Name _____ Date _____ Class _____

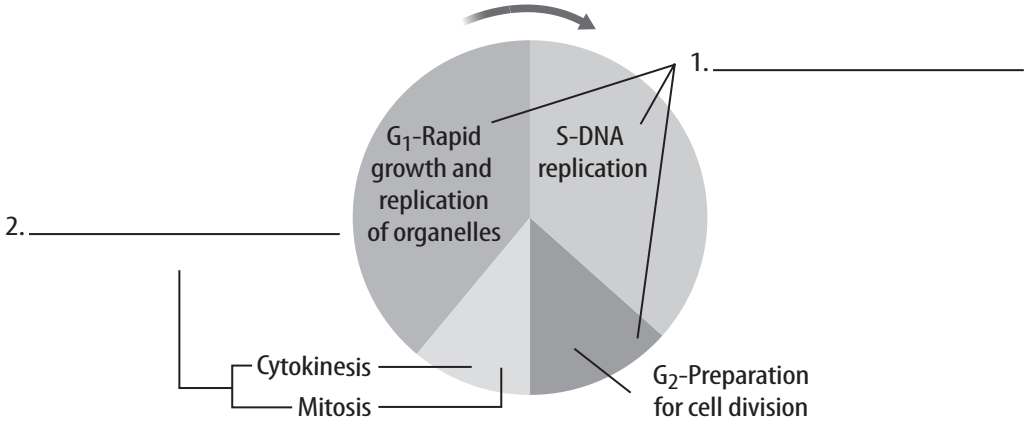
Key Concept Builder

LESSON 1

The Cell and Cell Division

Key Concept What are the phases of the cell cycle?

Directions: *Label this diagram by writing the correct term on each line.*



Directions: *Answer each question on the lines provided.*

3. Which phase of the cell cycle is the period of growth and development?

_____

4. During which phase do the nucleus and cytoplasm divide?

_____

5. How many stages are in each phase of the cell cycle?

_____

6. How does a cell at the end of the first phase of the cell cycle differ from a cell at the end of the second phase?

_____

_____

_____

_____

_____

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LESSON 1

The Cell and Cell Division

Key Concept What are the phases of the cell cycle?

Directions: *Complete this table by writing a description in each space provided.*

Phases of the Cell Cycle		
Phase	**Stage**	**Description**
Interphase	G_1	**1.**
	S	**2.**
	G_2	**3.**
Mitotic phase	mitosis	**4.**
	cytokinesis	**5.**

Directions: *Answer each question or respond to each statement on the lines provided.*

6. What is the DNA in the G_1 stage called? What does it look like?

_____

7. During which stage is DNA in the nucleus duplicated?

_____

8. After DNA is duplicated, what is it called? What does it look like?

_____

9. **Compare** the replication of mitochondria to the replication of organelles that do not have their own DNA.

_____

_____

_____

_____

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The Cell and Cell Division

Key Concept What are the phases of the cell cycle?

Directions: *Mitosis is one stage in the mitotic phase of the cell cycle. Mitosis is divided into four parts. Work with a partner to read each sentence and decide which part of mitosis it describes. On each line, write the term from the word bank that correctly matches each sentence. Terms will be used more than once.*

anaphase **metaphase** **prophase** **telophase**

1. Duplicated chromosomes align along the middle of the cell. _____
2. The cell begins to get longer. _____
3. Duplicated chromatin coils together tightly. _____
4. Sister chromatids in each duplicated chromosome separate and are pulled in opposite directions by the spindle fibers. _____
5. The nucleolus disappears, the nuclear membrane breaks down, and spindle fibers form in the cytoplasm. _____
6. A nuclear membrane grows around each set of chromosomes. _____
7. Spindle fibers that helped divide the chromosome begin to disappear, and chromosomes begin to uncoil. _____
8. Spindle fibers pull and push the duplicated mitotic chromosomes to the middle of the cell. _____
9. Two new identical nuclei are formed. _____
10. Two identical sets of chromosomes are at opposite ends of the cell. _____

Directions: *Answer each question on the lines provided.*

11. What are the two cell division stages in the mitotic phase of the cell cycle?

_____

12. What happens during cytokinesis?

_____

_____

Name _____ Date _____ Class _____

Key Concept Builder

LESSON 1

The Cell and Cell Division

Key Concept Why is the result of the cell cycle important?

Directions: *Answer each question or respond to each statement on the lines provided.*

1. If a parent cell has 24 chromosomes, how many chromosomes will each daughter cell have? Explain. Then compare the chromosomes in the parent cell and the daughter cells.

2. **Explain** what kind of organism might use cell division as a form of reproduction.

3. Why is cell division important for a baby?

4. **Explain** how cell division is important for replacement and repair. Give specific examples.

Enrichment **LESSON 1**

Why do cells divide?

A whale is many times bigger than a human. But the cells of whales and humans are nearly the same size. In fact, most cells are small. In plants and animals, most cells are less than 100 micrometers long. You cannot see them without a microscope.

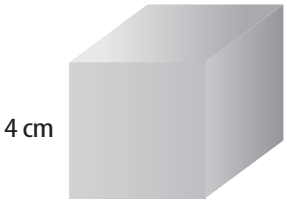
Cells are small for a good reason—their small size makes it possible to efficiently take in nutrients and oxygen and to eliminate wastes and carbon dioxide. As you have learned, nutrients and oxygen are transported from the outer cell surface to the inside of the cell. These materials must reach all parts of the cell. As the cell grows, its volume increases faster than its surface area. Eventually, the surface area is not sufficient to handle the large amount of material passing into and out of the cell.

Ratio of Volume to Surface Area

Let's look at how the ratio of surface area to volume changes. Consider a cube that is 2 centimeters on each side, as shown in the image. Its surface area is 24 cm^2 (height × width × number of sides). Its volume is 8 cm^3 (height × length × width). The ratio of surface area to volume is 3:1 (24 cm^2 ÷ 8 cm^3). If the length of each side of the cube doubles, the surface area is 96 cm^2 and the volume is 64 cm^3. The ratio of surface area to volume is now 1.5:1.

As the length of each side of the cube increases, the ratio of surface area to volume becomes smaller. The volume of the cube increases faster than its surface area. The same trend is true in a cell. As the cell grows, its surface area eventually reaches the point where materials are not efficiently passing into and out of the cell.

Surface area: 24 cm^2
Volume: 8 cm^3
Ratio: 3:1



Surface area: 96 cm^2
Volume: 64 cm^3
Ratio: 1.5:1

Cell Division

When a cell's surface area is too small for its volume, the cell divides or stops functioning. Cell division is the cell's response to unlimited growth. By maintaining a proper ratio of surface area to volume, the cell ensures that it can interact efficiently with its environment. The small size also means materials do not have to travel far to reach all parts of the cell.

Applying Critical-Thinking Skills

Directions: *Respond to each statement.*

1. **Solve** Imagine a model of a cell shaped like a cube. Calculate the ratio of surface area to volume for a cell model that measures 3 cm on each side.
2. **Summarize** how cell size relates to cell division.