

Section

8.2

Cell Growth and Reproduction**► Before You Read**

In this section you will learn about the way cells grow and divide. Have you ever watched someone trim a bush or a tree? What would have happened if the bush or tree had not been trimmed? Write down a few of your thoughts on the lines below.

► Read to Learn**Cell Size Limitations**

As you have learned, the plasma membrane lets nutrients into the cell and allows wastes to leave. Inside the cell, nutrients and wastes move by diffusion. Because a cell's size can slow the rate of diffusion, cells have to have a way of limiting their growth. Fortunately, cells divide before they become too big and unable to function well. Cell division also has other purposes.

Cell Reproduction

When cells divide, new cells are produced from one cell. The two cells that are produced are identical to the original cell. Just before cells divide, several short, stringy structures appear in the nucleus. These structures are called chromosomes. ✓

What do chromosomes do?

Chromosomes (KROH muh sohms) contain DNA and are the carriers of the genetic material that is copied and passed from generation to generation. For most of a cell's lifetime, chromosomes exist as something called chromatin (KROH muh tih). **Chromatin** is long, stringy strands of DNA. Without the proper amount of DNA, the cell cannot survive. Therefore the chromosomes must be accurately passed on to new cells.

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The Cell Cycle

The **cell cycle** is the time of growth and division of a cell. A cell's life cycle is divided into two periods. There is a period of

STUDY COACH**Mark the Text****Identify the**

Main Idea As you read this section, stop after every paragraph and put what you read into your own words. Highlight the main idea in each paragraph.

✓ Reading Check

1. What structures appear in the nucleus shortly before cell division?

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Cell Growth and Reproduction, *continued*

STUDY COACH

Mark the Text

Analyze the

Diagram As you read about mitosis, highlight each stage in the diagram below.

growth called interphase. There is also a period of nuclear division called mitosis.

What is interphase?

During **interphase** a cell grows in size, carries on metabolism, duplicates chromosomes, and prepares for division. Interphase is the busiest phase of the cell cycle.

What is mitosis?

Mitosis (mi TOH sus) follows interphase. It is the process of nuclear division in which two daughter cells form. Each of these daughter cells contains a complete set of chromosomes that are identical to those of the parent cell.

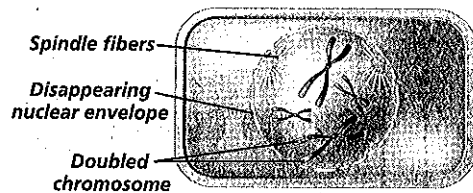
What are the phases of mitosis?

There are four phases of mitosis. Each phase merges into the next phase. The four phases are prophase, metaphase, anaphase, and telophase as shown in the illustration to the left.

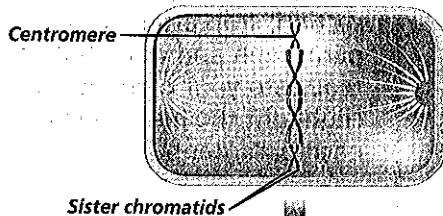
Prophase is the first and longest phase. During prophase the chromatin coils up to form chromosomes. Each duplicated chromosome is made up of two identical halves, called **sister chromatids**. **Centromeres** (SEN truh meers) hold the sister chromatids together.

During **metaphase**, the second phase of mitosis, the doubled chromosomes are pulled to the center of the cell. **Anaphase** is the third phase of mitosis. During this phase, the centromeres of the sister chromatids split apart. This separates the sister chromatids from each other. In **telophase**, the last phase of mitosis, the chromatids move to opposite sides of the cell. Two nuclei are formed—one on each side of the cell. Finally, a new double membrane begins to form between the two new nuclei.

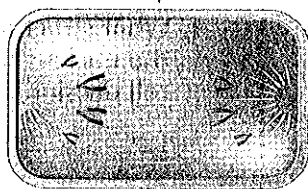
Stages of Mitosis



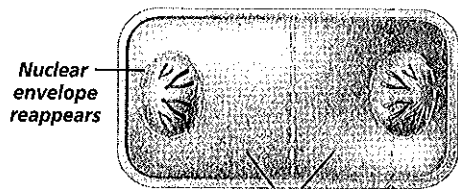
A Prophase
The chromatin coils to form chromosomes.



B Metaphase
The chromosomes move to the center of the cell.



C Anaphase
Centromeres split and sister chromatids are pulled to the opposite sides of the cell.



D Telophase
Two new nuclei are formed and a double membrane begins to form between them.

Two daughter cells are formed

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Cell Growth and Reproduction, *continued***Cytokinesis**

Following telophase, the cell's cytoplasm divides and separates into two new identical cells. This is called **cytokinesis** (si toh kih NEE sus).

Results of Mitosis

When mitosis is complete, one-celled organisms remain as single cells. The organism simply multiplied into two organisms. These daughter cells eventually will repeat the same cell cycle as the parent cell and will grow and divide. In larger organisms, cell growth and reproduction result in groups of cells that work together as **tissue** to perform a certain function. Tissues organize in combinations to form **organs**. Organs perform specific complex tasks within the organism. Multiple organs that work together form an **organ system**, such as the digestive system. The stomach is one organ in the digestive system. It functions to digest food. It is important to remember that no matter how complex the organ system or organism becomes, the cell is still the most basic unit of that organization. ♥

✓ Reading Check

2. What do tissues organize to form?

► After You Read**Mini Glossary**

anaphase: the third phase of mitosis in which the centromeres split and the sister chromatids of each chromosome are pulled apart

cell cycle: continuous sequence of growth (interphase) and division (mitosis) in a cell

centromere (SEN truh meer): cell structure that joins two sister chromatids of a chromosome

chromatin (KROH muh tihn): long strands of DNA found in the eukaryotic cell nucleus; coils up to form chromosomes

chromosomes (KROH muh sohmz): cell structures that contain DNA and carry the genetic material that is copied and passed from generation to generation of cells

cytokinesis (si toh kih NEE sus): cell process following mitosis in which the cell's cytoplasm divides and separates into new identical cells

interphase: cell growth period where a cell increases in size, carries on metabolism, and duplicates chromosomes prior to division

metaphase: short second phase of mitosis where doubled chromosomes move to the center of the cell

mitosis (mi TOH sus): period of nuclear cell division in which two daughter cells are formed, each containing a complete set of chromosomes

organ: group of two or more tissues organized to perform complex activities within an organism

organ system: multiple organs that work together to perform a specific life function

prophase: first and longest phase of mitosis where chromatin coils into visible chromosomes

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Cell Growth and Reproduction, continued

sister chromatid: identical half of duplicated parent chromosome formed during the prophase stage of mitosis; the halves are held together by a centromere

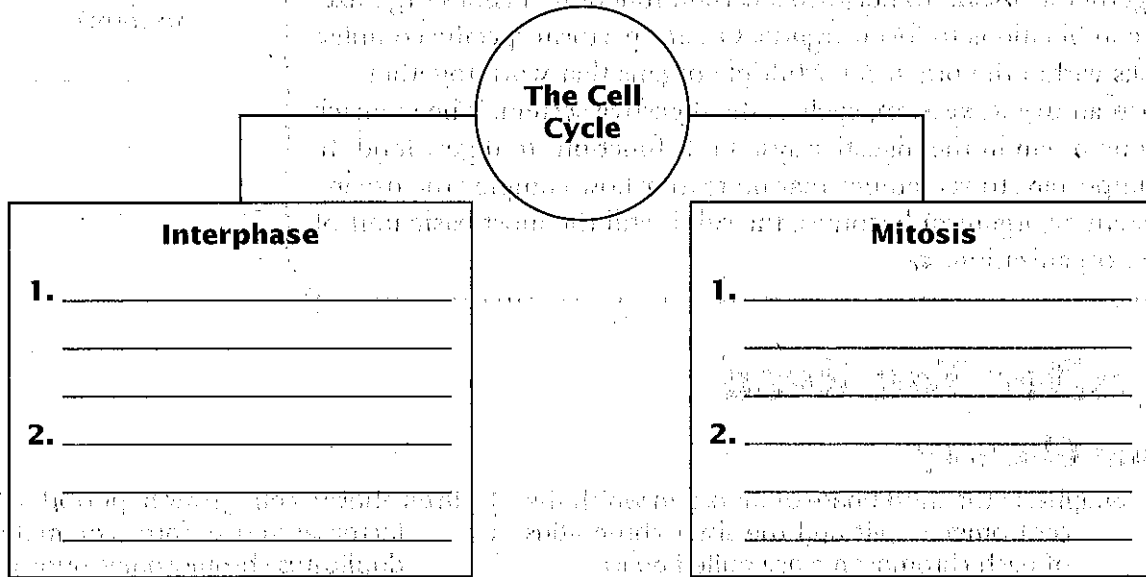
telophase: final phase of mitosis during which new cells prepare for their own independent existence

tissue: groups of cells that work together to perform a specific function

1. Circle the terms from the Mini Glossary that identify the phases of mitosis. Then, in the space provided, list them in the order they occur.

1. _____ 3. _____
 2. _____ 4. _____

2. Use the diagram below to help you review the cell cycle by providing two facts for each period.



3. Fill in the blanks with the following terms: **tissues, sister chromatids, cell cycle, mitosis, and chromosomes.**

- a. Two identical halves of a duplicated parent chromosome are called _____.
- b. The process of cell division is called _____.
- c. _____ are the carriers of genetic material that is copied and passed from generation to generation.
- d. The _____ is the period of growth and division of a cell.
- e. _____ are groups of cells that work together to perform specific functions.



Visit the Glencoe Science Web site at science.glencoe.com to find your biology book and learn more about cell growth and reproduction.