

📖 Topic Page: [Mitosis](#)

Definition: **mitosis** from *Philip's Encyclopedia*

Cell division resulting in two genetically identical 'daughter' cells with the same number of chromosomes as the parent cell. Mitosis is the normal process of tissue growth, and is also involved in asexual reproduction. See *also* meiosis

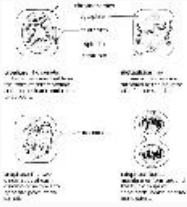


Image from: [mitosis in The Macmillan Encyclopedia](#)

Summary Article: **mitosis**
From *The Columbia Encyclopedia*

(mītō'sīs, mī–), process of nuclear division in a living cell by which the carriers of hereditary information, or the chromosomes, are exactly replicated and the two copies distributed to identical daughter nuclei. Mitosis is almost always accompanied by cell division (cytokinesis), and the latter is sometimes considered a part of the mitotic process. The pattern of mitosis is fundamentally the same in all cells. However, while animal cells apparently

divide by pinching into two separate cells, plant cells develop a cell plate, which becomes a cellulose cell wall between the two daughter cells. The importance of mitosis is the maintenance of the chromosomal set; each cell formed receives chromosomes that are alike in composition and equal in number to the chromosomes of the parent cell.

The Stages of Mitosis

Mitosis is simply described as having four stages—prophase, metaphase, anaphase, and telophase; the steps follow one another without interruption. The entire four-stage division process averages about one hour in duration, and the period between cell divisions, called interphase or interkinesis, varies greatly but is considerably longer.

During **interphase** the chromosomes are dispersed in the nucleus and appear as a network of long, thin threads or filaments, called the chromatin. At some point before prophase begins, the chromosomes replicate themselves to form pairs of identical sister chromosomes, or chromatids; the deoxyribose nucleic acid (DNA) of the chromosomes is synthesized only during interphase, not while mitosis is in process.

During **prophase** the two chromatids remain attached to one another at a region called the centromere, but each contracts into a compact tightly coiled body; the nucleolus and, in most cases, the nuclear envelope break down and disappear. Also during prophase the spindle begins to form. In animal cells the centrioles separate and move apart, and radiating bundles of fibers, called asters, appear around them. Some sets of fiber run from one centriole to the other; these are the spindle fibers. In plant cells the spindle forms without centrioles.

During **metaphase** the chromosomes congregate at a plane midway between the two ends to which the spindle tapers. This is called the equatorial plane and marks the point where the whole cell will divide when nuclear division is completed; the ends of the spindle are the poles to which the chromatids will migrate. The chromatids are attached to the spindle fibers at the centromeres.

During **anaphase** the two chromatids of each chromosome separate and move to opposite poles, as

if pulled along the spindle fibers by the centromeres. During **telophase** new nuclear envelopes form around the two groups of daughter chromosomes (as they are now called), the new nucleoli begin to appear, and eventually, as the formation of the two daughter nuclei is completed, the spindle fibers disappear. The chromosomes uncoil to assume their dispersed distribution within the interphased nucleus. Cytokinesis, which may begin before or after mitosis is completed, finally separates the daughter nuclei into two new individual daughter cells.

A considerable variance in the degree and timing of these stages exists across species, and cells can be classified by their mitotic characteristics. Despite the relative ease of observation of the physical stages of mitosis under the microscope (primarily because the chromosomes stain readily when in their coiled state), the exact chemical and kinetic nature of mitosis is not yet fully understood. For instance, the spindle has been determined to consist largely of thin, elongate tubules called microtubules, but their functions have yet to be understood.

Meiosis and Amitosis

Mitotic division is the method of nuclear division of the somatic (body) cells, as distinguished from the gametes, or sex cells (eggs and sperm). In sexual reproduction, i.e., by the union of two gametes, the complex process of meiosis takes place, which produces cells that each contain only half the normal number of chromosomes. Direct cell division, in which the nucleus simply cleaves in two (sometimes but not always followed by division of the cytoplasm), is called amitosis and is very rare.

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