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# Organic Chemistry Reactions (Quick Study Academic)

**ORGANIC CHEMISTRY REACTIONS**

**Features of an Organic Reaction**

- Mechanism:** Describes the overall reaction using a series of simple steps.
- Stoichiometry:** Calculates reactant and product masses using the balanced equation and molar masses.
- Kinetics:** Study of the reaction rate and mechanisms.
- Theoretical Yield:** Mass of product given by a complete reaction; % yield =  $100\% \times \text{product mass} / \text{theoretical yield}$ .
- Equilibrium:** Reaction does not proceed to completion. Instead, it reaches a balanced state of forward and reverse reactions.

**Major Reaction Types**

- Acid
- Base
- Oxidation
- Reduction
- Condensation
- Substitution ( $\text{S}_{\text{N}}$ ,  $\text{S}_{\text{E}}$ ,  $\text{S}_{\text{O}}$ )
- Radical reactions
- Isotope reaction

**Important Named Reactions**

- Dieck-Miller:** Form cyclic ether
- Friedel-Crafts:** Add  $\text{acyl}$  or  $\text{aryl}$  group
- Grignard:** Add  $\text{alkyl}$  or  $\text{aryl}$  group
- Wolff-Kishner, Clemmensen:** Reduce ketone to alcohol
- Wittig:** Convert alkylketones to alkene

**Kinetics & Reaction Mechanism**

**Organic Acid & Base**

**Acid**

- Electron pair acceptor (Lewis acid)
- Proton donor (Brønsted-Lowry acid)
- Ex: Carbonyl acid

**Base**

- Electron-pair donor (Lewis base)
- Proton acceptor (Brønsted-Lowry base)
- Ex: Amino

**Factors Enhancing Acid Strength (HA)**

- Weaker H-A bond
- Greater electronegativity of "A"
- Inductive effect of substituent on "A" (electron withdrawal enhances transfer)
- More "z" character in hybrid orbital (z-orbital is lower in energy than p-orbital)
- Resonance-stabilized conjugate base ( $\text{A}'$ )

**Factors Enhancing Base Strength**

- Alkali metal cations
- A lone pair is a nucleophilic, electron-donating effect which shifts electron density to the atom with the lone pair increases base strength

**Alkane**

**Properties**

- Hydrocarbon
- Weak intermolecular forces
- Non-Cyclic: General formula  $\text{C}_n\text{H}_{2n+2}$
- Tetrahedral:  $\text{C}-\text{C}$  (0°)

**Noncyclic Alkanes**

- Add "ene" to prefix
- Locate substituents by position #
- Isobutane:** Substituted isobutane for -II

**Cycloalkane ( $\text{C}_n\text{H}_n$ )**

- Bicyclic: Two fused or bridged rings
- Cyclopropane:  $n=3$  (highly strained)
- Cyclobutane:  $n=4$  (some flexibility)
- Cyclopentane:  $n=5$  (slight packing)
- 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>1</sub> and H<sub>2</sub> in chair diagram below

**Cis:** Two substituents in the up position

**Trans:** One substituent up and one down

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## 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 âœa must haveâ• study tool. Suggested uses: o Quick Reference â“ 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 â“ 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 â“ 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)

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