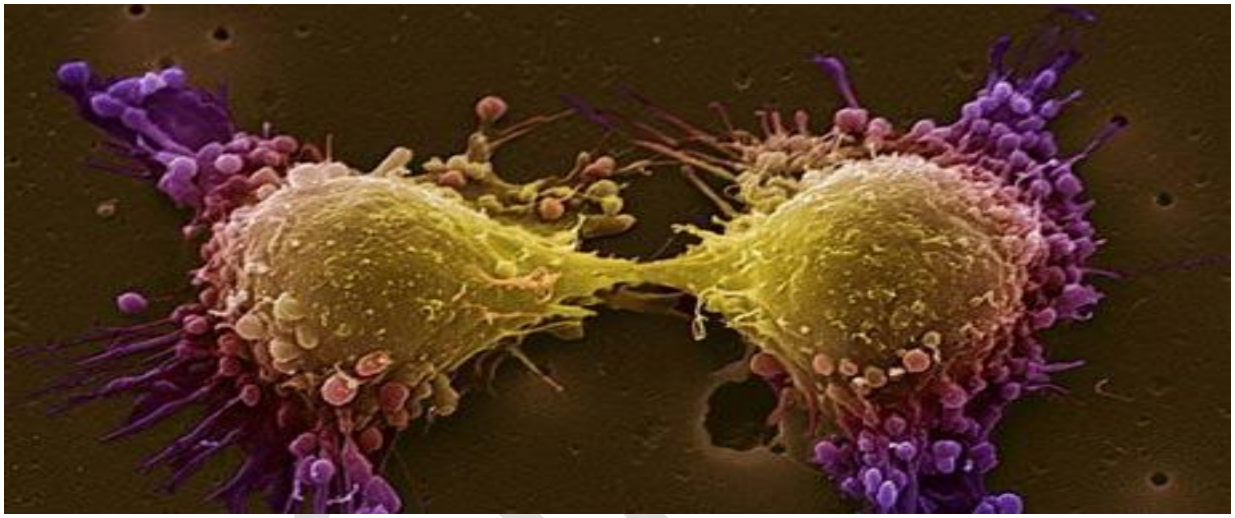

# Shree H. N. Shukla Institute of Pharmaceutical Education and Research, Rajkot

## B. Pharm
## Semester-I

**Subject Name: HUMAN ANATOMY AND PHYSIOLOGY-I**
**Subject Code: BP101TP**

**Chapter-2**

# Introduction to Cell Division



**Cell Division**

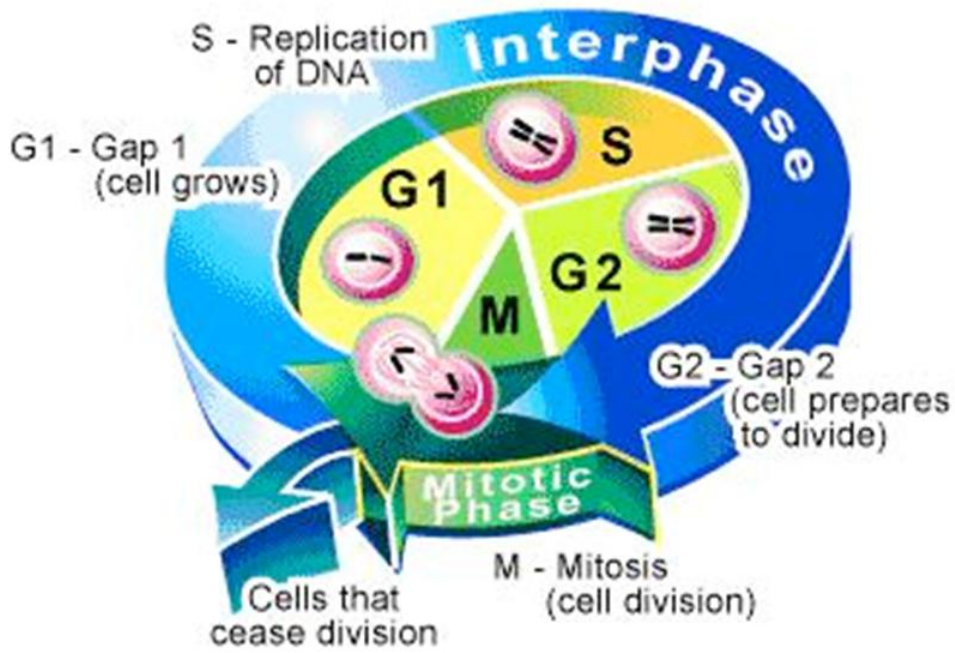
- All cells come from other living cells.
- You (and other living things) grow because your cells get bigger and your number of cells gets larger.
  - A single cell divides into two cells.
  - Two cells divide into four, etc.
  - Cells must also divide because old cells die and need new cells to replace them!

**The Cell Cycle**

- **Cell cycle –** regular sequence of growth and division that eukaryotic cells undergo.
  - Prokaryotic cells undergo binary fission
- Divided into three main stages:
  - **Interphase** – cell grows into its mature size, makes a copy of its DNA, and prepares for division.
  - **Mitosis** – one copy of the DNA is distributed into each of its daughter cells
  - **Cytokinesis** – the cytoplasm divides and organelles are distributed into the two new cells

# Interphase

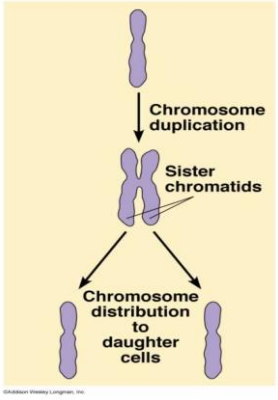
- Interphase is made up of 3 separate parts.




  - G1
  - S
  - G2
- Interphase is the stage that the cell is in for most of its life!

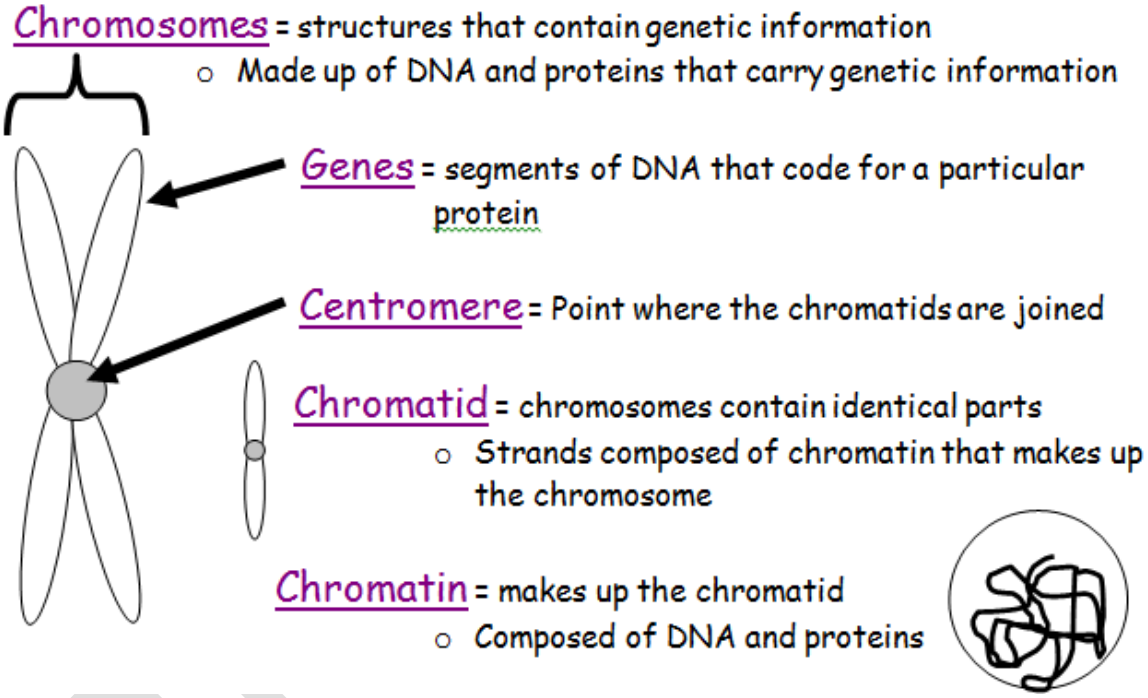
**Sister Chromatids & Chromosomes**

Human somatic cells (any cell other than a gamete) have **23 pairs** of chromosomes. – one from mom and one from dad. These are called **homologous chromosomes**.



- The cell's ***chromatin*** condenses into ***chromosomes***
- The chromosomes look like an "X"
  - Each chromosome is made up of two identical *sister* ***chromatids*** attached by a ***centromere***
  - This is "created" in S phase of interphase

## Chromosome Structure

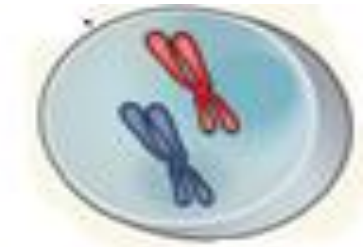



**G1 – Growth Phase**

- Cell doubles in size
- Cell produces all of the structures it needs to carry out its functions
- Think of this phase as the cell just living its normal life.

**S – DNA Copying**

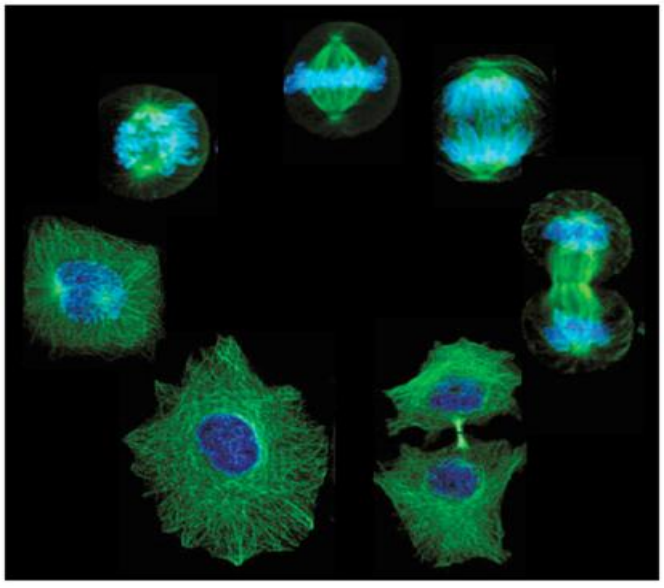
- Cell makes a copy of its DNA (replication)
- This happens because the new cell needs all of the directions for its function and survival.
- Think of this phase as placing the DNA on a copy machine.



**G2 – Preparation**

- Cell prepares to divide
- Cell produces structures needed for cell division
- Think of this phase as the cell double checking everything it needs to divide.

## Mitosis and Cytokinesis

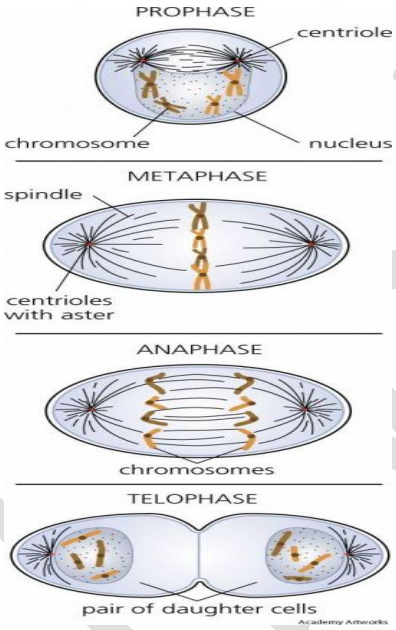


**Mitosis**

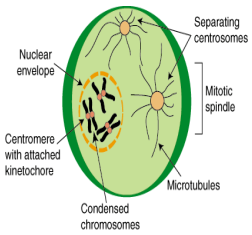
- During mitosis, the cells' copied genetic material separates and the cell prepares to split into two cells
- This allows the cell's genetic material to pass into the new cells
  - The resulting daughter cells are genetically identical!!

**The Four Stages of Mitosis**

- **Prophase** **Anaphase**
- **Metaphase** **Telophase**

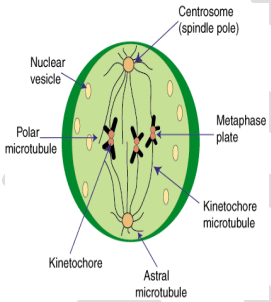


**Prophase**

- Nucleus disappears
- Spindle fibers form in the cytoplasm
- Spindle fibers attach to sister chromatids
- 

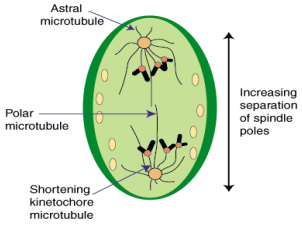

**Metaphase**

- The sister chromatids are pulled to the center of the cell
- They line up in the middle of the cell



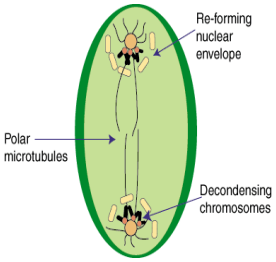

**Anaphase**

- Spindle fibers begin to shorten
- The sister chromatids are pulled to the opposite ends of the cell



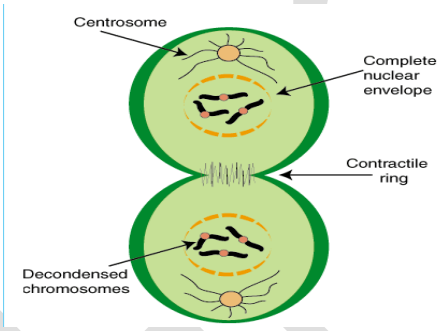
**Telophase**

- The sister chromatids arrive at the opposite poles of the cell and begin to unravel
- New nucleus begins to form

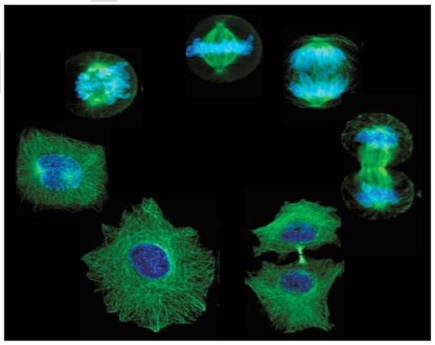



**Cytokinesis**

- Cytokinesis is the division of the cytoplasm
- Results in two separate daughter cells with identical nuclei




# Real-Life Cells Dividing



# Meiosis

*Meiosis* - the process of cell division that produces haploid gametes (half the number of chromosomes: humans: 23)