



Objectives

- ✿ List the components of chromosomes from smallest to largest.
- ✿ Differentiate between haploid and diploid cells.
- ✿ List the phases of the Cell Cycle and describe what is happening in each.
- ✿ Evaluate the importance of mitosis.
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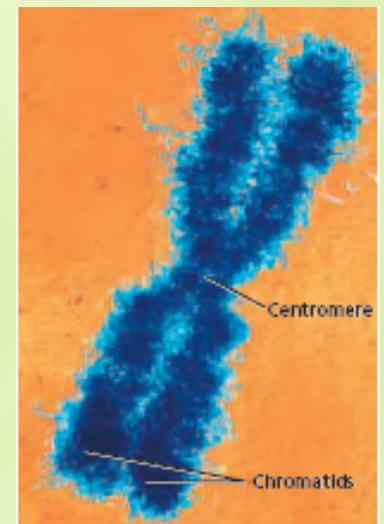
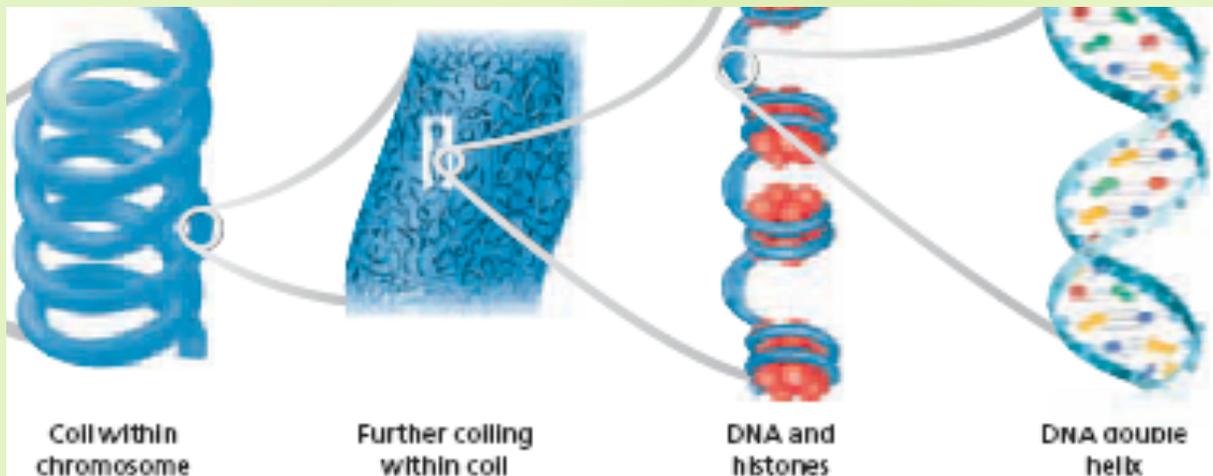


Chromosomes

- ✿ **Chromosomes** are rod-shaped structures made of DNA and proteins that contain all of the genetic information from a cell.
- ✿ They are located in the nucleus of each cell and are responsible for **EVERYTHING** that a cell is and does.
- ✿ Chromosomes have a complex structure that is designed for protection as well as ease of **replication**.

The Structure of Chromosomes

- ✿ Chromosomes are composed of coils of **DNA**.
- ✿ Proteins called **histones** help maintain the shape of the DNA coils.
- ✿ Large rods composed of these coils are called **chromatids**.
- ✿ Two chromatids are held together at a **centromere** to make a single chromosome.





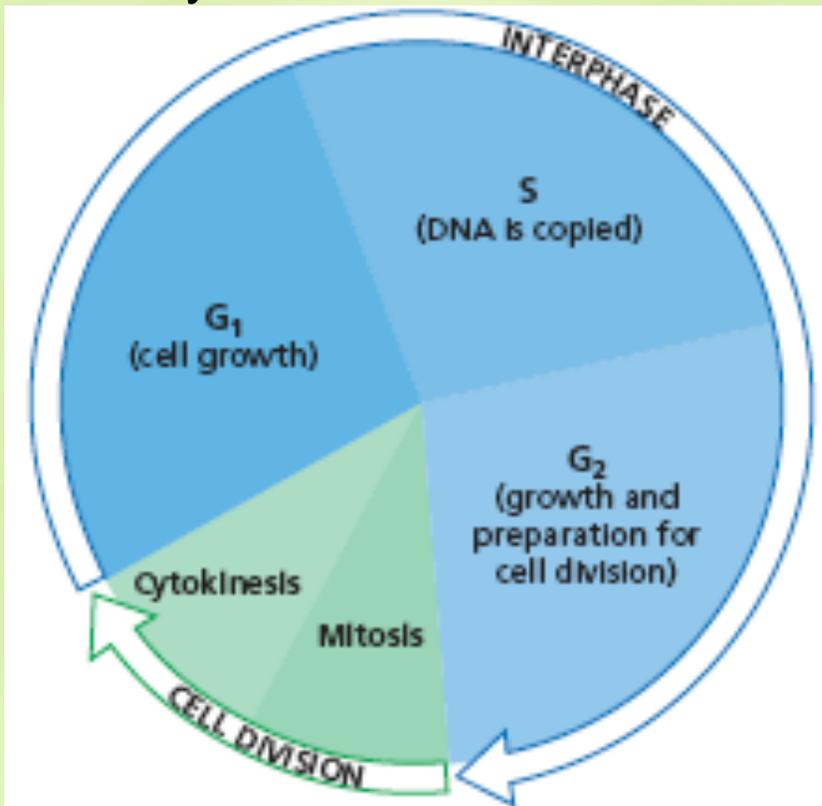
Haploid vs. Diploid

- ✿ The number of chromosomes (n) that a cell has is very important.
- ✿ For a cell to reproduce (replicate) it needs to be able to pass on the information from its chromosomes.
- ✿ Some cells are **diploid** (2 sets or $2n$) and can make EXACT genetic copies of themselves.
- ✿ Other cells are **haploid** (1 set or $1n$) and can reproduce sexually with another cell (these are called **gametes**, like sperm and egg cells.)

Cell Cycle

- ✿ The **cell cycle** is a repeating set of events in the life of a cell.
- ✿ The time from when a cell is newly formed until it divides itself is called **interphase**.
- ✿ Interphase is broken into 3 parts:
 - ✿ G_1 : Cell Growth
 - ✿ S: DNA is copied ($2n$)
 - ✿ G_2 : Growth and preparation for cell division.

- ✿ Cellular division is broken down into 2 parts:
 - ✿ Mitosis:
 - ✿ Cytokinesis





Mitosis

- ✿ **Mitosis**, or cell division, is the process by which a cell divides its nuclear content and cytoplasm to form 2 genetically identical cells.
- ✿ This is a form of **asexual reproduction** because a diploid offspring can be formed from a single parent cell.
- ✿ **Meiosis** is the cell division of gametes which results in the production of haploid offspring.
- ✿ Mitosis occurs only in eukaryotic cells.
- ✿ Prokaryotes undergo a similar process called **binary fission**.



The Phases of Mitosis

- ✿ Mitosis occurs in phases where particular things occur to prepare the cell for division.
- ✿ The phases of mitosis are (in order):
 - ✿ Prophase
 - ✿ Metaphase
 - ✿ Anaphase
 - ✿ Telophase (& Cytokinesis)

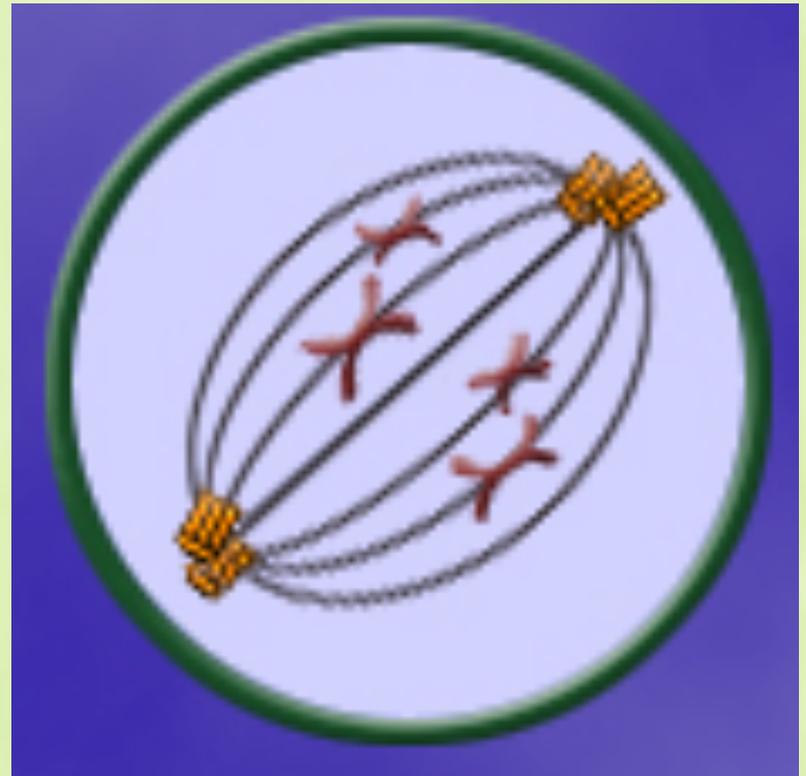
Prophase

- ✿ The first stage of mitosis is **prophase**.
- ✿ In prophase the DNA in the chromosomes tighten and become more dense.
- ✿ Also, the centrioles of the cell separate and begin to build fibers between them called **spindle fibers**.



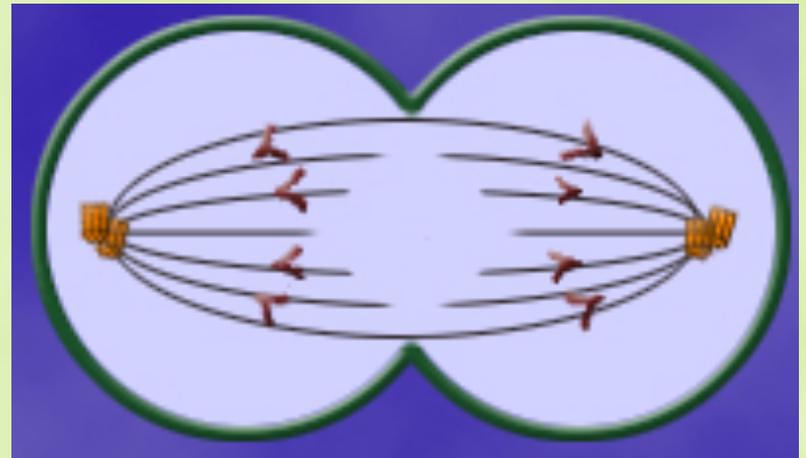
Metaphase

- ✿ The second phase of mitosis is **metaphase**.
- ✿ In metaphase the nuclear membrane disintegrates and the chromosomes begin to line up across the center of the cell.
- ✿ The structure that appears as a result of the lining up of the chromosomes is called the **mitotic spindle**.



Anaphase

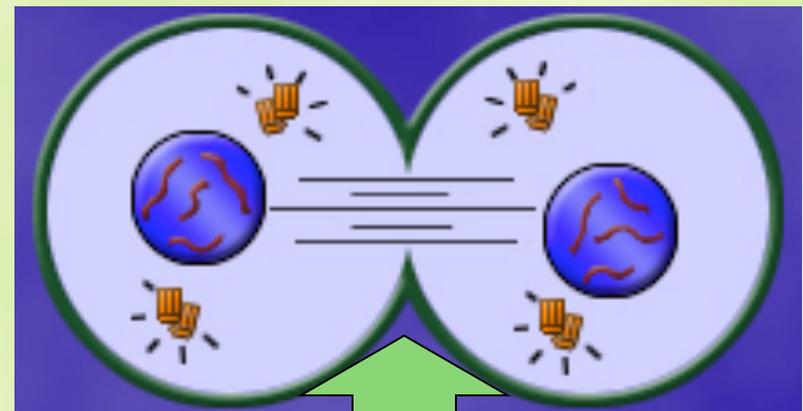
- ✿ The third phase of mitosis is **anaphase**.
- ✿ In anaphase, the chromatids of each chromosome split at the centromere and begin to move to opposite poles of the cell.
- ✿ The cell also begins to elongate (get longer.)



Telophase

- ✿ The fourth phase of mitosis is **telophase**.
- ✿ In telophase, the chromosomes reach the opposite poles and begin to recoil.
- ✿ The Nuclear membrane reforms around the chromosomes.

- ✿ During telophase, the cytoplasm starts to divide by the process of **cytokinesis**.
- ✿ This creates a **cleavage furrow** which, when it collapses, cuts the cell into 2 separate, but identical cells.



Cleavage Furrow

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