Functional Groups Determine Chemical Properties

Most biomolecules can be regarded as derivatives of hydrocarbons, compounds with a covalently linked carbon backbone to which only hydrogen atoms are bonded. The backbones of hydrocarbons are very stable. The hydrogen atoms may be replaced by a variety of functional groups to yield different families of organic compounds. Typical of these are alcohols, which have one or more hydroxyl groups; amines, which have amino groups; aldehydes and ketones, which have carbonyl groups; and carboxylic acids, which have carboxyl groups (Fig. 3–5).

Many biomolecules are polyfunctional, containing two or more different kinds of functional groups (Fig. 3–6), each with its own chemical characteristics and reactions. The chemical "personality" of a compound such as epinephrine or acetyl-coenzyme A is determined by the chemistry of its functional groups and their disposition in three-dimensional space.

figure 3–5

Some common functional groups of biomolecules. All groups are shown in their uncharged (nonionized) form. In this figure and throughout the book, we use R to represent "any substituent." It may be as simple as a hydrogen atom, but typically it is a carbon-containing moiety. When two or more substituents are shown in a molecule, we designate them R^1, R^2, and so forth.