

Let's make more

cells that is



Cell Cycle

How do cells produce more cells?

To grow and replace worn-out cells, an organism must make new cells. New cells are made from existing cells in a process called the **cell cycle**.

The cell cycle has several parts. First, a cell doubles in size and makes new organelles. The chromosomes in the nucleus are duplicated, or copied. Each chromosome becomes two identical **chromatids**, held together by a **centromere**. The cell is preparing for **mitosis**. During mitosis, the cell's nucleus divides. Finally, **cytokinesis** happens. The cytoplasm divides, and two cells of almost equal size form.

Mitosis and cytokinesis

Phase 1—During the first phase of mitosis, the nuclear membrane disappears. A football-shaped set of spindle fibers forms. The fibers attach to the centromeres that connect the chromatids.



Phase 2—The chromosomes line up along the middle of the cell.



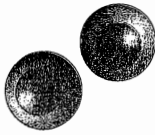
Phase 3—The two chromatids of each pair separate, becoming individual chromosomes, as the spindle fibers pull them to opposite sides of the cell.



Phase 4—The nuclear membrane re-forms around each group of chromosomes. The spindle fibers disappear.



Cytokinesis—after mitosis is completed, the cytoplasm splits in two, forming two complete cells.



Our goal is to understand how cells make more cells by mitosis, mitosis and cytokinesis

Meiosis

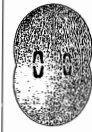
What is meiosis and why is it necessary?



Phase 1—Homologous chromosomes pair up. Each chromosome has two chromatids.



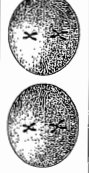
Phase 2—Homologous pairs line up together along the middle of the cell.



Phase 3—Spindle fibers pull the two homologous pairs to opposite sides of the cell.



Phase 4—The cell divides. Each new cell has half as many chromosomes as the original, but each chromosome still has two chromatids.



Phase 5—The chromosomes line up again.



Phase 6—Spindle fibers pull the chromatids to opposite sides of the cell. A nuclear membrane re-forms around each group of chromosomes.



Phase 7—The cells divide to make four new cells. Each has 23 chromosomes, or half the number of chromosomes as the original cell.

In meiosis, the chromosomes are copied once, but the nucleus divides twice.

What is the difference between mitosis and meiosis?

Almost all human body cells contain 23 pairs of chromosomes, or 46 chromosomes in all. The chromosomes in each pair have the same size and shape. They also contain similar hereditary information. The two chromosomes in each pair are called **homologous chromosomes**.

In humans, each sperm cell and each egg cell contains 23 chromosomes, or one-half the usual number of chromosomes.

When a sperm and an egg unite during sexual reproduction, the zygote receives the chromosomes from both. This gives the zygote 23 pairs of chromosomes, or a total of 46 chromosomes.

For a zygote to have 46 chromosomes, sex cells can have only half that number. This makes meiosis necessary. Meiosis is a unique kind of cell division that produces sex cells. Before meiosis begins, each chromosome in the nucleus makes an exact copy of itself, forming two identical chromatids, just like in mitosis.

Standards
52a, 52c,
56d, 57c,
57e

If an organism has 12 chromosomes in its body cells how many chromosomes are in one of its sex cells?

Think and search question

How does the process of mitosis make sure that all new cells have a complete set of chromosomes?

Think and search question

read pages 229 to 238 of your textbook NY Science -grade 6 -chapter 8, section 3, to help you with this work

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Think and search question

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