

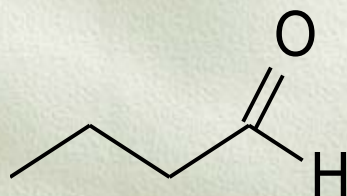
Acylation

Making molecules useful!

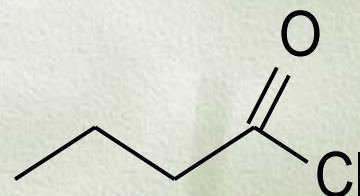


Acyl Halides

- An acyl halide looks like an aldehyde but with a halide instead of the H



Aldehyde



Acyl chloride

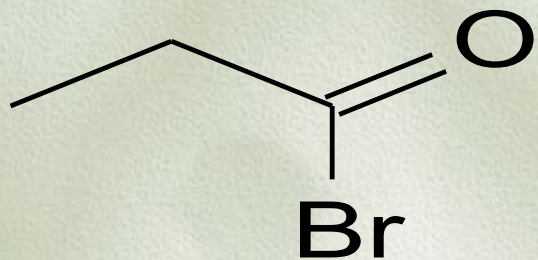
- They are highly reactive and undergo **NUCLEOPHILIC SUBSTITUTION** reactions

Naming an acyl halide

- As always, take the longest C chain for the skeletal name
- Add “anoyl” after the skeletal part
- The big difference is that the halide is no longer a group, but named as if it was part of an ionic compound
 - Fluoride, Chloride, Bromide, Iodide



Naming an acyl halide

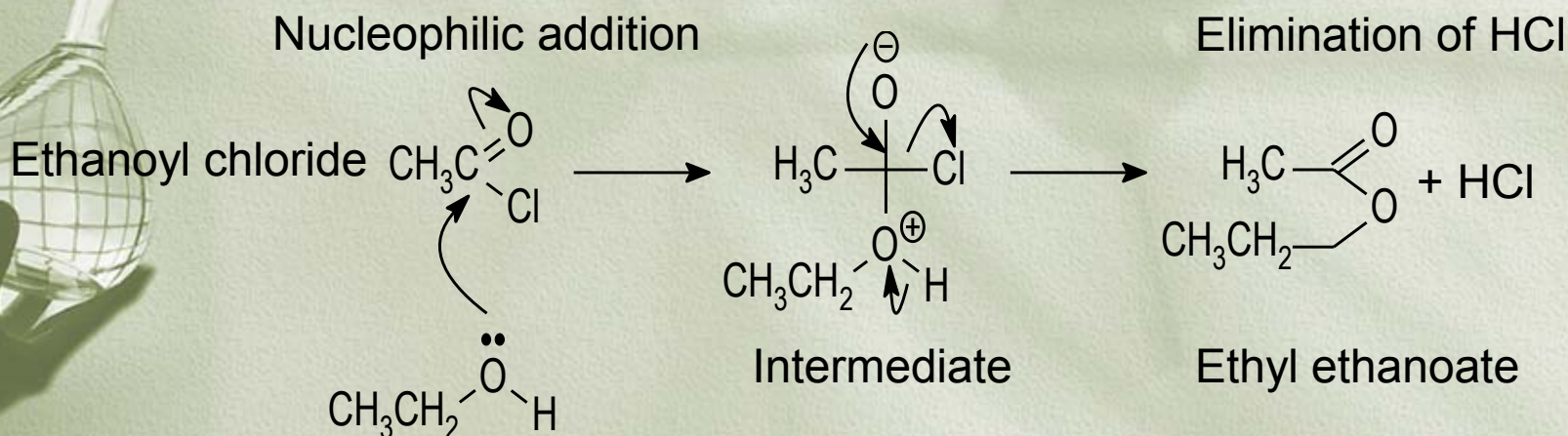


- Longest chain = 3 (prop)
- Name of halide = bromine
 - Becomes bromide
- Acyl compound, add “anoyl”

Propanoyl Bromide

Use of acyl halides

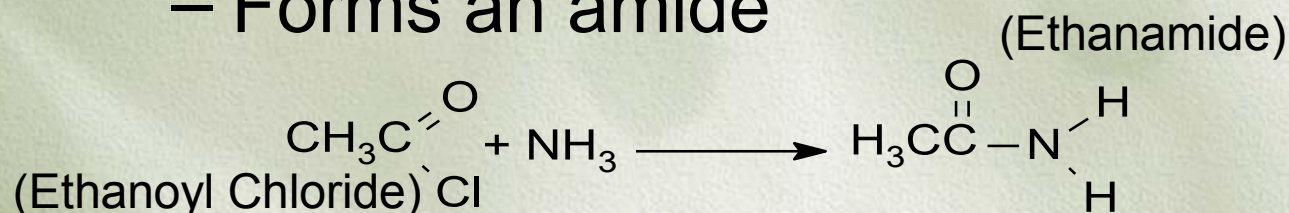
- They are very reactive
 - Easy way to add a Nu⁻ group to a chain
 - Easy route to make an acids and esters



Other acyl halide reactions

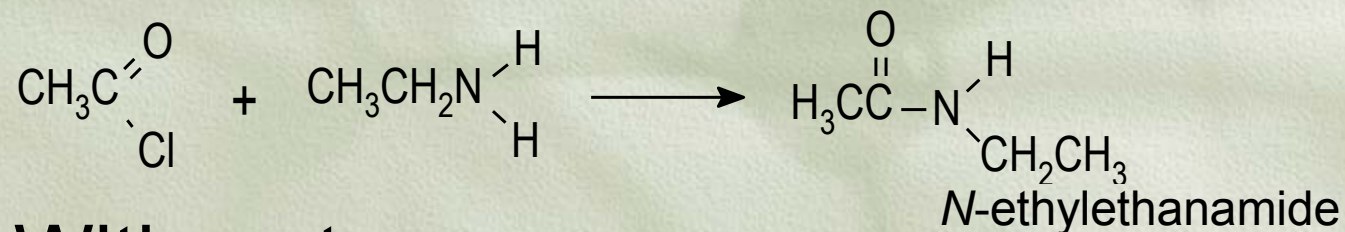
- With ammonia

- Forms an amide



- With primary amines

- Forms a substituted amide

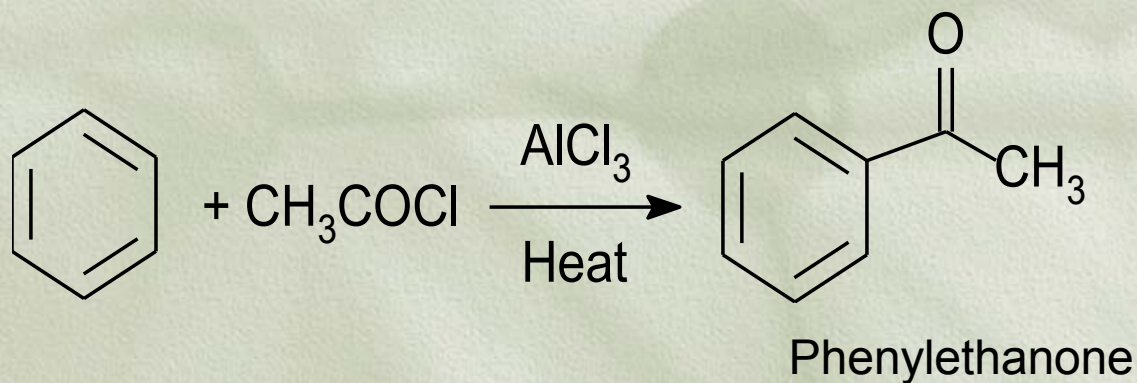


- With water

- Forms a carboxylic acid

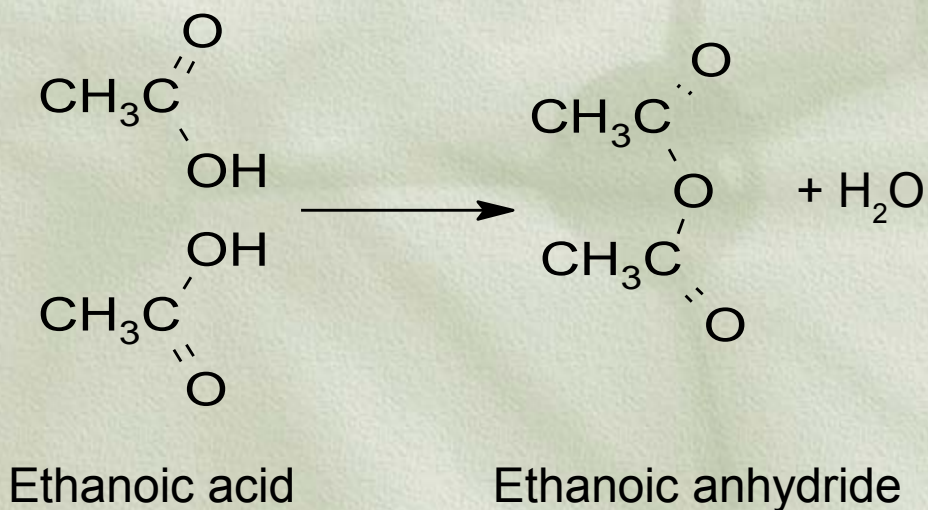
Acylation of benzene

- This is also known as a Friedel Crafts acylation
 - uses AlCl_3 as a catalyst
 - Very handy way to add a carbonyl to a phenyl ring



Acid anhydrides

- When two molecules of a carboxylic acid are dehydrated, they form an acid anhydride
 - General formula : $(\text{RCO})_2\text{O}$



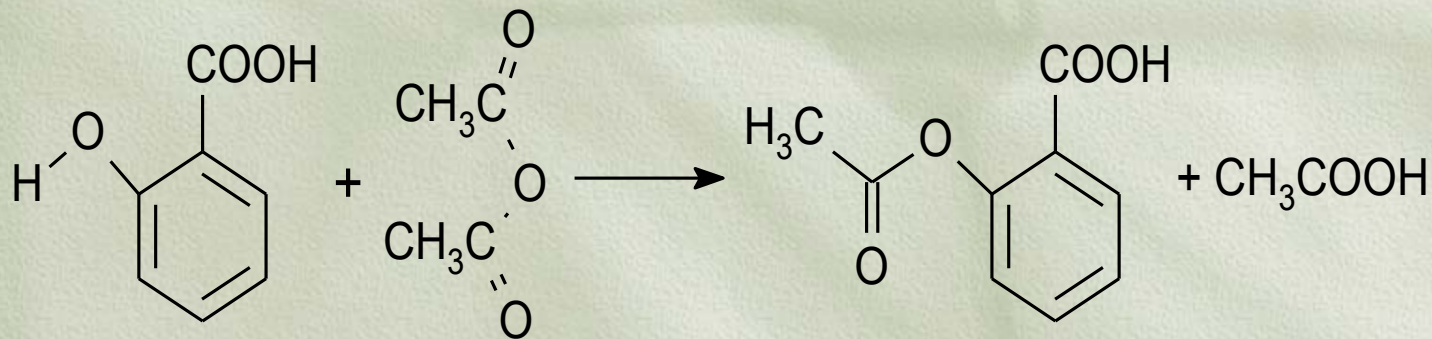
Acid anhydrides

- Acid anhydrides readily attack nucleophiles
 - H_2O , NH_3 , ROH , RNH_2
- Acid anhydrides are less reactive than acyl halides so are safer to use
 - Very commonly used in industry
 - Usually much cheaper than acyl halides



Production of aspirin

- 2-hydroxybenzoic acid is “ethanoylated” with ethanoic anhydride
- This replaces the nucleophilic OH group with an ester to give aspirin and ethanoic acid



2-hydroxybenzoic acid

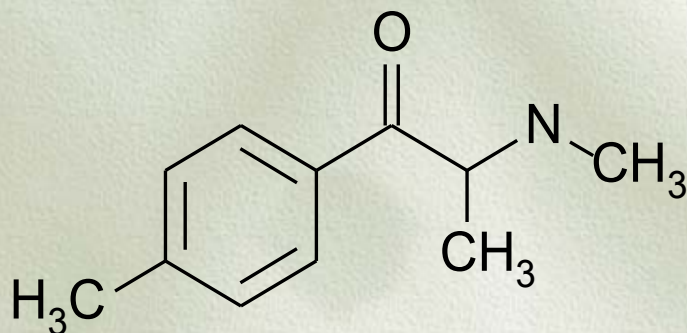
Aspirin (acetyl salicylic acid)

Methadone

- The drug “methadone” is a class of drugs known as “psychoactive” drugs
 - They interrupt the transmission of nerve impulses in the brain
 - The danger is that it is hard to predict which nerve impulses are interrupted
 - Harmless ones include balance
 - Harmful ones include nervous control of vital organs



Methadrone structure



- The compound contains a number of groups
 - Toluene (methyl benzene)
 - Ketone
 - 2° amine
- Synthesis is not easy!

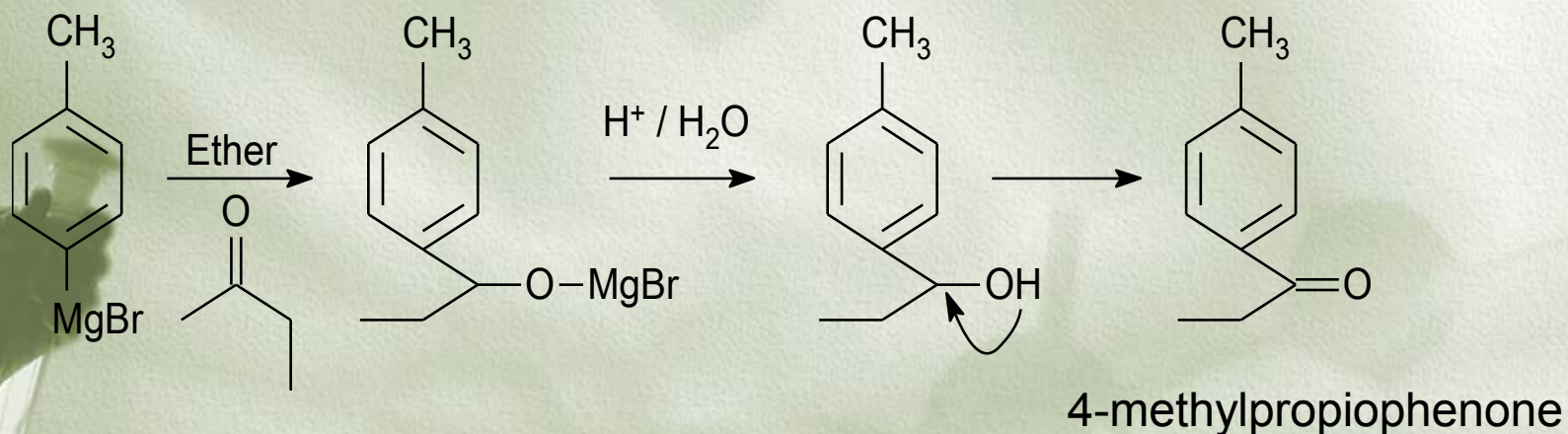
Synthesis routes

- As with all reactions, there are many ways to crack this (such as)
 - React methylamine with an ketone to give the imine
 - React the imine with methyl benzene



Synthesis routes

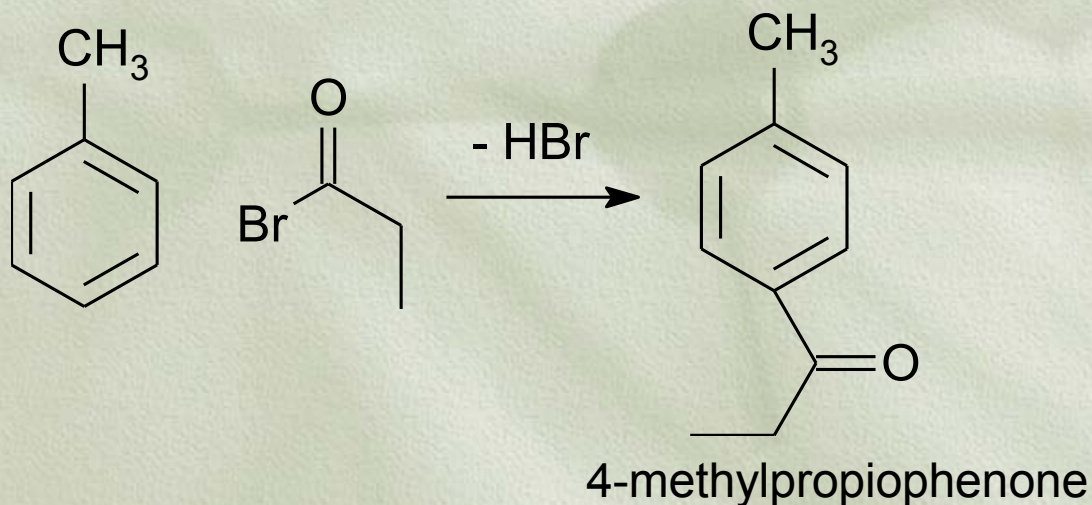
- Another route involves the use of a Grignard reagent



- This gives one half
 - It is a messy route
 - Needs to be anhydrous and requires many steps

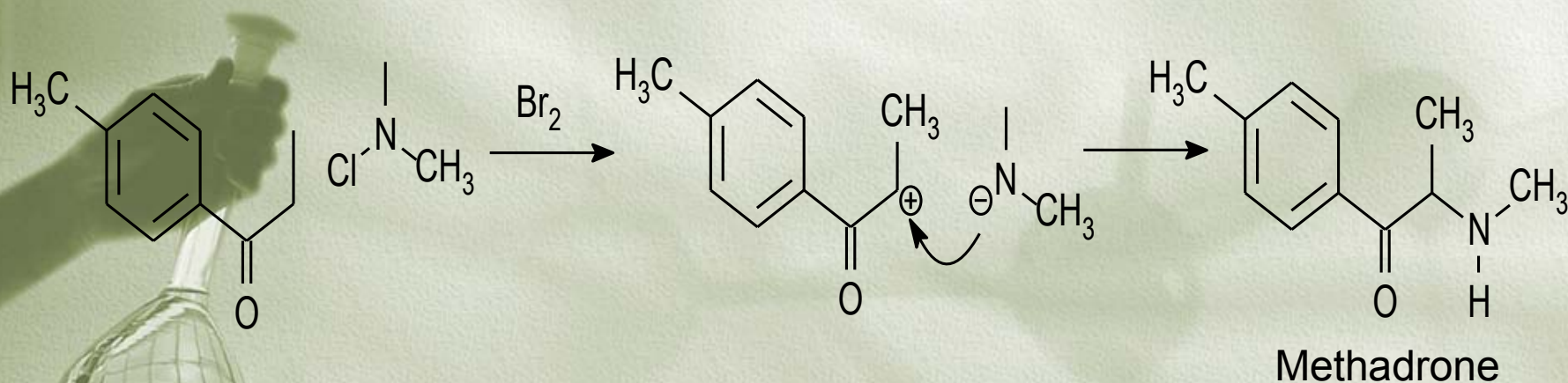
Synthesis routes

- A simpler route would be to use an acyl chloride, though this would be a very vigorous reaction
 - The 4-methylpropiophenone though is easier to produce



Synthesis routes

- The 4-methylpropiophenone is then reacted with a 2° amine, methylamine chloride $\text{Cl}^-\text{N}^+\text{HCH}_3$



**A STEP HAS BEEN MISSED OUT HERE
DELIBERATELY!!!!**