

# Mitosis

Mitosis is the process where a eukaryotic cell doubles its chromosomes (DNA) and then divides into two cells that are copies of the original cell. It is how new cells are made when an organism (like you) grows or repairs damaged tissue (like a cut).

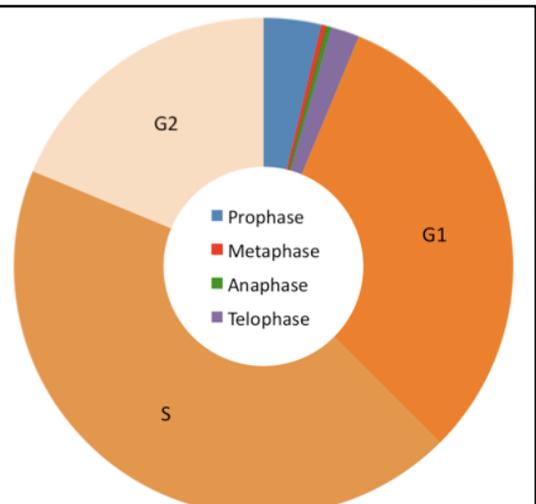
A cell with 2 chromosomes is shown to the right in interphase. Each of these chromosomes duplicates to produce copies (sister chromatids) shown in blue to the left (all the chromosomes are not condensed and visible until prophase).

## Prophase

Centrioles within the centrosome.

A spindle fiber made of microtubules made of tubulin.

In prophase, the spindle fibers begin to form and attach to the **centromeres** (shown in white) of each pair of **sister chromatids**. The **nuclear envelope** dissolves and the **centrioles** move towards opposite poles of the cell. A protein structure called the **kinetochore** connects the spindle fibers to the centromeres.



Mitosis is part of a larger cell cycle. When not in mitosis the cell is in **interphase** which is divided into **G1** (Gap1), **S** (Synthesis) and **G2** (Gap 2). The chromosomes are actually duplicated in the S phase but not visible until prophase. The relative time of each stage is shown in the pie chart above.

## Metaphase

The spindle fibers pull the chromosomes to the center of the cell (the **metaphase plate**). We call this stage metaphase, once all the centromeres are aligned in the center of the cell.

## Anaphase

Anaphase is the stage of mitosis when the sister chromatids are pulled apart (they **disjoin**) and each copy is pulled to an opposite pole of the cell.

## Telophase

In telophase the cell divides in half (**cytokinesis**), spindle fibers disappear and the nuclear envelope forms around each set of chromosomes.

When telophase is complete, two cells have been produced which are copies of the original cell.