Mitosis

by Sophia

WHAT'S COVERED

In this lesson, you will learn to identify various components of mitosis. Specifically, this lesson will cover:

1. The Cell Cycle

Mitosis is a part of the **cell cycle**. The cell cycle describes events that happen from the time a cell is formed until it divides. Mitosis is a type of cell division that happens in somatic cells (all the cells in your body except for gametes). This process produces new cells. Cells are constantly going through the cell cycle and producing new cells. As cells grow old and die, they need to be replaced by new ones.

TERM TO KNOW

Cell Cycle

Describes the events that occur from the time a cell is formed until it divides.

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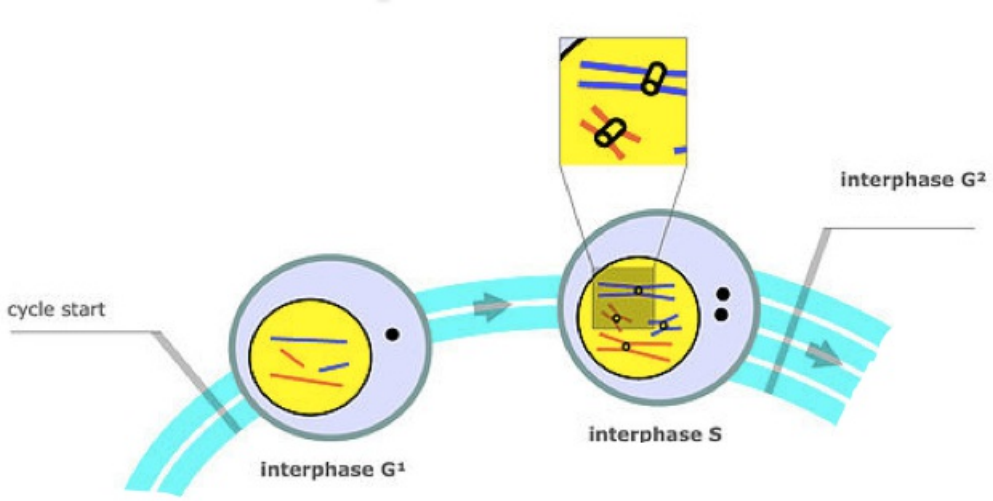
2. Interphase

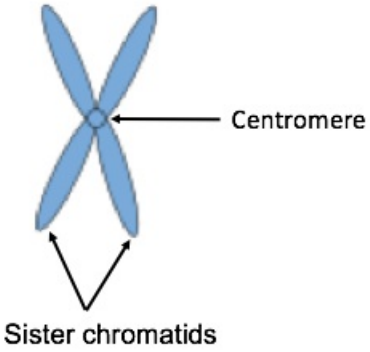
Interphase is the first part of the cell cycle, but it's not considered to be a part of mitosis. Interphase is the part of the cycle where the cell is getting ready to divide but is not dividing yet. It is the longest phase of the cell cycle and is where the cell spends most of its life.

There are three sub-phases to interphase:

- **G1 Phase**: Part of interphase is when the cell will start to increase in size and grow in preparation for cell division.
- **S Phase**: During this part, DNA is copied (DNA synthesis), and chromosomes are duplicated
- **G2 Phase**: Cell grows, making its final preparations in order to get ready to divide



Typically in interphase, chromosomes are not visible. Genetic information, or DNA, is found in the form of chromatin, which is like a thread-like ball of yarn that's found within the nucleus. As a cell is preparing to divide, that DNA will then condense into chromosomes, which will be copied in preparation for division. Chromosomes are made of **sister chromatids** attached in the middle at a point called the**centromere**.



TERMS TO KNOW

Interphase

A phase of the cell cycle in which a cell carries out its normal functions; includes all parts of a cell's life except for when the cell is dividing.

G1 Phase

The portion of interphase in which a cell grows in size.

S Phase

The portion of interphase in which a cell's DNA is copied.

G2 Phase

The portion of interphase in which a cell makes final preparations for cell division.

Sister Chromatid

A duplicate of an original chromosome produced during mitosis.

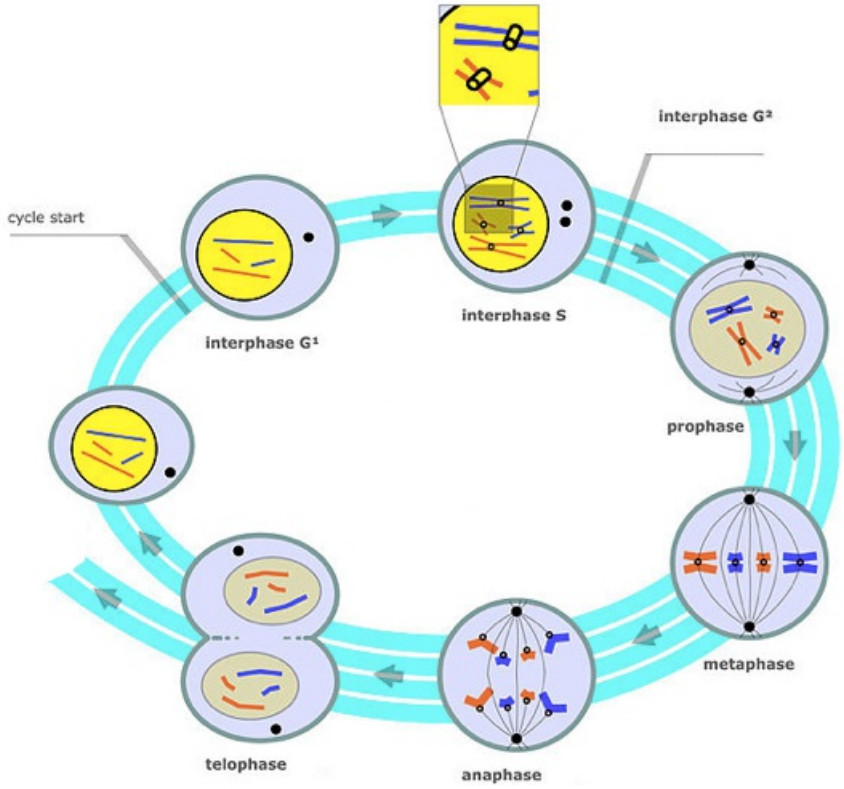
Centromere

The point at which sister chromatids are attached to one another.

3. Mitosis Phases

Mitosis actually includes four phases:

- **Prophase**. During this phase, the nuclear envelope that normally surrounds the genetic information will start to break down. Poles will form on opposite ends of cells; they become the attachment points to each sister chromatid's centromere so that each new cell gets exactly one of the two sister chromatids for each chromosome.
- **Metaphase**. Chromosomes will line up on the metaphase plate, which is an invisible line in the middle of the cell. Spindle fibers are attached to the centromeres of the chromosomes to prepare these chromosomes to be pulled apart to separate ends of the cell.
- **Anaphase**. Sister chromatids are separated and moved to opposite ends of the cell.
- **Telophase**. The nuclear envelope will begin to reform around the chromosomes, and the plasma membrane will start to pinch off. This area where it's pinching off is called the **cleavage furrow**.



TERMS TO KNOW

Prophase

The first phase of mitosis in which chromosomes are condensed, the nuclear membrane breaks down, and poles at opposite ends of the cell begin to form.

Metaphase

The second phase of mitosis in which chromosomes line up on the metaphase plate and are attached at the centromere to spindle fibers.

Anaphase

The third phase of mitosis in which sister chromatids are separated and pulled by spindle fibers

toward opposite poles of the cell.

Telophase

The final phase of mitosis in which the plasma membrane begins to pinch off and the nuclear membrane begins to reform; chromosomes begin to return to their thread-like state.

Cleavage Furrow

The pinching off of the plasma membrane to produce two new cells.

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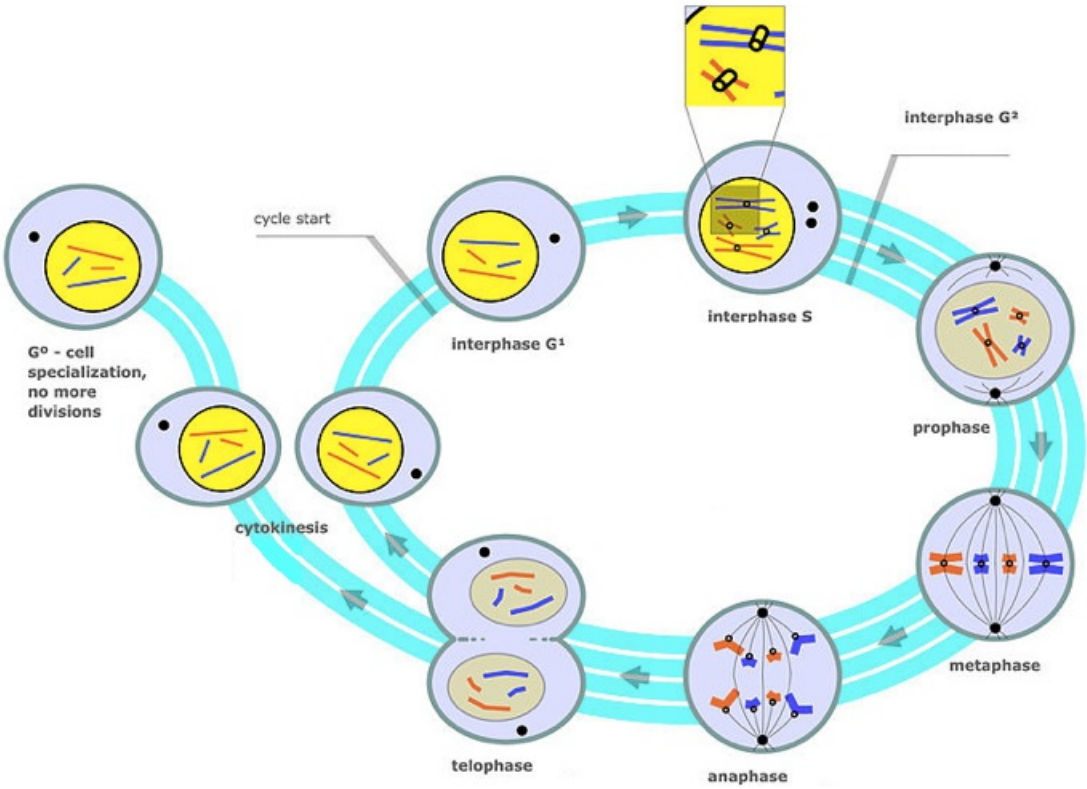
4. Cytokinesis

Cytokinesis follows mitosis. Cytokinesis is were two completely new individual cells exist. These two separate cells are diploid **daughter cells**. They are called **diploid** because they each contain 46 chromosomes (23 chromosomes from each of the two parents), the same number as the original cell. These diploid cells are also identical to the original cell. At this point, the nuclear envelope has completely reformed, and the DNA will return to its thread-like form.



TERMS TO KNOW

Cytokinesis

The end result of mitosis in which two diploid daughter cells are produced which are identical to the parent cell.

Daughter Cells

The name for cells produced by the process of mitosis.

Diploid

Cells that contain two copies of each chromosome (one copy from our mother, and one copy from

other father).

LEARN MORE

Investigate the process of mitosis in three dimensions using augmented reality (AR)!

If you're on a laptop or desktop computer: Scan the QR code using the camera on your smartphone or tablet.

If you are on a phone or tablet click here.

SUMMARY

Mitosis the part of **the cell cycle** where a cell divides to reproduce. **Interphase** is the part of the cycle where a cell spends most of its life and is preparing for mitosis. There are three phases to interphase. G1 is the phase where the cell is growing, S phase is where DNA is copied, and G2 is where the cell makes final preparations for mitosis. During interphase, chromosomes are normally not visible, but as the cell prepares to divide, it will condense and become visible. Once duplicated, sister chromatid are held together by a centromere.

There are four **phases of mitosis**. Prophase is when the nuclear envelope breaks down, and poles are formed at opposite ends of the cell. Metaphase is when the chromosomes start to line up in the middle of the cell, and spindle fibers attach to the centromeres of the chromosomes. During anaphase, sister chromatids are separated and move to the poles. Finally, in telophase, the nuclear envelope will begin to reform around the chromosomes, and the plasma membrane will pinch off.

Cytokinesis follows mitosis and is where two completely new daughter cells exist.

Keep up the learning and have a great day!

Source: THIS WORK IS ADAPTED FROM SOPHIA AUTHOR AMANDA SODERLIND

ATTRIBUTIONS

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TERMS TO KNOW

Anaphase
The third phase of mitosis in which sister chromatids are separated and pulled by spindle fibers toward

opposite poles of the cell.

Cell Cycle
Describes the events that occur from the time a cell is formed until it divides.

Centromere
The point at which sister chromatids are attached to one another.

Cleavage Furrow
The pinching off of the plasma membrane to produce two new cells.

Cytokinesis
The end result of mitosis in which two diploid daughter cells are produced which are identical to the parent cell.

Daughter Cells
The name for cells produced by the process of mitosis.

Diploid
Cells that contain two copies of each chromosome.

G1 Phase
The portion of interphase in which a cell grows in size.

G2 Phase
The portion of interphase in which a cell makes final preparations for cell division.

Interphase
A phase of the cell cycle in which a cell carries out its normal functions; includes all parts of a cell's life except for when the cell is dividing.

Metaphase
The second phase of mitosis in which chromosomes line up on the metaphase plate and are attached at the centromere to spindle fibers.

Prophase
The first phase of mitosis in which chromosomes are condensed, the nuclear membrane breaks down and poles at opposite ends of the cell begin to form.

S Phase
The portion of interphase in which a cell's DNA is copied.

Sister Chromatid
A duplicate of an original chromosome produced during mitosis.

Telophase
The final phase of mitosis in which the plasma membrane begins to pinch off and the nuclear membrane begins to reform. Chromosomes begin to return to their thread-like state.