


Cell Membranes All cells contain cell membranes, which almost always are made up of a double-layered sheet called a lipid bilayer, as shown in **Figure 7-13**. The **lipid bilayer** gives cell membranes a flexible structure that forms a strong barrier between the cell and its surroundings.  The cell membrane regulates what enters and leaves the cell and also protects and supports the cell.

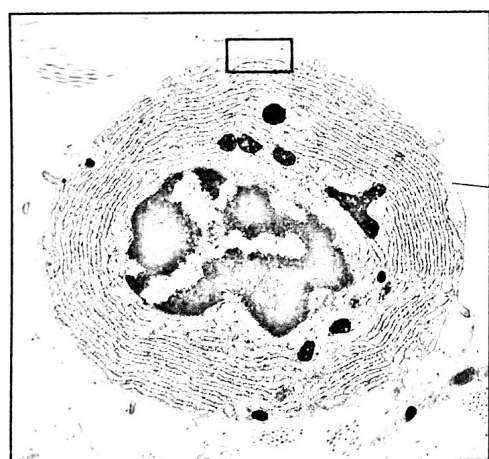
► **The Properties of Lipids** The layered structure of cell membranes reflects the chemical properties of the lipids that make them up. You may recall that many lipids have oily fatty acid chains attached to chemical groups that interact strongly with water. In the language of a chemist, the fatty acid portions of this kind of lipid are hydrophobic (hy druh FOH bik), or “water-hating,” while the opposite end of the molecule is hydrophilic (hy druh FIL ik), or “water-loving.” When these lipids, including the phospholipids that are common in animal cell membranes, are mixed with water, their hydrophobic fatty acid “tails” cluster together while their hydrophilic “heads” are attracted to water. A lipid bilayer is the result. As you can see in **Figure 7-13**, the head groups of lipids in a bilayer are exposed to the outside of the cell, while the fatty acid tails form an oily layer inside the membrane that keeps water out.

ZOOMING IN

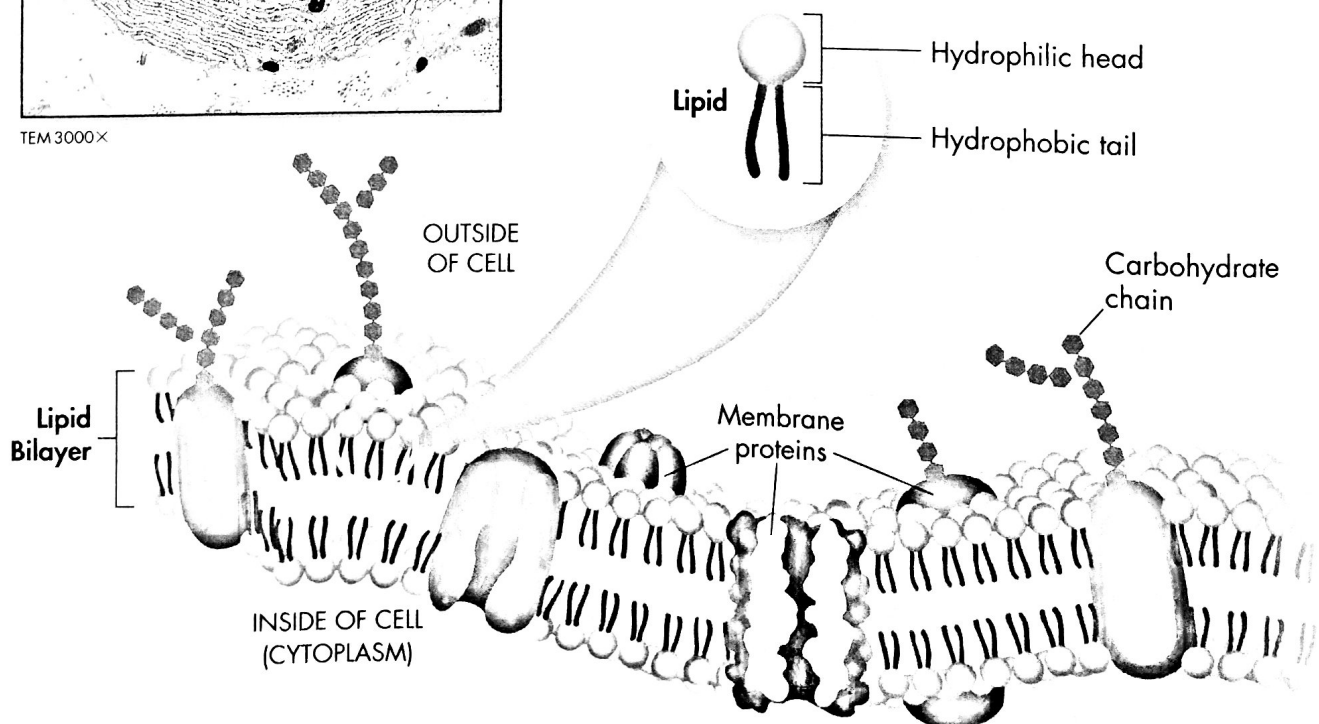
THE CELL MEMBRANE

FIGURE 7-13 Every cell has a membrane that regulates the movement of materials. Nearly all cell membranes are made up of a lipid bilayer in which proteins and carbohydrates are embedded.

Apply Concepts Explain why lipids “self-assemble” into a bilayer when exposed to water.



TEM 3000X



► **The Fluid Mosaic Model** Embedded in the lipid bilayer of most cell membranes are protein molecules. Carbohydrate molecules are attached to many of these proteins. Because the proteins embedded in the lipid bilayer can move around and “float” among the lipids, and because so many different kinds of molecules make up the cell membrane, scientists describe the cell membrane as a “fluid mosaic.” A mosaic is a kind of art that involves bits and pieces of different colors or materials. What are all these different molecules doing? As you will see, some of the proteins form channels and pumps that help to move material across the cell membrane. Many of the carbohydrate molecules act like chemical identification cards, allowing individual cells to identify one another. Some proteins attach directly to the cytoskeleton, enabling cells to respond to their environment by using their membranes to help move or change shape.

As you know, some things are allowed to enter and leave a factory, and some are not. The same is true for living cells. Although many substances can cross biological membranes, some are too large or too strongly charged to cross the lipid bilayer. If a substance is able to cross a membrane, the membrane is said to be permeable to it. A membrane is impermeable to substances that cannot pass across it. Most biological membranes are **selectively permeable**, meaning that some substances can pass across them and others cannot. Selectively permeable membranes are also called semipermeable membranes.

7.2 Assessment

Review Key Concepts

- a. Review** What are the two major parts of the cell?

b. Use Analogies How is the role of the nucleus in a cell similar to the role of the captain on a sports team?
- a. Review** What is the function of lysosomes?

b. Apply Concepts How do contractile vacuoles help maintain water balance?
- a. Review** What is the difference between rough and smooth ER?

b. Sequence Describe the steps involved in the synthesis, packaging, and export of a protein from a cell.
- a. Review** What is the function of mitochondria?

b. Infer You examine an unknown cell under a microscope and discover that the cell contains chloroplasts. From what type of organism does the cell likely come?

- a. Review** Why is the cell membrane sometimes referred to as a fluid mosaic? What part of the cell membrane acts like a fluid? And what makes it like a mosaic?

b. Explain How do the properties of lipids help explain the structure of a cell membrane?

c. Infer Why do you think it's important that cell membranes are *selectively permeable*?

VISUAL THINKING

- Using the cells on the next page as a guide, draw your own models of a prokaryotic cell, a plant cell, and an animal cell. Then use each of the vocabulary words from this lesson to label your cells.