.). *4.3 Properties of the Hydrocarbons – Introductory Organic Chemistry*. 4.3 Properties of the Hydrocarbons – Introductory Organic Chemistry. <https://openoregon.pressbooks.pub/introductoryorganic/chapter/properties-of-the-hydrocarbons/#:~:text=Hydrocarbons%20are%20nonpolar%20substances%2C%20with,in%20polar%20solvents%2C%20including%20water>

*Hydrocarbon | Definition, Types, & Facts*. (n.d.). Encyclopedia Britannica. <https://www.britannica.com/science/hydrocarbon>

J. (2023, January 12). *How To Make A 3D Carbon Model: A Step-By-Step Guide | Open World Learning*. How to Make a 3D Carbon Model: A Step-By-Step Guide | Open World Learning. <https://www.openworldlearning.org/how-to-make-a-3d-carbon-model-a-step-by-step-guide/>