Chapter 3, Cellular Form and Function

“Apply What You Know” Answers

p. 79— For one thing, this ensures that damage to one cell, or even to many, destroys a smaller portion of the organ and is less detrimental to organ function. For another, it ensures a large pool of cells that can specialize for different functions within that organ. Another reason is that the plasma membrane and especially the cytoskeleton are unable to physically support cells of excessive size. A large cell, like an extremely full water balloon, will rupture more easily.

p. 83—If the plasma membrane were made of a hydrophilic substance, it would dissolve in the fluids within and around a cell. The membrane would fall apart and the cell would disintegrate. This demonstrates, at a molecular level, the unity of form and function because the hydrophobic structure of the plasma membrane serves the function of containment of the cytoplasm.

p. 89—Each cilium would push the mucus a short distance forward on the power stroke, but it would fail to “let go” and would pull the mucus back to the starting position on the recovery stroke. Thus the mucus would merely oscillate back and forth rather than moving steadily along the mucous membrane.

p. 92—The fluid would rise to a lower level than before because of a lower osmotic pressure on side A. With more water on side A, more water molecules would move from A to B than in the original experiment, so there would be less net accumulation of water on side A.

p. 96—In order to transfer a ligand to the other side of the plasma membrane, the carrier protein must change shape. This is induced by the binding of the solute to the carrier. Then, in order to pick up a new ligand particle, the protein must change back to its original shape. This is induced by the dissociation of the previous ligand from it. If a protein did not change shape as a result of ligand binding and dissociation, it would be unable to pick up a particle on one side of the membrane and release it on the other.