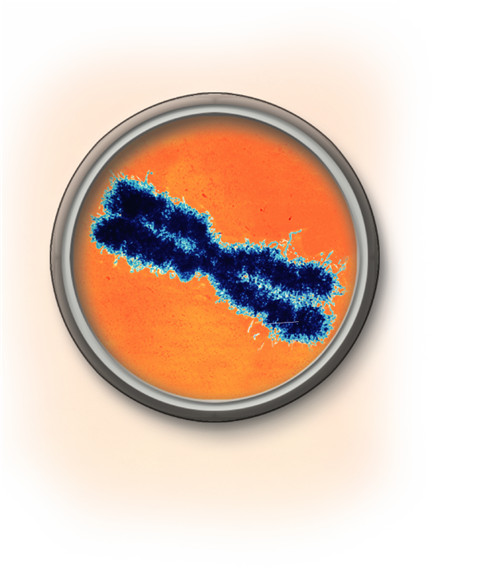
**Chapter 10 – Cell Growth and Division**

Section 1 – Cell Growth

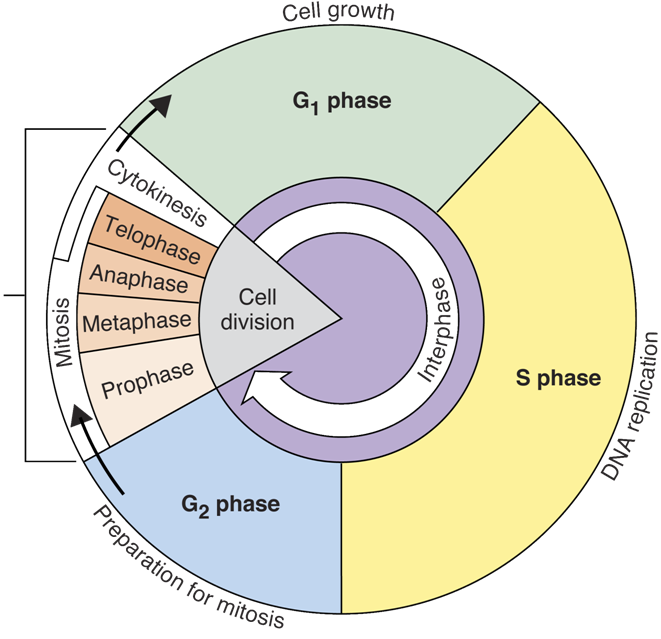
* Limits to Cell Growth
  + The larger a cell becomes, the more \_\_\_\_\_\_\_\_\_\_\_\_\_\_ the cell places on its DNA. In addition, the cell has more trouble moving enough nutrients and wastes across the cell \_\_\_\_\_\_\_\_\_\_\_\_\_.
  + The rate at which food, oxygen, water, and wastes are moved in and out of the cell is dependent on the surface \_\_\_\_\_\_\_\_\_\_\_\_\_\_ of the cell.
  + The rate at which food, oxygen and water are used and waste is produced depends on the cell’s \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
* Ratio of Surface Area to Volume
  + As the length of a cell increases, its volume increases faster than the surface area.
  + The decrease in the cell’s ratio of surface area to volume makes it more difficult for the cell to \_\_\_\_\_\_\_\_\_\_\_\_\_\_ needed materials in and waste products out quickly enough for the cell to survive.
  + Therefore, it is beneficial for cells to have a \_\_\_\_\_\_\_\_\_\_\_\_ surface area and a \_\_\_\_\_\_\_\_\_\_\_ volume
* Division of the Cell
  + Before it becomes too large, a growing cell \_\_\_\_\_\_\_\_\_\_\_\_ forming two “daughter” cells.
  + The process by which a cell divides into two new daughter cells is called cell \_\_\_\_\_\_\_\_\_\_\_\_\_.

Section 2 – Cell Division

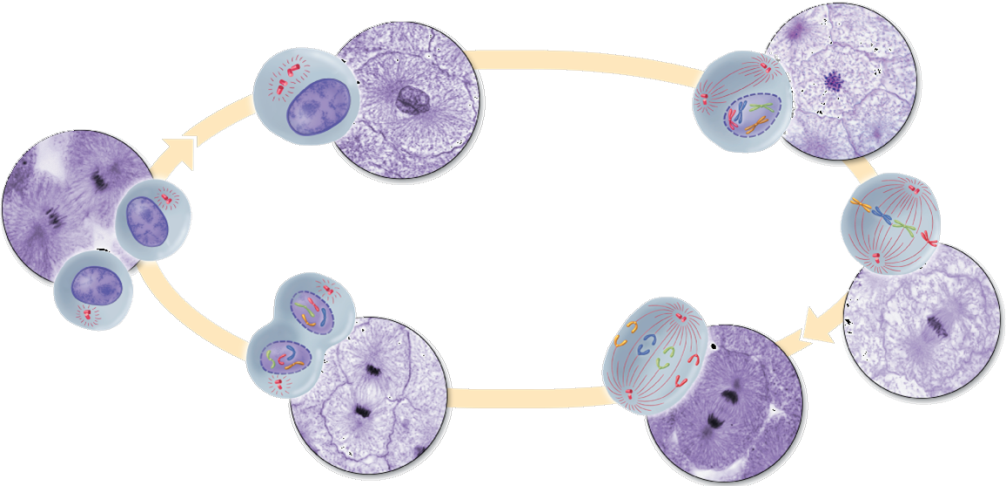
* In eukaryotes, cell division occurs in two major stages.
  + The first stage, division of the cell nucleus, is called **\_\_\_\_\_\_\_\_\_\_\_\_\_.**
  + The second stage, division of the cell cytoplasm, is called **cytokinesis.**
* Chromosomes
  + Genetic information is passed from one generation to the next on **\_\_\_\_\_\_\_\_\_\_\_\_\_**.
  + Before cell division, each chromosome is \_\_\_\_\_\_\_\_\_\_\_\_\_\_, or copied.
  + Each chromosome consists of two identical “\_\_\_\_\_\_\_\_\_\_\_\_\_” chromatids.
  + Each pair of chromatids is attached at an area called the **centromere.**
  + When the cell divides, the chromatids separate.
  + Each new cell gets \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ chromatid.

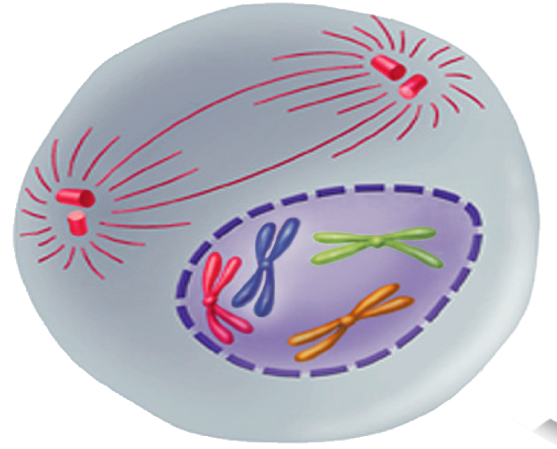


* The Cell Cycle
  + The **cell \_\_\_\_\_\_\_\_\_** is the series of events that cells go through as they grow and divide.
  + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_** is the period of growth that occurs between cell divisions.
  + The cell cycle consists of four phases:
    - G1 (First Gap Phase)
    - S Phase
    - G2 (Second Gap Phase)
    - M Phase
  + During G1, the cell
    - increases in ­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
    - synthesizes new proteins and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + During the S phase,
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are replicated
    - \_\_\_\_\_\_\_\_\_\_\_\_\_\_ synthesis takes place
    - Once a cell enters the S phase, it usually completes the rest of the cell cycle.
  + The G2 Phase (Second Gap Phase)
    - organelles and molecules required for cell \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ are produced
    - Once G2 is complete, the cell is ready to start the M phase—Mitosis

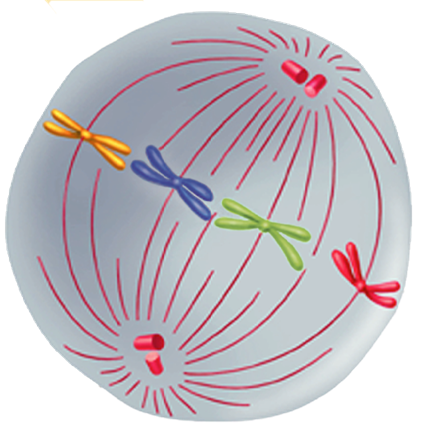


Section 2 – Cell Division (Part 2)

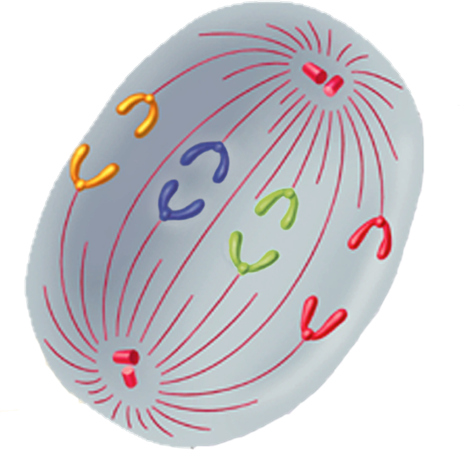
* Mitosis
  + Biologists divide the events of mitosis into \_\_\_\_\_\_\_\_\_ phases:
    - **Prophase**
    - **Metaphase**
    - **Anaphase**
    - **Telophase**
  + Prophase
    - Prophase is the first and \_\_\_\_\_\_\_\_\_\_\_\_\_\_ phase of mitosis.
    - The **centrioles** separate and take up positions on opposite sides of the nucleus.
    - The centrioles lie in a region called the centrosome.
    - The centrosomehelps to organize the **\_\_\_\_\_\_\_\_\_\_\_\_\_\_**, a fanlike microtubule structure that helps separate the chromosomes.
    - Chromatin condenses into \_\_\_\_\_\_\_\_\_\_\_\_.
    - The centrioles separate and a spindle begins to form.
    - The nuclear \_\_\_\_\_\_\_\_\_\_\_\_\_\_ breaks down.



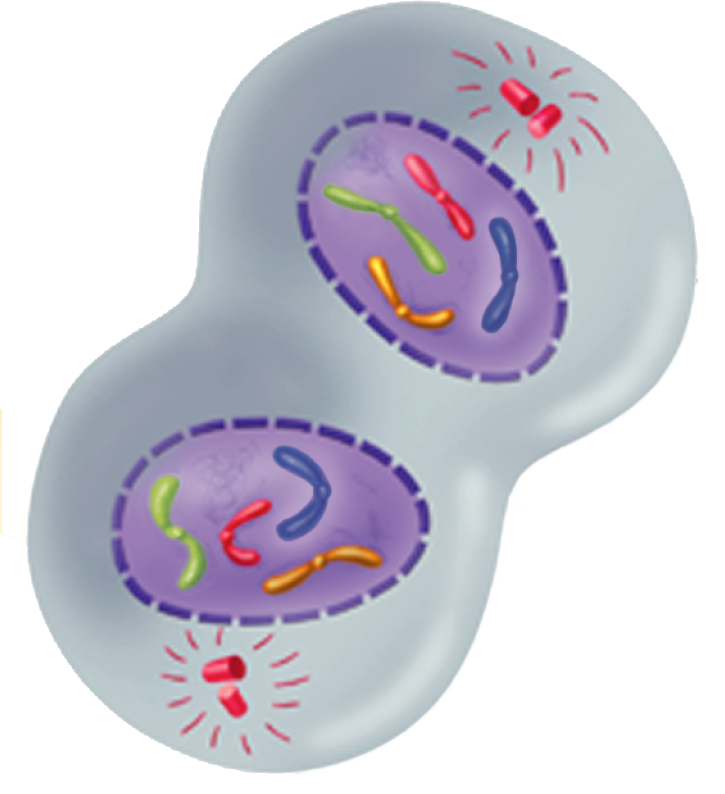
* + Metaphase
    - The second phase of mitosis is metaphase.
    - The chromosomes line up across the \_\_\_\_\_\_\_\_\_\_\_ of the cell.
    - Microtubules connect the centromere of each chromosome to the poles of the spindle.



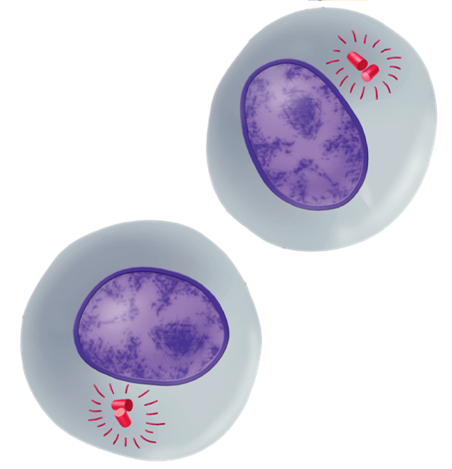
* + Anaphase
    - Anaphase is the third phase of mitosis.
    - The sister chromatids \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ into individual chromosomes.
    - The chromosomes continue to move until they have separated into two groups.

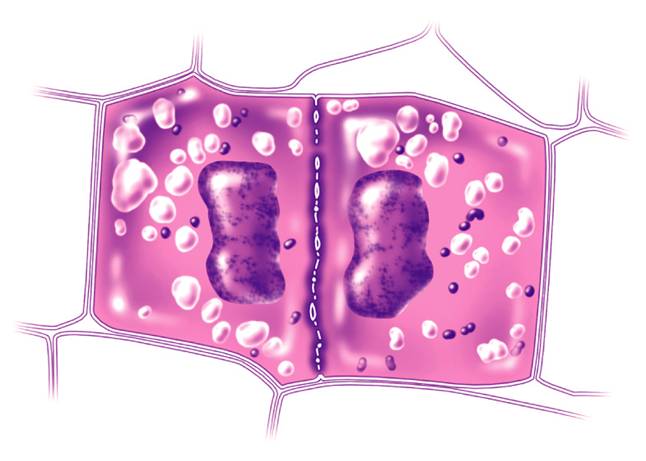


* + Telophase
    - Telophase is the fourth and final phase of mitosis.
    - Chromosomes gather at opposite \_\_\_\_\_\_\_ of the cell and lose their distinct shape
    - A new \_\_\_\_\_\_\_\_\_\_\_\_\_\_ envelope forms around each cluster of chromosomes.



* Cytokinesis
  + During cytokinesis, the \_\_\_\_\_\_\_\_\_\_\_\_\_ pinches in half.
  + Each daughter cell has an identical set of duplicate chromosomes



* Cytokinesis in Plants
  + In plants, a structure known as the cell \_\_\_\_\_\_\_\_\_\_\_\_\_ forms midway between the divided nuclei.
  + The cell plate gradually develops into a separating membrane.
  + A cell wall then begins to appear in the cell plate.

Cell Plate

Section 3 – Regulating the Cell Cycle

* Controls on Cell Division
  + Experiments show that normal cells will reproduce until they come into contact with other cells.
  + When cells come into contact with other cells, they respond by not \_\_\_\_\_\_\_\_\_\_\_\_\_.
  + This demonstrates that controls on cell growth and division can be turned on and off.
  + This is known an \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ inhibition
* Cell Cycle Regulators
  + The cell cycle is regulated by a specific \_\_\_\_\_\_\_\_\_\_\_\_\_.
  + The amount of this protein in the cell rises and falls in time with the cell cycle.
  + Scientists called this protein \_\_\_\_\_\_\_\_\_\_\_\_ because it seemed to regulate the cell cycle.
  + Cyclins regulate the timing of the cell   
    cycle in eukaryotic cells.
* Internal Regulators
  + Proteins that respond to events \_\_\_\_\_\_\_\_\_\_\_\_\_ the cell are called internal regulators.
  + Internal regulators allow the cell cycle to proceed only when certain processes have happened inside the cell.
* External Regulators
  + Proteins that respond to events \_\_\_\_\_\_\_\_\_\_\_\_\_\_ the cell are called external regulators.
  + External regulators direct cells to speed up or slow down the cell cycle.
* Uncontrolled Cell Growth
  + \_\_\_\_\_\_\_\_\_\_\_\_\_ is a disorder in which some of the body's own cells lose the ability to control growth.
  + How are cancer cells different from other cells?
    - Cancer cells do not respond to the signals that regulate the growth of most cells.
    - Cancer cells divide uncontrollably and form masses of cells called \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that can damage the surrounding tissues.
    - Cancer cells may break loose from tumors and spread throughout the body, disrupting normal activities and causing serious medical problems or even \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.