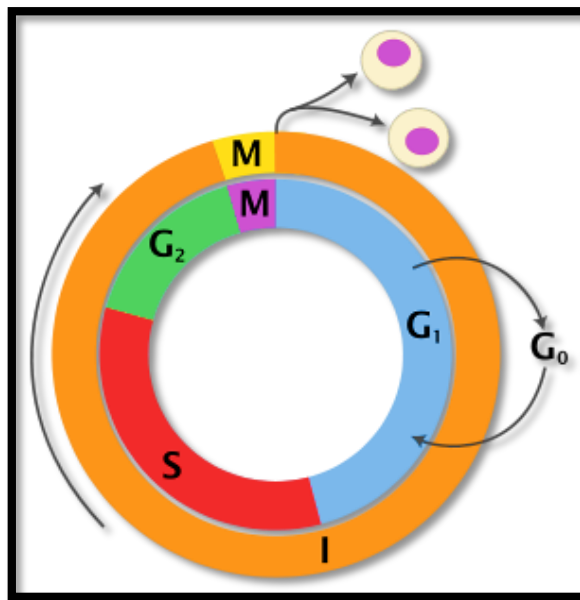


Cell Life Cycle (Mitosis)

- ✚ **The cell cycle** or **cell-division cycle** is the series of events that take place in a cell leading to its division and duplication of its DNA (**DNA replication**) to produce two daughter cells.
- ✚ The cell cycle tightly regulated and controlled by a series of biochemical switches (checkpoints) by responding to internal and external signals.
- ✚ In addition to replicating their genome (Genetic information), most cells replicate their other organelles and macromolecules.
- ✚ DNA molecules in a cell are packaged into chromosomes
 - Prokaryotes- circular DNA
 - Eukaryotes- linear DNA
- ✚ The cell cycle consists of **four distinct phases**: **G1 phase**, **S phase** (synthesis), **G2 phase** (collectively known as interphase) and **M phase** (mitosis).
- ✚ **M phase** is itself composed of two tightly coupled processes: **karyokinesis** (Nucleus division) in which the cell's chromosomes are divided, and **cytokinesis**, in which the cell's cytoplasm divides forming two daughter cells.



(Cell cycle stages)

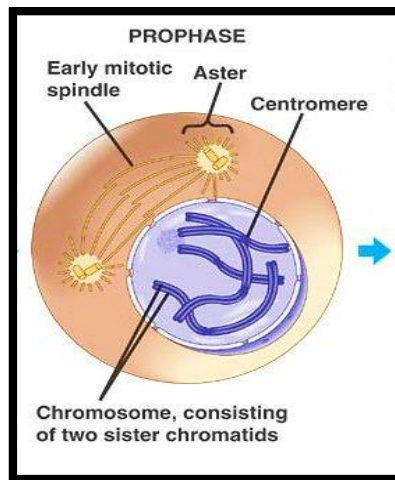
State	Phase	Abbreviation	Description
Resting	Gap 0	G ₀	A phase where the cell has left the cycle and has stopped dividing.
Interphase	Gap 1	G ₁	Cells increase in size in Gap 1. The <i>G₁ checkpoint</i> control mechanism ensures that everything is ready for DNA synthesis.
	Synthesis	S	DNA replication occurs during this phase.
	Gap 2	G ₂	During the gap between DNA synthesis and mitosis, the cell will continue to grow. The <i>G₂ checkpoint</i> control mechanism ensures that everything is ready to enter the M (mitosis) phase and divide.
Cell division	Mitosis	M	Cell growth stops at this stage and cellular energy is focused on the orderly division into two daughter cells. A checkpoint in the middle of mitosis (<i>Metaphase Checkpoint</i>) ensures that the cell is ready to complete cell division.

Mitosis

karyokinesis

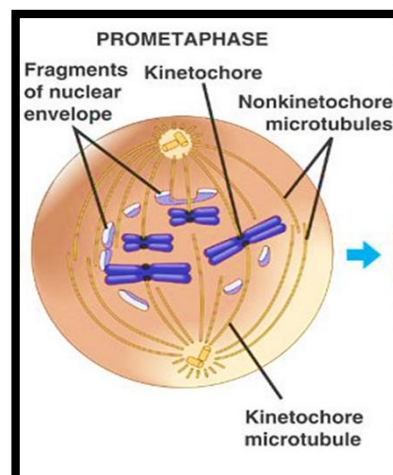
1 – Prophase :

- Chromatin in the nucleus begins to condense and becomes visible in the light microscope as chromosomes.
- The nucleolus disappears.
- Centrioles begin moving to opposite ends of the cell and fibers extend from the centromeres.
- Some fibers cross the cell to form the mitotic spindle.



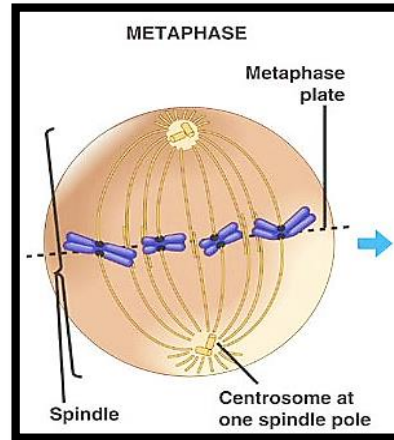
2- Prometaphase :

- The nuclear membrane dissolves, marking the beginning of prometaphase.
- Proteins attach to the centromeres creating the kinetochores.
- Microtubules attach at the kinetochores and the chromosomes begin moving.



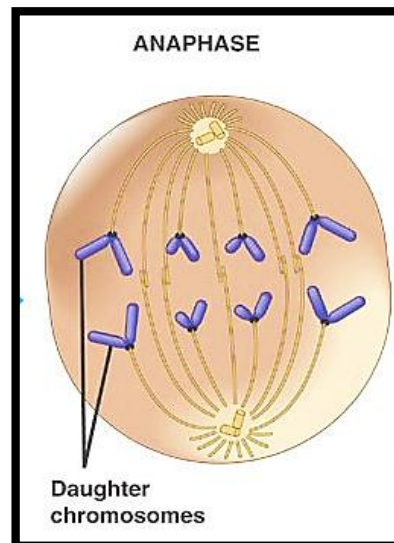
3- Metaphase :

- Spindle fibers align the chromosomes along the middle of the cell nucleus.
- This line is referred to as the metaphase plate.
- This organization helps to ensure that in the next phase, when the chromosomes are separated, each new nucleus will receive one copy of each chromosome.



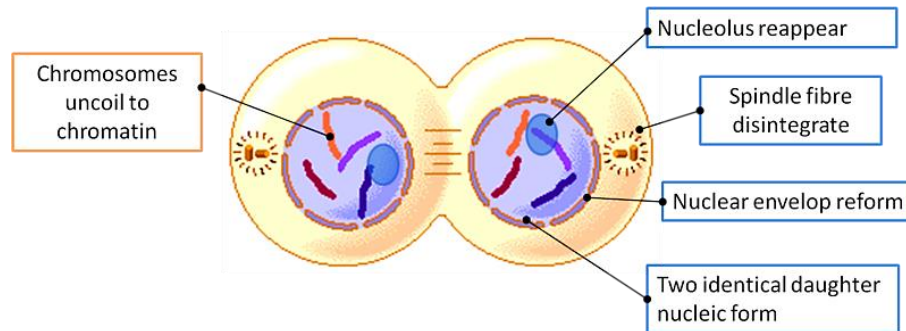
4 – Anaphase :

- The paired chromosomes separate at the kinetochores and move to opposite sides of the cell.



5 – Telophase :

- Chromatids arrive at opposite poles of cell, and new membranes form around the daughter nuclei.
- The chromosomes disperse and are no longer visible under the light microscope.
- The spindle fibers disperse.



Cytokinesis

- In **animal cells**, cytokinesis results when a fiber ring composed of a protein called actin around the center of the cell (**cleavage furrow**) contracts pinching the cell into two daughter cells, each with one nucleus.
- In plant cells, the rigid wall requires that a cell plate be synthesized between the two daughter cells.

Cytokinesis in Animal and Plant Cells

