STAGES OF THE CELL CYCLE

In eukaryotic cells, or cells with a nucleus, the stages of the cell cycle are divided into two major phases: interphase and the mitotic (M) phase.

During interphase, the cell grows and makes a copy of its DNA.

During the mitotic (M) phase, the cell separates its DNA into two sets and divides its cytoplasm, forming two new cells.

Table 2: Phases in the Cell Life Cycle

State	Phase	Abbreviation	Description
Quiescent/senescent	Gap 0	G0	A resting phase where the cell has left the cycle and has stopped dividing.
Interphase	Gap 1	G1	Cells increase in size in Gap 1. The G1 checkpoint control mechanism ensures that everything is ready for DNA synthesis.
	Synthesis	S	DNA replication occurs during this phase.
	Gap 2	G2	During the gap between DNA synthesis and mitosis, the cell will continue to grow. Mitochondria and other organelles replicate, chromosomes condense, and microtubules begin to assemble at a spindle. The G2 checkpoint 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 (Metaphase Checkpoint) ensures that the cell is ready to complete cell division.

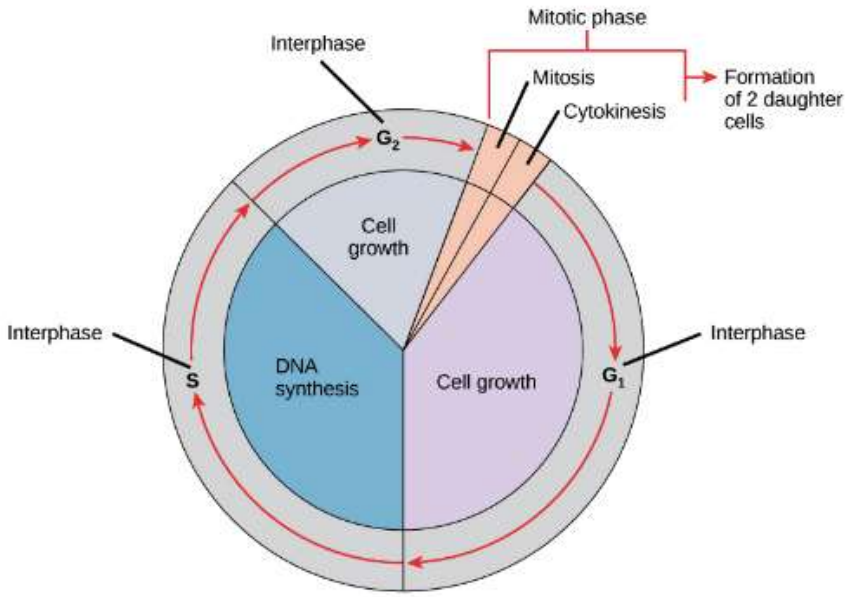

Figure 1: The Cell Cycle

Interphase

Let's enter the cell cycle just as a cell forms, by division of its mother cell. What must this newborn cell do next if it wants to go on and divide itself? Preparation for division happens in three steps:

- **G1.** During G1 phase, also called the first gap phase, the cell grows hysically larger, copies organelles, and makes the molecular building blocks it will need in later steps.
- **S phase.** In S phase, the cell synthesizes a complete copy of the DNA in its nucleus. It also duplicates a microtubule-organizing structure called the centrosome. The centrosomes help separate DNA during M phase.
- **G2.** During the second gap phase, or G2 the cell grows more, makes proteins and organelles, and begins to reorganize its contents in preparation for mitosis. G2 phase ends when mitosis begins.

The G1, S, and G2 phases together are known as **interphase**. The prefix *inter-* means between, reflecting that interphase takes place between one mitotic (M) phase and the next.

M phase

During the mitotic (M) phase, the cell divides its copied DNA and cytoplasm to make two new cells. M phase involves two distinct division-related processes: mitosis and cytokinesis.

In mitosis, the nuclear DNA of the cell condenses into visible chromosomes and is pulled apart by the mitotic spindle, a specialized structure made out of microtubules. Mitosis takes place in four stages: prophase (sometimes divided into early prophase and prometaphase), metaphase, anaphase, and telophase. In cytokinesis, the cytoplasm of the cell is split in two, making two new cells. Cytokinesis usually begins just as mitosis is ending, with a little overlap. Importantly, cytokinesis takes place differently in animal and plant cells.

Cell cycle exit and G0

This stage is also known as the cell cycle exit. After one round of the cell cycle in which two daughter cells produced. Some types of cells start dividing rapidly, and in these cases, the daughter cells may immediately undergo another round of cell division. For instance, many cell types in an early embryo divide rapidly, and so do cells in a tumor.

Other types of cells divide slowly or not at all. These cells may exit the G1 phase and enter a resting state called **G**0. In G0 phase, a cell is not actively preparing to divide, it's just doing its job. For instance, it might conduct signals as a neuron or store carbohydrates as a liver cell. G0 is a permanent state for some cells, while others may re-start division if they get the right signals.