

CONCEPT 2

All eukaryotic cells reproduce by the cell cycle.

Activity

How Many Times Have You Shed Your Skin?



A snake sheds its skin all at once, but you are always shedding cells from the outer layer of your skin. This happens because older cells are constantly being pushed to the surface by new cells that are reproducing below them. In about 28 days, your entire outer layer of skin is replaced by new cells. Use the equation below to determine the number of times that you have changed your skin in your lifetime.

$$\text{Number of times you have changed your skin} = \frac{\text{your age} \times \text{number of days in a year} + \text{number of days since your last birthday}}{28 \text{ number of days your skin takes to replace itself completely}}$$

Right now, cell reproduction is taking place in your body as it produces thousands of new cells. Different types, such as red blood cells, skin cells, and cells that line your digestive tracts, are continually being made to replace older cells.

Cell reproduction is also needed for the body to heal. Imagine you fall and scrape your skin. You might have a wound like the one shown in **Figure 1.8**. The wound heals because your body can make new skin cells to replace those that were damaged.

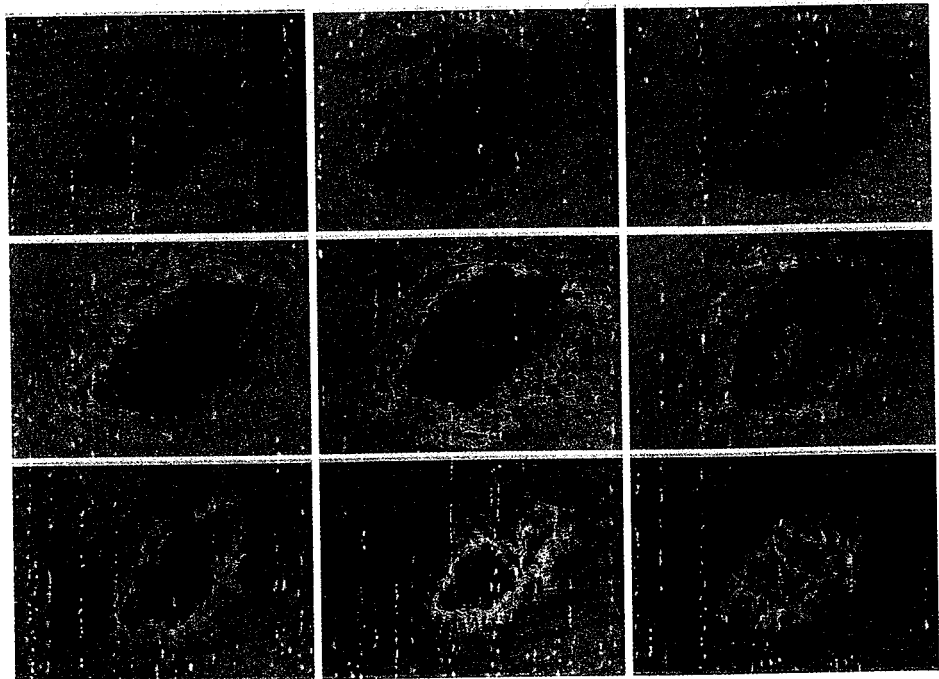


Figure 1.8 A scab forms as some of the remaining skin cells beneath the wound reproduce repeatedly to form a new skin layer to replace what was scraped away. What clues help you know what sequence to follow to interpret this image?

Reproduction and the Cell Cycle

Replacing damaged cells is not the only reason eukaryotic cells must reproduce. It is an essential part of an organism's life cycle. For single-cell eukaryotes such as amoebas, the process of making new cells is how they produce new offspring. For you and other multicellular eukaryotes, different cells of the body have different life spans. For example, cells of the colon live for a few days. Skin cells live a few weeks. Red blood cells last for a few months, and some white blood cells last more than a year.

However, eukaryotic cells share this in common: They reproduce by a series of events called *interphase*, *mitosis*, and *cytokinesis*. See Figure 1.9.

First Peoples Perspectives

Create a story about the cell cycle. How does it help you understand what happens or remember the process better?



1 Interphase

- The cell grows and the number of organelles increases.
- The DNA in the nucleus is copied.

2 Phase 1 of mitosis (prophase)

- The nuclear membrane begins to disappear.
- DNA condenses into duplicated chromosomes. Each contains two copies of the same DNA.

3 Phase 2 of mitosis (metaphase)

- Structures called spindle fibres guide chromosome movement.
- Chromosomes line up along the middle of the cell.

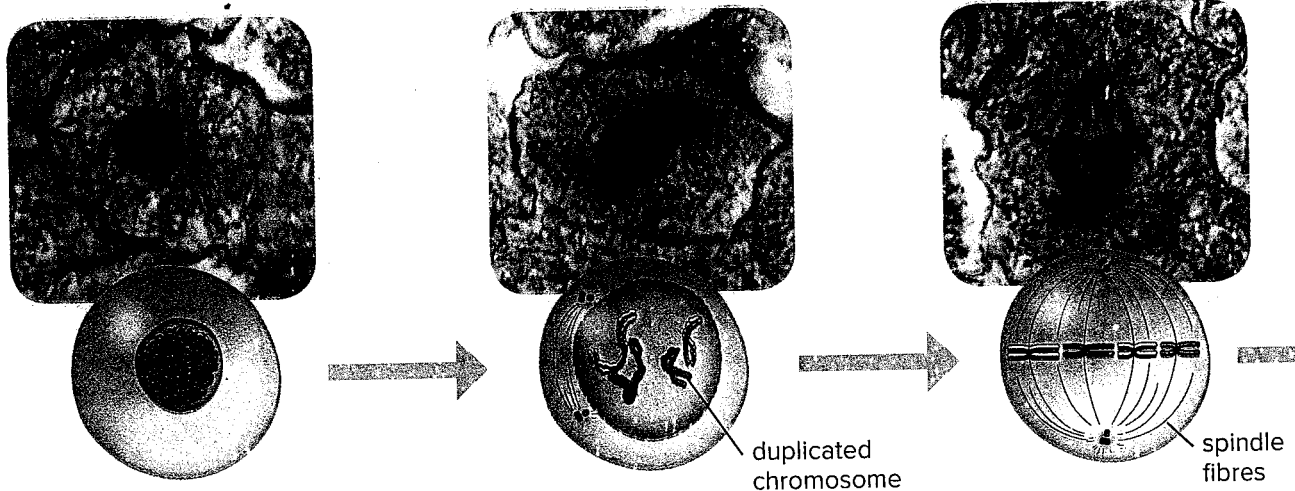


Figure 1.9 Cell reproduction by mitosis results in daughter cells that are genetically identical to each other and to the parent cell.

Activity

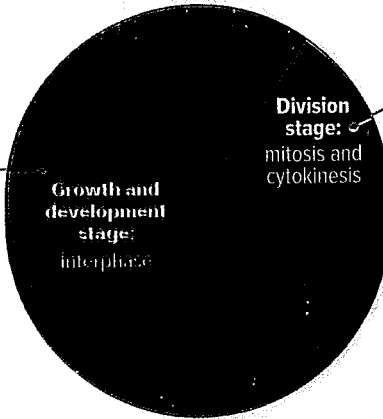
Mitosis Flip Book

Make a mitosis flip book to show the changes that happen at each phase of mitosis. Design your flip book on paper, or develop a digital one for a computer or hand-held device. Compare your completed flip book with others in the class.

The events in **Figure 1.9** are part of what is called the **cell cycle**. The cell cycle is made up of two stages: (1) a growth and development stage, and (2) a cell division stage. See **Figure 1.10**.

cell cycle a series of events in the life cycle of a cell

1. The growth and development stage of the cell cycle is called interphase. The cell grows and prepares for division by copying its DNA and organelles.



2. The cell division stage of the cell cycle involves mitosis, during which DNA is distributed between the two developing daughter cells, and cytokinesis, when those cells separate into independent daughter cells.

Figure 1.10 The cell cycle involves growth, development, and then division. In which stage does a cell spend most of its life?

1 Phase 3 of mitosis (anaphase)

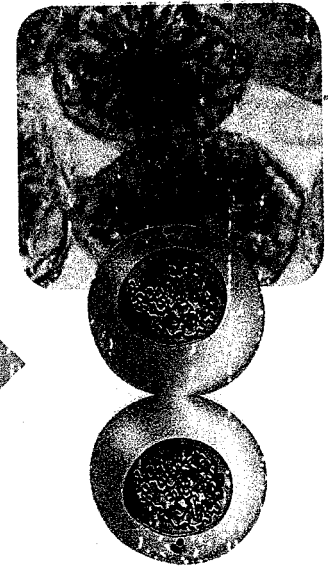
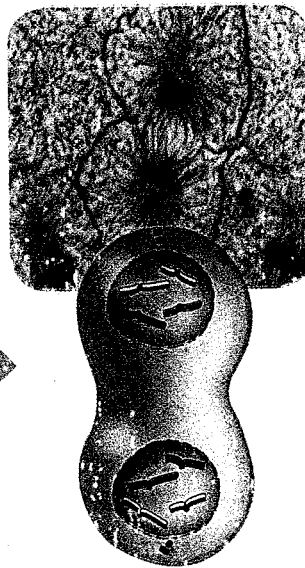
- The copies of DNA are separated and go to each end of the cell.

2 Phase 4 of mitosis (telophase)

- Two nuclei form and each nucleus contains a complete copy of the cell's DNA.

3 Cytokinesis

- The cytoplasm and organelles are divided, and two separate cells form.
- The cells then begin interphase.



Before you leave this page . . .

Connect to Investigation 1-E on page 38

1. What happens to the DNA in a cell during interphase? Why is this step important for the reproduction process?
2. In two or three sentences, describe what the cell cycle is.