CHAPTER 4—CELL STRUCTURE AND FUNCTION

MULTIPLE CHOICE

1. Hooke's discovery of cells was made observing
   a. living algal cells.
   b. living human blood cells.
   c. dead plant cells.
   d. dead protist cells.

   ANS: C DIF: 1 OBJ: 4-1.1

2. The smallest units of life in all living things are
   a. cells.
   b. mitochondria.
   c. cytoplasm.
   d. Golgi apparatus.

   ANS: A DIF: 1 OBJ: 4-1.3

3. When the volume of a cell increases, its surface area
   a. increases at the same rate.
   b. remains the same.
   c. increases at a faster rate.
   d. increases at a slower rate.

   ANS: D DIF: 1 OBJ: 4-2.2

4. Surface area is an important factor in limiting cell growth because
   a. the cell can burst if the membrane becomes too large.
   b. materials cannot enter the cell if the surface is too large.
   c. the cell may become too large to take in enough food and to remove enough wastes.
   d. waste products cannot leave the cell if the cell is too small.

   ANS: C DIF: 1 OBJ: 4-2.2

5. The size to which a cell can grow is limited by its
   a. location.
   b. structure.
   c. function.
   d. surface area.

   ANS: D DIF: 1 OBJ: 4-2.2

6. A cell that can change its shape would be well suited for
   a. receiving and transmitting nerve impulses.
   b. covering the body surface.
   c. moving to different tissues through narrow openings.
   d. All of the above

   ANS: C DIF: 2 OBJ: 4-2.1

7. One difference between prokaryotes and eukaryotes is that
   a. nucleic acids are found only in prokaryotes.
   b. mitochondria are found in larger quantities in eukaryotes.
   c. the Golgi apparatus is found only in prokaryotes.
   d. prokaryotes have no nuclear membrane.

   ANS: D DIF: 1 OBJ: 4-2.4

8. Which of the following is characteristic of prokaryotes?
   a. They have a nucleus.
   b. They existed on Earth before eukaryotes.
   c. The organelles in their cytoplasm are surrounded by membranes.
   d. None of the above

   ANS: B DIF: 1 OBJ: 4-2.4

9. Which of the following is an example of a prokaryotic cell?
   a. an amoeba
   b. a virus
   c. a bacterium
   d. a liver cell

   ANS: C DIF: 1 OBJ: 4-2.4

10. Only eukaryotic cells have
   a. DNA.
   b. membrane-bound organelles.
   c. ribosomes.
   d. cytoplasm.

   ANS: B DIF: 1 OBJ: 4-2.4

11. Studying a picture of a cell taken with an electron microscope, you find that the cell has no nucleus and no mitochondria, but it does have a plasma membrane and a cell wall. You conclude that the cell is probably from a(n)
   a. animal.
   b. plant.
   c. prokaryote.
   d. extinct organism.

   ANS: C DIF: 1 OBJ: 4-2.4

12. Plasma membranes
   a. are part of only a small number of cells.
   b. contain genes.
   c. are made of DNA.
   d. are thin coverings that surround cells.

   ANS: D DIF: 1 OBJ: 4-2.3

13. The structure that regulates what enters and leaves the cell is called the
   a. nucleus.
   b. cell wall.
   c. nuclear membrane.
   d. plasma membrane.

   ANS: D DIF: 1 OBJ: 4-2.3

14. The plasma membrane
   a. encloses the contents of a cell.
   b. allows material to enter and leave the cell.
   c. is selectively permeable.
   d. All of the above

   ANS: D DIF: 1 OBJ: 4-3.1

15. A structure within a cell that performs a specific function is called a(n)
   a. organelle.
   b. organ tissue.
   c. tissue.
   d. biocenter.

   ANS: A DIF: 1 OBJ: 4-2.4

16. A particularly active cell might contain large numbers of
    a. chromosomes.
    b. vacuoles.
    c. mitochondria.
    d. walls.

    ANS: C DIF: 1 OBJ: 4-3.4

17. The Golgi apparatus is an organelle that
    a. receives proteins and lipids from the endoplasmic reticulum.
    b. labels the molecules made in the endoplasmic reticulum with tags that specify their destination.
    c. releases molecules in vesicles.
    d. All of the above

    ANS: D DIF: 1 OBJ: 4-3.3

18. One important organelle that helps maintain homeostasis by moving supplies from one part of the cell to the other is the
    a. endoplasmic reticulum.
    b. mitochondrion.
    c. nucleus.
    d. cytoplasm.

    ANS: A DIF: 1 OBJ: 4-3.3

19. In which of the following organelles is a cell's ATP produced?
    a. mitochondrion
    b. endoplasmic reticulum
    c. Golgi apparatus
    d. lysosome

    ANS: A DIF: 1 OBJ: 4-3.4

20. Numerous hairlike organelles that protrude from the surface of a cell and are packed in tight rows are called
    a. flagella.
    b. microtubules.
    c. actin filaments.
    d. cilia.

    ANS: D DIF: 1 OBJ: 4-3.3

21. Proteins are made on the
    a. mitochondria.
    b. ribosomes.
    c. nucleus.
    d. plasma membrane.

    ANS: B DIF: 1 OBJ: 4-3.3

22. The packaging and distribution center of the cell is the
    a. nucleus.
    b. Golgi apparatus.
    c. central vacuole.
    d. nuclear envelope.

    ANS: B DIF: 1 OBJ: 4-3.3

23. The double membrane surrounding the nucleus is called the
    a. nucleolus.
    b. nuclear wall.
    c. nucleoplasm.
    d. nuclear envelope.

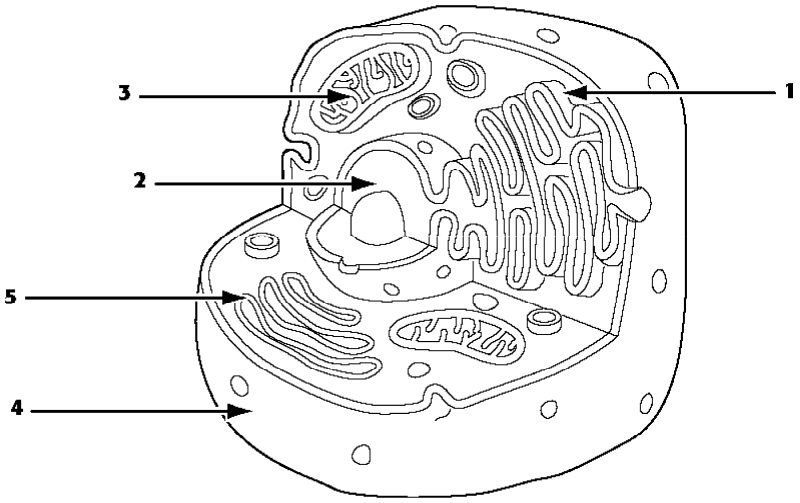
    ANS: D DIF: 1 OBJ: 4-3.2

24. All cells have
    a. a covering called a plasma membrane that surrounds the cell and controls what information and materials enter and leave it.
    b. an internal fluid that gives shape to the cell and supports the other things within it.
    c. either a central zone or a nucleus that contains the cell's genes.
    d. All of the above

    ANS: D DIF: 1 OBJ: 4-1.4

25. cell : plasma membrane ::
    a. nucleus : chromosome
    b. nucleus : nuclear envelope
    c. chromosome : DNA
    d. cell : DNA

    ANS: B DIF: 2 OBJ: 4-3.3



26. Refer to the illustration above. Which structure immediately identifies this cell as a eukaryote?
    a. structure 1
    b. structure 2
    c. structure 3
    d. structure 4

    ANS: B DIF: 2 OBJ: 4-2.4

27. Refer to the illustration above. The cell uses structure 3
    a. to transport material from one part of the cell to another.
    b. to package proteins so they can be stored by the cell.
    c. as a receptor.
    d. to transfer energy from organic molecules to ATP.

    ANS: D DIF: 2 OBJ: 4-3.4

28. Refer to the illustration above. Structure 1 is
    a. the endoplasmic reticulum.
    b. a Golgi apparatus.
    c. a mitochondrion.
    d. the nucleus.

    ANS: A DIF: 2 OBJ: 4-3.3

29. Refer to the illustration above. This cell's chromosomes are found in
a. structure 1.
b. structure 2.
c. structure 3.
d. structure 5.

ANS: B DIF: 2 OBJ: 4-3.2

30. Refer to the illustration above. The cell shown is probably an animal cell because
a. it has mitochondria.
b. it does not have a cell wall.
c. it has a plasma membrane.
d. it does not have a nucleus.

ANS: B DIF: 2 OBJ: 4-4.1

31. All of the following are found in both plant and animal cells, *except*
a. a cell wall.
b. a plasma membrane.
c. mitochondria.
d. the endoplasmic reticulum.

ANS: A DIF: 1 OBJ: 4-4.1

32. How are chloroplasts like mitochondria?
a. They can both use energy from sunlight.
b. They look alike.
c. They both contain DNA.
d. They are both found in animal cells.

ANS: C DIF: 1 OBJ: 4-4.4

33. The organelles associated with photosynthesis are the
a. mitochondria.
b. chloroplasts.
c. Golgi apparatus.
d. vacuoles.

ANS: B DIF: 1 OBJ: 4-4.4

34. The organelles in plant cells that contain a green pigment are the
a. mitochondria.
b. bilayer lipids.
c. chloroplasts.
d. Golgi apparatus.

ANS: C DIF: 1 OBJ: 4-4.4

35. Plant cells have a large membrane-bound space in which water, waste products, and nutrients are stored. This place is known as a
a. mitochondrion.
b. chloroplast.
c. Golgi apparatus.
d. central vacuole.

ANS: D DIF: 1 OBJ: 4-4.3

36. Which of the following pairs contains unrelated items?
a. eukaryote–amoeba
b. ribosomes–protein
c. cell wall–animal cell
d. mitochondria–energy

ANS: C DIF: 2 OBJ: 4-4.1

37. Plant cells
    a. do not contain mitochondria.
    b. have a cell wall instead of a plasma membrane.
    c. have a large central vacuole instead of a Golgi apparatus.
    d. have chloroplasts and a cell wall.

    ANS: D DIF: 1 OBJ: 4-4.1

38. Which of the following is the correct order of organization of structures in living things, from simplest to most complex?
    a. organ systems, organs, tissues, cells
    b. tissues, cells, organs, organ systems
    c. cells, tissues, organ systems, organs
    d. cells, tissues, organs, organ systems

    ANS: D DIF: 1 OBJ: 4-2.5

COMPLETION

1. The statement "Cells are produced only from existing cells" is part of the _____.

   ANS: cell theory

   DIF: 1 OBJ: 4-1.3

2. The ratio of surface area to _____ puts limitations on a cell's size.

   ANS: volume

   DIF: 1 OBJ: 4-2.2

3. Eukaryotic cells are much larger and have more specialized functions than prokaryotic cells because they contain _____, which carry out specialized activities.

   ANS: organelles

   DIF: 2 OBJ: 4-4.5

4. A cell with a well-defined nucleus and cytoplasm surrounded by a plasma membrane is a(n) _____ cell.

   ANS: eukaryotic

   DIF: 1 OBJ: 4-2.3

5. A plasma membrane is said to be _____ permeable because it allows the passage of some solutes and not others.

   ANS: selectively

   DIF: 1 OBJ: 4-3.1

6. _____ molecules have “heads” and “tails” and are found in the plasma membrane.

ANS: Phospholipid

DIF: 1 OBJ: 4-3.1

7. Scientists have discovered that cells contain smaller specialized structures known as _____.

ANS: organelles

DIF: 1 OBJ: 4-3.3

8. The spherical organelles that are the site of protein synthesis in a cell are the _____.

ANS: ribosomes

DIF: 1 OBJ: 4-3.3

9. The meshlike network of protein fibers that supports the shape of the cell is called the _____.

ANS: cytoskeleton

DIF: 1 OBJ: 4-3.5

10. The fluid portion of the cytoplasm is called the _____.

ANS: cytosol

DIF: 1 OBJ: 4-2.3

11. Photosynthesis takes place in the _____ of plant cells.

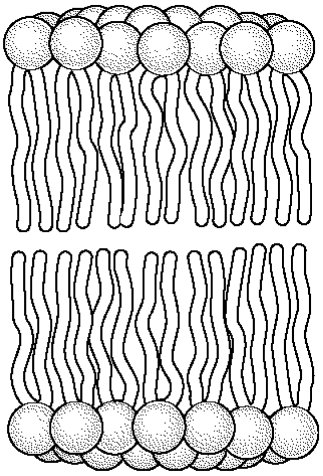
ANS: chloroplasts

DIF: 1 OBJ: 4-4.4

12. Both plant and animal cells have plasma membranes. In addition, plant cells are surrounded by a(n) _____.

ANS: cell wall

DIF: 1 OBJ: 4-4.1

13. 

Refer to the illustration above. The diagram shows the _____ that makes up the framework of the plasma membrane.

ANS: phospholipid bilayer

DIF: 2 OBJ: 4-3.1

14. Matthias Schleiden worked with _____ cells, and Theodor Schwann worked with _____ cells.

ANS: plant, animal

DIF: 1 OBJ: 4-1.2

15. Some plants produce a _____ between the plasma membrane and the primary cell wall.

ANS: secondary cell wall

DIF: 1 OBJ: 4-4.2

PROBLEM

1. A living cell has certain characteristics in common with a working factory. In a factory, products are assembled according to specified plans, energy is used in the assembly process, products are packaged and taken out of the factory, and a supervisor directs and oversees all of the activities occurring in the factory. Draw a model of a factory, labeling areas where the following important activities would occur: main office where supervisor keeps the plans and oversees activities, assembly line, electricity generator, packaging center, and factory doors. Next to each of your labels, write the name of the cellular organelle or structure that has a similar function. Choose the cellular organelles and structures from this list: nucleus, cytoplasm, cell membrane, mitochondrion, endoplasmic reticulum, Golgi apparatus, vacuole. Write your answer in the space below.

   ANS:
   The drawing should include the following pairs:
   main office—nucleus
   assembly line—endoplasmic reticulum
   electricity generator—mitochondrion
   packaging center—Golgi apparatus
   factory doors—plasma membrane

   DIF: 3 OBJ: 4-3.3

ESSAY

1. How are the organs of a multicellular organism like the organelles of a single cell? Write your answer in the space below.

   ANS:
   The organs of a multicellular organism each carry out specialized tasks that enable the whole organism to survive. Similarly, organelles of a single cell each carry out specialized tasks that enable the whole cell to survive.

   DIF: 3 OBJ: 4-2.5