

READING TOOLBOX

Comparisons Write two sentences that compare and two sentences that contrast meiosis and mitosis.

Comparing Mitosis and Meiosis

The processes of mitosis and meiosis are similar but meet different needs and have different results. ➤ **Mitosis** makes new cells that are used during growth, development, repair, and asexual reproduction. **Meiosis** makes cells that enable an organism to reproduce sexually and happens only in reproductive structures. Mitosis produces two genetically identical diploid cells. In contrast, meiosis produces four genetically different haploid cells. The haploid cells produced by meiosis contain half the genetic information of the parent cell. When two such cells, often an egg cell and a sperm cell, combine, the resulting zygote has the same number of chromosomes as each of the parents' cells.

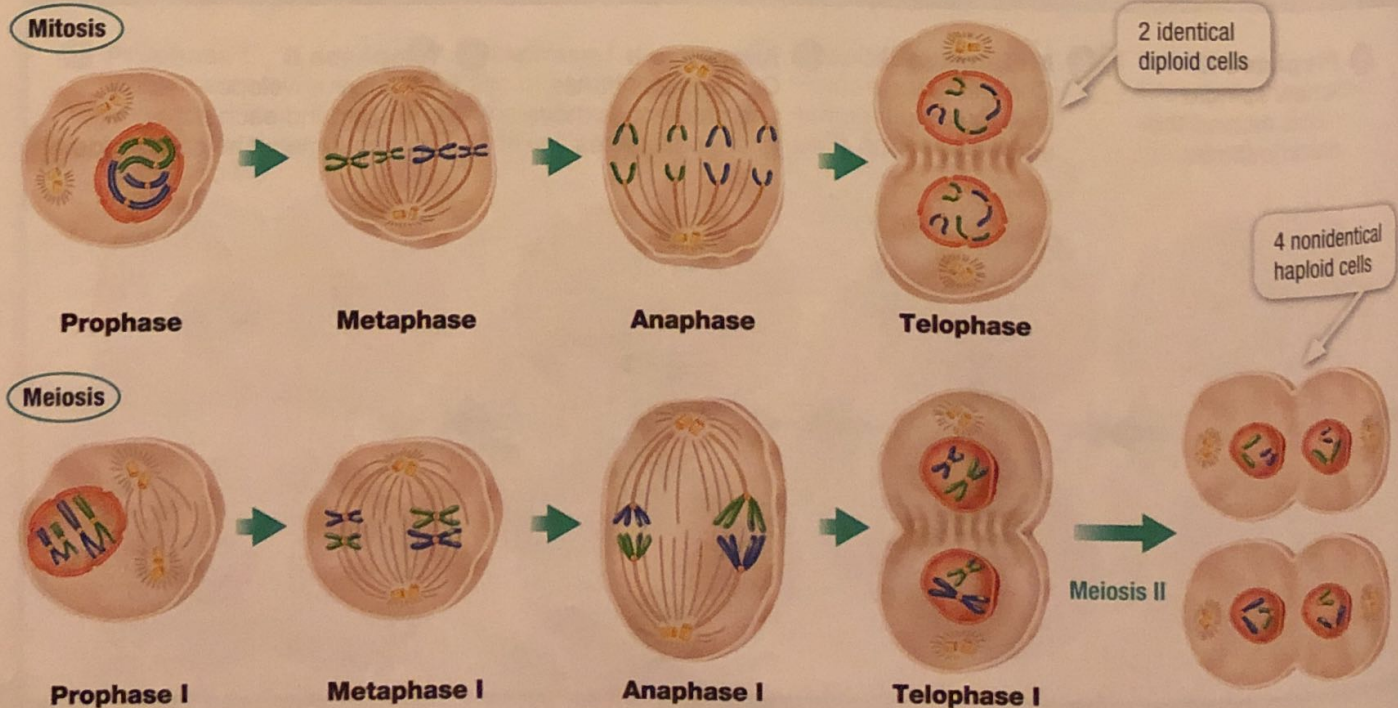
If you compare meiosis and mitosis, as shown in **Figure 5**, you may think that they are alike. For example, in metaphase of mitosis and metaphase I of meiosis, the chromosomes move to the equator. However, there is a major difference that happens in an earlier stage.

In prophase I of meiosis, every chromosome pairs with its homologue. A pair of homologous chromosomes is called a *tetrad*. As the tetrads form, different homologues exchange parts of their chromatids in the process of crossing-over. The pairing of homologous chromosomes and the crossing-over do not happen in mitosis. Therefore, a main difference between meiosis and mitosis is that in meiosis, genetic information is rearranged. The rearranging of genetic information leads to genetic variation in offspring. Crossing-over is one of several processes that lead to genetic variation.

Figure 5 Mitosis produces two diploid daughter cells that are identical to the parent cell. Meiosis produces four haploid cells from a diploid cell. ➤ *What is the difference between anaphase in mitosis and anaphase I in meiosis I?*

➤ **Reading Check** *How are cells formed by mitosis different from cells formed by meiosis in relation to number of chromosomes?*

Comparing Mitosis and Meiosis



The Importance of Meiosis



Personal Tutor

Table 1 shows a comparison of mitosis and meiosis. Recall that mitosis consists of only one set of division phases and produces two identical diploid daughter cells. Meiosis, however, consists of two sets of divisions and produces four haploid daughter cells that are not identical. Meiosis is important because it results in genetic variation.

Mitosis	Meiosis
One division occurs during mitosis.	Two sets of divisions occur during meiosis: meiosis I and meiosis II.
DNA replication occurs during interphase.	DNA replication occurs once before meiosis I.
Synapsis of homologous chromosomes does not occur.	Synapsis of homologous chromosomes occurs during prophase I.
Two identical cells are formed per cell cycle.	Four haploid cells (n) are formed per cell cycle.
The daughter cells are genetically identical.	The daughter cells are not genetically identical because of crossing over.
Mitosis occurs only in body cells.	Meiosis occurs only in reproductive cells.
Mitosis is involved in growth and repair.	Meiosis is involved in the production of gametes and providing genetic variation in organisms.

