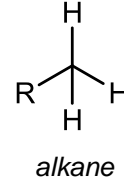
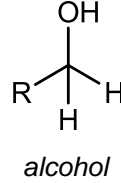
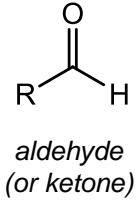
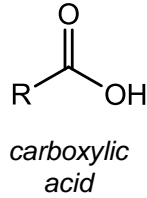


Oxidation States of Carbon

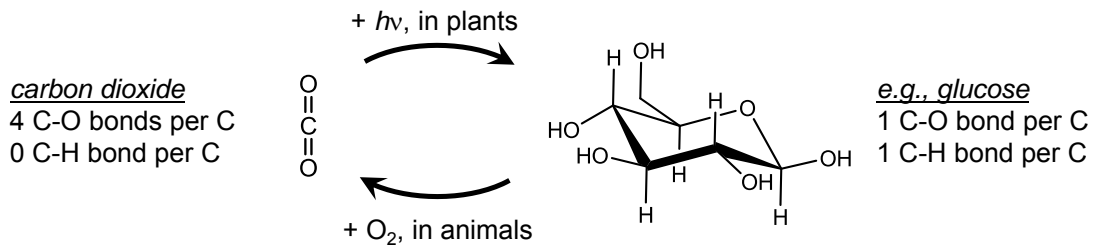


- Loss of H₂
- Addition of O₂ or O



Neither oxidation nor reduction: Addition or loss of H⁺, H₂O, or HX

Oxidation and Reduction in Biology

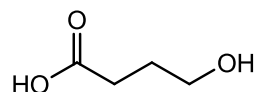
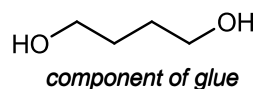


- Loss of H₂
- Addition of O₂ or O



Neither oxidation nor reduction: Addition or loss of H⁺, H₂O, or HX

Biological Oxidation Gone Wrong



gamma-hydroxybutyrate
(GHB, an intoxicant/
date rape drug)



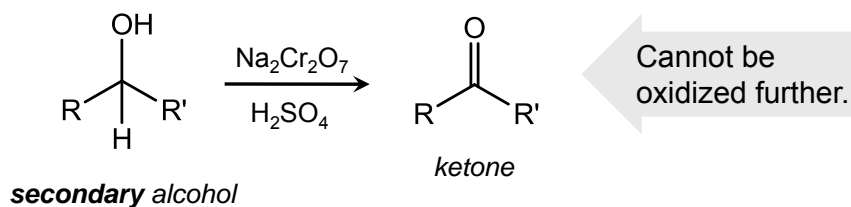
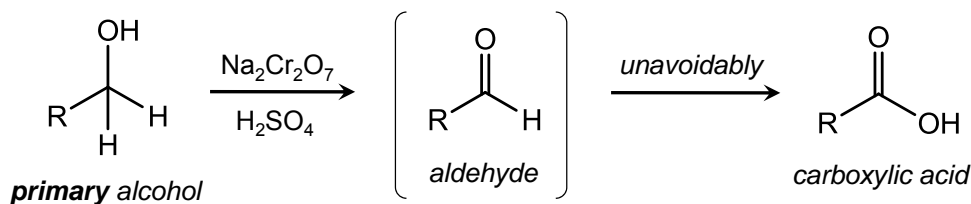
Dr. Kevin Carpenter, biochemical geneticist (specialist in pediatric metabolic disorders), Children's Hospital at Westmead (Sydney), Australia.

Behind him: The Agilent GC/MS used to analyze the Aqua Dots.

New York Times, Nov. 8, 2007
"Sleuthing for Danger in Toy Beads"

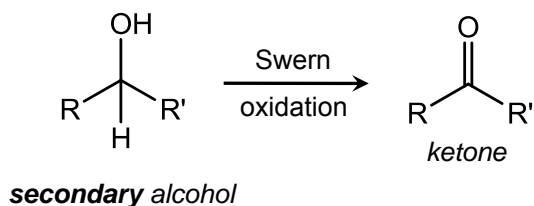
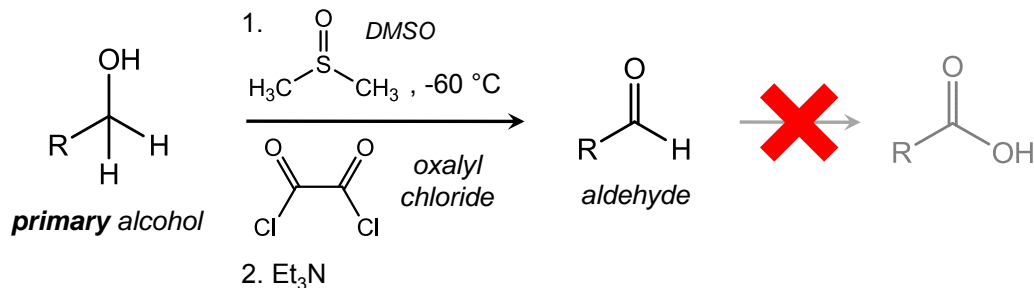
Alcohol Oxidation: Strong Oxidizers

Chromate ($\text{Cr}_2\text{O}_7^{2-}$) is a *strong* oxidizing agent; it oxidizes primary alcohols all the way to carboxylic acids, and secondary alcohols to ketones.



Alcohol Oxidation: Mild Oxidizers

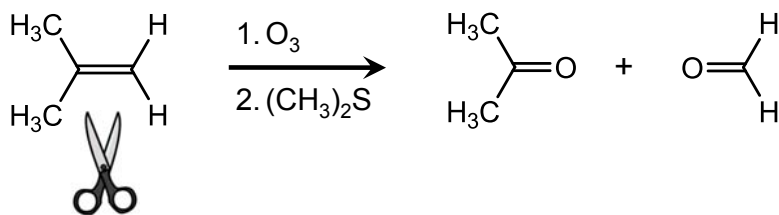
Swern oxidation is a *mild* oxidation process; it oxidizes primary alcohols just to aldehydes (and not all the way to carboxylic acids). It also oxidizes secondary alcohols to ketones.



Smith describes PCC as another mild oxidizing agent that achieves the same goal. The reagents and waste products from Swern oxidation are much less toxic; no one uses PCC any more.

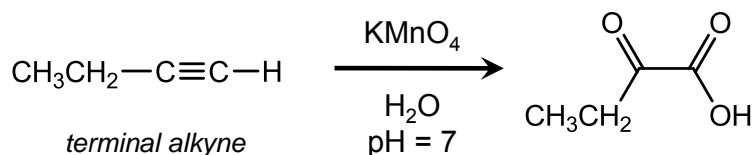
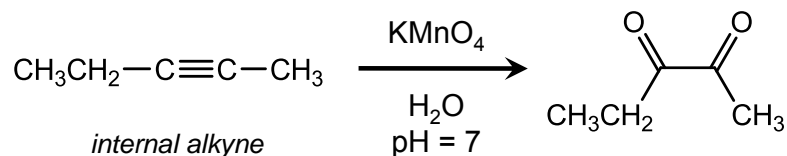
Alkene Ozonolysis

Splits C=C double bonds, converts alkene carbons into carbonyls (C=O).



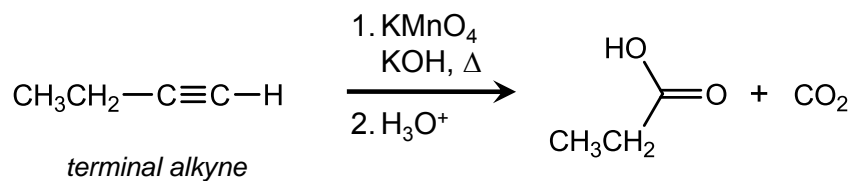
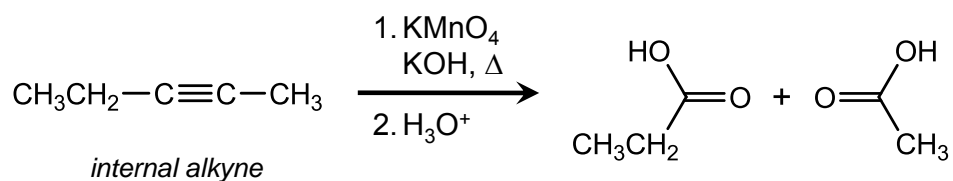
Mild Permanganate Oxidation of Alkynes

At pH = 7, permanganate (MnO_4^-) converts alkynes to C=O groups, but keeps the C-C bond intact.



Strong Permanganate Oxidation of Alkynes

Under harsher conditions, MnO_4^- cleaves the $\text{C}\equiv\text{C}$ bond to yield carboxylic acids.



$\text{O}_3, \text{H}_2\text{O}$ (ozonolysis)
also cleaves C-C bond,
w/ same products.