

# Reactions of Amines and Epoxydes

## Preparation of Amines

Ammonium hydroxide:  $\text{NH}_4^+ + \text{OH}^- \rightarrow \text{NH}_3 + \text{H}_2\text{O}$



## Four different types of bonds

1. Ionic bond  
2. Covalent bond  
3. Hydrogen bond  
4. Metallic bond



## The Behavior of the bond



## Strong and Weak bond



## Distance between atoms



## Strength of different bonds



## Hydrogen bond



## Electrostatic interaction



## Covalent bond



There are four types of bonding: ionic bonding and covalent bonding

- Ionic bonds are formed by the transfer of electron from one atom to another (non-metallic (proton) and metal (acceptor) atoms).



## Regions (p) and (n) (p) bonds

- Covalent bonds are classified as sigma (σ) and pi (π) bonds.
- Sigma bonds are formed by head-on overlap of orbitals.
- Pi bonds are formed by side-on overlap of orbitals.
- Very simple bond is a sigma bond.
- Very complex bond is a pi bond.



π bonds are stronger than σ bonds.

## Polar and Nonpolar Covalent Bonds

Depending on the difference in the electronegativity values, polar bonds can be polar and nonpolar.

- If the difference in electronegativity is less than 0.4, the electrons are almost equally shared between the two atoms. Forming a nonpolar or non-bonded bond. (Nonpolar example:  $\text{H}_2\text{S}$  and  $\text{H}_2\text{O}$  bonds).
- If the difference in electronegativity is between 0.5 and 1.7, the more polar covalent bond. Nonpolar example: in our atoms the carbon is bonded to  $\text{H}$ ,  $\text{O}$ ,  $\text{F}$  and other halogens.
- A difference of 1.7 or higher one of both the atoms can have a larger share and a polar bond is formed.

## A Summary of Ring-Opening Reactions of Epoxydes with Strong and Weak Protagonists



Protagonists and Protagonists

## Bond Types, Strength, Length, Polarity and Dipole Moment

### Dipole Moment

The polarity of a bond is denoted by the dipole moment ( $\mu$ ).

1. Nonpolar covalent bond  
2. Polar covalent bond  
3. Ionic bond



Electrostatic map of the surface of the molecule.

- The dipole moment is shown as a vector pointing from the less electronegative to the more electronegative atom.
- The vector (dipole moment) starts from a partial negative charge and the vector (dipole moment) ends in a partial positive charge.
- The dipole plot indicates the charge difference.
- The dipole moment indicates the charge and area.

### Molecular Dipole

To measure the molecular polarity, the sum of the dipole is used.

The polarity of the molecule is equal to the sum of the dipole moment. The polar value for dipole moment is measured. A good example is water, dipole.



Water has water as the most polar molecule in the water.

## Bond Length and Bond Strength

→ Bond length = bond length



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## Average values of C-C and C-H bond depending on the molecule

C-C bond:  $\text{H}_2\text{C}-\text{CH}_3$ ,  $\text{CH}_2=\text{CH}_2$ ,  $\text{CH}_3=\text{CH}_2$

Hydrogen bond:  $\text{H}-\text{C}=\text{O}$ ,  $\text{H}-\text{C}=\text{O}$ ,  $\text{H}-\text{C}=\text{O}$

Length: 1.54 Å, 1.35 Å, 1.35 Å

Strength: 100 kJ/mol, 177 kJ/mol, 200 kJ/mol

Hydrogen bond:  $\text{H}-\text{C}=\text{O}$ ,  $\text{H}-\text{C}=\text{O}$ ,  $\text{H}-\text{C}=\text{O}$

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# Organic Chemistry Final Study Guide

**Mary Millhollon, Richard H. Langley**

## Organic Chemistry Final Study Guide:

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**Fundamentals of Organic Chemistry, Textbook, Study Guide and Solutions Manual** T. W. Graham Solomons, 1996-08-15 A realistic approach to the study of mechanisms The book addresses real functional group chemistry with an emphasis on the biological environmental and medical applications of organic chemistry

**Student Study Guide and Solutions Manual to accompany General Organic and Biological Chemistry, 1e** Kenneth W. Raymond, 2005-10-07 Finally readers have a shorter less intimidating introduction to general organic and biological chemistry Not only is Raymond's text concise it also takes an integrated approach to presenting important topics in a way that makes the material easier to understand In this approach similarities can be exploited and concepts reinforced The result is that readers see the strong connections that exist between these three branches of chemistry

*Organic Chemistry* Marye Anne Fox, James K. Whitesell, 2004 Accompanying CD ROM has been enhanced with updated animated illustrations to accompany the presentations and Chem3D files for helpful structure visualization Page 4 of cover

**Introduction to the study of organic chemistry** John Wade (DSc.), 1898

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**Fundamentals of General, Organic, and Biological Chemistry, Third Edition** John McMurry, Susan McMurry, 1999

Provides worked out solutions to text problems along with chapter by chapter outlines and a variety of self tests at the end of each chapter **5 Steps to a 5: AP Chemistry 2020** Mary Millhollen, Richard H. Langley, 2019-08-02 Get ready to ace your AP Chemistry Exam with this easy to follow multi platform study guide The immensely popular test prep guide has been updated and revised with new material and is now accessible in print online and mobile formats 5 Steps to a 5 AP Chemistry 2020 introduces an easy to follow effective 5 step study plan to help you build the skills knowledge and test taking confidence you need to reach your full potential The book includes hundreds of practice exercises with thorough answer explanations and sample responses You'll learn how to master the multiple choice questions and achieve a higher score on this demanding exam Because this guide is accessible in print and digital formats you can study online via your mobile device straight from the book or any combination of the three This essential guide reflects the latest course syllabus and includes four full length practice exams 2 in the book and 2 online plus proven strategies specific to each section of the test 5 Steps to a 5 AP Chemistry 2020 features 4 Practice Exams 2 in the book 2 online Access to the entire Cross Platform Prep Course in AP Chemistry 2020 Hundreds of practice exercises with thorough answer explanations Powerful analytics you can use to assess your test readiness Flashcards games and more

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## **Organic Chemistry Final Study Guide Introduction**

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