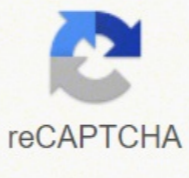




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Organic Chemistry Core Concept Cheat Sheet

### Introduction to Organic Chemistry

#### Organic Chemistry

- Chemistry of Carbon
- Terminology
- Proper Structures


#### Functional Groups

- Alkane:** Contains a carbon-carbon single bond.
 

CC
- Alkene:** Contains a carbon-carbon double bond.
 

C=C
- Alkyne:** Contains a carbon-carbon triple bond.
 

C#C
- Aromatic:** Contains a six-membered ring, with alternating double and single bonds.
 


- Alkyl Halide:** Contains an alkyl (alkane - H) and a halogen, RX.
- Alcohol:** Contains a ROH.
- Ether:** Contains a ROH.
- Thiol:** Contains a RSH.
- Sulfide:** Contains a RSR.
- Aldehyde:** Contains a H bonded to a C on one side of a C=O and a R or H bonded to a C on the other side.
 

CC=O
- Ketone:** Contains 2 R groups attached to the C on either side of a C=O.
 

CC(=O)C
- Acid Halide:** Contains a C=O, with an X attached to the C on one side and an R or H attached to the C on the other side.
 

CC(=O)X
- Carboxylic Acid:** Contains a COOH, with an R or H attached to the C of the COOH.
 

CC(=O)O
- Ester:** Contains a COO, with an R attached to the O and a H or R attached to the C.
 

CC(=O)OR
- Anhydride:** Contains an OCOO, with an R or H attached on either side of the O.
 

CC(=O)OC(=O)C

- Amine:** Contains an N, with R and / or H attached to the N.
 

CCN
- Amide:** Contains a N attached to the C of a C=O, with H or R on the other positions.
 

CC(=O)N
- Nitrile:** Contains a carbon nitrogen triple bond.
 

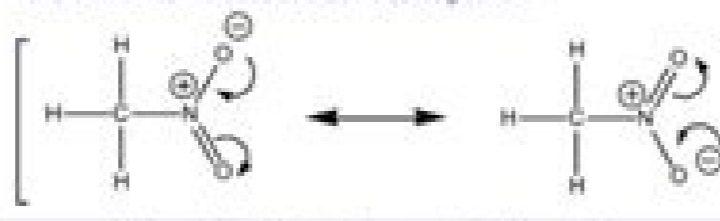
CC#N

#### Acids and Bases

- Arrhenius Acid:** Dissociates to give  $H_3O^+$ .
- Arrhenius Base:** Dissociates to give  $OH^-$ .
- Bronsted-Lowry Acid:** Donates an  $H^+$ .
- Bronsted-Lowry Base:** Accepts an  $H^+$ .
- Conjugate Acid:** acid that results from the Bronsted-Lowry base gaining an  $H^+$ .
- Conjugate Base:** the base that results from the Bronsted-Lowry acid losing an  $H^+$ .
- Amphoteric:** Reacts as an acid or a base.
- Lewis Acid:** Accepts electron pairs to form new bonds.
- Lewis Base:** Donates electron pairs to form new bonds.

#### Electron Pushing

- Locate the electrons on the more electronegative atoms.
- Identify the most electronegative atom and the least electronegative atom in a bond.
- A mechanism is a step-by-step explanation of what happens in a chemical reaction.
- The flow of electrons in a mechanism is from the most electronegative atom to the least electronegative atom.
- The nucleophile donates the electrons in a mechanism.
- The electrophile accepts the electrons in a mechanism.
- Resonance structures are two or more equivalent structures for the same arrangements of atoms, the only difference is the location of the electrons.
- Delocalization are electrons that are distributed among more than two atoms that are bonded together.



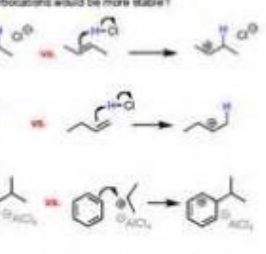
#### How to Study Organic Chemistry

- For the terminology, know the definition of such terms as nucleophile, electrophile, syn, anti, etc.
- Learn the functional groups and be able to recognize them quickly.
- Learn the first ten alkanes, along with the prefixes and suffixes.
- Identify the most electronegative and the least electronegative atoms.
- The flow of electrons is from negative to positive.
- Understand the concepts, do not just memorize examples.
- Find examples in the textbook or on websites to reinforce the concepts.
- Make flashcards.
- Ask for help if you don't understand something.

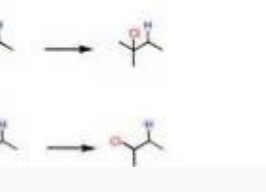
How to Use This Cheat Sheet: These are the keys related this topic. Try to read through it carefully twice then recite it out on a blank sheet of paper. Review it again before the exams.

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Apply the concept



For 4 and 5, show resonance structures and indicate the most stable form.



#### Key Reactions of Aldehydes and Ketones

**Aldehyde and Ketone Reactions:**

- Oxidation:** Aldehydes can be oxidized to carboxylic acids, while ketones cannot.
- Reduction:** Aldehydes and ketones can be reduced to primary and secondary alcohols, respectively.
- Hydroxylation:** Aldehydes and ketones can be hydroxylated to form geminal diols.
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- Hydroxylation:** Aldehydes and ketones can be hydroxylated to form geminal diols.

**Aldehyde and Ketone Synthesis:**

- Aldehyde Synthesis:** Aldehydes can be synthesized from alcohols, nitriles, and other precursors.
- Ketone Synthesis:** Ketones can be synthesized from alcohols, nitriles, and other precursors.

#### Summary Sheet: Two Key Concepts for Nucleophilic Substitution on Carbonyls

**Key Concept 1: The importance of resonance**

The resonance structures of a carbonyl group show the delocalization of electrons from the oxygen atom to the carbon atom, creating a partial positive charge on the carbon and a partial negative charge on the oxygen. This makes the carbon atom electrophilic and the oxygen atom nucleophilic.

**Key Concept 2: The importance of steric hindrance**

Steric hindrance is the repulsion between atoms or groups of atoms that are too close to each other. In nucleophilic substitution reactions, steric hindrance can significantly affect the rate and outcome of the reaction.

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