11.2.3

# Secondary Active Transport

Like primary active transport, secondary active transport also moves solutes against their concentration gradients. However, with secondary active transport, ATP is not directly involved in the pumping of the solute. Instead, this process uses the energy stored in concentration gradients to move the solute. Since sodium is always in higher concentration outside of the cell (due to primary active transport), the sodium gradient is often used to power secondary active transport. In this process, the carrier protein has a binding site for the solute to be transported, as well as a binding site for sodium. Once both solutes have bound, sodium moves down its concentration gradient and moves into the cell, much like what happens with carrier-mediated diffusion, and in the process pulls another solute into the cell (**symport**) or moves another solute out of the cell (**antiport**), against its concentration gradient. Several organic molecules are transported across membranes by this process, such as glucose and amino acids. ATP energy is required to generate the sodium concentration gradient but is not directly involved in moving the desired solute across the membrane, hence the designation as *secondary active transport*.