

STUDY GUIDE FOR MODULE NO. 4

HYDROCARBON CHAINS AND RINGS



MODULE OVERVIEW

Many hydrocarbons occur in nature. In addition to making up fossil fuels, they are present in trees and plants, as, for example, in the form of pigments called carotenes that occur in carrots and green leaves. More than 98 percent of natural crude rubber is a hydrocarbon polymer, a chainlike molecule consisting of many units linked together. The structures and chemistry of individual hydrocarbons depend in large part on the types of chemical bonds that link together the atoms of their constituent molecules.

Nineteenth-century chemists classified hydrocarbons as either aliphatic or aromatic on the basis of their sources and properties. Aliphatic (from Greek *alephos*, "fat") described hydrocarbons derived by chemical degradation of fats or oils. Aromatic hydrocarbons constituted a group of related substances obtained by chemical degradation of certain pleasant-smelling plant extracts. The terms *aliphatic* and *aromatic* are retained in modern terminology, but the compounds they describe are distinguished on the basis of structure rather than origin.



MODULE LEARNING OBJECTIVES

At the end of the unit, the student should be able to:

1. Identify the structures and homologous members of alkene, alkane and alkyne families
2. Describe the structure of benzene and the substituted aromatics
3. Name the organic compounds using IUPAC
4. Differentiate the types of structural compounds



LESSON 1: HYDROCARBONS: REPRESENTATIVE ALKANES, ALKENES, ALKYNES, AND AROMATIC COMPOUNDS

HYDROCARBONS

The simplest organic compounds are those composed of only two elements: carbon and hydrogen. These compounds are called hydrocarbons. Hydrocarbons themselves are separated into two types: aliphatic hydrocarbons and aromatic hydrocarbons. Aliphatic hydrocarbons are hydrocarbons based on chains of C atoms. There are three types of aliphatic hydrocarbons. Alkanes are aliphatic hydrocarbons with only single covalent bonds. Alkenes are aliphatic hydrocarbons that contain at least one C=C double bond, and alkynes are aliphatic hydrocarbons that contain a C-C triple bond. Occasionally, we find an aliphatic hydrocarbon with a ring of C atoms; these hydrocarbons are called cycloalkanes (or cycloalkenes or cycloalkynes).

The general molecular formulas and molecular structures of the alkanes, alkenes, and alkynes:

Group	General Molecular Formula	Example Compound	Molecular Structure
Alkanes	C_nH_{2n+2}	Ethane	
Alkenes	C_nH_{2n}	Ethene	
Alkynes	C_nH_{2n-2}	Ethyne	

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Table of Contents **Hydrocarbons Alkanes Study Guide Answers**

1. Understanding the eBook **Hydrocarbons Alkanes Study Guide Answers**
 - The Rise of Digital Reading **Hydrocarbons Alkanes Study Guide Answers**
 - Advantages of eBooks Over Traditional Books
2. Identifying **Hydrocarbons Alkanes Study Guide Answers**
 - Exploring Different Genres
 - Considering Fiction vs. Non-Fiction
 - Determining Your Reading Goals
3. Choosing the Right eBook Platform
 - Popular eBook Platforms
 - Features to Look for in an **Hydrocarbons Alkanes Study Guide Answers**
 - User-Friendly Interface
4. Exploring eBook Recommendations from **Hydrocarbons Alkanes Study Guide Answers**
 - Personalized Recommendations
 - **Hydrocarbons Alkanes Study Guide Answers** User Reviews and Ratings
 - **Hydrocarbons Alkanes Study Guide Answers** and Bestseller Lists

5. Accessing Hydrocarbons Alkanes Study Guide Answers Free and Paid eBooks
 - Hydrocarbons Alkanes Study Guide Answers Public Domain eBooks
 - Hydrocarbons Alkanes Study Guide Answers eBook Subscription Services
 - Hydrocarbons Alkanes Study Guide Answers Budget-Friendly Options
6. Navigating Hydrocarbons Alkanes Study Guide Answers eBook Formats
 - ePub, PDF, MOBI, and More
 - Hydrocarbons Alkanes Study Guide Answers Compatibility with Devices
 - Hydrocarbons Alkanes Study Guide Answers Enhanced eBook Features
7. Enhancing Your Reading Experience
 - Adjustable Fonts and Text Sizes of Hydrocarbons Alkanes Study Guide Answers
 - Highlighting and Note-Taking Hydrocarbons Alkanes Study Guide Answers
 - Interactive Elements Hydrocarbons Alkanes Study Guide Answers
8. Staying Engaged with Hydrocarbons Alkanes Study Guide Answers
 - Joining Online Reading Communities
 - Participating in Virtual Book Clubs
 - Following Authors and Publishers Hydrocarbons Alkanes Study Guide Answers
9. Balancing eBooks and Physical Books Hydrocarbons Alkanes Study Guide Answers
 - Benefits of a Digital Library
 - Creating a Diverse Reading Collection Hydrocarbons Alkanes Study Guide Answers
10. Overcoming Reading Challenges
 - Dealing with Digital Eye Strain
 - Minimizing Distractions
 - Managing Screen Time
11. Cultivating a Reading Routine Hydrocarbons Alkanes Study Guide Answers
 - Setting Reading Goals Hydrocarbons Alkanes Study Guide Answers
 - Carving Out Dedicated Reading Time
12. Sourcing Reliable Information of Hydrocarbons Alkanes Study Guide Answers
 - Fact-Checking eBook Content of Hydrocarbons Alkanes Study Guide Answers
 - Distinguishing Credible Sources
13. Promoting Lifelong Learning

- Utilizing eBooks for Skill Development
- Exploring Educational eBooks

14. Embracing eBook Trends

- Integration of Multimedia Elements
- Interactive and Gamified eBooks

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