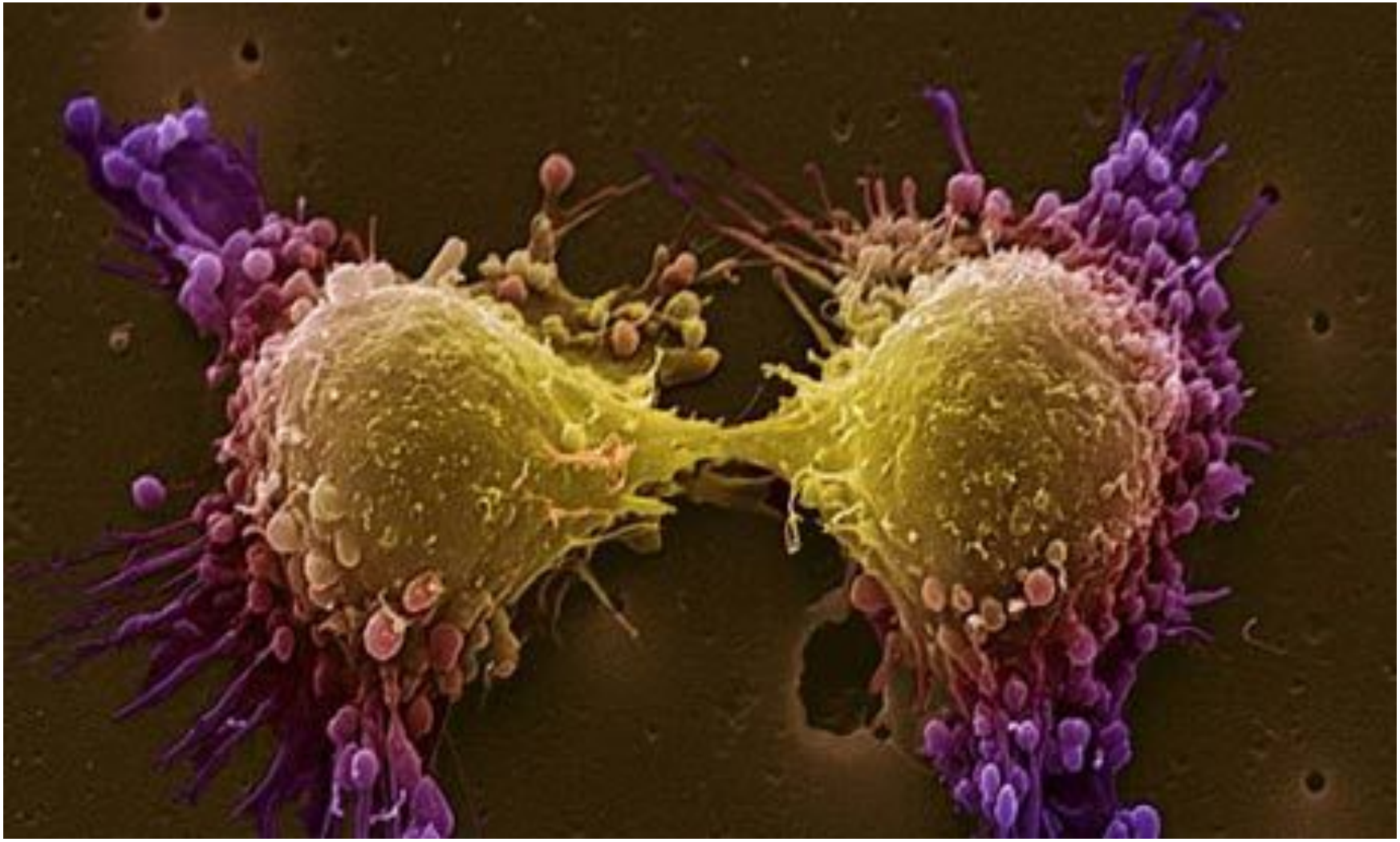
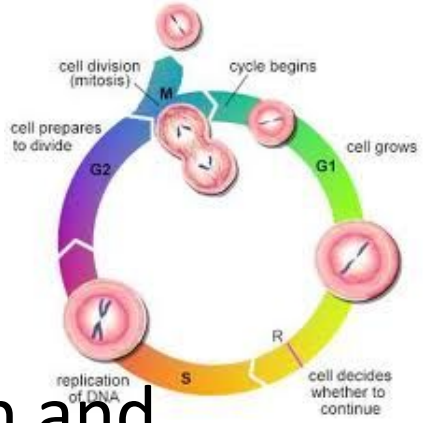
Cell Division



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

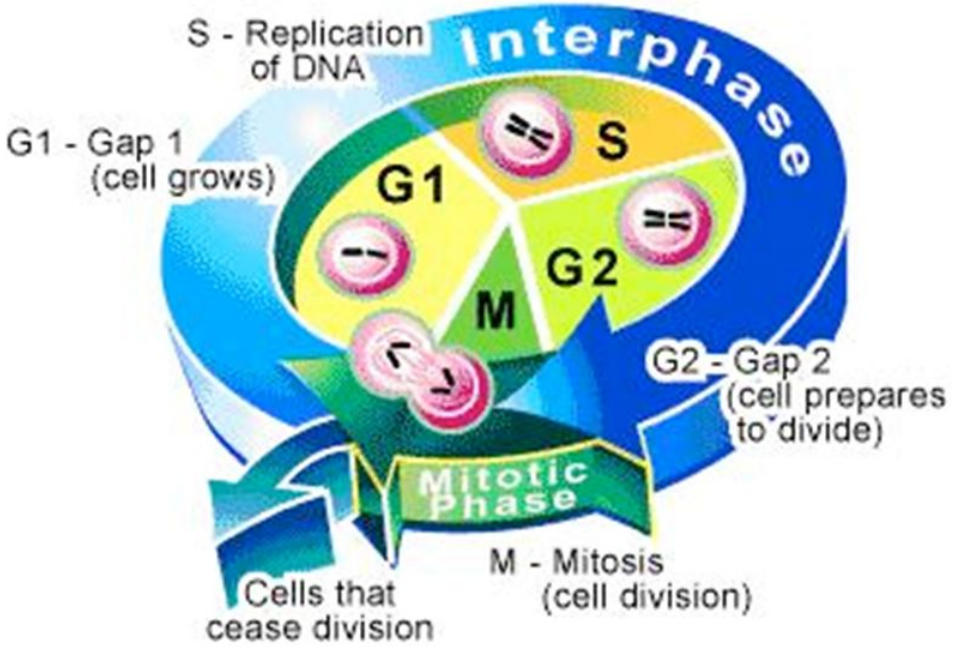


- **Cell cycle** – regular sequence of growth and division that eukaryotic cells undergo.
  - Prokaryotic cells undergo binary fission

- 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

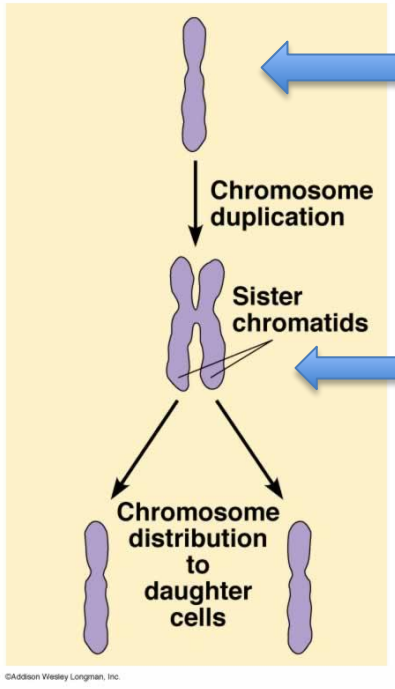
- Interphase is made up of 3 separate parts.
  - G1
  - S
  - G2



- 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**.



Copy of chromosome from mom or dad

Chromosome made in S phase of Interphase

- 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

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

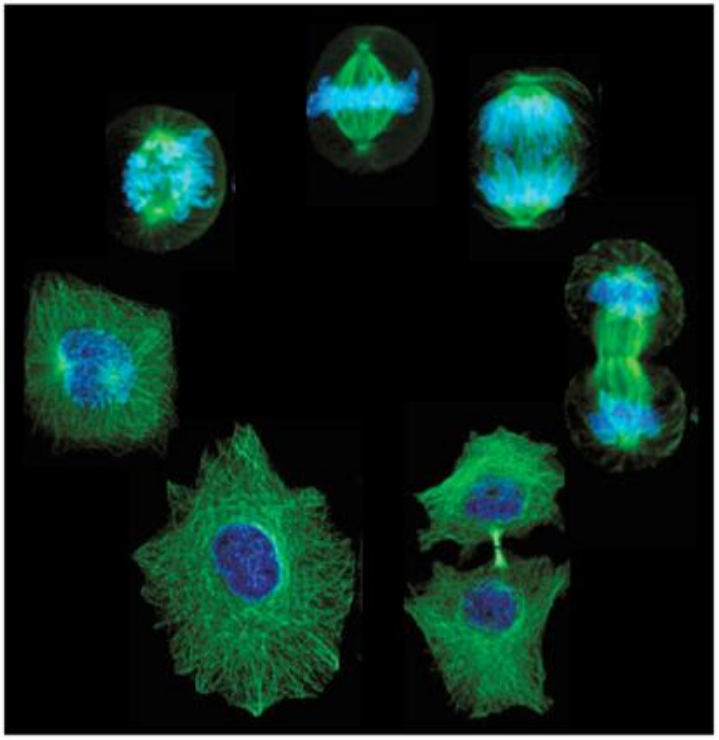
- Cell makes a copy of its DNA (replication)
- This happens because the new cell needs all of the directions for its function and survival.

- 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

Mitosis and Cytokinesis



Mitosis

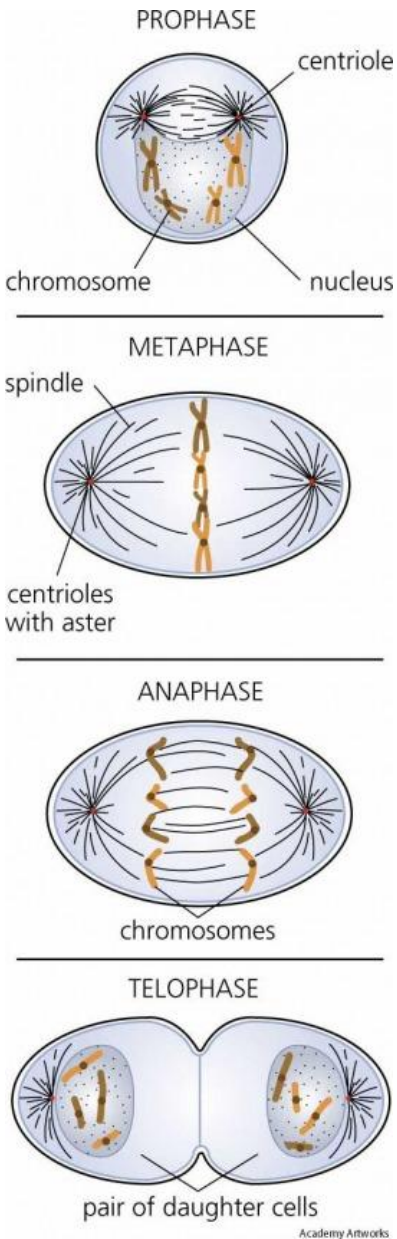
- During mitosis, the cells' copied genetic material separates and the cell prepares to split into two cells

- 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

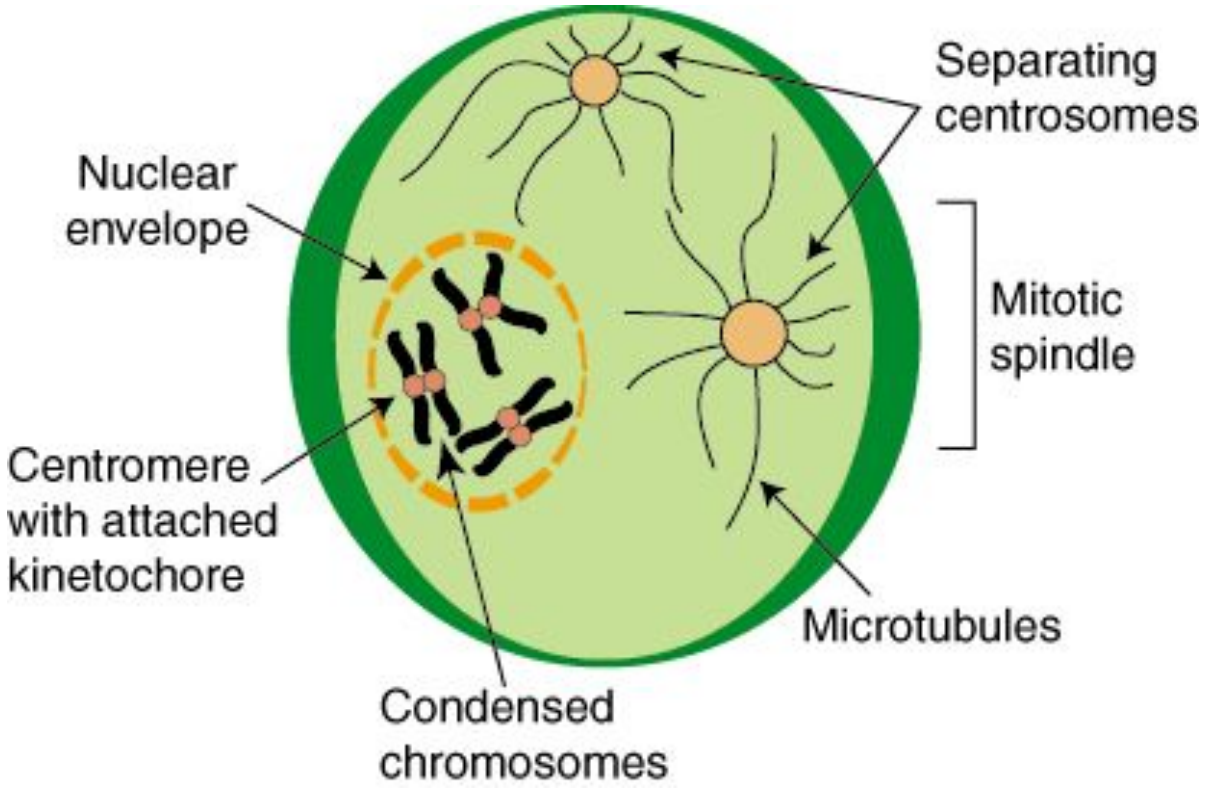
- Remember PMAT!

- Prophase
- Metaphase
- Anaphase
- Telophase



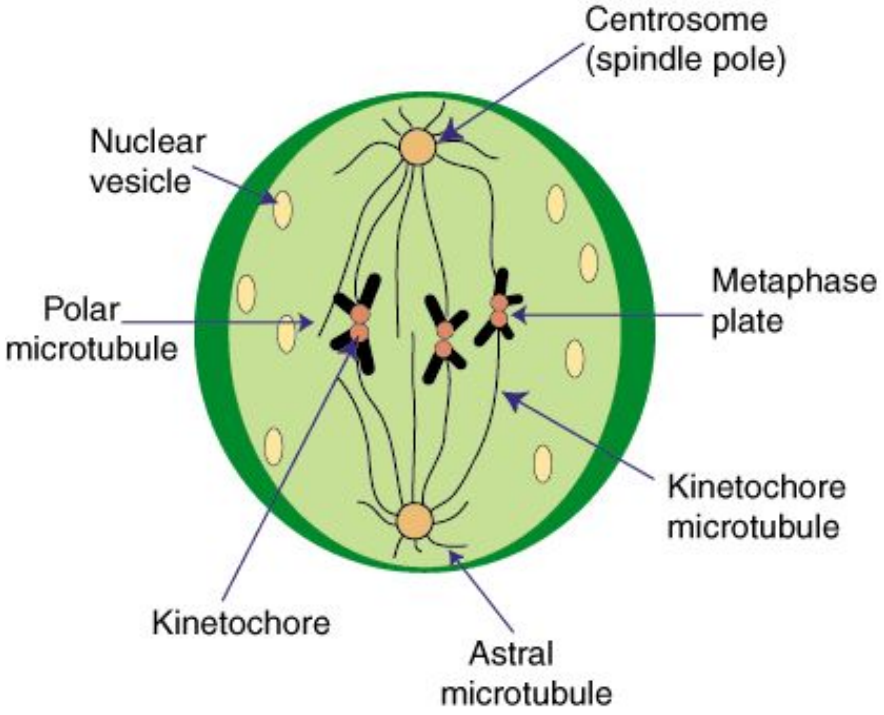
Prophase

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



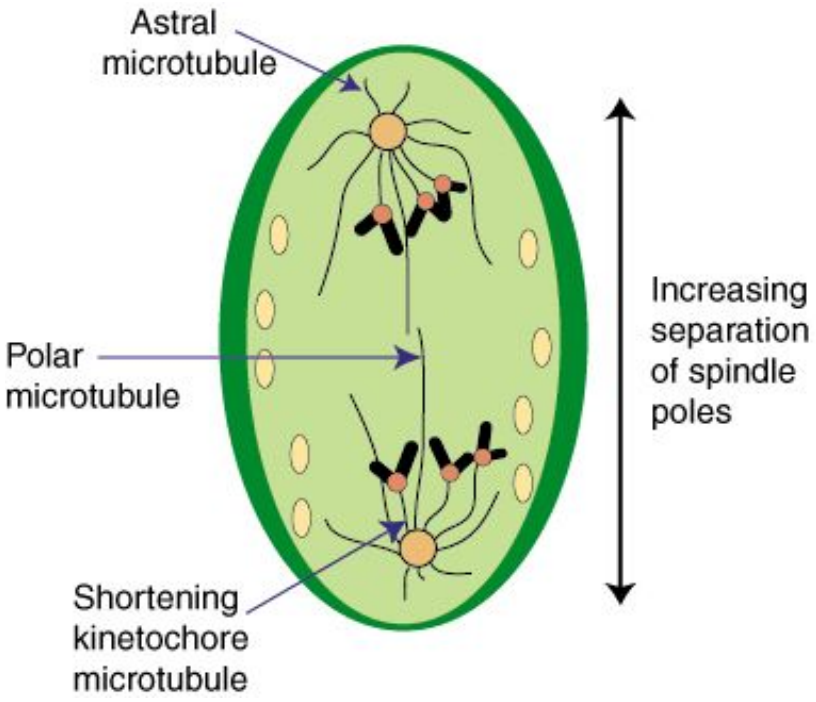
Metaphase

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



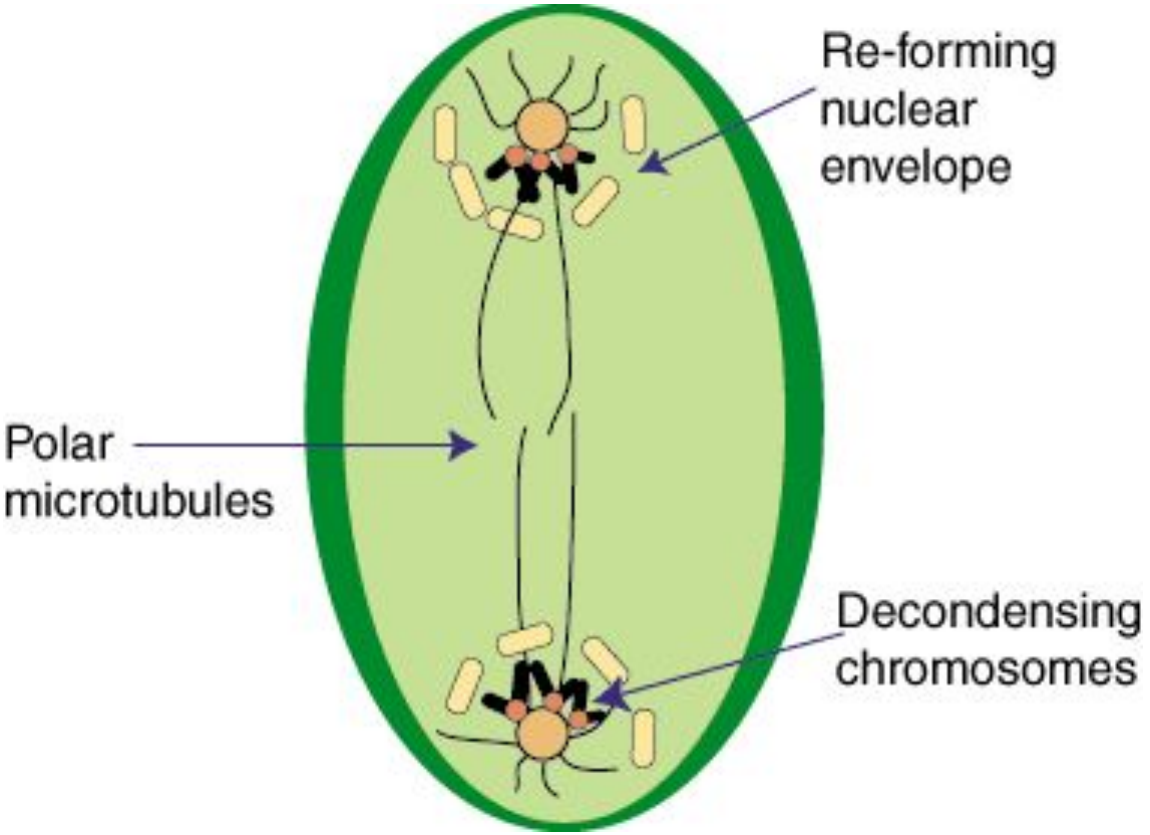
Anaphase

- 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