

Refer to diagrams in your textbook and the good websites in Senior Links (Biology) for more information about Meiosis and Mitosis.

You must be able to recognise the differences between Meiosis and Mitosis in a diagram, and also to recognise and describe the phases themselves in a diagram – prophase, metaphase, anaphase and telophase.

CHROMOSOME NUMBERS IN CELLS

- ◆ Haploid / Monoploid (1n) – Gametes (male sperm or pollen cells, or female egg cells) contain one set of chromosomes from one parent. Gametes are called haploid.
- ◆ Diploid (2n) – Body cells apart from gametes have 2 sets of chromosomes (2n) - one set from the father and the other set from the mother. These cells are called diploid.
- ◆ Example in Humans – In human sperm or egg cells, there are 23 chromosomes. After fertilisation or joining of the sperm and the egg, the fertilised cell (zygote) has 46 chromosomes (23 pairs). From this single cell, all of our body cells (somatic cells) divide and grow.

2 TYPES OF CELL DIVISION - MEIOSIS AND MITOSIS

- ◆ Meiosis is the process of cell division that forms the gametes (male sperm or pollen, and female ovum). One diploid cell (2n) in the male or female reproductive organs (testes and ovaries) produces 4 haploid/monoploid cells (1n). These 4 cells become the 4 sperm cells in males, or 1 egg and 3 polar bodies in females.
- ◆ Mitosis is the process that produces cells with the same chromosome number as the parent cell. Usually one diploid cell produces 2 new ‘daughter’ cells that are also diploid. Mitosis produces all body cells except the gametes.
- ◆ In humans, the gametes are formed by meiosis, the zygote if formed by fertilisation, and the rest of the growth of the organism is by mitosis.
- ◆ Prophase, Metaphase, Anaphase and Telophase are the 4 phases in both meiosis and mitosis.
- ◆ Interphase is the resting phase when cells are not dividing.

TERMS RELATING TO MEIOSIS AND MITOSIS

- ◆ Chromosome – A chromosome is a threadlike structure in the nucleus. It carries the genetic material in the form of genes made of DNA. Chromosomes in human body cells (somatic cells) are in pairs, with one of each pair deriving from the mother via the egg and the other deriving from the father via the sperm. Human body cells have 46 chromosomes, whereas gametes (sperm and egg cells) have only 23 chromosomes.
- ◆ Chromatid – In the two cell division processes, a chromatid is one of the two daughter strands of a replicated chromosome. Each chromatid separates and becomes a daughter chromosome.
- ◆ Centromere – The centromere is the central point of a chromosome at which the chromatids are held together. The spindle fibres attach at the centromere. These spindle fibres serve to ‘pull’ the chromatids apart during anaphase.
- ◆ Chromatin – Chromatin is the less distinct fibril form of chromosomes during interphase.

- ◆ [Prophase](#) – Prophase is the first stage during mitosis and meiosis, during which the indistinct chromatin threads condense and are easily visible, the nuclear membrane disappears and a spindle forms.
- ◆ [Metaphase](#) – Metaphase is the second phase of mitosis and meiosis during which the chromosomes line up at the equator of the cell.
- ◆ [Anaphase](#) – Anaphase is the stage in mitosis and meiosis that follows metaphase. The chromosomes move apart towards the poles of the cell.
- ◆ [Telophase](#) – Telophase is the phase which follows anaphase in both mitosis and meiosis. The nuclear membrane reappears and daughter cells form. Two daughter cells form in mitosis. Four cells form in meiosis (i.e. These 4 cells become the 4 sperm cells in human males, or 1 egg and 3 polar bodies in human females.)
- ◆ [Interphase](#) is the resting phase when cells are not dividing.

LINKED GENES, CROSSING OVER AND RECOMBINATION

Refer to diagrams showing linked genes, crossing over and recombination in your textbook.

- ◆ [Locus](#) – The locus of a gene is its place on a chromosome.
- ◆ [Linked Genes](#) are those genes on the same chromosome.
- ◆ [Linkage](#) is the tendency for a group of genes located on the same chromosome to be inherited together in successive generations.
- ◆ [Homologous Chromosomes](#) – Homologous chromosomes are pairs of chromosomes. Humans have 23 pairs of chromosomes in their body cells.
- ◆ [Crossing Over and Recombination](#) may occur during meiosis, when parts of homologous chromosomes break and rejoin, so that the combinations of genes in the offspring were not present in the parents.
- ◆ [Gene Mapping](#) is the process of determining the position of genes in chromosomes, by using observations from the crossing over of chromosomes.