Cell Division

Mitosis
Reasons for Mitosis

There are three main reasons:

A. growth
B. repair/healing
C. asexual reproduction
Cell Division by mitosis

- Some cells divide constantly: cells in the embryo, skin cells, gut lining cells, etc.

Epithelial Cell

Intestinal Cell

7 week old embryo
Cell Division

- Other cells divide rarely or never.
Cell Division

- 2 kinds of cell division:
  - 1. *Mitosis*: division of somatic cells
  - 2. *Meiosis*: creation of new sex cells

- Sperm cells
- Human egg cell
Cell Division Vocabulary

- **Somatic cell** – a body cell; a cell whose genes will not be passed on to future generations.

- **Germ cell** – a cell that is destined to become a gamete (egg or sperm); a cell whose genes can be passed on to future generations.
Cell Division Vocabulary

- **diploid (2N)** – a cell with 2 chromosome sets in each of its cells; all body (somatic) cells

- **haploid (N)** – a cell with 1 chromosome set in each of its cells; all gametes (sperm, eggs)
Characteristics of Mitosis

- **Adiploid cell will give rise to adiploid cell**
- **Chromosome number remains the same**
- **The DNA remains identically the same**
- **One cell (2N) gives rise to two cells (2N)**
Cell Cycle

- A typical cell goes through a process of growth, development, and reproduction called the cell cycle.

- Most of the cycle is called interphase.
The longest phase in the cell cycle is interphase.

The 3 stages of interphase are called $G_1$, $S$, and $G_2$. 
The cell cycle (Figure 11.5)

INTERPHASE

- S: Growth and DNA replication
- G1: Growth

M: Mitosis

Mitotic phase

- Prophase
- Prometaphase
- Metaphase
- Anaphase
- Telophase
- Cytokinesis

G2: Growth and final preparations for division
Cell Division

- All living cells come from other living cells.
- During mitosis, the nucleus of the cell divides, forming two nuclei with identical genetic information.
Mitos is

- Mitosis produces two genetically identical cells.
- Mitosis is referred to in the following stages: prophase, metaphase, anaphase, and telophase.
**Prophase**

- In prophase, the cell begins the process of division.
- The chromosomes condense.
DNA wraps around protein to make chromatin.

Chromatin folds up to make chromosomes.
Prophase

- Nuclear envelope disappears.
Prophase

- Centrioles migrate to opposite poles of the cell.
- Asters and spindle fibers form.

Aster and the mitotic apparatus in an animal cell
Draw Prophase
Prophase

- Spindle fibers
- Aster
- Centriole
- Centromere
- Sister chromatids
Metaphase

- The chromosomes line up at the equator of the cell (metaphase plate), with the centrioles at opposite ends and the spindle fibers attached to the centromeres.
Draw Metaphase
Anaphase

- In anaphase, the centromeres divide.

- At this point, each chromosome goes from having 2 sister chromatids to being 2 separate chromosomes.
Anaphase

- The spindle fibers contract and the chromosomes are pulled to opposite poles.
Draw Anaphase
Telophase

- In telophase the nucleus actually divides.
- The chromosomes are at the poles of the cell.
- The nuclear envelope re-forms around the two sets of chromosomes.
Draw Telophase e
Cytokines is

- The division of the cytoplasm.

- In animal cells, a Cleavage Furrow forms and separates Daughter Cells.

Cleavage furrow in a dividing frog cell.
Cytokinesis is

- In plant cells, a Cell Plate forms and separates Daughter Cells.
ANIMAL VS. PLANT MITOSIS

- **ANIMAL CELL**
  - Centriole and aster present
  - Daughter cells separated by cleavage furrow

- **PLANT CELL**
  - No visible centriole or aster
  - Daughter cells separated by cell plate
Mitosis: Can you name the stages?
Mitosis: Can you name the stages?

Prophase

1. Prophase
2. Metaphase
3. Anaphase
4. Telophase
5. Cytokinesis
Mitosis: Can you name the stages?

- **Prophase**
- **Metaphase**

Labels:
3
4
5
Mitosis: Can you name the stages?

- Prophase
- Metaphase
- Anaphase
Mitosis: Can you name the stages?

- Prophase
- Metaphase
- Anaphase
- Telophase
Mitosis: Can you name the stages?

- Prophase
- Metaphase
- Anaphase
- Telophase

Cytokinesis
Phases of cell cycle: IPMATIC

- Interphase
- Prophase
- Metaphase
- Anaphase
- Telophase

Cytokinesis

Two daughter cells
Phases of cell cycle - IPMATIC

Important

People

Must

Analyze

Tasks

Correctly

Impatient

People

May

Attack

Teachers

Constantly