KEY CONCEPT  The cell membrane is a barrier that separates a cell from the external environment.

The cell membrane forms a boundary that separates the inside of a cell from the outside environment. It plays an active role by controlling the passage of materials into and out of a cell and by responding to signals. The membrane is made of molecules called phospholipids, which consist of three parts: (1) a charged phosphate group; (2) glycerol; (3) two fatty acid chains.

The structure of phospholipids gives them distinct chemical properties. The phosphate group and glycerol form a polar “head.” The fatty acid chains form a nonpolar “tail.”

Cells are both surrounded by water and contain water. In the cell membrane, phospholipids form a double layer, or bilayer. In this way, the polar heads interact with the polar water molecules outside and inside a cell. The nonpolar tails are sandwiched together inside the bilayer, away from the water.

The cell membrane also includes a variety of molecules that give the membrane properties it would not otherwise have.

• Cholesterol molecules make the membrane stronger.
• Proteins help molecules and ions cross the membrane and can act as receptors, proteins that detect a signal and respond by performing an action.
• Carbohydrates help cells distinguish one cell type from another.

The fluid mosaic model describes the characteristics and makeup of the cell membrane. The phospholipids can slip past each other like a fluid. The membrane is made up of many different molecules, like a mosaic.

The cell membrane has a property called selective permeability, which means that it allows some molecules to cross but blocks others. Selective permeability helps a cell maintain homeostasis.

Cells have receptors both in the cell membrane and inside the cell. Receptors help cells communicate with other cells and respond to the environment.

• Membrane receptors bind to signals that cannot cross the cell membrane. They cross the membrane and transmit a message inside the cell by changing shape.
• Intracellular receptors are located inside a cell and bind to molecules that can cross the cell membrane. They may interact with DNA to control certain genes.

1. Why do phospholipids form a bilayer in the cell membrane?

2. How does a sieve (or colander) demonstrate the property of selective permeability?