Teacher Notes and Answers

SECTION 3
Instant Replay

1. Answers will vary. An example answer is a colander. Water can pass through it. Food cannot.
2. by changing shape

Vocabulary Check
1. sponge
2. cell membrane
3. receptor

The Big Picture
4. controls what enters and leaves, encloses contents
5. The phospholipids are arranged in a double layer. The polar heads are on the outside, where they interact with the watery environment. The nonpolar tails are on the inside.
6. No, they only respond to a signal if they have a receptor that can receive the signal.
7. The tea bag allows water to pass through the openings, but the tea cannot pass through and stays inside the bag.
Cell membranes are composed of two phospholipid layers.

The cell membrane is the package that a cell comes in. It is a thin layer that separates the inside of the cell from the outside of the cell. It controls what comes into and goes out of the cell. The cell membrane is made up of a double layer of phospholipids. A phospholipid is made of three parts: a phosphate group, a glycerol, and two fatty acid chains.

The phosphate group and glycerol make up the “head.” The fatty acids make up the “tail.” In the cell membrane, phospholipids are arranged tail-to-tail so that the heads face outward. The phosphate group has an electrical charge, so the heads on the outside are polar. They interact with water. All through the two layers of phospholipids are other molecules. Some are proteins; some are cholesterol; some are carbohydrates.
Fluid Mosaic Model

Scientists have developed the **fluid mosaic model** to describe the cell membrane. The membrane is fluid because the phospholipids in each layer can move and slide. It acts like a film of oil on the surface of water. The membrane is like a mosaic because of all the different molecules embedded* among the phospholipids. Together, they look like a mosaic.

Selective Permeability

The cell membrane has **selective permeability**. This means that it allows some materials, but not all, to cross it, or permeate it. In other words, the cell membrane is semipermeable. You might own a semipermeable jacket. The jacket is waterproof; it does not allow water in from the outside. But water vapor from your sweat can exit through the fabric. Just like the jacket, a semipermeable cell membrane lets only some materials through.

In a cell, small nonpolar molecules can usually cross the membrane by themselves. Small polar molecules can be carried by proteins. Large molecules can be moved in vesicles.

**Name another semipermeable object. What can pass through it? What cannot?**

Chemical signals are transmitted across the cell membrane.

Cells are exposed to lots of signals. These signals may be molecules in a cell’s environment. They may be molecules secreted by other cells. Or they may be molecules on the surface of another cell. How can a cell make sense of all these signals? Cells have receptors. A **receptor** is a protein that detects a signal and acts because of it. Only certain molecules will bind to a receptor. A cell responds to a signal only if it has a receptor for that signal.

When a receptor binds to a signal, it changes shape. As a result, the receptor interacts with other molecules in new ways. The binding between a receptor and its signal can set off a chain of events that will affect certain genes. The signal may cause the genes to make proteins, or it may cause the genes to stop making proteins.

* ACADEMIC VOCABULARY

**embedded** to be completely enclosed in; to make an integral part of something
Cells have receptors both inside the cell and in the cell membrane. Recall that some molecules can easily cross the cell membrane, but others cannot. Molecules that can cross the membrane bind to receptors inside the cell. Molecules that cannot cross the membrane bind to receptors in the membrane. When the signal binds to a receptor, the receptor changes its shape. Other molecules inside the cell respond to the changing shape of the receptor. The signal molecule itself never enters the cell.

**How does a receptor in the membrane transmit a message to the cell?**

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**3.3 Vocabulary Check**

| cell membrane | selective permeability |
| phospholipid | receptor |
| fluid mosaic model | |

Circle the correct word from the choices below.

1. Which material has selective permeability, a sponge or a shovel?
2. Which contains the other, cell membrane or phospholipid?
3. Which receives signals, a fluid mosaic model or a receptor?

**3.3 The Big Picture**

4. What does the cell membrane do for the cell? _________________

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5. Describe how the phospholipids are arranged in the cell membrane.

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6. Do cells respond to every signal? Explain. _________________

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7. Explain how a tea bag is an example of selective permeability. ________

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