

Stages of Mitosis : GCSE Biology

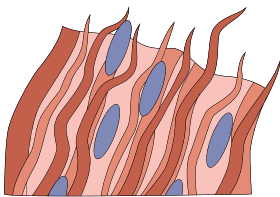
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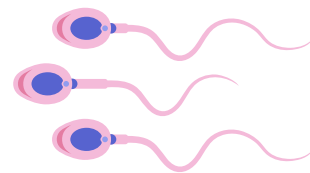
1. Introduction:

- The **basic unit** of an organism's body is a **cell**.
- Cells make up tissue, tissues come together to make an organ, organs constitute an organ system, which makes an organism.
- Therefore, to **grow**, **reproduce**, and **repair**, cells undergo division.
- Cell division is of two types - **Meiosis** and **Mitosis**.

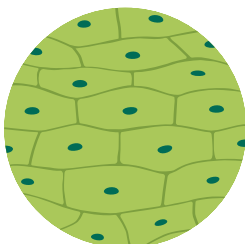
Real-life examples:



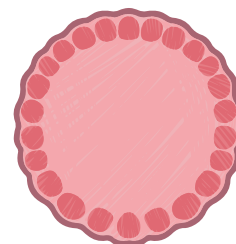
Cell repair



Sperm cell for reproduction



Tissue exposing cells



Growth after zygote formation

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2. What is Mitosis?

- In mitosis, **a cell** divides into **two identical daughter cells**.
- Mitosis is needed in **multicellular** living beings to **grow**.
- It helps **repair the damaged cells**.
- In organisms like bacteria, protists, and some plants, **asexual reproduction** is carried out using mitosis.

3. Importance of Mitosis

- Mitosis assists organisms in **Growth, repair, and asexual reproduction**.

Growth:

- When an organism **grows** from a young individual to an adult, the **number** and the **size** of **cells increase**.
- As **mitosis** gives **two identical cells from a parent cell**, it is used by the organisms to meet the need for an increasing number of cells.

Repair:

- Mitosis gives birth to new cells from parent cells.
- These **new cells replace old, damaged, and dead cells** at the site of injury, helping repair the tissue.

Asexual Reproduction:

- There are a few organisms that have the **ability to reproduce** using only **one parent**, known as asexual reproduction.
- In this, parents give birth to offspring that are exactly the same (**clones**).
- This happens with the help of mitosis.

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4. Stages of the Cell Cycle:

- In a cell cycle, there are two phases - **Interphase** + **Mitosis**
- Before the cell undergoes mitosis, it passes through interphase.
- **Interphase** is the longest phase, divided into **three stages**.

Interphase stage	Characteristics
G1 (Gap 1)	Cell growth, protein, and organelle synthesis
S (Synthesis)	DNA Replication
G2 (Gap 2)	Continued cell growth, and preparation for mitosis

5. Stages of Mitosis:

- Once the cell is **prepared** through various **Interphase stages**, it goes for cell division by **mitosis**.
- A cell crosses **five** stages to complete **Mitosis**.

Prophase:

- In **G2 of Interphase**, the cell continues to grow. For division into two equal daughter cells, the nucleus must divide.
- Thus, the **nuclear membrane** breakdown begins.
- **Condensation** of **chromosomes** begins.
- **Spindle fibres** emerge.

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Metaphase:

- **Spindle fibres** get developed.
- Each **chromosome** gets attached to a spindle fibre.
- On these fibres, the **chromosomes align** themselves in the **middle of the cell**.

Anaphase:

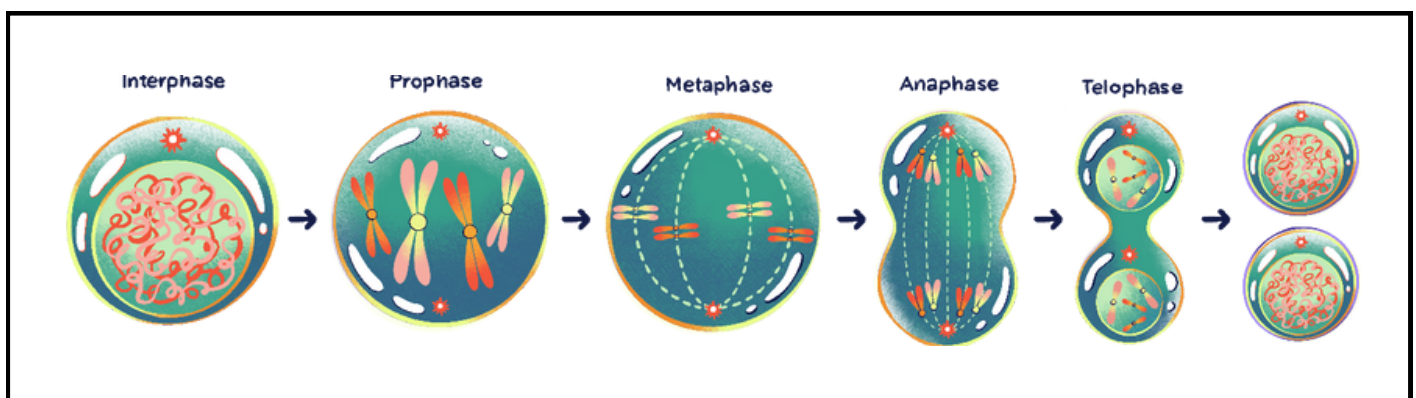
- **Cell elongation** begins after the spindle fibres lengthen.
- The copies of chromosomes (sister chromatids) **segregate** and are **pulled to opposite ends**.
- This opposite movement of sister chromatids happens on the spindle fibres.

Telophase:

- The chromosomes meet at opposite poles and **decondense**.
- Nuclear membrane starts to develop around each set.
- This marks the **formation of new nuclei**.

Cytokinesis:

- The **cytoplasm** of the elongated cell is divided by **surface membrane**.
- Formation of cell wall is observed in plant cells.
- With this, the **cell division completes** and gives two daughter cells.



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6. How does Mitosis Occur?

- For a cell to divide and give birth to new cells, it undergoes **mitosis**.
- **Interphase** prepares the cell by providing the necessary **proteins**, developing **organelles**, and **DNA Replication**.
- The cell enters **Mitosis** after completing interphase.
- As a cell must have a nucleus, in mitosis, its nucleus must divide; that is, **karyokinesis** must occur.
- The stages from **Prophase** to **Telophase** modify the cell.
- Telophase has the cell with **new nuclei**.
- Once it has two nuclei, it splits into **clones**. This **splitting** of the cell from the **cytoplasm** is known as **cytokinesis**.

7. Cancer tumours:

- Generally, cell division occurs only when needed.
- But, sometimes, uncontrollable cell division occurs.
- Such rapid cell division gives rise to the formation of lumps in the body, which are tumors.
- This leads to cancer, which can be deadly.

8. Asexual Reproduction:

- **Asexual reproduction** involves only **one parent** to produce offspring.
- The organism undergoes **mitosis**.
- The offspring produced are **clones** (genetically, they are the same).
- Thus, **no variation** as in sexual reproduction.
- This mode of reproduction is **faster** than sexual reproduction as no partner is needed.
- For example, strawberry plants, aphids, and female Komodo dragons.