

The book was found

# Organic Chemistry Reactions (Quick Study Academic)



**Quick Study ACADEMIC**

## ORGANIC CHEMISTRY REACTIONS

**Features of an Organic Reaction**

- Mechanism:** Describes the overall reaction using a series of single steps
- Stoichiometry:** Calculate reactant and product moles using the balanced equation and molar masses
- Kinetics:** Study of the reaction rate and mechanism
- Theoretical Yield:** Mass of product given by a complete reaction, % yield =  $\frac{\text{actual yield}}{\text{theoretical yield}} \times 100\%$
- Equilibrium:** Reaction does not proceed to completion, instead, it reaches a balanced state of forward and reverse reactions

**Major Reaction Types**

- Acid-Base: Oxidation (E1, E2), E1cB, E2cB
- Base: Cyclohexane
- Oxidation-reduction: Hydrolysis
- Condensation: Addition
- Substitution (S<sub>N</sub>1, S<sub>N</sub>2): Radical reaction
- Isomeric reaction

**Important Named Reactions**

- Diels-Alder: Forms cyclic alkenes
- Friedel-Crafts: Add acyl or alkyl group
- Grignard: Add alkyl or aryl group
- Wittig Reaction, Clemmensen: Reduce ketone to alkane
- Wittig: Convert aldehyde/ketone to alkene

**Kinetics & Reaction Mechanism**

**Transition State (TS):** Maximum on the reaction-coordinate curve, the least stable intermediate

**Activation Energy (E<sub>a</sub>):** Energy of the TS relative to the reactant. The change in enthalpy (ΔH) is 0 for exothermic reactions and > 0 for endothermic reactions

**Hammett-Lippert Postulate:** The TS is more like the reactant or product that is closer in energy. The endothermic TS is like the product and the exothermic TS is like the reactant

**Kinetic vs. Thermodynamic Control:** K<sub>1</sub> and ΔH describe thermodynamic stability. If K<sub>1</sub> is large and negative (exergonic), the product formation is fully controlled by "thermodynamics". A large K<sub>1</sub> corresponds to a large amount of product, relative to reactant. A large E<sub>a</sub> may give rise to "kinetic" control; the energy of the TS controls the reaction, instead of the product-reactant thermodynamics

**Solvent Effects:** A solvent may stabilize an intermediate, decreasing the E<sub>a</sub> and increasing the rate of the reaction. Charged complexes are stabilized by polar solvents

**Organic Acid & Base**

**Acid**

- Electron-pair acceptor (Lewis acid)
- Proton donor (Brønsted-Lowry acid)
- K<sub>a</sub>: Carboxylic acid

**Base**

- Electron-pair donor (Lewis base)
- Proton acceptor (Brønsted-Lowry base)
- K<sub>b</sub>: Amine

**Factors Enhancing Acid Strength (H<sub>A</sub>)**

- Weaker H-A bond
- Greater electronegativity of "A"
- Inductive effect of substituent on "A" inductively withdraws electron density
- More "s" character in hybrid orbital to orbital is lower in energy than p-orbital
- Resonance-stabilized conjugate base (A<sup>-</sup>)

**Factors Enhancing Base Strength**

- Reverse of acid strength guidelines
- A base is a nucleophile, electronic effects which shift electron density to the atom with the lone pair increases base strength

**Alkane**

**Properties**

- Hydrocarbon
- Weak intermolecular forces
- Non-Cyclic: General formula C<sub>n</sub>H<sub>2n+2</sub>
- Tetrahydral: C-C-C (109°)

**Nomenclature**

- Add "ane" to prefix
- Locate substituent by position #
- Halalkane: Substituent halide for H

**Cycloalkane (C<sub>n</sub>H<sub>2n</sub>)**

- Bicyclic: Two fused or bridged rings
- Cyclopropane: n = 3 (highly strained)
- Cyclobutane: n = 4 (some flexibility)
- Cyclopentane: n = 5 (slight puckering)
- Cyclohexane: n = 6 (no strain)
- Chair Conformation: Stable conformation
- Boat Conformation: Less stable
- Axial Position: Perpendicular to ring
- Equatorial Position: In ring plane
- See H<sub>a</sub> and H<sub>e</sub> in chair diagram below
- Cis: Two substituents in the up position
- Trans: One substituent up and one down

**Isomers**

- Hydrogenated alkene or alkyne (H<sub>2</sub>, Pt catalyst)
- Free-radical reaction of alkene
- Radical halohydrate (X<sub>2</sub>, H<sub>2</sub>O)
- Friedel-Crafts alkylation

**Reaction**

- Combustion: Alkane + O<sub>2</sub> → CO<sub>2</sub> + H<sub>2</sub>O
- Halogenation to haloalkane (Cl<sub>2</sub>, Br<sub>2</sub>, light or heat)

**Alkene -C=C-**

**Properties**

- Similar to alkanes, non-polar, flammable

**Nomenclature**

- Add "ene" to prefix, use # to denote C=C position
- Isolated: C=C-C=C-C=C
- Conjugated: C=C=C=C
- Polysubstituted Fatty Acid: 2 or more C=C
- Alkene: Adjacent C=C
- Vinyl Group: H<sub>2</sub>C=CH-
- Methylene Group: H<sub>2</sub>C
- Allyl Group: H<sub>2</sub>C=CH-CH<sub>2</sub>-
- Vinyl Halide: Halide replaces H on "C=C"
- Conjugated: Alternate C=C and C-C (increases)
- Alkadiene: 2 conjugated C=C (e.g., butadiene), cis and trans (exists about C=C bond)
- Alkatriene: 3 conjugated C=C
- Aromatic: Conjugated monocyclic compound
- K<sub>1</sub> (H) aromatic = benzene
- Aromatic Cyclic Ions: Cyclopentadienyl anion, cycloheptatrienyl cation (6 electrons)

**Isomers**

- No free rotation of C=C
- E,Z: prioritize groups by atomic weight
- Q: Higher priority groups on the same side

**Reaction**

- Hydration to 2°/3° alcohol (H<sub>2</sub>O, H<sup>+</sup>) from alkene (acid-catalyzed) (Markovnikov)
- Hydrohalogenation (HX) (Markovnikov)
- Hydrogenation (H<sub>2</sub>, Pt, Pd, Ni catalyst)
- Hydroboration (BH<sub>3</sub>, THF, anti-Markovnikov)
- Hydroxylation (KMnO<sub>4</sub>, syn-Markovnikov)
- Halogenation (X<sub>2</sub>, via dihaloalkane (X<sub>2</sub>, CCl<sub>4</sub>, anti-addition)
- Hydrohalogenation (H<sub>2</sub>, Pt, Pd, Ni catalyst)
- Hydroboration-oxidation (BH<sub>3</sub>, H<sub>2</sub>O<sub>2</sub>, OH<sup>-</sup>) (anti-addition)
- Oxidation to carboxylic acid (KMnO<sub>4</sub>, hot OH<sup>-</sup>)
- Oxidation to ketone (H<sub>2</sub>, Pt, Pd, Ni catalyst)
- Hydrogenation to alkane (H<sub>2</sub>, Pt, Pd, Ni catalyst)
- Free-radical polymerization
- Alkylation reaction
  - Allylic halogenation (Cl<sub>2</sub>, heat)
  - Diels-Alder: Cyclohexene from diene + alkene/alkyne



## Synopsis

Quick Reference for the core essentials of a subject and class that is challenging at best and that many students struggle with. In 6 laminated pages our experienced chemistry author and professor gathered key elements organized and designed to use along with your text and lectures, as a review before testing, or as a memory companion that keeps key answers always at your fingertips. As many students have said "a must have" study tool. Suggested uses:

- o Quick Reference – instead of digging into the textbook to find a core answer you need while studying, use the guide to reinforce quickly and repeatedly
- o Memory – refreshing your memory repeatedly is a foundation of studying, have the core answers handy so you can focus on understanding the concepts
- o Test Prep – no student should be cramming, but if you are, there is no better tool for that final review

## Book Information

Series: Quick Study Academic

Paperback: 6 pages

Publisher: QuickStudy; Lam Rfc Cr edition (December 1, 2015)

Language: English

ISBN-10: 1423228189

ISBN-13: 978-1423228189

Product Dimensions: 8.5 x 11 x 0.1 inches

Shipping Weight: 4 ounces (View shipping rates and policies)

Average Customer Review: 5.0 out of 5 stars 5 customer reviews

Best Sellers Rank: #25,483 in Books (See Top 100 in Books) #69 in Books > Science & Math > Chemistry > Organic #160 in Books > Science & Math > Chemistry > General & Reference #190 in Books > Textbooks > Science & Mathematics > Chemistry

## Customer Reviews

This really helps me like chemistry equations and answers. This is a must have for going to college and trying to be a chemist or a biologist. Bless you.

Great resource.

Very easy to work with. Quick service. A++++

great product good condition

High quality product, a great gift.

[Download to continue reading...](#)

Study Guide: Ace Organic Chemistry I - The EASY Guide to Ace Organic Chemistry I: (Organic Chemistry Study Guide, Organic Chemistry Review, Concepts, Reaction Mechanisms and Summaries) Organic Chemistry Reactions (Quick Study Academic) Organic Chemistry Reactions (Quickstudy: Academic) Cycloaddition Reactions in Organic Synthesis, Volume 8 (Tetrahedron Organic Chemistry) Organic Chemistry Fundamentals (Quick Study Academic) Organic Chemistry Reactions: An Overview (Quick Review Notes) Medical Coding: ICD-9 & ICD-10-CM: Quick Study Guide (Quick Study Academic) Ace General Chemistry I and II (The EASY Guide to Ace General Chemistry I and II): General Chemistry Study Guide, General Chemistry Review Experimental Organic Chemistry: A Miniscale & Microscale Approach (Cengage Learning Laboratory Series for Organic Chemistry) The Organic Chemistry of Drug Synthesis, Volume 3 (Organic Chemistry Series of Drug Synthesis) Organic Chemistry of Enzyme-Catalyzed Reactions, Revised Edition, Second Edition March's Advanced Organic Chemistry: Reactions, Mechanisms, and Structure Organic Chemistry by Inquisition, 1. General Reactions Advanced Organic Chemistry: Reactions, Mechanisms, and Structure Foundations of Organic Chemistry: Unity and Diversity of Structures, Pathways, and Reactions Organic Chemistry of Enzyme-Catalyzed Reactions, Revised Edition Reactions and Syntheses: In the Organic Chemistry Laboratory CHEMISTRY 14D THINKBOOK (Organic Reactions and Pharmaceuticals) Free Radical Reactions in Preparative Organic Chemistry The Organic Chemistry of Enzyme-Catalyzed Reactions

[Contact Us](#)

[DMCA](#)

[Privacy](#)

[FAQ & Help](#)