UNIT 2 Preparation

Prerequisite Concepts

This unit builds on your knowledge of interactions of organisms within ecosystems from Unit 1, and it draws upon your knowledge of biological diversity and energy transfer in global systems from previous studies.

The Need for Reproduction

All species of organisms grow and produce offspring and, in so doing, pass on their hereditary information to succeeding generations. Thus, reproduction is essential to the survival of a species.

In order for multicellular organisms to grow, repair themselves, and reproduce, their cells undergo division. While many cells in your body, for instance, are growing and dividing, some are wearing out and dying. Cells reproduce through a continuous sequence of growth and division known as the cell cycle. The cell cycle consists of two main stages, the growth stage and the division stage. There are two types of cell division: *mitosis* and *meiosis*.

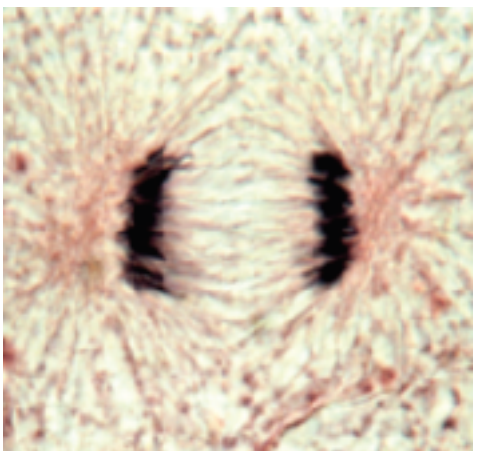
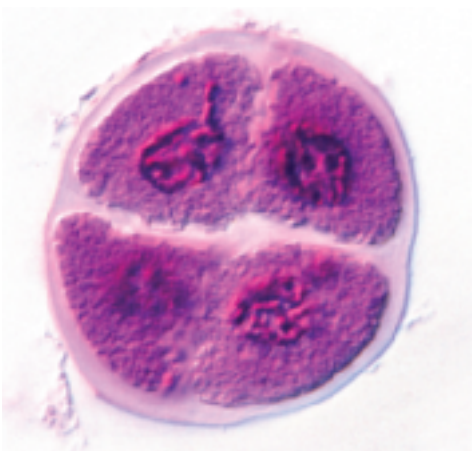
Mitosis

In mitosis, body cells (but not reproductive cells) divide to form two new cells, which are identical to the parent cell. Before a cell divides, the chromosomes first replicate (make copies of themselves). The cell then divides. The resulting two cells have the same number of chromosomes as the parent cell. (Chromosomes consist of DNA, the genetic information of a cell.) So, if a body cell has 46 chromosomes (as human cells do) after mitosis, the "daughter cells" also have 46 chromosomes.

Meiosis

Meiosis is a special type of cell division that occurs only in reproductive cells (sperm cells and egg cells). Meiosis

Table P2.1 Comparing Mitosis and Meiosis

Mitosis	Meiosis
one division	two divisions
two daughter cells	four daughter cells
daughter cells are genetically identical	daughter cells are genetically different
chromosome number in daughter cells same as in parent cell	chromosome number in daughter cells half that in parent cell
occurs in somatic (body) cells	occurs in reproductive cells (sperm and egg cells)
used for growth and repair of body cells (and in asexual reproduction in some organisms)	used for sexual reproduction, producing new genetic combinations in offspring from one generation to the next
	

produces reproductive cells called gametes. During meiosis, the nucleus of a gamete divides twice. The gametes, either egg or sperm, contain only one copy of each type of chromosome that the parent cell contains. So, in humans for example, the gametes from each parent contain only 23 chromosomes. Meiosis ensures that when a sperm fertilizes an egg, the resulting cell has the correct number of chromosomes. In humans, this is 46. (If the gametes did not go through meiosis before fertilization, there would be 92 chromosomes in humans.) Table P2.1 and Figure P2.1 compare meiosis with mitosis.

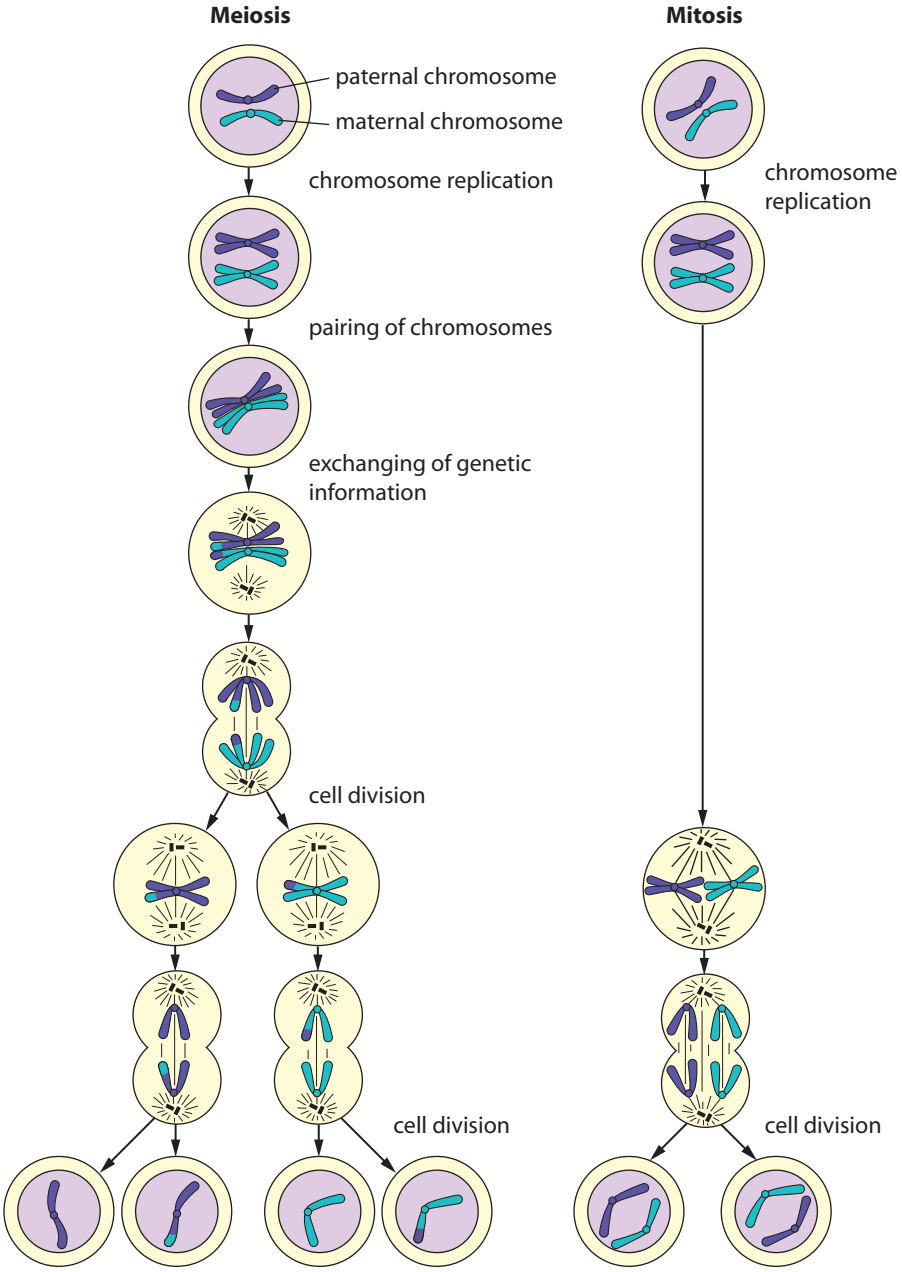


Figure P2.1 Meiosis involves two divisions of the nucleus with no replication of genetic material between them. Thus, it produces four daughter cells, each with half the original number of chromosomes. Mitosis involves a single division of the nucleus after chromosome replication. Thus, it produces two daughter cells, each containing the original number of chromosomes.