Note: Exam is next Wednesday.

Recall from last lecture: oxidation of alcohols

\[
R\quad OH \quad H_2C\text{r}O_4 \quad \rightarrow \quad R\quad O\quad R'
\]

(Jones Ox.)

General idea for oxidation: Removal of electrons.

Consider the mechanism of the above reaction.

Another way to make alcohols - using organometallics

Types: \( R-\text{Na} \quad R-\text{Li} \quad R-H_3\text{X} \)
\( R-K \quad R-\text{MgBr} \quad R-\text{SnR}_3 \)
\( R-Pb\text{R}_3 \)

Very ionic \quad Highly polarized \quad Covalent

\# Most useful
How to make $R Li$, $R Mg X$? ($X = Br, I$ and $Cl$, Not $F$)

$$R - X + 2Li \longrightarrow R - Li + Li X$$

or

$$R - X + Mg \longrightarrow R - Mg X$$

These reagents react like alkyl anions.

$R Li$ / $R Mg X$ reactivity

1) Deprotonation i.e. $R - C=CH + R' Li \rightarrow R - C=CH - Li + R' H$ (acid base)

2) Nucleophilic Attack on Epoxides $\overset{\text{Nu}}{R - \overset{\text{ Nu}}{\text{O}}}$

3) Nucleophilic addition to carbonyl compounds $R' - C=O - R'' + Nu$

4) These reagents are not useful for SN2 displacement (often see E2 elimination) of alkyl bromides.
More on reactions with epoxides:

Design a retrosynthesis of $\text{Ph} \xrightarrow{\text{OH}}$ using an epoxide.

(an example reaction is)

$$R-\text{Li} + \bigtriangleup \rightarrow R\xrightarrow{\text{OH}} + \text{MgBr}$$

$$\downarrow$$

$$\text{Br} + \text{Mg}$$

Remember, that in nucleophilic attack on epoxides, the nucleophile attacks the less hindered site.
Another way to form alcohols: Addition to carbonyl

$$R' \cdot MgX + R'' \cdot \equiv O \rightarrow OH \quad \text{(both enantiomers are formed)}$$

Different types of carbonyls that can be used:

1. $$\text{H-C} = \text{O} \rightarrow R \cdot \text{OH} \quad \text{1° alcohol}$$
2. $$R' \cdot \text{C} = \text{O} \rightarrow R' \cdot \text{OH} \quad \text{2° alcohol (both enantiomers formed)}$$
3. $$R' \cdot \text{C} = \text{O} \rightarrow R \cdot R'' \cdot \text{OH} \quad \text{3° alcohol (both enantiomers formed)}$$
4. $$R' \cdot \text{C} = \text{O} \rightarrow \text{OH} \quad \text{Addition of Two alkyl lithium compounds}$$