Cell Division

Cells divide for many reasons. For example, when you skin your knee, cells divide to replace old, dead, or damaged cells. Cells also divide, allowing living things to grow. Organisms grow because cells divide to produce more cells. In human bodies, nearly two trillion cells divide every day.

Types of Cell Division

There are two types of cell division: **Mitosis** and **Meiosis**. Most of the time, when people refer to "**cell division**," they mean **Mitosis**, the process by which new **body cells** are formed. **Meiosis** is the type of cell division that creates **egg** and **sperm** cells.

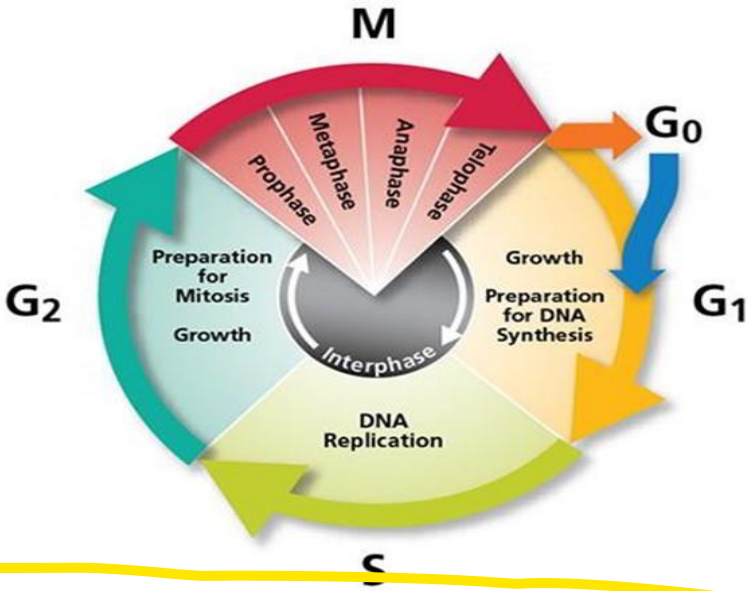
Cell cycle

"The cell cycle refers to the series of events that occur in a cell, resulting in the duplication of DNA and the division of cytoplasm and organelles to produce two daughter cells."

The cell cycle is a four-stage process:

1. (**Gap 1**, or **G1**, stage). The cell is metabolically active and continues to grow without replicating its DNA.
2. Copies its DNA (**synthesis**, or **S**, stage). DNA replication
3. Prepares to divide (**Gap 2**, or **G2**, stage). During this phase, the cell produces the RNA, proteins, and other macromolecules necessary for cell organelle multiplication, spindle formation, and cell growth as it prepares to enter the mitotic phase.
4. Divides (**mitosis**, or **M**, stage). In mitotic division (**Mitosis**), two genetically identical daughter cells are produced from the original cell. The daughter cells, which are structurally and genetically identical, could be used to replace dead cells or repair damaged tissue. All cells of the body, except the fully differentiated nerve cells, undergo mitotic division.

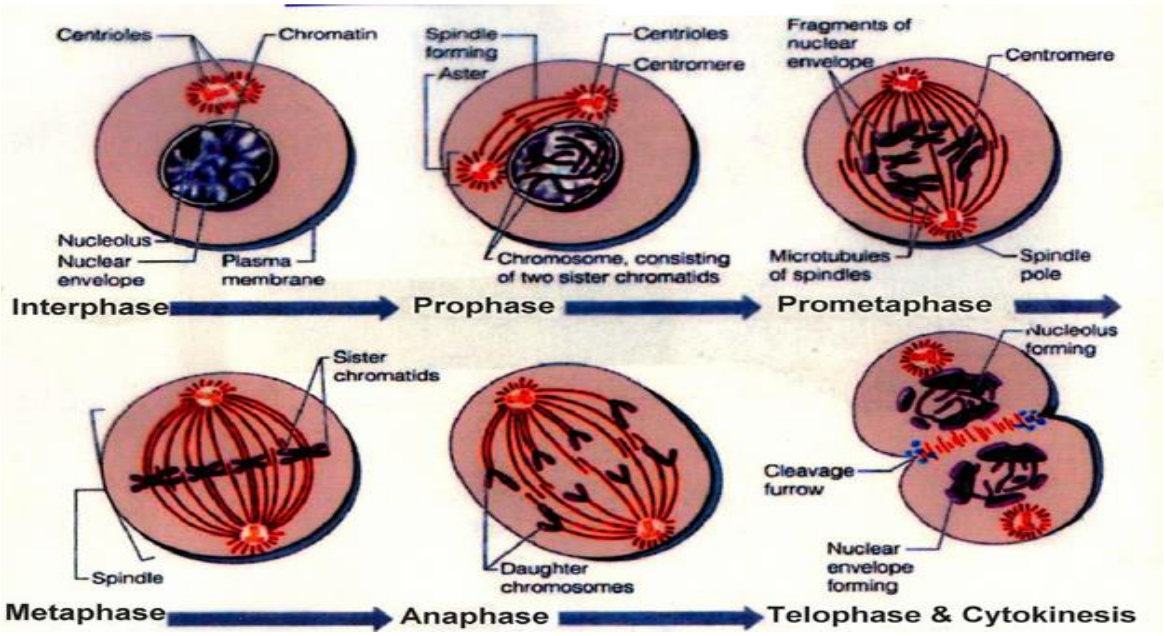
The stages **G1**, **S**, and **G2** comprise **interphase**, which spans the period between cell divisions. Based on the stimulatory and inhibitory messages it receives, a cell decides whether to enter the cell cycle and divide.



↯ Mitotic division proceeds through 5 stages, which include:

1) **Prophase:** Chromosomes condense, shorten, thicken, and become visible
2) **Prometaphase:**
   a. Centrioles separate and migrate in opposite directions
   b. Mitotic spindles (derived from Microtubules) are formed
   c. Nuclear envelope disintegrates (**karyokinesis**)
   d. Chromosomes are attached to the mitotic spindle and are organized by the spindle and centrioles
3) **Metaphase:** Chromosomes are arranged along the **equatorial plane** of the cell by the mitotic spindle
4) **Anaphase:**
   a. Chromosomes split at the centromere
   b. Chromatids are pulled apart by mitotic **spindles/centrioles** in opposite directions
5) **Telophase:**
   a. Chromatids, which are now new Chromosomes, are assembled and enclosed in the nuclear membrane on either side of the cell's center.
   b. Cytoplasm is divided into two (**Cytokinesis**), leading to the formation of two daughter cells from one mother cell.

Stages of Mitosis



Cytokinesis: the process by which cell division is completed through the physical separation of cytoplasmic components into two daughter cells, particularly in **animal cells** that lack cell walls. A contractile ring composed of actin filaments forms just inside the plasma membrane at the former metaphase plate. The actin filaments pull the equator of the cell inward, creating a fissure. This fissure, or "**crack**," is called the **cleavage furrow**.

In **plant cells**, during telophase, the Golgi vesicles move on microtubules to collect at the metaphase plate. There, the vesicles fuse from the center outward toward the cell walls; this structure is called a **cell plate**. As more vesicles fuse, the cell plate enlarges until it merges with the cell wall at the cell's periphery.

