Chapter 11: Ionic Substitution Reactions

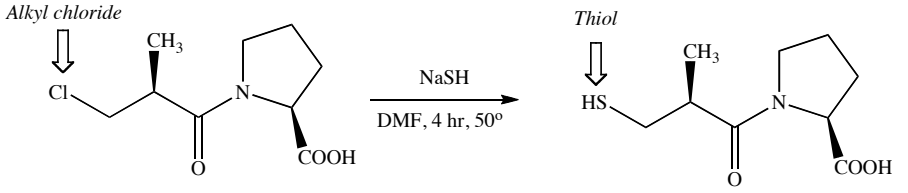
11.01 Why Should I Study This?

Concept Connection

Substitution reaction (8.xx)

In a substitution reaction, one portion of the molecule is replaced by something new. In most organic substitution reactions, the new piece that adds to the molecule, or the old piece that is replaced, or both, are ions. Therefore this process is frequently called an **ionic substitution reaction**. Ionic substitution at sp^3 carbon (the topic of this chapter) is also called *nucleophilic aliphatic substitution*.

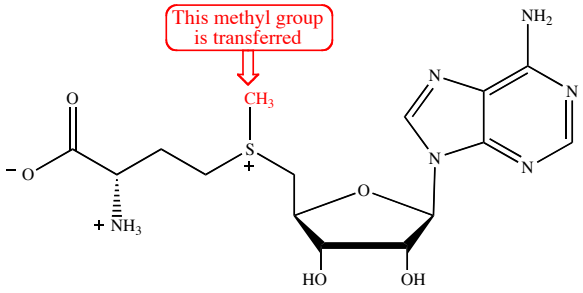
Ionic substitution is among the simplest and most fundamental, as well as most common of all organic reactions. It usually results in the conversion of one functional group, such as an alkyl halide, into a new functional group. Replacement of one functional group with another is a fundamental operation in **organic synthesis**, the science and art of converting simple organic molecules into more complex molecules such as pharmaceuticals. (We study organic synthesis in chapters 14 and 33.) Reaction 11.01 illustrates an ionic substitution reaction in which an alkyl chloride is converted into a thiol. This reaction is the last step in the manufacture of captopril, an antihypertensive drug that works by inhibiting angiotension-converting enzyme.



11.01

Captopril

Ionic substitution is also widespread in biochemical processes. For example, *S*-adenosylmethionine (SAM) can add a methyl group to another molecule to meet a variety of cellular needs. SAM is the focus of this chapter's In the Real World discussion, section 11.10.



S-adenosylmethionine (SAM)

While exploring ionic substitution reactions we will also become familiar with some basic features that are common to many other organic reactions: nucleophiles, leaving groups, steric effects, and solvents.