

Chapter 8 Carbon Chemistry ▪ Section 2 Summary

Carbon Compounds

Key Concepts

- What are some similar properties shared by organic compounds?
- What are some properties of hydrocarbons?
- What kinds of structures and bonding do hydrocarbons have?
- What are some characteristics of substituted hydrocarbons, esters, and polymers?

With some exceptions, a compound that contains carbon is called an **organic compound**. **Many organic compounds have similar properties in terms of melting points, boiling points, odor, electrical conductivity, and solubility.**

A **hydrocarbon** is a compound that contains only the elements carbon and hydrogen. **Like many other organic compounds, hydrocarbons mix poorly with water. Also, all hydrocarbons are flammable.** Hydrocarbons differ in the number of carbon and hydrogen atoms in each molecule. The chemical formula for methane is CH_4 . The formula tells you that methane has one carbon atom and four hydrogen atoms.

The carbon chains in a hydrocarbon may be straight, branched, or ring-shaped. A **structural formula** shows the kind, number, and arrangement of atoms in a molecule. Compounds that have the same chemical formula but different structures are called **isomers**. Each isomer is a different substance with its own characteristic properties.

In addition to forming a single bond, two carbon atoms can form a double bond or a triple bond. Hydrocarbons made up of only single bonds are classified as **saturated hydrocarbons**. Hydrocarbons with double or triple bonds are classified as **unsaturated hydrocarbons**.

If just one atom of another element is substituted for a hydrogen atom in a hydrocarbon, a different compound is created. In a **substituted hydrocarbon**, atoms of other elements replace one or more hydrogen atoms in a hydrocarbon. Substituted hydrocarbons include halogen-containing compounds, alcohols, and organic acids.

The group —OH is made of an oxygen atom and a hydrogen atom and is called a **hydroxyl group**. An **alcohol** is a substituted hydrocarbon that contains one or more hydroxyl groups.

An **organic acid** is a substituted hydrocarbon with one or more carboxyl groups. A **carboxyl group** is written as —COOH . Citric acid is an organic acid found in oranges and lemons.

If an alcohol and an organic acid are chemically combined, the resulting compound is called an **ester**. **Many esters have pleasant, fruity smells.**

A very large molecule made of a chain of many smaller molecules bonded together is called a **polymer**. The smaller molecules are called **monomers**. **Organic compounds, such as alcohols, esters, and others, can be linked together to build polymers with thousands or even millions of atoms.** Some polymers are made naturally by living things. Others are manufactured in factories.

Carbon Chemistry ▪ *Reading/Notetaking Guide***Carbon Compounds** (pp. 296–304)

This section describes the properties that many carbon compounds have in common. It also describes carbon compounds that contain only the elements carbon and hydrogen.

Use Target Reading Skills

Use the Venn diagram to compare and contrast saturated and unsaturated hydrocarbons. Write the phrases listed below in the correct sections of the diagram. Write the similarities in the center, overlapping section. Write the differences in the outside parts of the circles.

Contain only single bonds

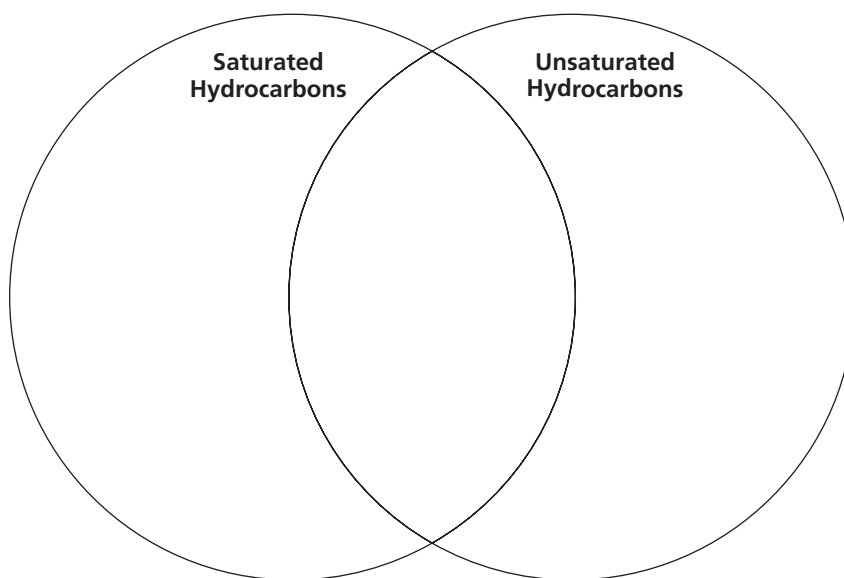
Contain double or triple bonds

Maximum number of carbon atoms on its chain

Molecules have the suffix *-ane*

Molecules have the suffix *-ene* or *-yne*

Contain both hydrogen and carbon atoms

**Organic Compounds** (p. 297)

1. Most compounds that contain carbon are called _____.
2. Why are many organic compounds liquid or gas at room temperature?

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Carbon Compounds *(continued)*

3. Circle the letter of each sentence that is true about organic compounds.
- a. They generally have strong odors.
 - b. They have high boiling points.
 - c. Many don't dissolve well in water.
 - d. They are good conductors of electric currents.

Hydrocarbons (pp. 298–299)

4. What is a hydrocarbon?

5. Why are hydrocarbons used for fuel in stoves, cars, and airplanes?

6. This is the chemical formula for a hydrocarbon called propane: C_3H_8 .
What does this formula tell you about a molecule of propane?

Structure of Hydrocarbons (pp. 299–301)

7. What are three carbon chains that form in hydrocarbons?

- a. _____ b. _____
c. _____

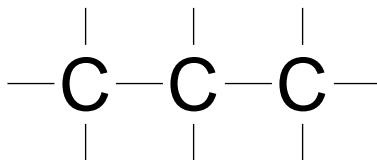
8. What does a structural formula show about a molecule of a compound?

9. Each dash in a structural formula represents a chemical

_____.

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10. The partially complete structural formula below shows the “backbone” for a propane molecule. Complete the structural formula of this hydrocarbon by showing all the hydrogen atoms that are bonded to the carbon chain.

**Propane (C₃H₈)**

11. Compounds that have the same molecular formula but different structures are called _____.
12. Is the following sentence true or false? Carbon atoms can only form a single bond between other carbon atoms. _____
13. Complete the table about saturated and unsaturated hydrocarbons.

Saturated and Unsaturated Hydrocarbons			
Type of Hydrocarbon	Bonds	Ending on Names	Example
a.	Single bonds		Ethane
b.	Double or triple bonds	<i>-ene</i> or <i>-yne</i>	

Substituted Hydrocarbons (pp. 302–303)

14. A hydrocarbon in which one or more hydrogen atoms have been replaced by atoms of other elements is called a(n) _____.

