

Meiosis

Meiosis is the reduction division producing four haploid daughter cells, each genetically different. Chromosomes replicate during interphase, before meiosis occurs. During **meiosis I**, homologous chromosomes separate, producing two haploid daughter cells. During **meiosis II**, chromatids separate, producing four haploid daughter cells.

Prophase I:

- Chromosomes begin to condense
- Homologous chromosomes pair up (producing a bivalent)
- Nuclear envelope disappears
- Crossing over may occur

Metaphase I:

- Chromosomes line up on the equator of the cell
- Random orientation occurs
- Spindle fibres attach to centromeres of homologous chromosomes

Anaphase I:

- Homologous pairs are separated
- One chromosome of each pair is pulled to the opposite ends of the cell as spindle fibres shorten / contract

Telophase I:

- Chromosomes reach poles of the cell and nuclear envelope starts to divide
- Chromosomes uncoil
- Nuclear membrane reforms and cytokinesis (cytoplasmic cleavage) occurs

Prophase II:

- Chromosomes consisting of two chromatids condense
- Nuclear envelope disappears
- Spindle fibres form at right angles to previous one

Metaphase II:

- Chromosomes line up on equator of the cell
- Centromeres attach to spindle fibres

Anaphase II:

- Centromeres separate and chromatids are pulled to opposite poles

Telophase II:

- Chromatids reach opposite poles
- Nuclear envelope reforms
- Cytokinesis occurs

Crossing over is the swapping of genetic material (alleles) between chromatids of homologous pairs that produces new combinations of genes in a gamete. Chiasmata are formed when chromatids of a