

# Meiosis

Meiosis is used in animals to generate gametes (egg and sperm). It is required for animals to do sexual reproduction. **The main function of meiosis is to reduce the chromosome number in half.** In many ways meiosis is very similar to mitosis, the stages are the same in general terms, and meiosis II is identical to mitosis. The unique aspects of meiosis (as compared to mitosis) are underlined. As with the mitosis study material, this is very brief overview of the process. For a more detailed account and animations or illustrations of what is occurring please visit the [University of Arizona's The Biology Project](#) or consult a general biology text.

## The Stages of Meiosis

### Prophase I

- Chromosomes appear in a condensed form.
- The nuclear membrane disappears
- Centrioles (or centrosomes) move apart and the spindle forms
- Homologous chromosomes associate and crossing over can occur

### Metaphase I

- Homologous chromosomes line up down the center of the cell

### Anaphase I

- Homologous chromosomes separate and move towards the centrioles (or centrosomes).

### Telophase I

- Chromosomes change into a less condensed form, fading from view.
- The nuclear membrane reappears
- Cytokinesis occurs
- 2 cells are formed that AREN'T identical

### Prophase II

- Chromosomes appear in a condensed form.
- The nuclear membrane disappears
- Centrioles (or centrosomes) move apart and the spindle forms
- *NO crossing over can occur*
- *NO new DNA replication has occurred since telophase I.*

## Metaphase II

- Replicated chromosomes (sister chromatids) line up down the center of the cell.

## Anaphase II

- Sister chromatids separate and move towards the centrioles (or centrosomes).

## Telophase II

- Chromosomes change into a less condensed form, fading from view.
- The nuclear membrane reappears
- Cytokinesis occurs
- Each new cell has  $\frac{1}{2}$  the amount of DNA as the *original* parent cell.
- Each cell has only 1 copy of each chromosome (haploid)
- These cells will become either egg or sperm cells.

In males, gamete formation will result in 1 parent cell producing 4 viable sperm cells and in females, it will result in 1 parent cell producing only 1 viable egg cell.

Errors do occur during meiosis and if the error results in too few chromosomes the embryo will often die (except if missing X chromosome). If it results in too many chromosomes, most embryos will die, some can live depending on which chromosome is the extra one. Down's syndrome is an example of 3 copies of chromosome 21 and it is also possible to have 2 X and 1 Y chromosome or 1 X and 2 Y chromosomes. There are physical abnormalities associated with these 3 syndromes, they range from mild to severe. The errors in meiosis increase significantly with age, this is why older pregnant women will routinely undergo amniocentesis to check if the embryo is normal.