



5. What are the two main ideas in cell theory?

### **3.3 Looking at Cells**

6. Why are light microscopes of limited use to cell biologists?

7. Why are electron microscopes particularly useful to cell biologists?

### **3.4 A Closer Look at Eukaryotic Cells**

8. What is the nucleus of a cell?

9. Which structure separates the inside of the cell from the outside?



10. Describe the cytoskeleton and the organelles, which are both found in the cytoplasm of cells.

### **3.5 The Cell Membrane**

11. What are three components of the cell membrane?

12. How are phospholipids arranged in the cell membrane?

13. What are some of the functions of membrane proteins?



### 3.6 Cell Organelles

14. What is the function of mitochondria?

15. What is the function of lysosomes?

16. What is the function of chloroplasts?

**(CLICK TO CHECK YOUR ANSWERS)**

### Challenging Review Questions

#### 3.1 What Is a Cell?

17. Are your cells more like those of yeast or those of bacteria? Defend your answer.



18. You look at a cell under a microscope and discover that the cell has mitochondria and chloroplasts. Is the cell a eukaryotic cell or a prokaryotic cell? Is the cell from a plant or from an animal? Defend your answers.

### 3.2 Cell Theory

19. Viruses are pieces of genetic of genetic material wrapped in a protein coat. Are viruses made up of cells? Based on what you know about cell theory, are viruses living things?

### 3.3 Looking at Cells

20. You hike near a pond, where you find strands of developing frog eggs. Each of the eggs is about 1 to 2 mm in diameter. You decide you want to study the eggs as they develop into tadpoles. What kind of microscope could you use?

21. What kind of microscope could you use to look at bacteria?



22. What kind of microscope could you use to look at viruses?

### **3.4 A Closer Look at Eukaryotic Cells**

23. How are a cell's cytoskeleton and organelles like a person's skeleton and organs?

24. How is the function of a cell wall different from the function of a cell membrane? Do you have cell walls, cell membranes, both, or neither?

### **3.5 The Cell Membrane**

25. Explain why phospholipids form a double layer in the cell membrane. Be sure to use the words hydrophilic and hydrophobic in your answer.

26. Why is the cell membrane called a fluid mosaic?



### 3.6 Cell Organelles

27. What organelle is found only in plants? What does this organelle do? Does this explain why animals have to eat but plants don't?

28. Some cells in the body have more mitochondria than others. For example, nerve cells, muscle cells, and liver cells have lots of mitochondria. Bone cells and fat cells have very few mitochondria. What do you think explains this difference?

**(CLICK TO CHECK YOUR ANSWERS)**

### Apply & Discuss Questions

29. A friend in your class is reading about biological cells that store energy in the form of tiny lipid droplets. He says, "It says here that the membranes around the droplets are just a single phospholipid layer, instead of a double layer like everywhere else. That doesn't make sense, does it?" What is your reply?

**(CLICK TO CHECK YOUR ANSWERS)**



## End of Chapter Solutions

### Simple Review Solutions

1. Prokaryotes now include two major lineages, the bacteria and the archaea. Eukaryotes include all animals, plants, fungi, and protists.
3. Eukaryotic cells have their DNA in a distinct nucleus, a feature that distinguishes them from prokaryotes. In addition, the DNA of eukaryotic cells is found in linear, rather than circular, chromosomes.
5. Cell theory says that all living things are made up of one or more cells and that all cells come from other cells.
7. Electron microscopes are able to resolve objects about a nanometer ( $10^{-9}$  meter) in size. This covers just about everything of biological interest.
9. The cell membrane.
11. The three primary components of the cell membrane are phospholipids, proteins, and short carbohydrates.
13. Membrane proteins serve a variety of functions—they help cells communicate with other cells, control transport into and out of cells, and join cells to one another.
15. Lysosomes are the garbage disposals of a cell. These organelles break down organic materials, such as damaged or worn-out organelles.

### Challenging Review Solutions

17. Yeast is a eukaryote, and bacteria are prokaryotes. You are also a eukaryote, and for that reason, your cells are definitely more like those of yeast. For example, like yeast cells, your cells have a nucleus and other organelles missing from prokaryotes.
19. Viruses are not made up of cells. Their structure is very different from, and much simpler than that of a cell. Based on cell theory, viruses are not living things because they are not made up of one or more cells.
21. Most bacteria are large enough to be seen using a light microscope. However, an electron microscope could allow you to see smaller details within bacteria that could be of great interest. So, it would be great to use both!
23. The cytoskeleton provides structure to a cell and helps it hold its shape. In other words, its function is similar to what your skeleton does for your body. And, each of a cell's organelles performs a specific function for the cell, similar to the way each of your organs performs a specific function in your body.
25. Phospholipids have hydrophilic "heads" and hydrophobic "tails." The hydrophilic heads are drawn to the watery environment inside and outside the cell. The hydrophobic tails, on the other hand, want to





“get away from” that environment. The setup in which the hydrophilic areas and the hydrophobic areas of phospholipids are all in the environments they prefer is one in which the phospholipids form a double layer with the heads pointing outwards and the tails pointing inwards.

27. Chloroplasts are found only in plant cells. Chloroplasts are responsible for photosynthesis. This does explain why plants don't need to eat but animals do—through photosynthesis, plants are able to make their own organic molecules that they can then break down for energy.

### Apply & Discuss Solutions

29. Phospholipids around a tiny lipid droplet have their hydrophilic heads pointing out and their hydrophobic tails pointing in. The tails are in this way shielded from the watery environment.

