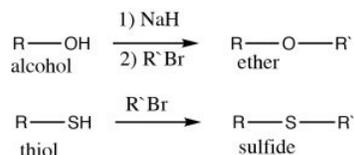


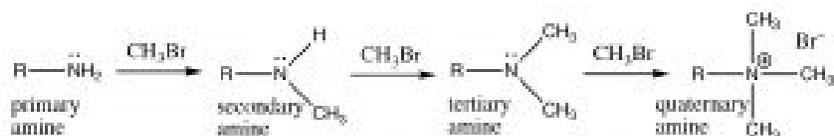
6.2: Nucleophilicity of ROH, RSH, and RNH₂

Earlier (Chapters 1 and 4), we discussed (at great length) that all three functional groups (⁻OH, ⁻NH, and ⁻SH) are nucleophilic: that is, they will react at the carbon center that is electron-deficient. For functional groups that contain nucleophilic centers from the same **row** of the periodic table, the trends in nucleophilicity parallel Bronsted basicity: amines are more nucleophilic (and basic) than alcohols. However, in functional groups that contain nucleophilic centers from the same **group** of the periodic table (nucleophilicity increases down the group, while basicity decreases), thiols are more nucleophilic than alcohols. Both amines and thiols are very nucleophilic. All three groups participate in nucleophilic substitutions as discussed in Chapters 1 and 4.



Examples of these kinds of nucleophilic substitutions are the reactions of alcohols, thiols, and amines with alkyl halides to give the corresponding ethers, sulfides, and (secondary, tertiary or quaternary) amines. Alcohols are not as nucleophilic as thiols and amines, and therefore typically the corresponding alkoxide must be used (because it is more reactive), for the synthesis of ethers.

In the case of amines, the nitrogen can react several times with the electrophile (alkyl halide), and in practice it is difficult to stop the reaction at any intermediate step (in the laboratory).



Amines typically react with electrophiles to give poly-alkylated amines

This page titled [6.2: Nucleophilicity of ROH, RSH, and RNH₂](#) is shared under a [CC BY-NC-SA 4.0](#) license and was authored, remixed, and/or curated by [Melanie M. Cooper & Michael W. Klymkowsky](#).