

Cell Division

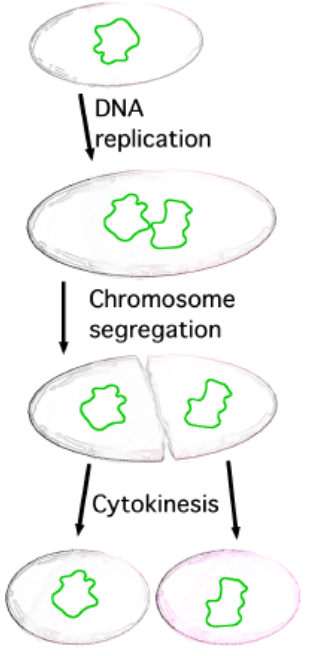
Cell division is the biological process by which a parent cell divides into two or more daughter cells. It is essential for **growth, repair, reproduction, and genetic continuity**.

Types of Cell Division

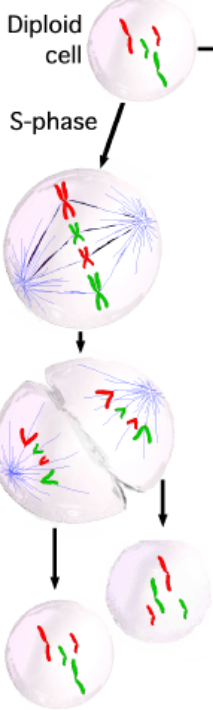
1. **Amitosis (Direct Cell Division)**
2. **Mitosis (Equational Division)**
3. **Meiosis (Reduction Division)**

1 Amitosis (Direct Division)

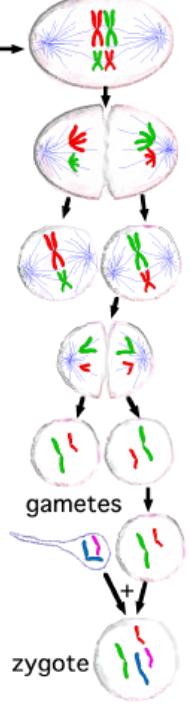
Binary fission



Mitosis



Meiosis



Binary Fission

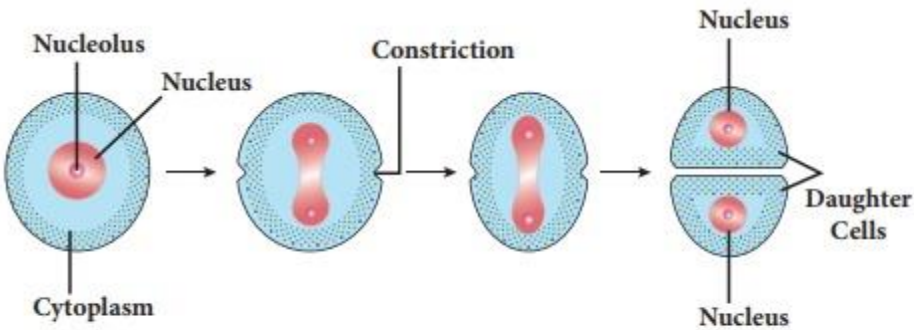
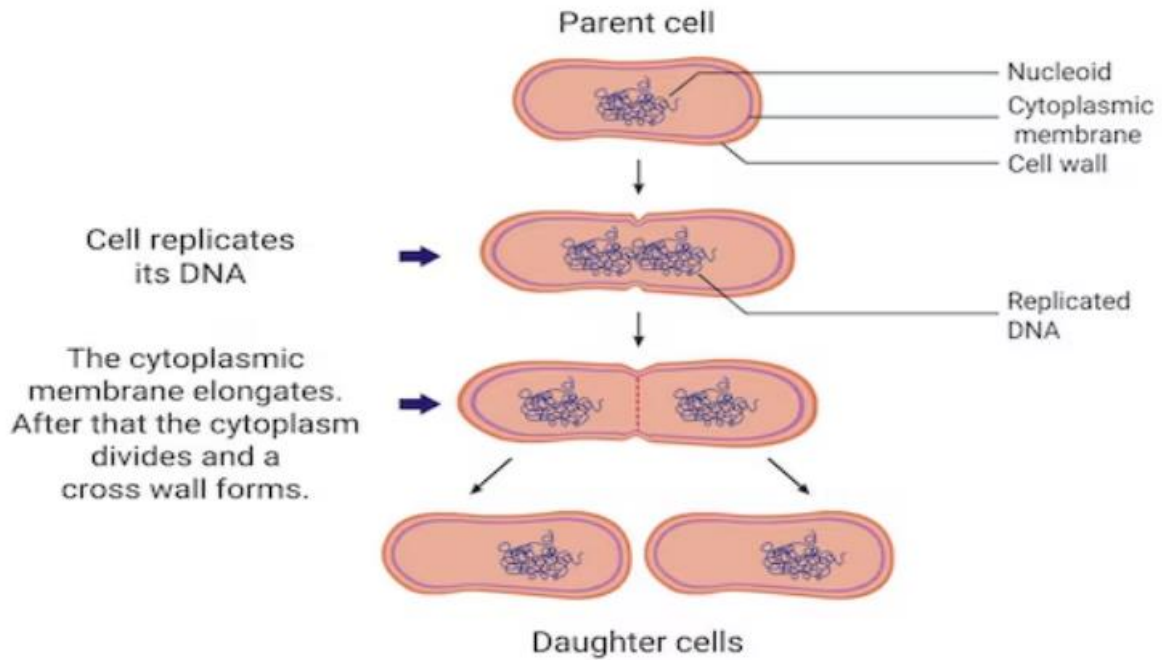


Figure 7.21 Amitosis

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Definition:

A simple type of cell division in which the nucleus divides directly by constriction without spindle formation.

Features:

- No spindle fibers
- No distinct stages
- Unequal distribution of genetic material may occur
- Seen in **prokaryotes** and some protozoans

Example:

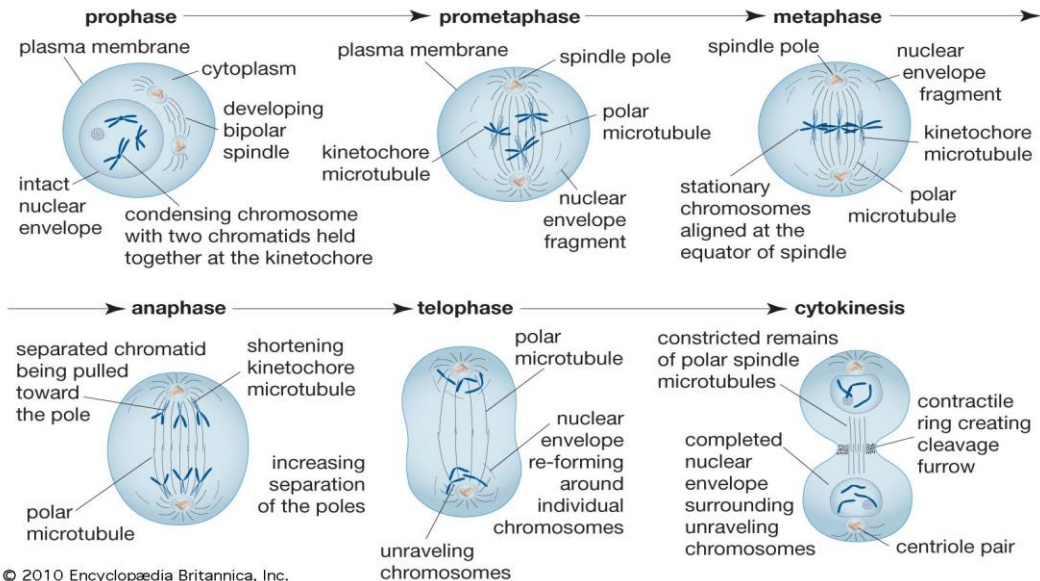
- Binary fission in bacteria

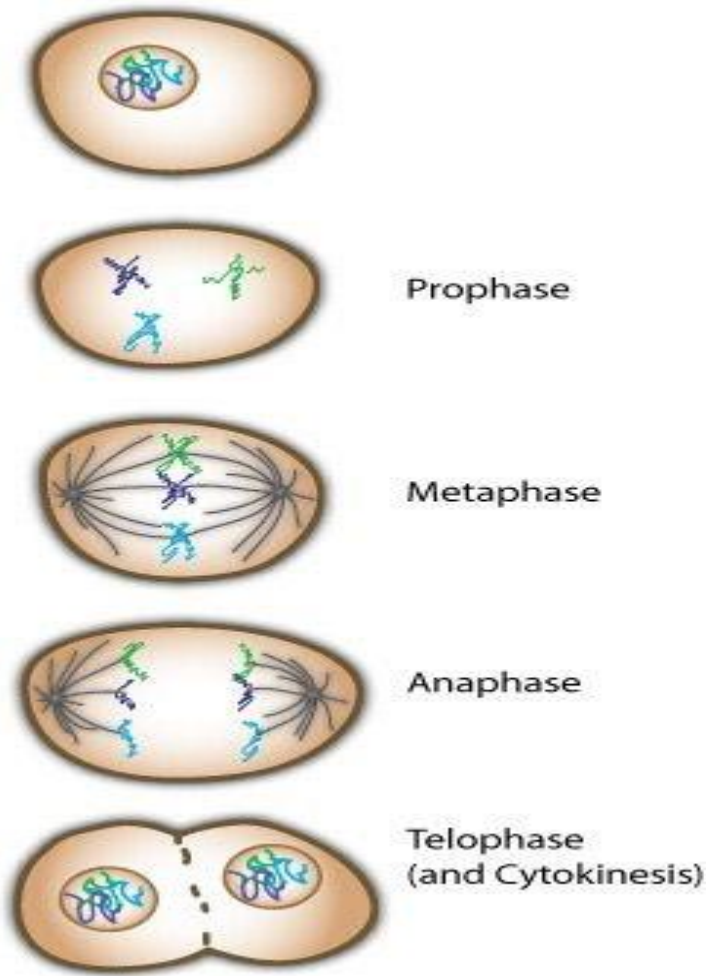
Significance:

- Rapid multiplication
- Simple and energy efficient

2 Mitosis (Equational Division)

Mitosis, or somatic cell division





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Definition:

Mitosis is a type of cell division where one diploid parent cell divides to form two genetically identical diploid daughter cells.

Occurrence:

- Somatic (body) cells
- Growth and tissue repair

Phases of Mitosis

A. Interphase (Preparatory Phase)

- G₁ Phase – Cell growth
- S Phase – DNA replication
- G₂ Phase – Preparation for division

B. Karyokinesis (Nuclear Division)

1. Prophase

- Chromosomes condense
- Nuclear membrane disappears
- Spindle fibers form

2. Metaphase

- Chromosomes align at equatorial plate
- Spindle fibers attach to centromere

3. Anaphase

- Sister chromatids separate
- Move to opposite poles

4. Telophase

- Nuclear membrane reforms
- Chromosomes decondense

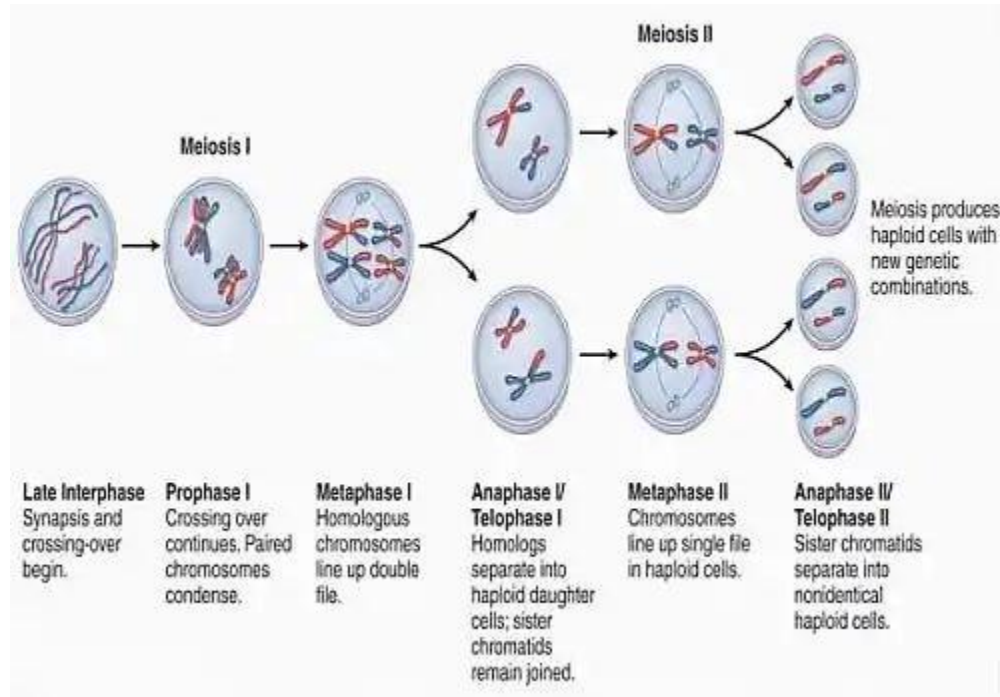
C. Cytokinesis

- Division of cytoplasm
- In animals → Cleavage furrow
- In plants → Cell plate formation

Significance of Mitosis

- Growth in multicellular organisms
- Replacement of damaged cells
- Maintains chromosome number ($2n \rightarrow 2n$)

3 Meiosis (Reduction Division)



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Definition:

Meiosis is a special type of cell division that reduces the chromosome number to half and produces four haploid daughter cells.

Occurrence:

- Germ cells (gamete formation)
- Testes and ovaries

Phases of Meiosis

Meiosis I (Reduction Division)

Prophase I (Sub-stages)

1. Leptotene – Chromosomes become visible
2. Zygotene – Synapsis occurs
3. Pachytene – Crossing over
4. Diplotene – Chiasmata visible
5. Diakinesis – Terminalization

Metaphase I

- Homologous chromosomes align at equator

Anaphase I

- Homologous chromosomes separate

Telophase I

- Two haploid cells formed

Meiosis II (Mitotic Division)

- Prophase II
- Metaphase II
- Anaphase II (Sister chromatids separate)
- Telophase II

Result → **4 haploid (n) daughter cells**

Differences Between Mitosis and Meiosis

Feature	Mitosis	Meiosis
Number of divisions	One	Two
Daughter cells	2	4
Chromosome number	Same as parent (2n)	Half (n)

Feature	Mitosis	Meiosis
Crossing over	Absent	Present
Occurrence	Somatic cells	Germ cells
Genetic variation	No	Yes

Conclusion of Cell Division

- Growth and development
- Tissue repair
- Reproduction
- Maintenance of chromosome number
- Evolution (genetic variation through meiosis)