

- Purposes of cell division
 - Growth and repair of damaged cells
 - Reproduction
- The cell cycle can be thought of as the typical life history of a cell
 - Consists of two periods
 - **INTERPHASE** - A growth period– “between” cell divisions
 - Accounts for 90% of the cell cycle
 - G1 phase – cell growth, normal metabolic activities, protein synthesis
 - S phase – DNA synthesis (replication) – *formation of sister chromatids*
 - G2 phase – metabolic activities in preparation for mitosis
 - **MITOSIS** (M) phase - a division period – process by which a nucleus gives rise to 2 identical daughter nuclei.
 - The M phase includes mitosis and cytokinesis.
 - Mitosis is a continuum of changes.
 - For description, mitosis is usually broken into five subphases:
 - » **prophase,**
 - » **Prometaphase,**
 - » **metaphase,**
 - » **anaphase,** and
 - » **telophase.**
- **Late Interphase**
 - By late interphase, the chromosomes have been duplicated but are loosely packed.
 - The centrosomes have been duplicated and begin to organize microtubules into an aster (“star”).
- **Prophase**
 - Chromatin coils and condenses into chromosomes
 - Nucleolus and nuclear envelope disappear
 - The mitotic spindle fibers begin to form and appear to push the centrosomes away from each other toward opposite ends (poles) of the cell.

- Prometaphase
 - Nuclear envelope fragments and microtubules from the spindle interact with the chromosomes.
 - Microtubules from one pole attach to one of two **kinetochores**, special regions of the centromere, while microtubules from the other pole attach to the other kinetochore.
 - Chromosomes begin to align on the equator of the cell
- Metaphase
 - The spindle fibers push the sister chromatids until they are all arranged at the **metaphase plate**, an imaginary plane equidistant between the poles, defining metaphase.
- Anaphase
 - At anaphase, the centromeres divide, separating the sister chromatids
 - Each is now pulled toward the pole to which it is attached by spindle fibers.
 - By the end, the two poles have equivalent numbers of chromosomes.
- Telophase
 - At telophase, the cell continues to elongate as free spindle fibers from each centrosome push off each other.
 - Two nuclei begin to form, surrounded by the fragments of the parent's nuclear envelope.
 - Spindle fibers begin to disappear
 - Chromosomes uncoil and take on the appearance of chromatin
 - Nucleoli/nuclear envelope reappear
- Cytokinesis
 - Division of the cytoplasm
 - Plant cells:
 - Golgi produces vesicles that fuse; form the cell plate (new cell wall)
 - Animal cells:
 - Cleavage furrow forms from squeezing of microfilaments