

Name \_\_\_\_\_ Period \_\_\_\_\_

## Chapter 4: A Tour of the Cell

### *Guided Reading Activities*

#### **Big idea:** Introduction to the cell

Answer the following questions as you read modules 4.1–4.4:

1. A(n) \_\_\_\_\_ uses a beam of light to illuminate the specimen.
2. Beginning students usually confuse magnification and resolution. Briefly compare magnification with resolution.
3. Which of the following associations is incorrect?
  - a. Light microscope; live bacterial cell
  - b. TEM; internal cellular structures
  - c. SEM; detailed structure of a nucleus
  - d. All of the above are correct.
4. Your small intestine absorbs nutrients from the food you eat. Are you able to draw any conclusions about the surface area-to-volume ratios of the cells that line the small intestine? If so, briefly explain your answer.
5. A cell's plasma membrane acts as both a boundary and barrier for the cell. Briefly explain how the walls and roof of a home are a good analogy for the plasma membrane.

6. Complete the table that compares prokaryotic and eukaryotic cells.

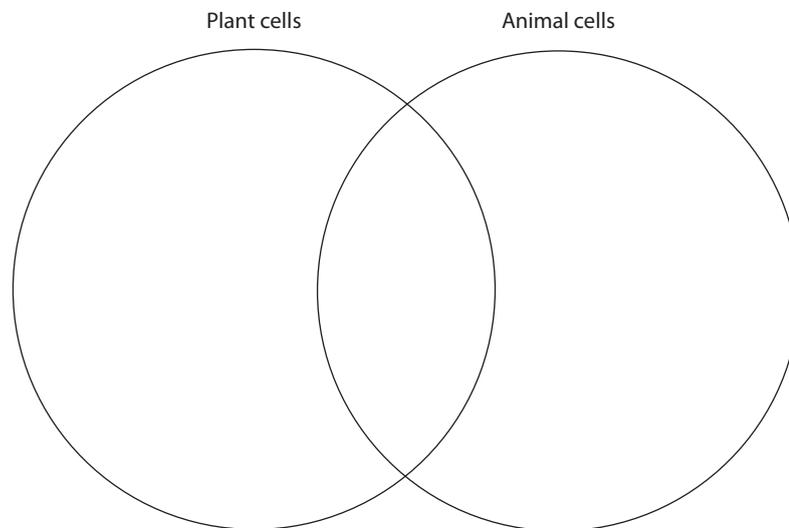
	Eukaryotic cells	Prokaryotic cells
<b>Similarities</b>		
<b>Differences</b>		
<b>Example(s)</b>		

7. Match the following terms with their description: cell wall, chromosomes, flagella, cytoplasm, and ribosomes.

- a. Used for movement by certain cells: \_\_\_\_\_
- b. Rigid structure that helps maintain bacterial cell shape: \_\_\_\_\_
- c. Thick fluid inside cells: \_\_\_\_\_
- d. Structures within cells that assemble proteins: \_\_\_\_\_
- e. Carry genes: \_\_\_\_\_

8. List the four basic functional groupings of eukaryotic organelles and structures and give an example within each group.

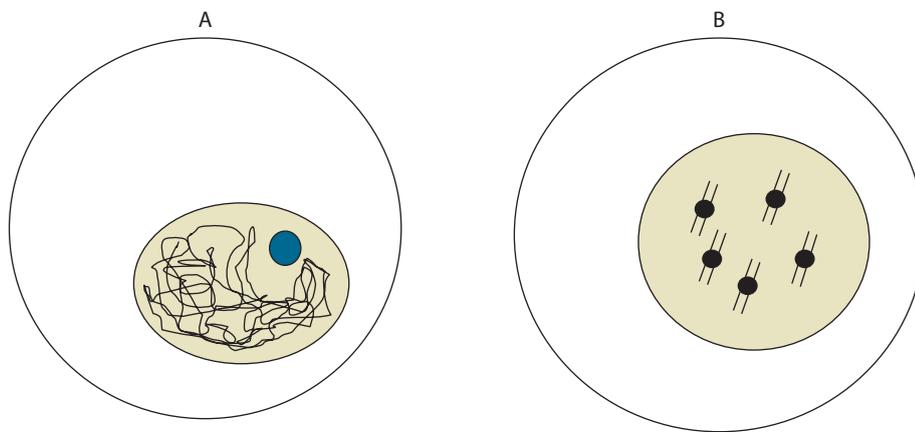
9. Complete the Venn diagram that compares plant and animal cells.



**Big idea: The nucleus and ribosomes**

Answer the following questions as you read modules 4.5–4.6:

1. DNA and its associated proteins are referred to as \_\_\_\_\_.
2. Which of the following cells would be preparing to divide? Briefly explain your answer.



3. Complete the following table that compares rRNA to mRNA.

	rRNA	mRNA
<b>Role in/part of . . .</b>		
<b>Made in . . .</b>		
<b>Travels to . . .</b>		

4. Briefly describe the relationship between the nucleus and ribosomes. Your answer should include the following key terms: **mRNA**, **rRNA**, and **protein synthesis**.

5. The nuclear envelope has passages for substances moving into and out of the nucleus. These passages are called nuclear pores and they are made by proteins that are inserted into the plasma membrane that makes up the nuclear envelope. These proteins are assembled by which of the following?
  - a. Free ribosomes
  - b. The nucleus
  - c. Bound ribosomes
  - d. Nuclear pores
  
6. You are an evolutionary biologist working for the Smithsonian. On a fossil dig in the Eastern Montana Badlands, you discover fossil evidence that shows early eukaryotic cells containing only free ribosomes. Briefly state what conclusion(s) could be drawn from this evidence.

**Big idea: The endomembrane system**

Answer the following questions as you read modules 4.7–4.12:

1. \_\_\_\_\_ are a distinguishing characteristic of eukaryotic cells.
  
2. Which of the following cellular components is not part of the endomembrane system?
  - a. Vacuoles
  - b. Golgi apparatus
  - c. Endoplasmic reticulum
  - d. Mitochondria
  
3. The literal translation of endoplasmic reticulum is “within the cytoplasm” and “little net.” Briefly explain why endoplasmic reticulum was a good choice of words for naming that organelle. Use Figure 4.5 on page 58 of your textbook to help formulate your answer.
  
4. Smooth endoplasmic reticulum (SER) lacks \_\_\_\_\_, which gives it a “smooth” appearance.

Use the following information to answer questions 5 and 6. The pancreas is an organ that makes and secretes a large amount of different proteins that function as enzymes or hormones.

5. Which type of ER would you expect the cells of the pancreas to have in greater abundance than other cells? Briefly explain your answer.
6. What other organelle of the endomembrane system would you expect to find in great abundance? Briefly explain your answer.
7. True or false: A protein that is destined to be inserted into the plasma membrane as opposed to being secreted still travels through the Golgi stacks. If false, make it a correct statement.
8. Place the following steps in the order in which they occur:
  - a. Proteins are modified as they pass through the Golgi apparatus.
  - b. A vesicle from the rough ER fuses with the Golgi membrane.
  - c. A vesicle buds off from a Golgi stack.
  - d. A vesicle containing a secretory protein fuses with the cell's plasma membrane.
9. Complete the following table that compares components of the endomembrane system.

	Lysosomes	Vacuoles	Vesicles
Function(s)			

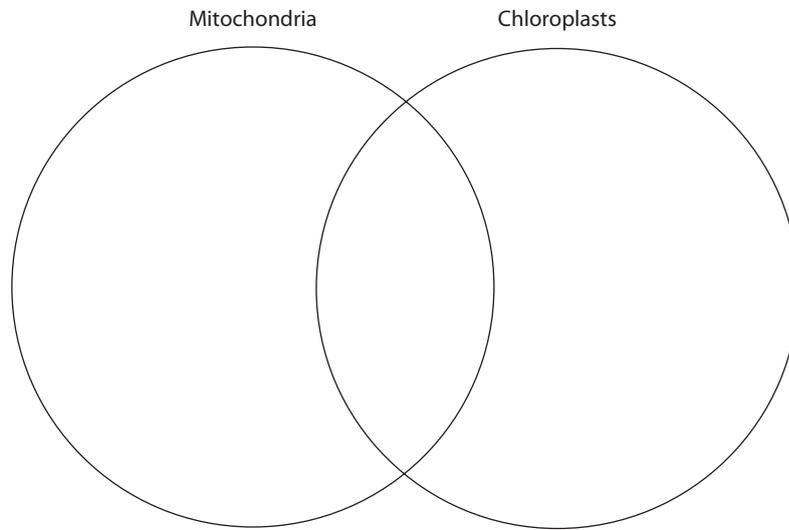
10. \_\_\_\_\_ are organelles involved in the metabolism of fatty acids.
11. Internal compartmentalization is crucial to the proper function of a cell. List two organelles where this is important and briefly explain why you chose them.

**Big idea: Energy-converting organelles**

Answer the following questions as you read modules 4.13–4.15:

1. \_\_\_\_\_ are responsible for converting the energy within food to molecules of ATP.
2. True or false: A mitochondrion has three separate phospholipid bilayers. If false, make it a correct statement.
3. Which of the following is the correct sequence of structures for a mitochondrion, from outside to inside?
  - a. Cristae
  - b. Outer membrane
  - c. Intermembrane space
  - d. Matrix
4. Match the following terms to their correct definition: thylakoid, granum, stroma, and chloroplast.
  - a. The organelle responsible for performing photosynthesis: \_\_\_\_\_
  - b. A stack of interconnected sacs: \_\_\_\_\_
  - c. Thick fluid found within the inner membrane: \_\_\_\_\_
  - d. Contain chlorophyll molecules embedded into a membrane: \_\_\_\_\_

5. Complete the Venn diagram that compares mitochondria to chloroplasts.



6. List three pieces of evidence that suggest mitochondria and chloroplasts evolved from prokaryotic cells.
7. How many sources of DNA does a typical plant cell contain?
- 1
  - 2
  - 3
  - 4

**Big idea: The cytoskeleton and cell surfaces**

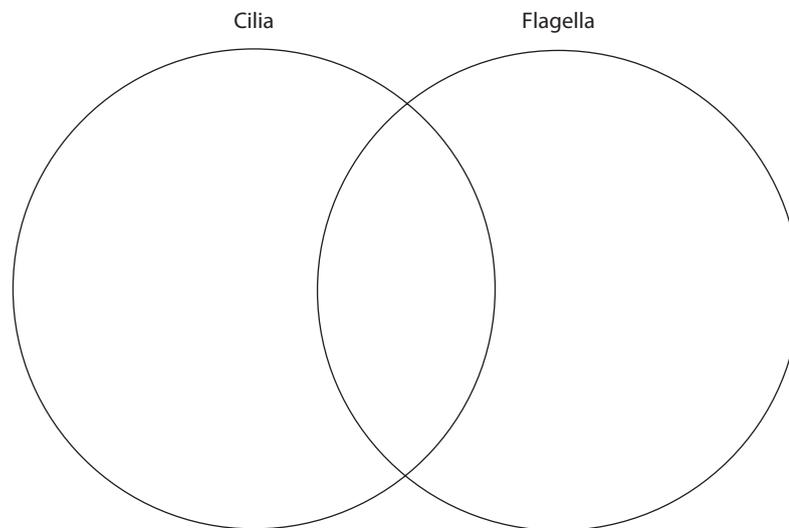
Answer the following questions as you read modules 4.16–4.22:

1. The \_\_\_\_\_ refers to a collection of protein fibers that provides structural support to the cell in addition to movement.

2. Complete the table that compares the different fibers of the cytoskeleton.

	Microtubules	Intermediate filaments	Microfilaments
<b>Function</b>			
<b>Location</b>			
<b>Relative thickness</b>			

3. Neurons are very long cells that require the movement of substances from one end of the cell to the other. Which type of cytoskeletal fiber would you expect to find participating in this process?
4. Place the following discoveries/technological advances in order: visualization using an electron microscope, isolation of actin and myosin from muscle cells, immunofluorescence, use of a video camera to observe events in real time, molecular cytochemistry, and microscopy used to establish how actin and myosin interact.
5. Complete the Venn diagram to compare cilia with flagella.



6. Briefly explain how the plasma membrane is supported both internally by elements of the cytoskeleton and externally by the ECM.

7. Which of the following spans a cell's membrane and allows for signaling between the ECM and cytoskeleton?
  - a. Integrins
  - b. Glycoproteins
  - c. Collagen
  - d. Actin
  
8. True or false: Gap junctions prevent substances from leaking through cell layers. If false, make it a correct statement.
  
9. \_\_\_\_\_ are connections between plant cells that allow for the passage of water and nutrients.
  
10. In biology, the relationship between form and function is critical. Briefly explain how this is apparent at the level of the cell. Your answer should include a specific example of how form follows function in a cell.

### CONNECTING THE BIG IDEAS

Use your knowledge of the information contained within this chapter's "Big Ideas" to answer this question.

Certain cells of your immune system will respond to certain pathogens by engulfing and digesting these invading cells and/or moving throughout your body tissues. Briefly identify the organelles that would be involved as well as their functions during these events.