

Week 9
CHE 3332 - Organic Chemistry 2

Hello and Welcome to the weekly resources for CHE 3332 – Organic Chemistry 2!

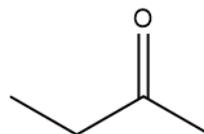
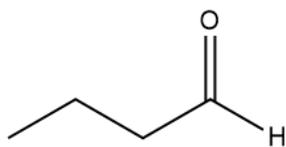
This week is Week 9 of class, and typically in this week of the semester your professors are covering these topics below. If you do not see the topics your particular section of class is learning this week, please take a look at other weekly resources listed on our website for additional topics throughout the semester.

We also invite you to **look at the group tutoring chart on our website to see if this course has a group tutoring session offered this semester.** If you have any questions about these study guides, group tutoring sessions, private 30 minute tutoring appointments, the Baylor Tutoring YouTube channel or any tutoring services we offer, please visit our website www.baylor.edu/tutoring or call our drop in center during open business hours. M-Th 9am-8pm on class days 254-710-4135.

Keywords: Carbonyl, Nucleophilic Attack, Ylide, Wittig

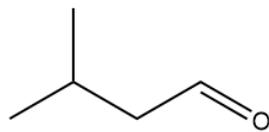
TOPIC OF THE WEEK: Aldehydes and Ketones (Chapter 19)

Aldehydes and ketones are both molecules with a carbonyl (C=O), with aldehydes having a terminal carbonyl, while ketones have theirs situated in the molecule.

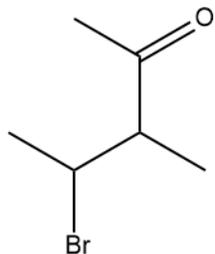


The process used to name both types of molecules is very similar:

1. Identify the parent chain (which has the carbonyl group)
2. Identify and number all substituents, with the carbonyl being of the highest priority
3. Name the molecule as you normally would. For aldehydes, the name will end in -al, and -one for ketones.



3-Methylbut-1-al

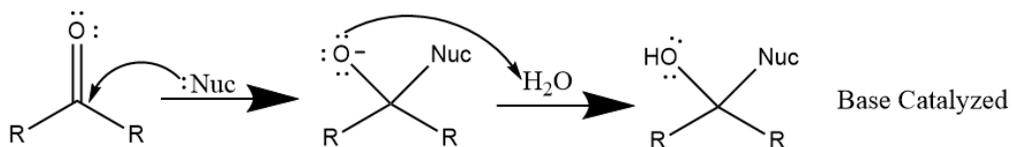
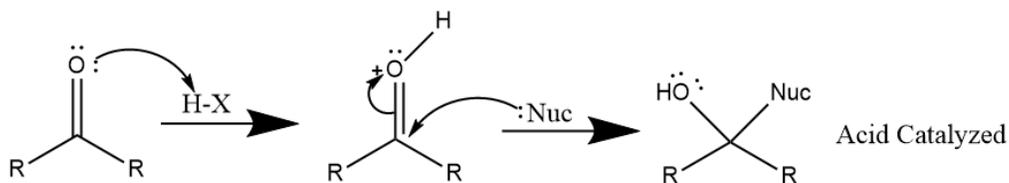


4-Bromo-3-Methylpent-2-one

Nucleophilic Addition Reactions:

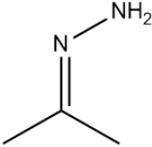
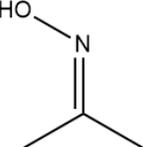
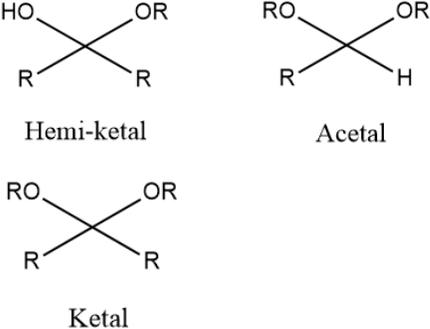
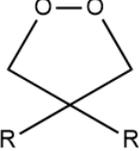
Because of the carbonyl group, which has an induced dipole, the carbon is a great candidate in nucleophilic attack. This results in the carbonyl being reduced to an alcohol in each reaction.

This reaction can be performed in both acid or basic conditions, and follows a similar mechanism:



Here is a list of nucleophiles and their product. Some of them you have covered before, such as Grignard Reagents, or using LiAlH_4 to reduce a carbonyl.

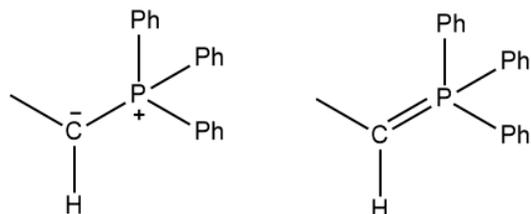
Reagent	Product
RNH_2 (Primary Amine)	<p style="text-align: center;">Imine</p>
R_2NH (Secondary Amine)	<p style="text-align: center;">Enamine</p>

H ₂ N-H ₂ N	 <p>Hydrazone</p>
NH ₂ -OH	 <p>Oxime</p>
2 RSH (Thiol)	 <p>Thioacetal</p>
CN	 <p>Cyanohydrin</p>
ROH (Ether)	 <p>Hemi-ketal Acetal</p> <p>Ketal</p>
Ethylene Glycol	 <p>Cyclic Acetal</p>

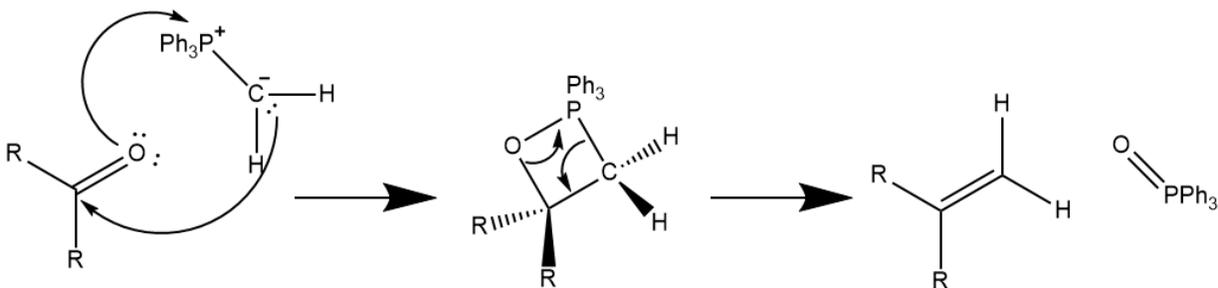
Highlight #1: Useful Reactions!

Wittig Reactions:

This type of reaction is very useful, as it can create a carbon-carbon double bond, using a carbonyl. To do so, this reaction uses a molecule known as a **ylide** which will add onto the carbonyl. Because carbonyls have a dipole, both the negative and positive ends will attack the charged ends of ylide to start the reaction.

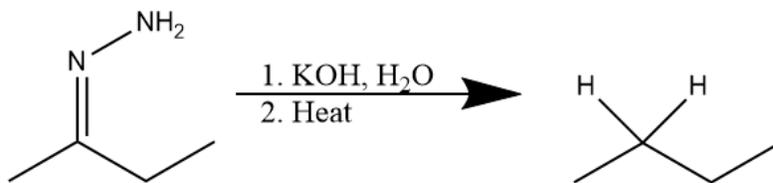


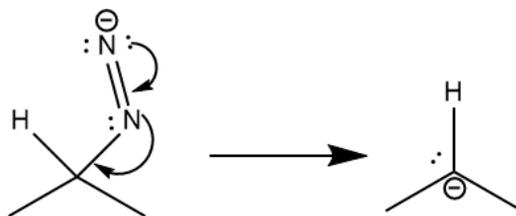
Ylides have two different resonance structures



Wolff-Kishner Reaction:

This reaction is quite useful if we want to easily reduce a ketone completely to hydrogens, using a hydrazone intermediate. By getting a hydrazone (which a ketone can be easily turned into), we can simply use a base and water in heat to pluck off the two nitrogens as a leaving group, replacing them with hydrogens.

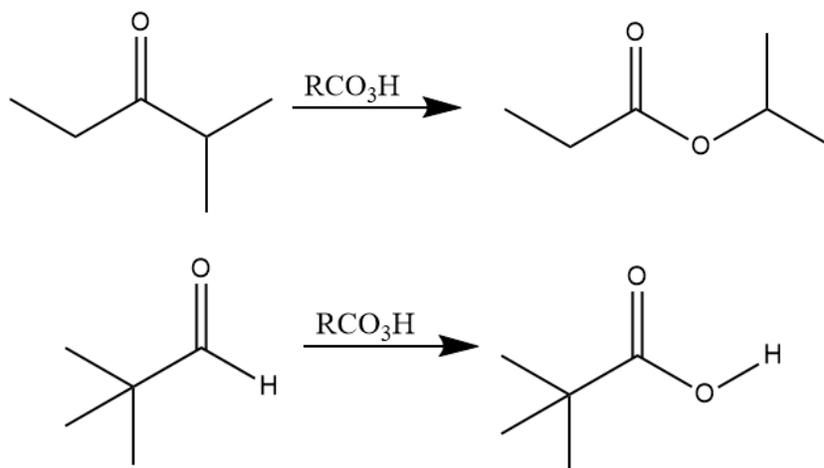




The N_2 group will leave as gas

Baeyer-Villiger Oxidation:

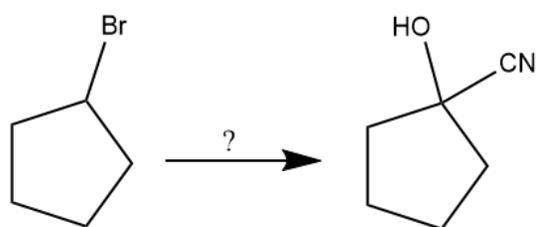
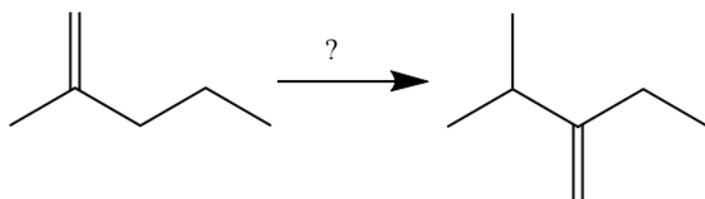
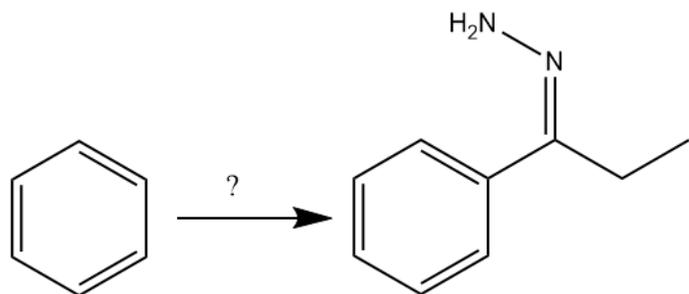
This is a very odd reaction, which can turn a ketone or aldehyde, into an ester, by putting an Oxygen atom within one of the R groups of a ketone.



This reaction is selective, and sensitive to how many bonds each R group has. As the number of bonds go down (tertiary \rightarrow secondary \rightarrow primary), the oxidation is less likely to happen, meaning that if a ketone were to have both a tertiary and secondary R group, the oxidation would take place at the tertiary position. Despite this, the hydrogens on aldehydes are the **MOST** reactive.

CHECK YOUR LEARNING:

Provide a synthesis for each problem:



THINGS YOU MAY STRUGGLE WITH:

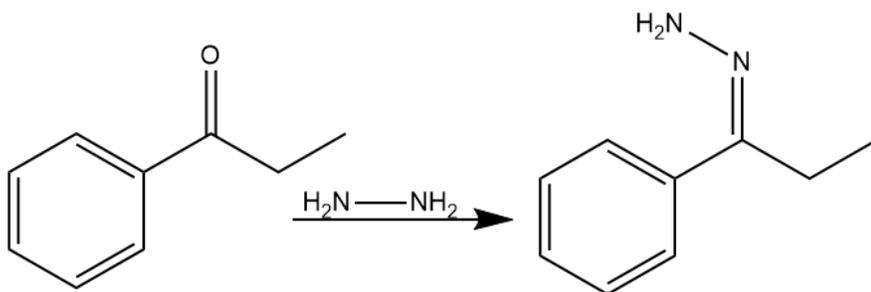
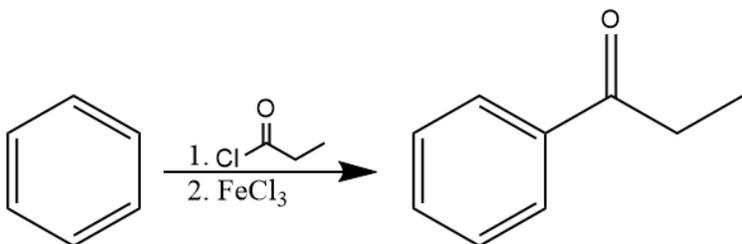
- Because many reactions in this chapter follow a similar mechanism, and have similar products, you may confuse yourself with what products go with what reactions. It would be a good idea to keep everything memorized very well.
- Additionally, many problems in this chapter can involve many steps (and thus many reactions / mechanisms), so it is very easy to get lost when doing something if you do not pay good attention.

Thanks for checking out these weekly resources!

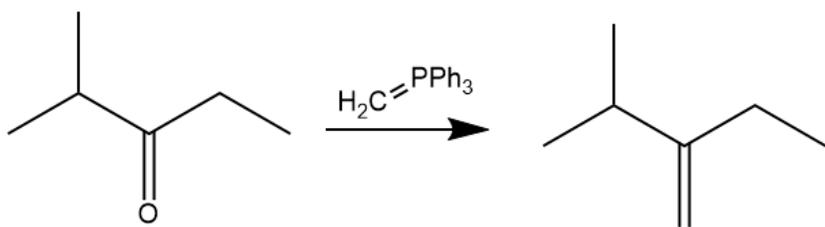
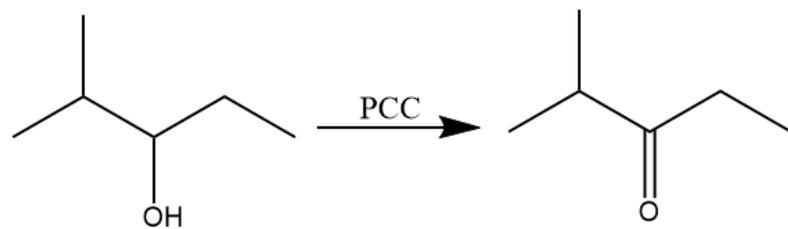
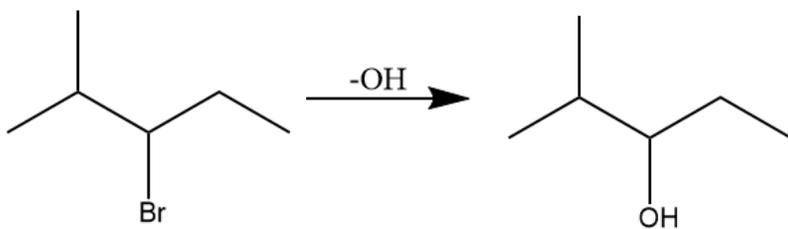
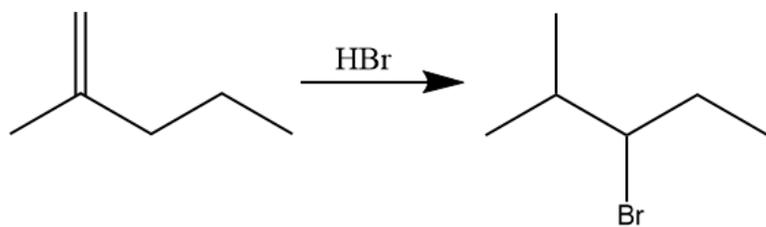
Don't forget to check out our website for group tutoring times, video tutorials and lots of other resources: www.baylor.edu/tutoring! Answers to check your learning questions are below!

ANSWERS FOR THE PRACTICE PROBLEMS:

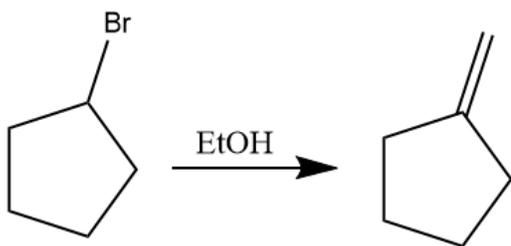
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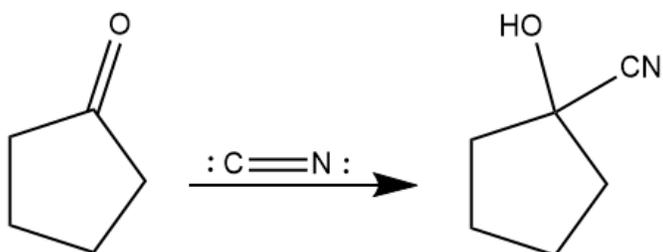
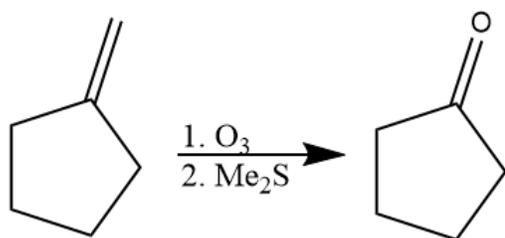


2.



3.





All tables are courtesy of Organic Chemistry by David Klein. All drawings of molecules and mechanisms are made by me.