

15 Hydrocarbons

Alkanes

Chemical Reactivity

Alkanes do not react with many reagents.

This is because the C-C bond and the C-H bond are relatively strong and so cannot form stronger bonds with other elements that easily and there are no polar side groups.

Their main reactions are combustion reactions in air although they can react with halogens in the presence of UV light.

Combustion

Complete Combustion

In excess oxygen alkanes will burn with complete combustion.

The products of complete combustion are CO_2 and H_2O .



Alkanes readily burn in the presence of oxygen. This combustion of alkanes is highly exothermic, explaining their use as **fuels**.

Reaction of alkanes with bromine / chlorine in UV light

Synthesis of chloroalkanes

In the presence of **UV light** alkanes react with chlorine to form a mixture of products with the halogens substituting hydrogen atoms.

Overall Reaction



This is the overall reaction, but a more complex mixture of products is actually formed.

*To understand this reaction fully we must look in detail at how it proceeds step by step. This is called its **mechanism**.*

The **MECHANISM** for this reaction is called a **FREE RADICAL SUBSTITUTION**.

It proceeds via a series of steps:
STEP ONE: Initiation
STEP TWO: Propagation
STEP THREE: Termination

STEP ONE Initiation

Essential condition: UV light



The UV light supplies the energy to break the Cl-Cl bond. It is broken in preference to the others as it is the weakest.

The bond has broken in a process called **homolytic fission**.

*each atom gets **one** electron from the covalent bond*

When a bond breaks by homolytic fission it forms **Free Radicals**.

Free Radicals do not have a charge and are represented by a



DEFINITION

A **Free Radical** is a reactive species which possess an **unpaired electron**.

STEP TWO Propagation



The chlorine free radicals are very reactive and remove an H from the methane leaving a methyl free radical

The methyl free radical reacts with a Cl_2 molecule to produce the main product and another Cl free radical

All propagation steps have a **free radical** in the **reactants** and in the **products**.

As the Cl free radical is regenerated, it can react with several more alkane molecules in a **CHAIN REACTION**.

Hydrocarbons Chemistry Study Guide Answers

Martha Mackin



Hydrocarbons Chemistry Study Guide Answers:

Hazmat Chemistry Study Guide (Second Edition) Jill Meryl Levy, 2011 Chemical Principles Study Guide/Solutions Manual John Krenos, Joseph Potenza, Carl Hoeger, 2007-01-18 Written for general chemistry courses Chemical Principles helps students develop chemical insight by showing the connection between chemical principles and their applications

Student Study Guide/Solutions Manual for Essentials of General, Organic, and Biochemistry Denise Guinn, Rebecca Brewer, Rachel C. Lum, 2009-09-15 The Student Study Guide and Solutions Manual provides students with a combined manual designed to help them avoid common mistakes and understand key concepts After a brief review of each section's critical ideas students are taken through stepped out worked examples try it yourself examples and chapter quizzes all structured to reinforce chapter objectives and build problem solving techniques The solutions manual includes detailed solutions to all odd numbered exercises in the text **Organic Chemistry, Student Study Guide and Solutions Manual**

David R. Klein, 2017-01-04 This is the Student Study Guide and Solutions Manual to accompany Organic Chemistry 3e Organic Chemistry 3rd Edition is not merely a compilation of principles but rather it is a disciplined method of thought and analysis Success in organic chemistry requires mastery in two core aspects fundamental concepts and the skills needed to apply those concepts and solve problems Readers must learn to become proficient at approaching new situations methodically based on a repertoire of skills These skills are vital for successful problem solving in organic chemistry Existing textbooks provide extensive coverage of the principles but there is far less emphasis on the skills needed to actually solve problems **Student Guide For Living Chemistry** Barbara Ucko, 2012-12-02 Student Guide for Living Chemistry is a 23 chapter textbook guide that allows students to study and review on their own and test their understanding to help them prepare for examinations Every chapter begins with a list of objectives stating exactly the skills to develop in a particular unit Each objective corresponds to a section in the textbook Living Chemistry Three kinds of questions are provided for each objective to check the student's understanding namely short answer Study Questions multiple choice and fill in The answers for all questions are provided at the end of the chapter The opening chapters cover the SI units composition of matter chemical bonding compounds chemical change gases respiration and water The subsequent chapters deal with solutions acids bases salts nuclear and organic chemistry oxygen derivatives and hydrocarbons polymers and other organic derivatives This textbook also explores the chemistry of carbohydrates lipids proteins enzymes and energy and carbohydrate metabolism The remaining chapters discuss the chemistry of vitamins hormones body fluid drugs and poisons Undergraduate chemistry students will find this book invaluable *Study Guide and Solutions Manual to Accompany The Essence of Organic Chemistry* Jane M. Cram, Donald J. Cram, 1978 *Organic Chemistry, 5e Student Study Guide and Solutions Manual* David R. Klein, Laurie S. Starkey, 2025-03-18 Success in organic chemistry requires mastery in two core aspects fundamental concepts and the skills needed to apply those concepts and solve problems With Organic Chemistry Student Study Guide and Solutions

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