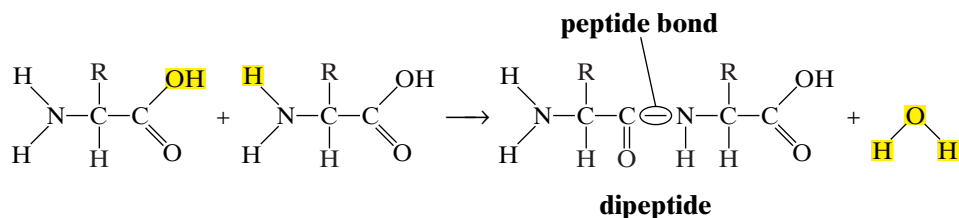


Amino Acid Reactions

Two amino acids can react with each other in an acid-base reaction similar to those discussed in Chapter 14. The basic amino group of one amino acid reacts with the acidic carboxylic acid group of another amino acid, forming a *peptide*, and a molecule of water is lost. This reaction, shown below, is classified as a condensation reaction because the two amino acid molecules join together, and water is formed. The bond formed is called a *peptide bond*, and the product is a *dipeptide* because it is made up of two amino acid units. Longer chains are called *polypeptides*, and chains of 50 or more amino acids are called *proteins*.



Peptide bonds can be broken by enzymes called *proteases*. These enzymes are found in cells and tissues where they aid in the digestion of proteins from food, or where they degrade unneeded or damaged proteins.

Proteins

Proteins are found in all living cells and are the most complex and varied class of biochemical molecules. A **protein** is an organic biological polymer that is made up of polypeptide chains of 50 or more amino acids and is an important building block of all cells. The name *protein* comes from the Greek *proteios*, which means “of first importance.” This name was chosen to show the importance of proteins in living things.

Proteins are the second most common molecules found in the human body (after water) and make up about 10% to 20% of the mass of a cell. Made up of specific sequences of amino acids, proteins have molecular masses that range from 6000 to more than 9 million atomic mass units. About 9000 different protein molecules are found in cells in the human body. Nitrogen accounts for about 15% of the mass of a protein molecule, which makes the structure of a protein quite different from that of a carbohydrate or lipid. Most proteins also contain sulfur, and some contain phosphorus or other elements, such as iron, zinc, and copper.

The importance of proteins in living things comes from their many different functions. Besides being the body’s main food source for nitrogen and sulfur, proteins have many important catalytic, structural, regulatory, and antibody defense functions. Some different kinds of proteins are *keratin*, which is the main component of hair and fingernails; *enzymes*, which catalyze biochemical reactions; *hemoglobin*, which carries oxygen in the blood; *insulin*, which regulates glucose levels; and *antibodies*, which protect the body from foreign substances.

