

## CELL DIVISION

- All organisms consist of cells and arise from pre-existing cells
- Cell division is important for cell growth, repair as well as reproduction
- Since living things are made from cells, understanding how cells divide and the different types of cell division is fundamental to understanding how multicellular organisms such as humans reproduce, grow and maintain themselves
- The types of cell division are:

Mitosis  
Meiosis

### MITOSIS

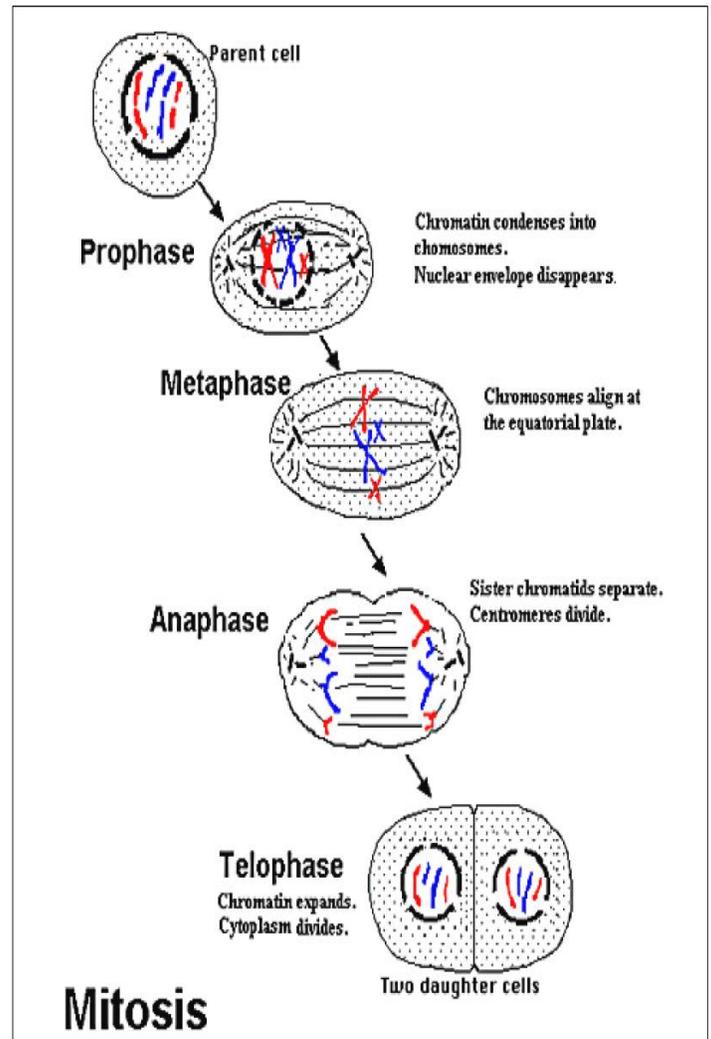
- Mitosis occurs in most of the cells of your body for growth, repair and replacement of damaged cells
- In mitosis, two daughter cells are typically produced from an original parent cell
- The chromosome number of the daughter cells is the same for the parent cell
- Chromosome number of the daughter cells is the same as for the parent cell
- In animals, the organism's cells are typically diploid and daughter cells produced by mitosis will be diploid. In addition the daughter cells will be genetically identical to the parent cell
- When a cell divides by mitosis, it goes through five stages namely

- i. Interphase
- ii. Prophase
- iii. Metaphase
- iv. Anaphase
- v. Telophase

In a typical animal cell, mitosis can be divided into four principal stages:

1. **Prophase:** the chromatin, diffuse in interphase, condenses into chromosomes. Each chromosome has duplicated and now consists of two sister chromatids. At the end of prophase, the nuclear envelope breaks down into vesicles
2. **Metaphase:** the chromosomes align at the equatorial plate and are held in place by microtubules attached to the mitotic spindle and to part of the centromere
3. **Anaphase:** the centromeres divide. Sister chromatids separate and move toward the corresponding poles

4. **Telophase:** daughter chromosomes arrive at the poles and the microtubules disappear. The condensed chromatin expands and the nuclear envelope reappears. The cytoplasm divides, the cell membrane pinches inward ultimately producing two daughter cells (phase: cytokinesis)



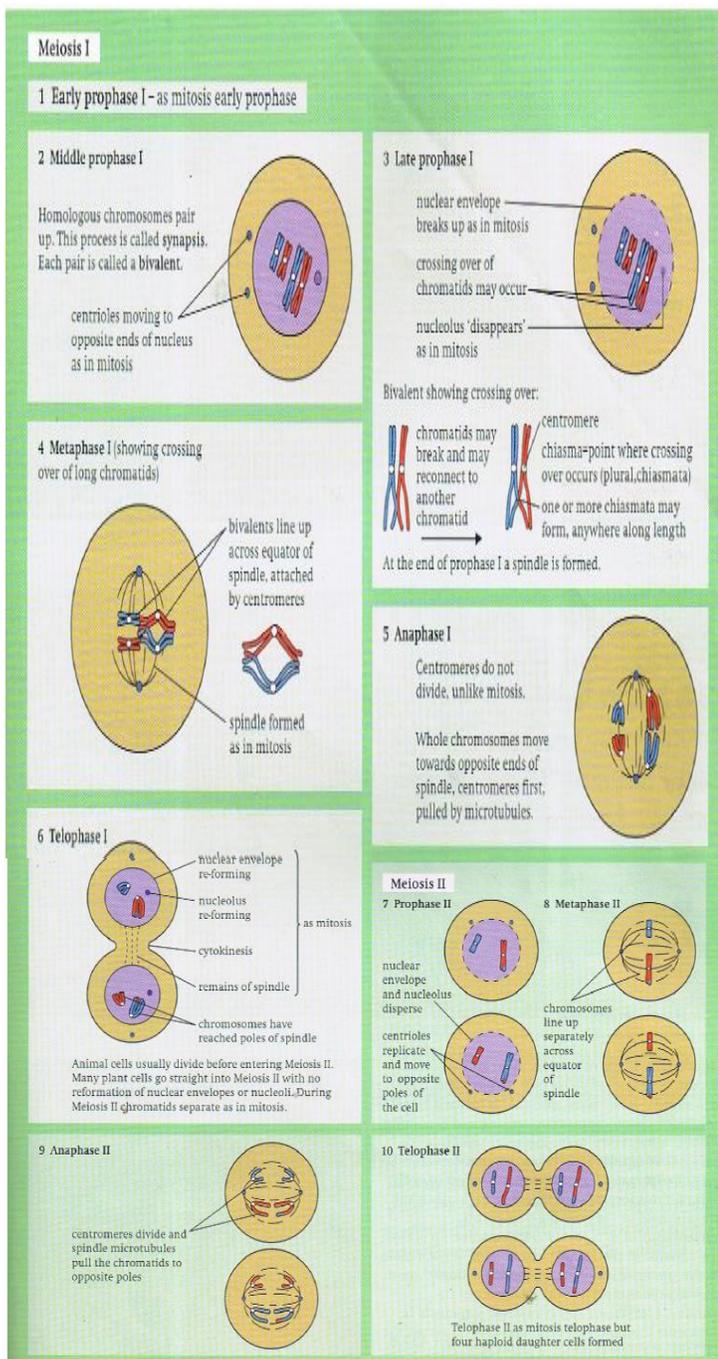
### MEIOSIS

- This is a type of cell division that produces haploid gametes (sex cells)
- This means that meiosis occurs only in the reproductive organs and nowhere else in the body i.e. the ovary of female and the testes in male
- In meiosis, a cell undergoes two consecutive divisions, called meiosis I and meiosis II
- Four daughter cells result from these divisions, in contrast to the two daughter cells that result from mitotic cell division

- The two divisions of meiosis are preceded by only one duplication of the chromosomes
- As a result – each of the four daughter cells produced by meiosis has only half as many chromosomes as the starting cell- a single haploid set of chromosomes
- The actual halving of chromosome number occurs during meiosis I
- The drawings here show how the process of meiotic division occurs:

**Review: A comparison Between Mitosis and Meiosis**

We have now looked into the two ways that cells of an organism divide

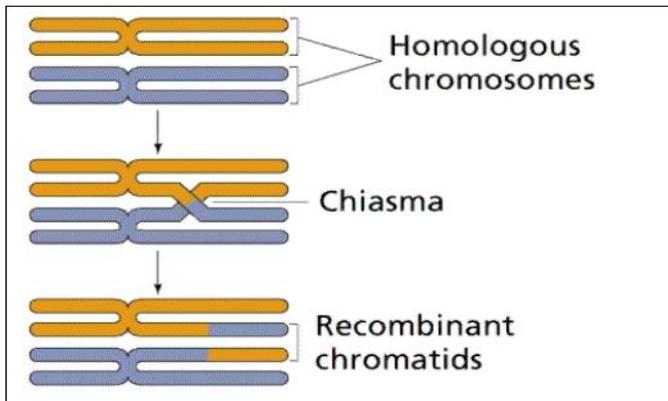


Major Differences	Types of Cell Division	
	Mitosis	Meiosis
1. Function	• Mitosis, which provides for growth, tissue repair and asexual reproduction.	• Meiosis needed for sexual reproduction.
2. Daughter Cells	• Produces daughter cells genetically identical to the parent cell.	• Produces daughter cells that are genetically different from that of the parent cell.
	• Produces daughter cells with the same number of chromosomes as the parent cell. (diploid number)	• Produces daughter cells that have only half the number of chromosomes of the parent cell (haploid).
3. Nuclear divisions	• Mitosis involves <b>one</b> division of the nucleus, accompanied by cytokinesis, producing two (diploid) daughter cells	• Meiosis entails <b>two</b> nuclear division and cytoplasmic divisions, yielding four haploid cells.
4. Crossing Over	• Crossing Over does not occur in mitosis, resulting in daughter cells with identical genetic material to that of the parent cell.	• During Metaphase I, crossing over between homologous chromosomes, producing daughter cells with different genetic materials from that of the parent.

**Crossing Over**

- This refers to when the sister chromatids of homologous chromosomes exchanged genetic materials, resulting in genes being mixed up and producing variation in genetic materials for the daughter cells
- This process occurs only at Meiosis during metaphase I

The following diagram illustrates what happens during crossing over



**Self-Check #2: Cell Division**

1. Name the types of cell division.
2. What are the functions of Mitosis and Meiosis?
3. Write down all stages in each type of cell division.
4. What are the differences between Mitosis and Meiosis?
5. Define crossing over.