Name: _____

esson

26 Mitosis and Meiosis

8.2-C25

Getting the Idea

Cells or organisms make more cells or organisms like themselves by **reproduction**. In unicellular organisms, cell reproduction results in a new organism. In multicellular organisms, cell reproduction lets the organism grow and develop.

Key Words

eproduction
:ell division
:ell cycle
:exual reproduction
neiosis
jamete
:perm
:gg
ertilization
ygote
nitosis

Cell Cycle

At the cell level, reproduction occurs when a cell called the parent cell divides, forming two new cells called daughter cells. Each daughter cell is an exact replica of the parent. **Cell division** is how a cell divides to form two identical daughter cells.

All the instructions for cell activities are found in a cell's DNA. In animal and plant cells, this DNA is located in the nucleus in structures called chromosomes. Chromosomes are made of DNA and proteins. Before a cell divides, it must make an exact copy of its chromosomes. That lets each daughter cell receive the same complete set of instructions. The **cell cycle** is a continuous process in which cells grow, copy their chromosomes, and divide to form daughter cells. Depending on the type of cell involved, the cell cycle can last from less than an hour to several days.

Multicellular organisms need new cells in order to grow, repair injuries, replace cells that are lost, and reproduce. Cells for growth and repair (somatic cells) form in a different way than cells for reproduction (germ cells).

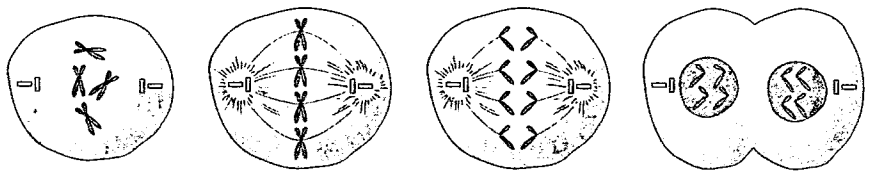
You Know?

ıetimes
ɜ continue to
ıe when they
ıldn't. Cancer
disease in
ɔh cell division
ıt of control.
uncontrolled
division
luces a tumor,
ass of cells
can crowd
damage
rby tissues.
ıor cells do not
orm a body
ɔtion. They
ɨ up space and
energy that
ɜeded by the
lthy body cells.

Mitosis

A cell reproduces by dividing into two cells, called daughter cells. Before dividing, the cell makes copies of its chromosomes. Then it divides by a process called mitosis. Each daughter cell produced by mitosis has the same number and kind of chromosomes as the parent cell. The diagram below shows the four stages of mitosis.

Mitosis



Prophase Metaphase Anaphase Telophase

Between cell divisions, the chromosomes are invisible because they are extremely long and thin and spread out through the nucleus. In prophase, the chromosomes condense. They become much shorter and thicker, so they can be seen in the nucleus. Then the membrane that holds the nucleus together disappears. Each chromosome has four "arms" because it is a pair of two strands called chromatids joined in the middle.

In the next stage, called metaphase, the chromosomes line up in the center of the cell. In anaphase, the chromatids are pulled apart. A group of chromosomes, which are now single chromatids, moves to each end of the cell. In the last stage, called telophase, nuclear membranes form around each group, and the chromosomes decondense. At the end of mitosis, the cell splits to form two daughter cells, each with one nucleus.

Mitosis is the process by which living things grow. For example, your bones grow by mitosis. One bone cell divides and produces two identical bone cells. Each of these cells then divides to produce more bone cells of the same kind. A plant root grows farther into the ground as cells at the root's tip grow and divide. Other parts of a plant grow in the same way.

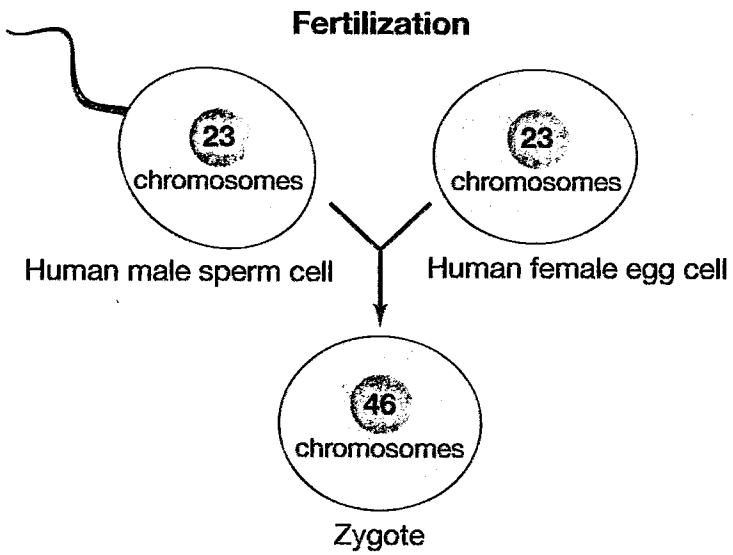
Mitosis is also the process by which the bodies of living things repair themselves. Your skin cells divide and produce new skin cells to replace the ones you lose. If you cut yourself, new cells form by cell division to heal the cut.

Meiosis

Most of the time, animals produce offspring from the union of two cells. In **sexual reproduction**, two different cells join together to form a new organism. A process called **meiosis** produces the cells animals and plants use for sexual reproduction.

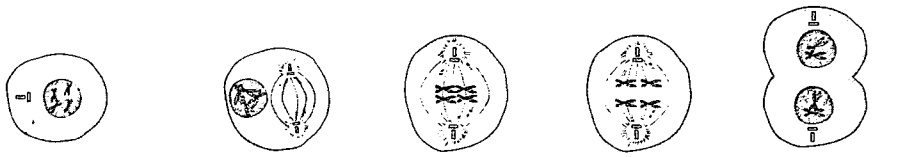
During meiosis, organisms produce specialized cells known as **gametes**, or sex cells. Gametes differ from ordinary cells because they have only half the number of chromosomes found in the organism's body cells. Organisms produce two types of gametes: sperm cells and egg cells. **Sperm** cells are male sex cells. **Eggs**, or ova, are female sex cells. During sexual reproduction, a male and a female gamete combine in the process of **fertilization**. The resulting cell is a **zygote**.

It is important that gametes have only half the number of chromosomes present in body cells. If two ordinary cells joined together, the organism formed from those cells would have twice as many chromosomes as it should. Because gametes each contain only half this number, the new organism has the correct number of chromosomes. It gets half its chromosomes from each gamete.



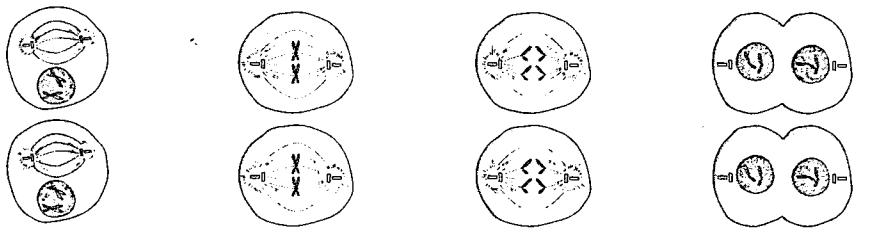
As in mitosis, a cell preparing for meiosis goes through interphase. During this stage, the cell grows and copies its chromosomes. After interphase, the cell goes through two cycles of cell division: meiosis I and meiosis II. The second cycle of cell division is needed to produce gametes with half as many chromosomes as the parent cell.

Meiosis I



Prophase I | Metaphase I | Anaphase I | Telophase I and Cytokinesis I

Meiosis II



Prophase II | Metaphase II | Anaphase II | Telophase II and Cytokinesis II

The result of meiosis I and II is four daughter cells that are genetically different from each other and the parent cell.

DISCUSSION QUESTION

If 25,000,000 cells are produced every second in an adult human body, how many cells would be produced in one hour? Why does the body produce so many cells?

LESSON REVIEW

1. When a cell reproduces during mitosis,

   A. it produces a zygote.

   B. it produces four other cells.

   C. it makes an exact copy of itself.

   D. it creates a cell that is different from itself.

Name: _____ Date: _____

C25. Mitosis & Meiosis

LESSON REVIEW

1. When a cell reproduces during mitosis,

   A. it produces a zygote.

   B. it produces four other cells.

   C. it makes an exact copy of itself.

   D. it creates a cell that is different from itself.

2. During which of the following stages of mitosis does the nucleus divide in two?

   A. prophase

   B. anaphase

   C. telophase

   D. metaphase

3. The cell division that produces cells that are used in sexual reproduction is

   A. mitosis

   B. meiosis

   C. interphase

   D. cytokinesis

4. Which of these is a fertilized cell?

   A. zygote

   B. allele

   C. gamete

   D. chromosome