Hi guys! This week we will be going over part 1 of chapter 13, which is Alcohols. This is a relatively dense chapter, so it is going to be broken up over two weeks. There are only a couple of weeks left in the semester, so let’s finish out strong! Happy studying, and don’t forget that group tutoring is every Thursday from 6:30-7:30, and we hope to see everyone there. Here is the link to sign up. https://www.baylor.edu/support_programs/index.php?id=40917.

Keywords: Alcohols, nomenclature of alcohols, Grignard’s reagent, protection of alcohols

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**TOPIC OF THE WEEK: Synthesis of alcohols**

You already know most of these reactions from previous chapters, but we are now going to focus on them in the context of creating alcohols.

What is an alcohol? An alcohol is a compound with a hydroxyl group.

- **Preparation from alkenes**: We can prepare alcohols from alkenes using some familiar reactions
  - Acid Catalyzed hydration

\[
\begin{align*}
\text{H}_2\text{O} & \quad \text{H}_2\text{SO}_4 \\
\text{C} & \quad \text{OH}
\end{align*}
\]

- Oxymercuration-Demercuration

\[
\begin{align*}
\text{CH}_2=\text{CH}- & \quad 1) \text{Hg(OAc)}_2, \text{H}_2\text{O} \\
\text{CH}_2\text{CH}_2\text{OH} & \quad 2) \text{NaBH}_4
\end{align*}
\]

Enantiomers

- Hydroboration oxidation

\[
\begin{align*}
\text{CH}_2=\text{CH}- & \quad 1) \text{BH}_3, \text{THF} \\
\text{CH}_2\text{CH}_2\text{OH} & \quad 2) \text{H}_2\text{O}_2, \text{NaOH}
\end{align*}
\]

Enantiomers

**syn addition**

- Syn or Anti Dihydroxylation

\[
\begin{align*}
\text{C} \equiv \text{C} & \quad \text{Syn Dihydroxylation} \\
\text{C} \equiv \text{C} & \quad \text{Anti Dihydroxylation}
\end{align*}
\]

\(\text{cis-diol}\) \(\text{trans-diol}\)
Grignards Reagent: This is a new way to create alcohols that you have not seen yet! In this process you create an alcohol and add an R group to the molecule. The idea of a Grignard is that you have a negatively charged carbon group that acts as a nucleophile on a carbonyl carbon (carbon of ketone or aldehyde). There are two major steps to this reaction
1. Creation of Grignard
2. Using Grignard to create the alcohol

- Creation of Grignard:

  ![Grignard Reaction](image)

  Use of Grignard as nucleophile:

- Grignard’s reagent with acid chlorides and esters: This is a similar process, except it happens twice to create tertiary alcohols
• Protection of Alcohols: You cannot have an OH group on a Grignard UNLESS you “protect” it. In this process, you cover up the OH with a specific group called TMS, create your Grignard, perform the reaction, then you take off the TMS. This results in the creation of a diol.

Practice #2 Draw the product

a. 

HIGHLIGHT 1: Acidity of the Alcohol and Phenol Protons

• Alcohols are WEAKLY acidic
• You need to be able to compare acidity of alcohols. Throwback to ARIO!

EX:

Rank in order of increasing acidity

1. 
2. 
3.
HIGHLIGHT 2: Cleavage of Alcohols using Periodic acid

- This reaction cleaves a diol
  - Reagent: HIO₄
- In a ring, the alcohols must be next to each other and on the same side!

\[
\begin{align*}
\text{2-methyl-1-phenyl-1,2-butanediol} & \quad \xrightarrow{\text{HIO₄}} \quad \text{benzaldehyde} + 2\text{-butanone} \\
\text{cis-1,2-cyclohexanediol} & \quad \xrightarrow{\text{HIO₄}} \quad \text{6-oxohexanol}
\end{align*}
\]

HIGHLIGHT 3: Alcohols as electrophiles

Normally, alcohols are weak nucleophiles, however, if we protonate the alcohol, it becomes a good leaving group and can participate in substitution or elimination reactions as an electrophile. This is not always the best way to make an alcohol an electrophile however. So, we are going to learn another way to make alcohols electrophiles.

- Turning the OH into a tosylate group. Tosylates are good leaving group
- Reagent: TSCL, Py/DCM
- EX.

Practice #3 Draw the product

\[
\begin{align*}
\text{OH} & \quad \xrightarrow{\text{TSCL, Py/DCM}} & \text{NaCl}
\end{align*}
\]

THINGS YOU MAY STRUGGLE WITH

This chapter has a lot of information, which is why we split it up over two weeks. Organizing each reaction based on its function will help a lot

- Review older material, because this chapter has a lot of review material in the context of alcohols.
- Grignard’s reagent is always something that can be confusing. Just remember that it is the creation of an alcohol and the addition of an R group at the same time. And your nucleophile is a carbon group.
Answers to practice:

1. 

\( \text{MCPBA} \quad \rightarrow \quad \text{OH} \) 

2. 

\( \text{CH}_3\text{MgBr} \quad \rightarrow \quad \text{OH} \) 

3. 

\( \text{OH} \quad \frac{\text{OTBClPy}}{\text{DCM}} \quad \text{Cl}^- \)