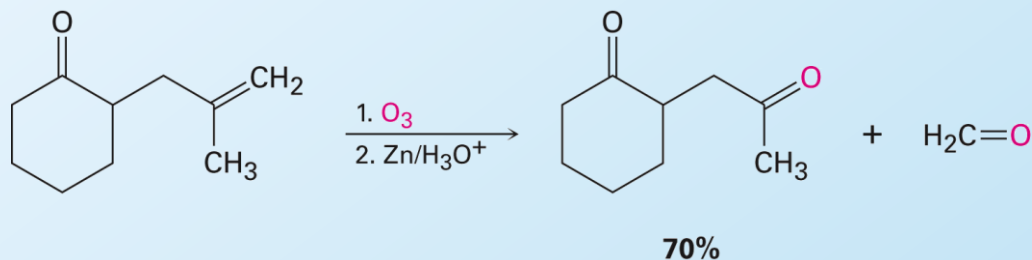
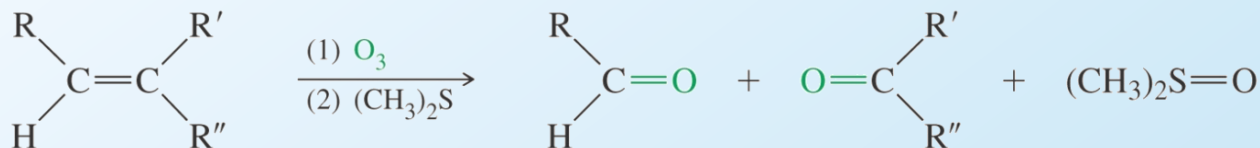
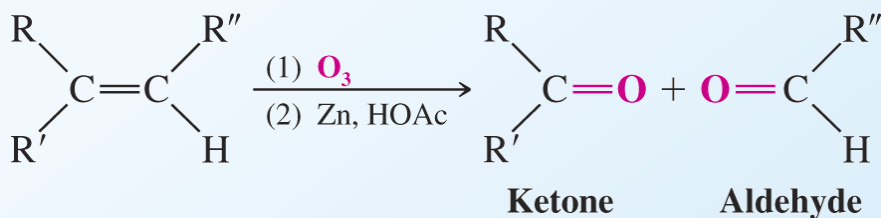


Aldehydes and Ketones Synthesis

Dr. Sapna Gupta

1) From Alkenes

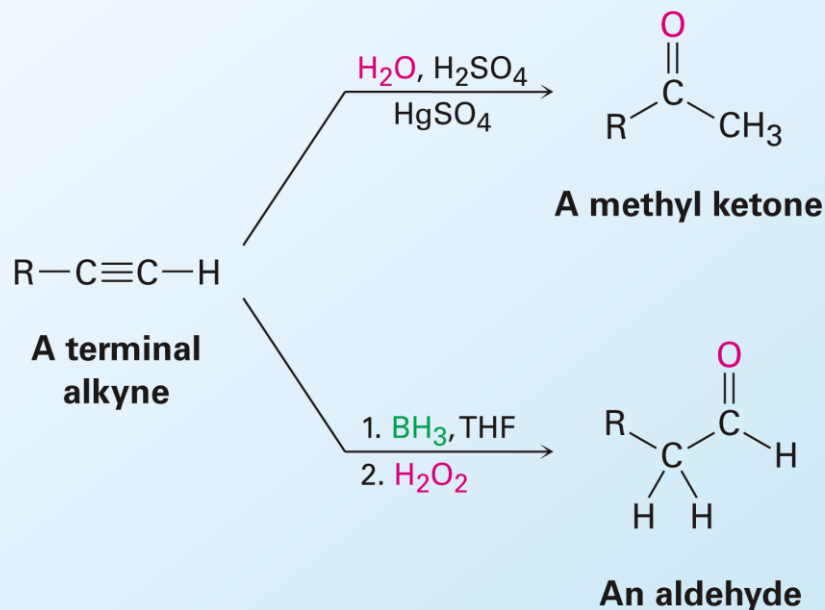
- By oxidative cleavage using ozonolysis.
- Substituted alkenes give ketones while alkenes with H will give aldehydes.



2) Synthesis From Alkynes

Hydration of terminal alkyne

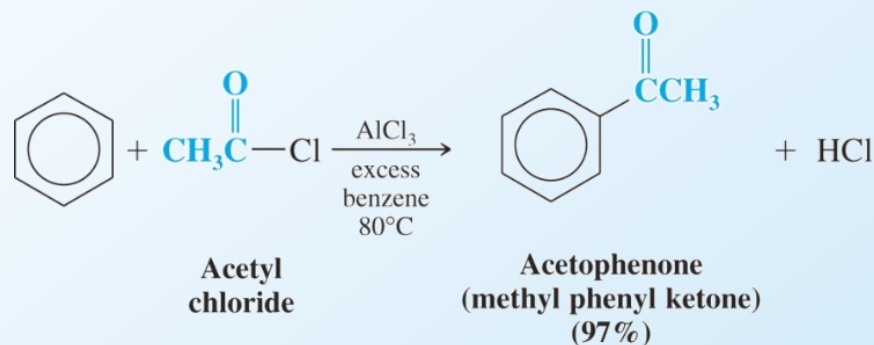
- Use HgSO_4 , H_2SO_4 , H_2O for methyl ketone
- Use Sia_2BH followed by H_2O_2 in NaOH for aldehyde
- Internal alkynes will give only ketones



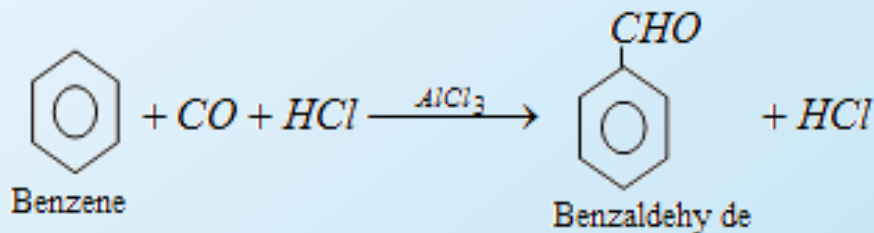
3) Synthesis from Benzene

Friedel-Crafts Acylation

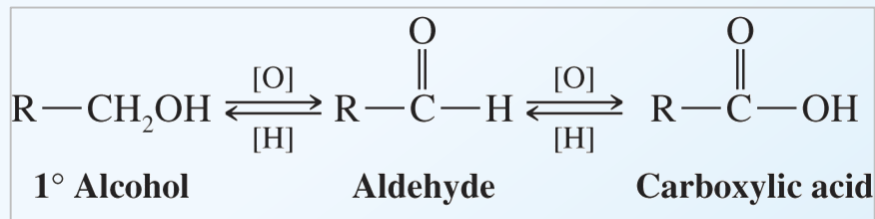
- For ketones: Acid chloride/ AlCl_3 + benzene \rightarrow ketone



- Gatterman-Koch synthesis: synthesis of benzaldehyde

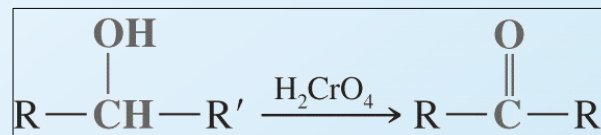


4) Synthesis – Oxidation/Reduction



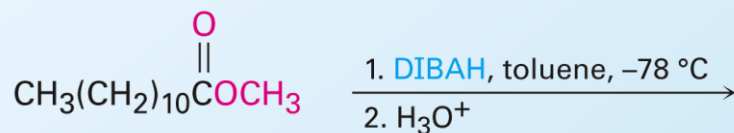
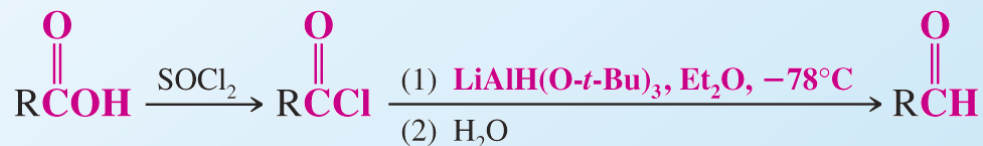
a) Oxidation of Primary and Secondary Alcohols

- 2° alcohol + Na₂Cr₂O₇ → ketone
- 1° alcohol + PCC → aldehyde

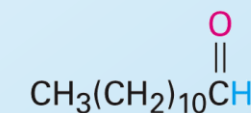


b) Reduction of Acid Chlorides and Esters to form Aldehydes

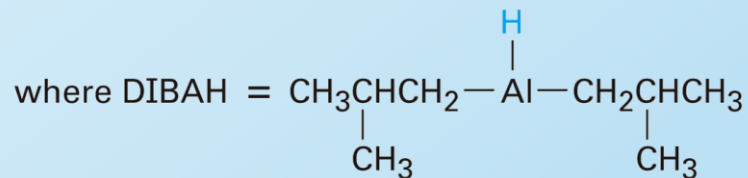
- Use a weak reducing agent to prevent reduction to 1° alcohol.
- Only aldehydes can be synthesized using reduction (not ketones)



Methyl dodecanoate

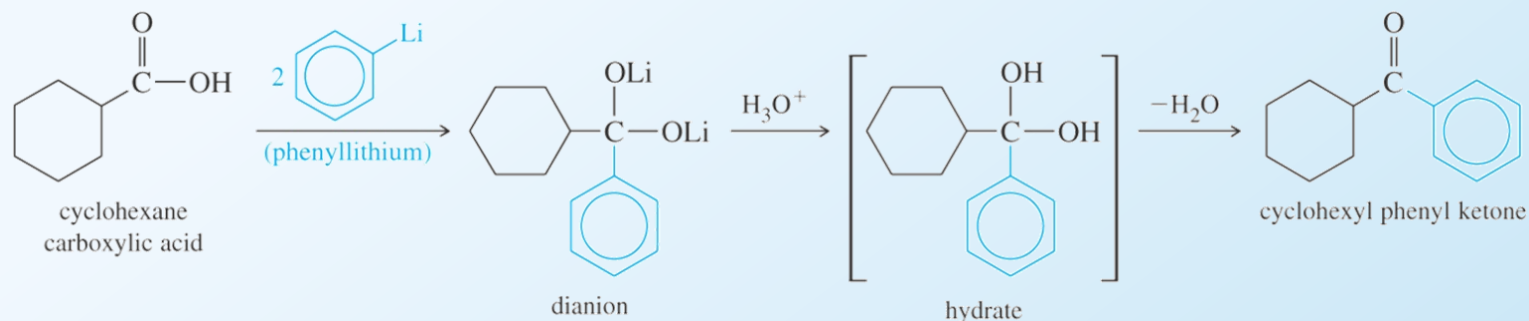


Dodecanal (88%)

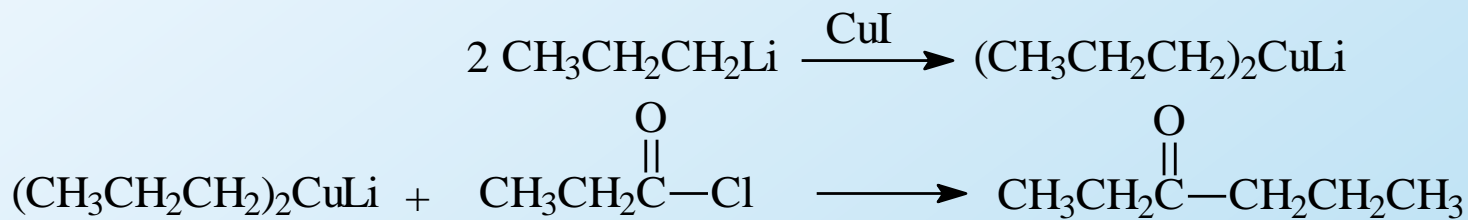


5) Ketones from Organometallics

- Organolithium/Grignard compounds attack the carbonyl and form a dianion.
- Neutralization with aqueous acid produces an unstable hydrate that loses water to form a ketone.

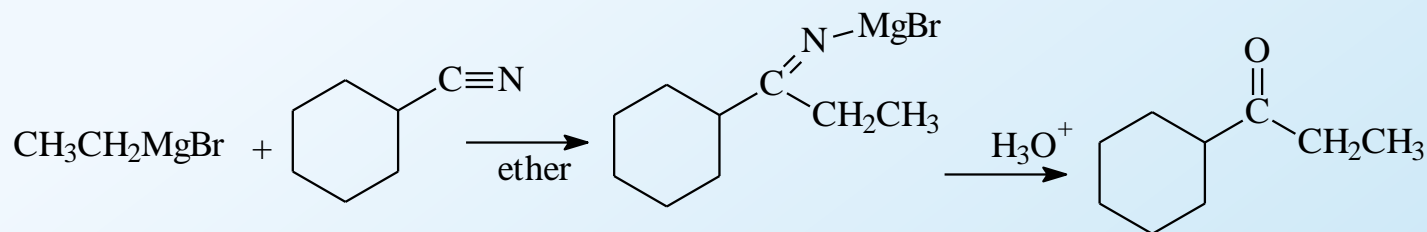


Use lithium dialkylcuprate (R₂CuLi), formed by the reaction of 2 moles of R-Li with cuprous iodide.



6) Ketones from Nitriles

- A Grignard or organolithium reagent attacks the nitrile carbon.
- The imine salt is then hydrolyzed to form a ketone.



Key Concepts

- Synthesis using
 - Alkenes
 - Alkynes
 - Benzene (Friedal Craft acylation)
 - Oxidation of alcohol
 - Reduction of acyl chloride and esters
 - Grignard Reagents