

Chapter 12: Alcohols

Today –Reactions with Alcohols

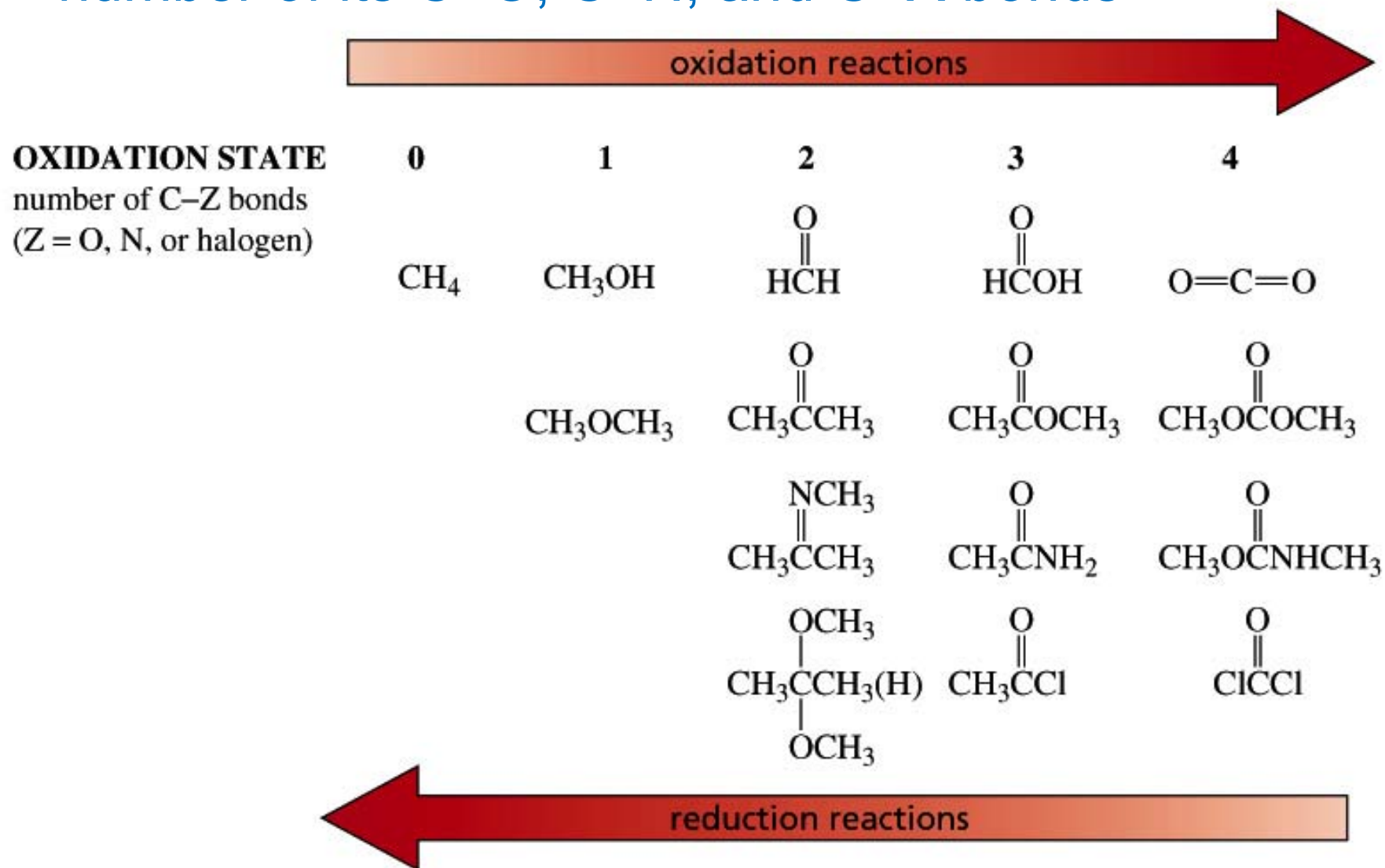
12.4 Preparation of Alcohols by Reduction

12.6 Preparation of Alcohols with Grignard

12.9 Reactions of Alcohols

12.10 Oxidation of Alcohols

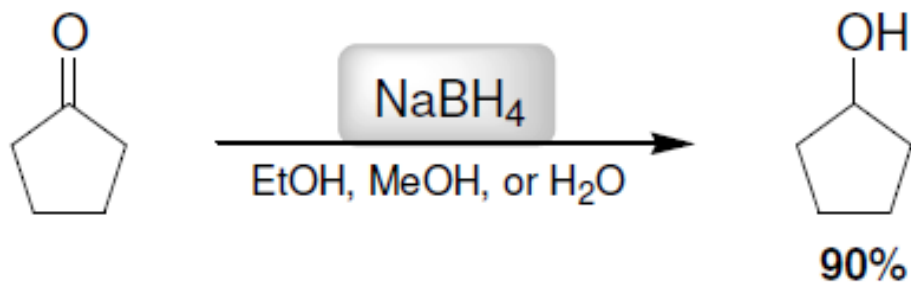
The oxidation state of a carbon atom equals the total number of its C–O, C–N, and C–X bonds



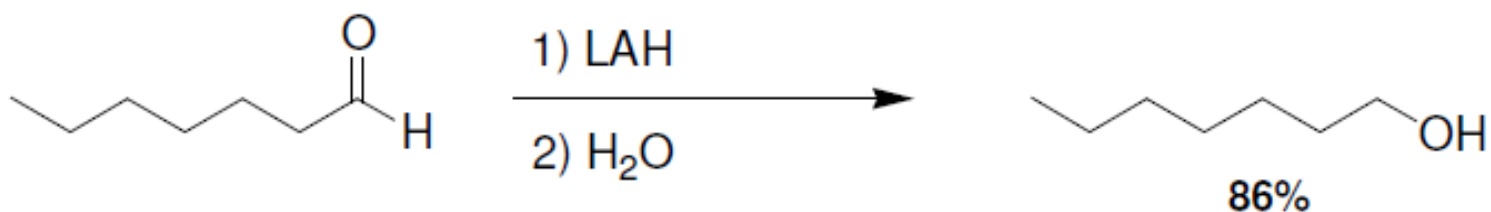
Lose Electrons Oxidation – Gain Electrons Reduction

Reagents that can donate a HYDRIDE are generally good reducing agents:

Sodium borohydride

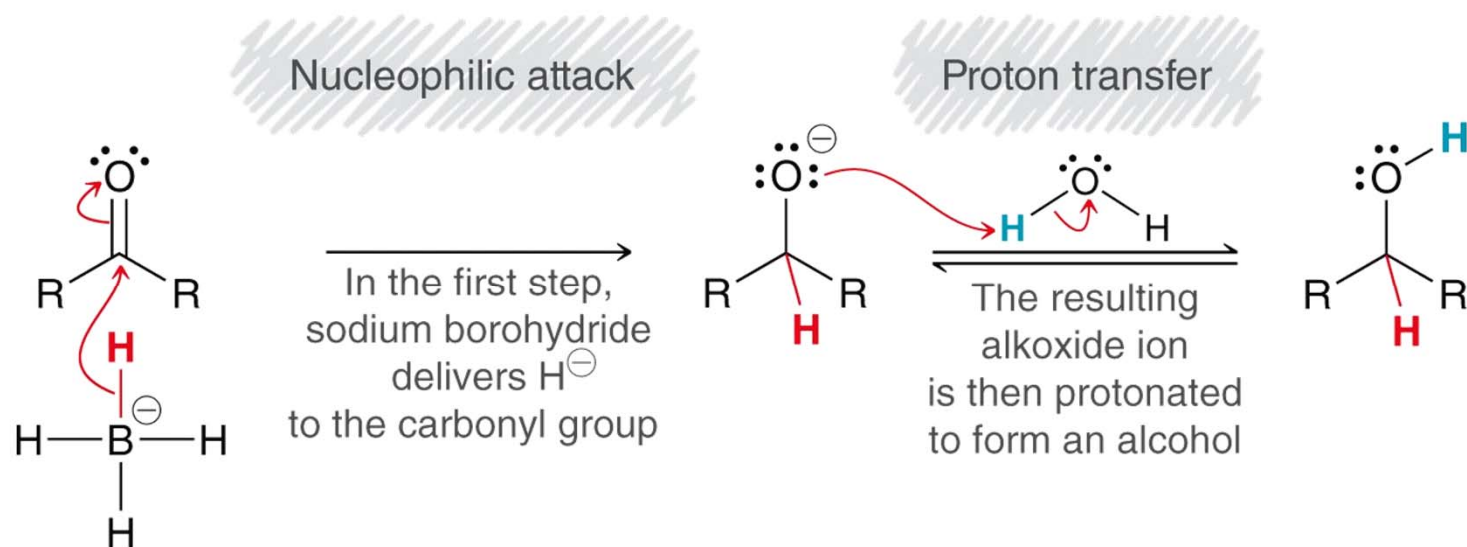


Lithium aluminum hydride (LAH or LiAlH₄)



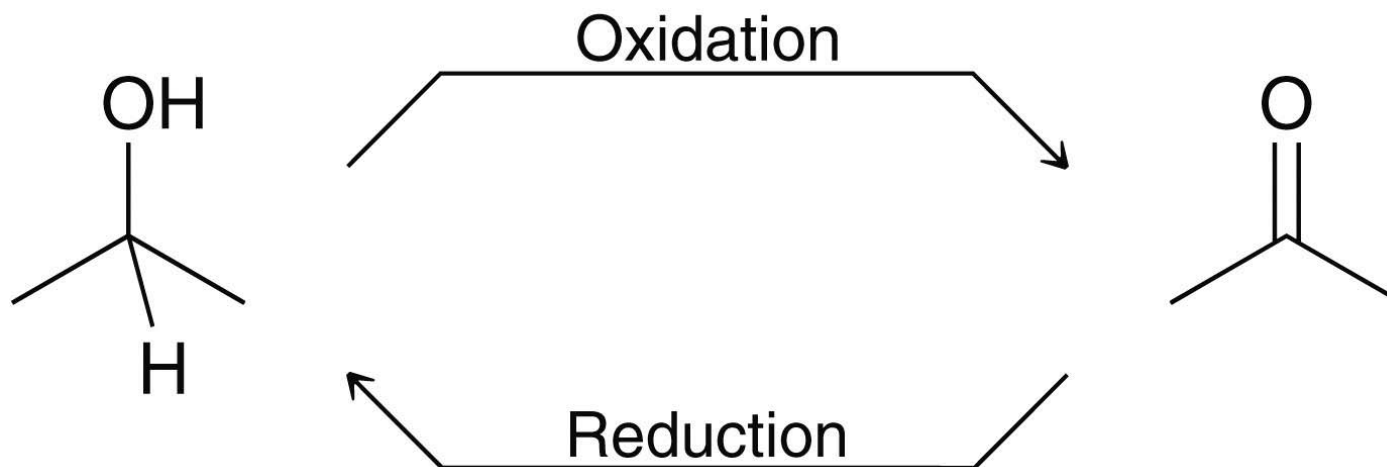
Alcohols via Reduction

- NaBH₄ is a source of hydride (H⁻) which does nucleophilic addition to the carbonyl carbon, followed by proton transfer from the solvent:

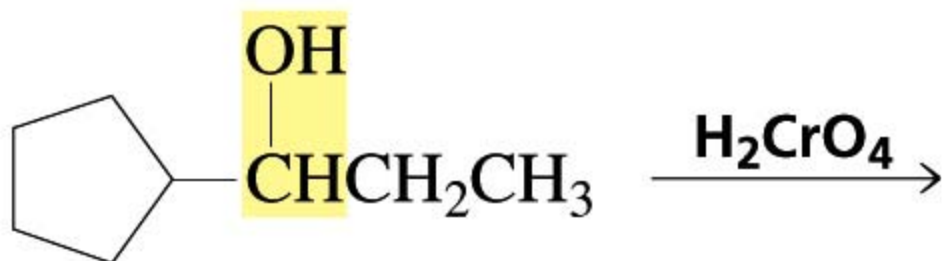
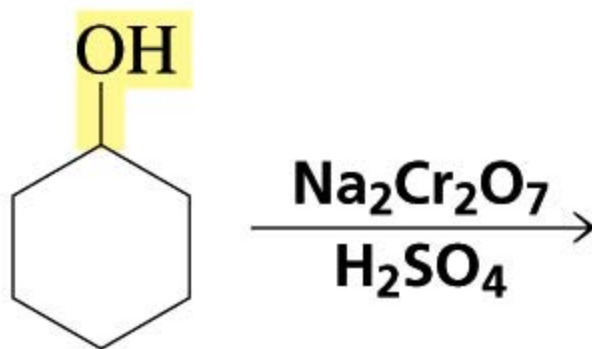


Oxidation of Alcohols

- We saw how alcohols can be formed by the reduction of a carbonyl.
- The reverse process is also possible with the right reagents.



Oxidation of Alcohols

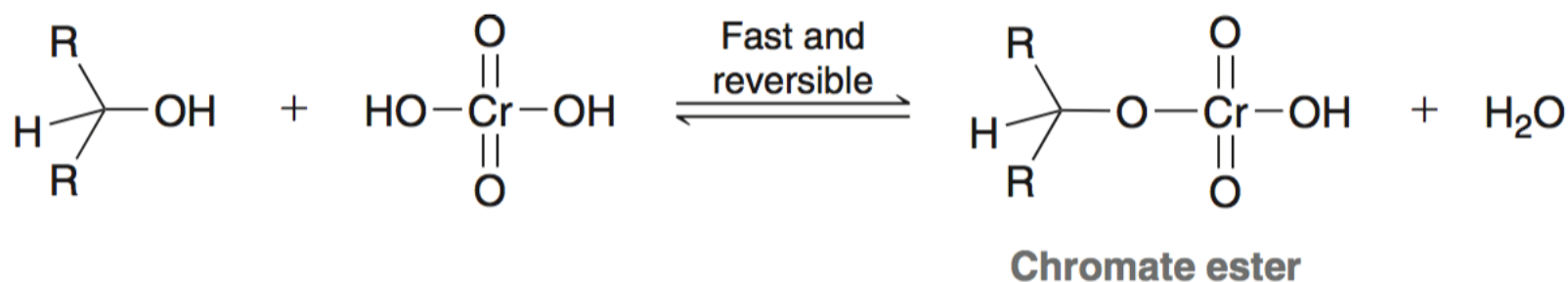


secondary alcohols

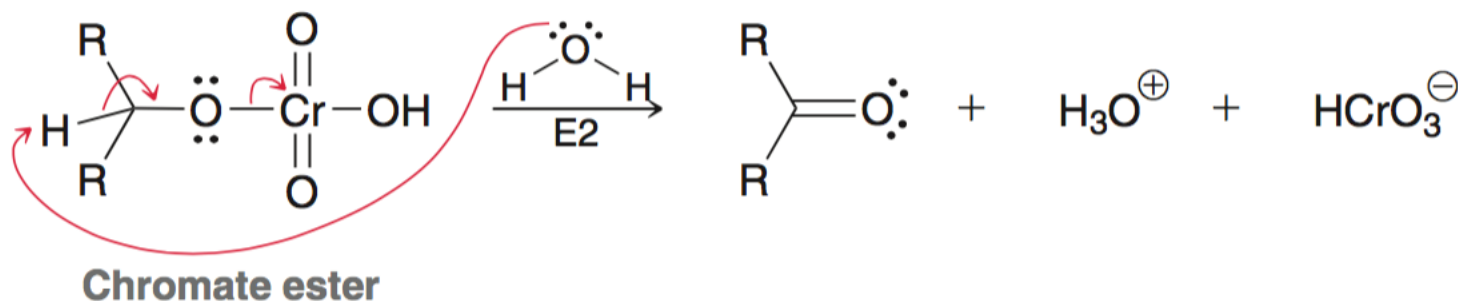
Oxidation of Alcohols

- Oxidation of the alcohol with chromic acid involves **(1)** formation of a chromate ester, and **(2)** elimination to form the π bond

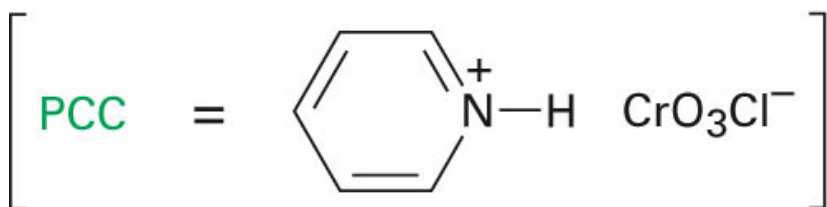
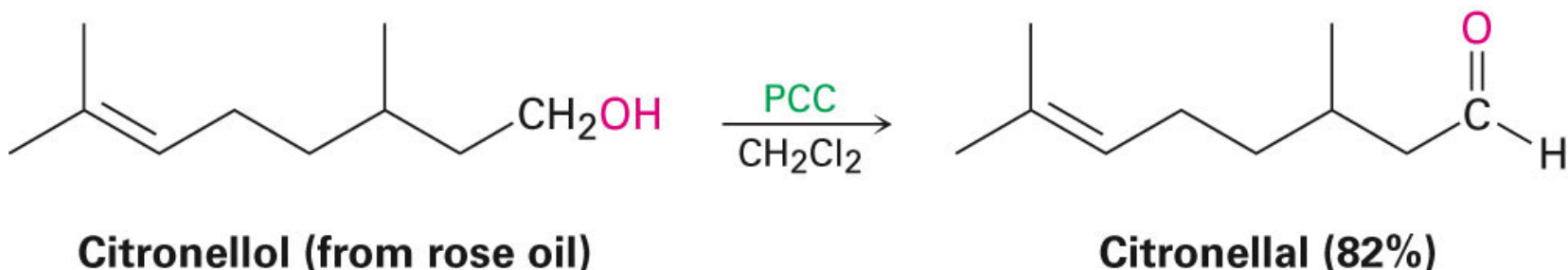
STAGE 1



STAGE 2

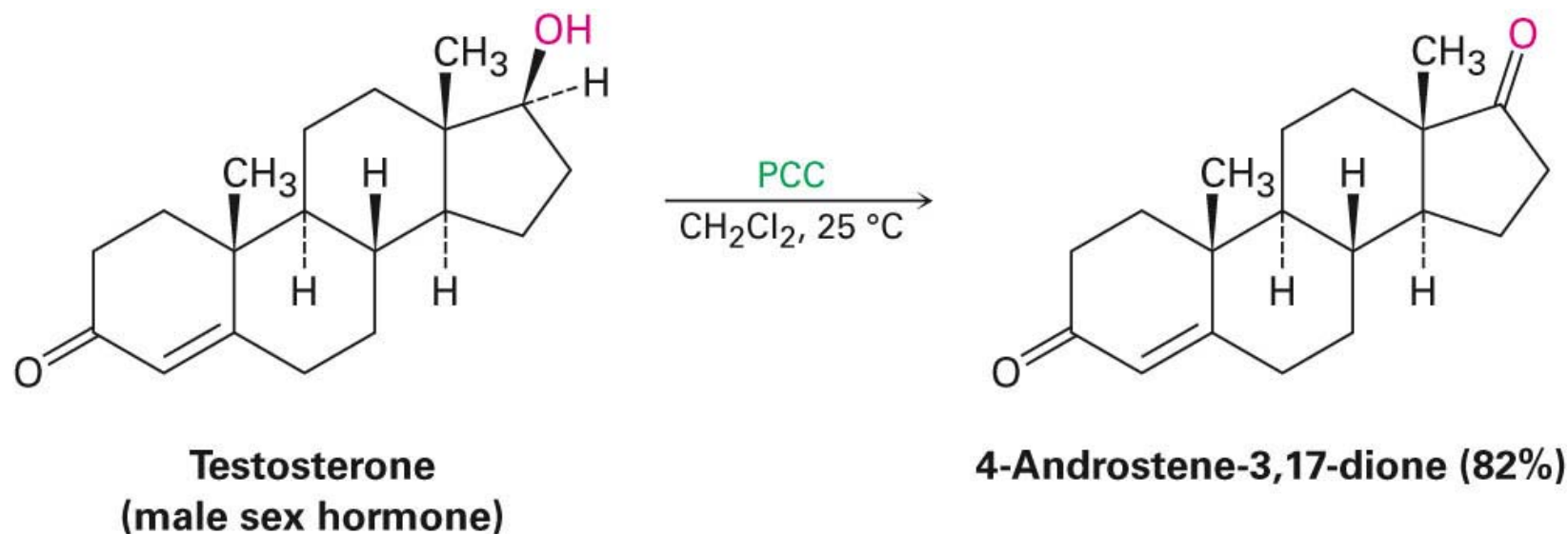


The oxidation of a primary alcohol can be stopped at the aldehyde if pyridinium chlorochromate (PCC) is used as the oxidizing agent



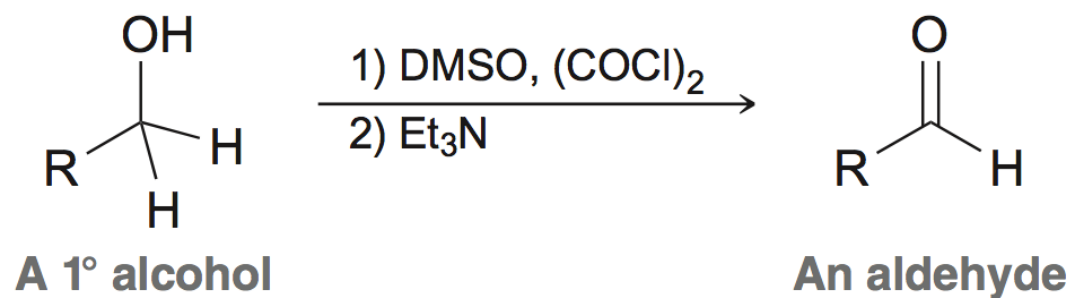
Oxidation of Secondary Alcohols

- Effective with inexpensive reagents such as $\text{Na}_2\text{Cr}_2\text{O}_7$ in acetic acid
- PCC is used for sensitive alcohols at lower temperatures



Oxidation of Alcohols

- Like PCC, the **Swern oxidation** converts **1° alcohols to aldehydes**



For Next Time....

Suggested Homework Problems Chapter 9

1, 7, 9, 13, 18, 20, 32-37, 41, 44, 52, 57

Suggested Homework Problems Chapter 10

1, 2, 12, 16, 23, 24, 33, 42

Suggested Homework Problems Chapter 12!

1, 4, 5, 7, 13, 17, 27-32, 34, 43-45