Lesson 3.1 Mitosis

mitosis: the process of cell division

DNA: long, complex molecules that contain the genetic information needed to construct new cells

chromatin: substance containing DNA chromosomes and proteins

centrosome: small area in a cell next to the nucleus; it controls the fibers, called *microtubules*, that play an important role in mitosis

chromosomes: long, thin structures that contain molecules of DNA and proteins

centromere: the point on the chromosomes where pairs are joined together, as well as where the pair attach to a fiber during metaphase

nuclear membrane: the membrane that encloses the contents of the nucleus and keeps them separate from the rest of the cell

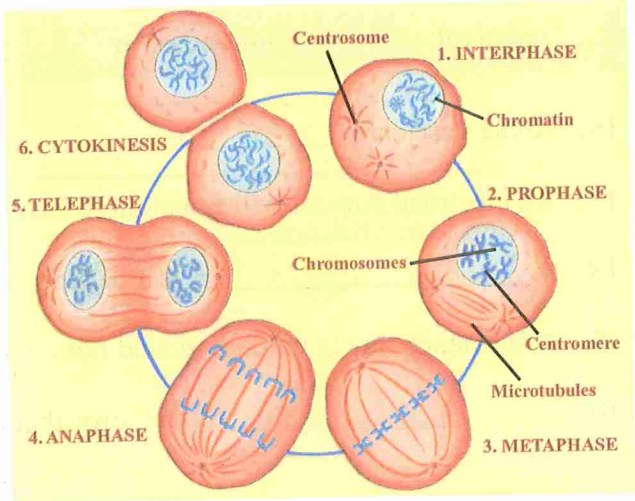
cell membrane: the structure that surrounds and contains the contents of a cell

Chromosome pairs are shaped like Xs, with one chromosome on each side and the centromere at the center.

How does a cell make an exact copy of itself?

With a few exceptions, the cells of your body make duplicates of themselves at regular intervals through a process called **mitosis**, or cell division. Whether the cells play a role in muscle contraction, bone structure, kidney function, or any of the thousands of other jobs a cell might do depends on the **DNA** that was passed along during cell division. Here are the steps involved in mitosis.

- Interphase: A cell spends 90 percent of its life doing specific tasks as a muscle cell or kidney cell, for example. During interphase, the nucleus contains packed DNA, proteins called **chromatin**, and one **centrosome** outside the nucleus. As the cells gets ready for mitosis, it makes a copy of its DNA inside the nucleus. Outside the nucleus, proteins are being assembled to create a copy of the cell's centrosome.
- Prophase: The loose bundles of chromatin begin condensing to reveal identical pairs of **chromosomes**. Each X-shaped pair is connected at a single point called a **centromere**. Outside the nucleus, thin fibers connecting the two centrosomes begin growing and push them away from each other. Toward the end of the prophase, the **nuclear membrane** breaks apart, and the chromosomes drift to the center of the cell.
- Metaphase: The centrosomes are now pushed to opposite sides of the cell, and the fibers stretch between them across the entire cell. The nuclear membrane has dissolved, and the chromosome pairs have attached themselves to the fiber.
- Anaphase: Each chromosome pair breaks apart, and the two complete sets move along the fibers toward opposite sides of the cell. The fibers that aren't involved with transporting chromosomes continue to lengthen and push the centrosomes farther apart. This action begins stretching the **cell membrane**.
- Telophase: Two new nuclear membranes form around the chromosomes in each side of the cell, and the fibers continue elongating the cell.
- Cytokinesis: Now that the cell has two nuclei, each one containing a complete set of DNA, the elongated cell membrane pinches together in the middle. The two sides break apart, and cell division is complete.



NAME _____

Use the words in the box to complete the sentences below.

nuclear	**cell**	**centrosomes**	**cytokinesis**	**chromosomes**
mitosis	**DNA**	**interphase**	**centromere**	**chromatin**

1. A _____ is the area of a chromosome pair that attaches to a fiber stretching across the cell during cell division.
2. Most of a cell's life is spent in _____, carrying out its specific tasks.
3. After the chromosome pairs have broken apart and been transported to opposite sides of the cell, two new _____ membranes form.
4. The final stage of cell division occurs during a phase called _____.
5. The fibers that grow across a cell and push it apart stretch between a pair of _____.
6. In the metaphase of _____, the nuclear membrane has completely dissolved.
7. During the prophase, bundles of _____ condense to reveal pairs of chromosomes.
8. _____ are long, complex molecules that contain genetic information.
9. After a cell has divided, the two new cells each contain an identical set of _____.
10. Centrosomes are found outside of the nucleus, but inside the _____ membrane.

Write your answer on the lines below.

11. The fibers that grow between the centrosomes are called *microtubules*. They have two important roles in mitosis. What are they?

_____

_____

Unifying Concepts and Properties

Healthy cells are genetically programmed to live, reproduce, and die at a steady rate. Cancer cells reproduce at a greatly increased rate, or they live longer than they're supposed to. The result is a mass of cells, called a *tumor*, which can interfere with the body's normal, healthy functions. Which part of a cell's structure do you think would most likely be abnormal in order for the cell to be cancerous? Why?

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