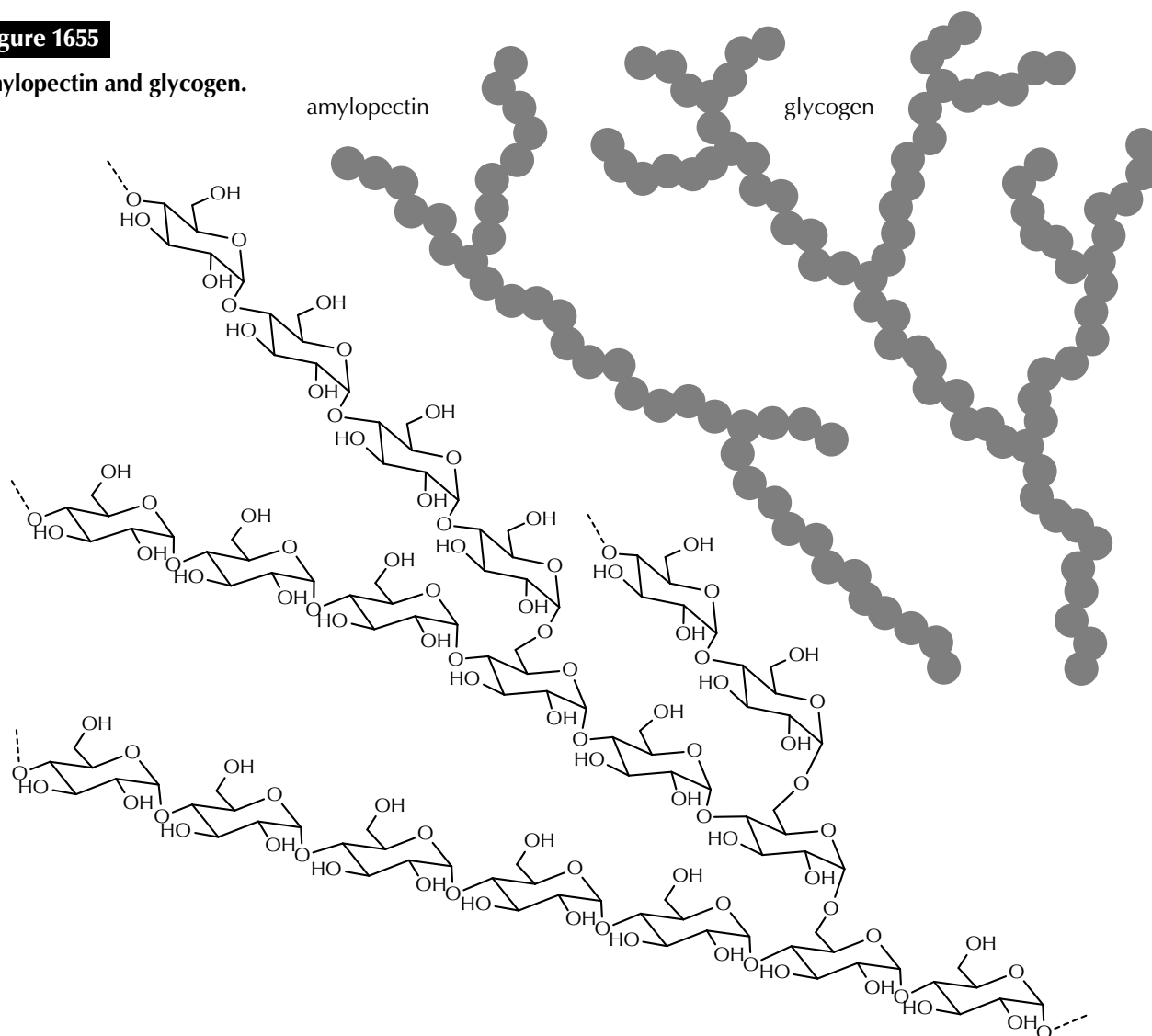


1740 CHAPTER 16 The Chemistry of Carbohydrates

Starch can be fractionated into two different kinds of molecules. One of these is amylose, in which, as in cellulose, there is a single-file line of 300–3,000 glucose molecules. The chief fraction of starch is amylopectin, which has a more complicated structure. It is highly polymeric, with as many as a million glucose units in a single molecule. Structurally, we know that amylopectin has a randomly branched structure, resembling the branching of a tree, in which the hydroxyl group at carbon-6 of some glucose units become the starting point for a new chain. In amylopectin, these branchpoints occur once every 20 to 25 glucose units. Glycogen, the form in which animals store carbohydrates, is similar to amylopectin in structure except that the branching occurs at shorter intervals, with about 12 glucose units in each branch (Figure 1655).

Figure 1655**Amylopectin and glycogen.**

Glycogen is especially abundant in the liver of mammals and also has been isolated from kidneys, brains, and skeletal and cardiac muscles. The highly branched glycogen molecule folds in on itself to form a compact structure that excludes water. This fact about starches is important, because it enables humans to be able to store these molecules efficiently without the need to also store huge amounts of water at the same time.

In 1814, scientists observed that solutions of iodine in water or alcohol, even at extremely low concentration, gave an intense blue-black color in the presence of starches. This extremely sensitive method for detecting starch became known as the starch-iodine test.