

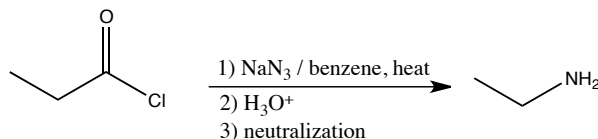
## Chem 345 – Organic Reactions Chapter 23

Prepared by José Laboy, MS

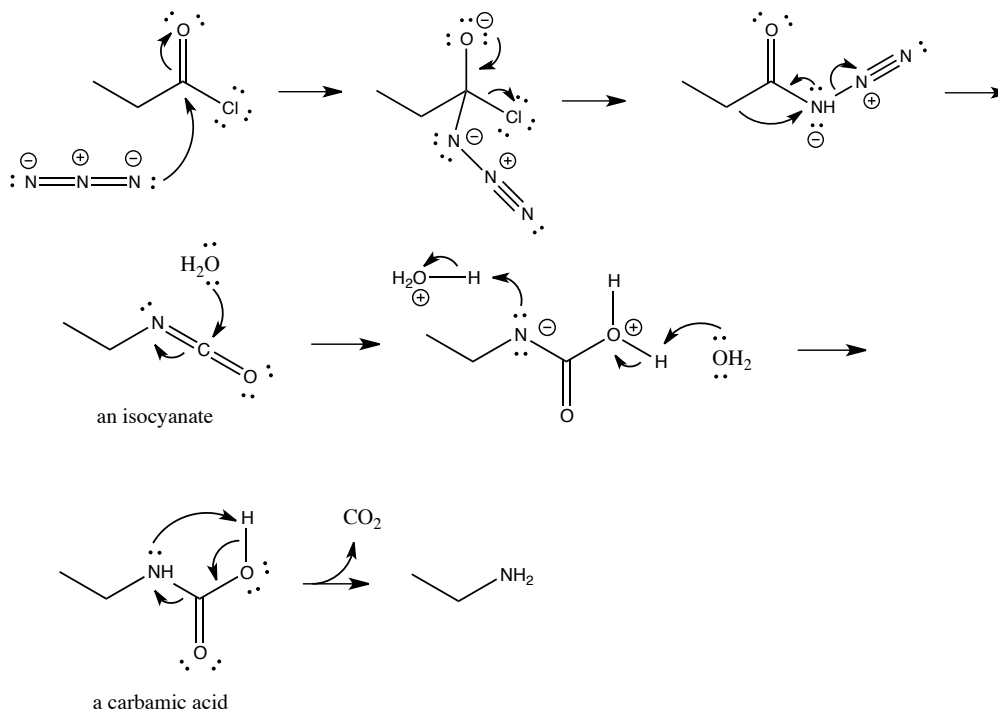
[http: www.chem.wisc.edu/areas/clc](http://www.chem.wisc.edu/areas/clc) (Resource page)

### Curtius Rearrangement

Reaction:



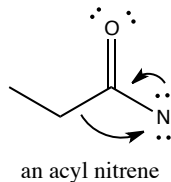
Mechanism:



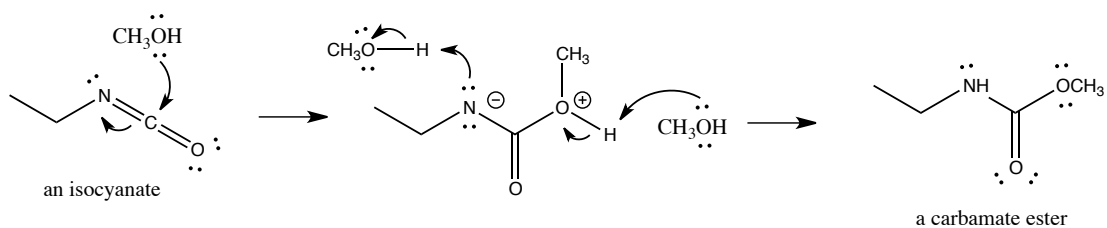
The reaction is concerted, that is, from the acyl azide to the isocyanate. In most cases the isocyanate can be isolated because the acid or basic step is separate. If an alcohol is used after the isocyanate is isolated then a carbamate ester is formed, if an amine is used then a urea derivative is formed. See reactions below.

The carbamic acid formed in acidic media is unstable in heat and readily decomposes into CO<sub>2</sub> and a 1° amine. This reaction occurs with retention of configuration.

There is also evidence though that an acyl nitrene is the intermediate in this reaction. Nitrenes are compounds where the nitrogen although electron deficient has its valence electrons. It's the equivalent of the carbene.



The reaction below shows the formation of a carbamate ester when the isolated isocyanate is placed in an alcohol medium.



On the other hand, the treatment of an isocyanate with an amine produces a urea derivative.

