

Meiosis

Textbook pages 188–203

Before You Read

Remind yourself: what happens during mitosis? Write your thoughts on the lines below.

State the Main Ideas

As you read this section, stop after each paragraph and put what you have just read into your own words.

✓ Reading Check

1. How many chromosomes are there in a human body cell?
-

What is sexual reproduction?

In **sexual reproduction**, genetic information from two parent cells are passed on to an offspring. Female organisms and male organisms make specialized cells called **gametes**. Gametes from female parents are called eggs. Gametes from male parents are called sperm. In sexual reproduction, the gametes from the two parents combine during a process called **fertilization** to form a new cell. The new cell is called a **zygote**. The zygote is the first body cell of a new organism. As the zygote undergoes repeated mitosis and cell division, it matures into an **embryo**.

How do gametes differ from body cells?

All human body cells have 46 chromosomes. These chromosomes are arranged into 23 pairs. You receive one member of each pair of chromosomes from your mother. You receive the other member of each pair from your father.

When a cell has pairs of chromosomes, it is said to be *diploid*. Di- means two or double, referring to the two sets—the pairs—of chromosomes. Human body cells are diploid. Gamete cells, on the other hand, have only one set of chromosomes, for a total of 23 chromosomes. Gametes are said to be *haploid*. ✓

How do gametes become haploid?

In order for human body cells to remain diploid, gametes must have one half the number of chromosomes—that is, 23. Only haploid gametes with 23 chromosomes can combine during fertilization to form a diploid zygote with 46 chromosomes.

Meiosis is the process that ensures that each gamete is haploid. In other words, meiosis produces gametes with one half the number of chromosomes as body cells.

The process of randomly dividing 23 pairs of chromosomes in half creates millions of possible combinations of chromosomes. Any of these combinations may be combined

with chromosomes from the other parent in any gamete during fertilization. In this way, sexual reproduction and meiosis increase genetic diversity (variety) in a species.

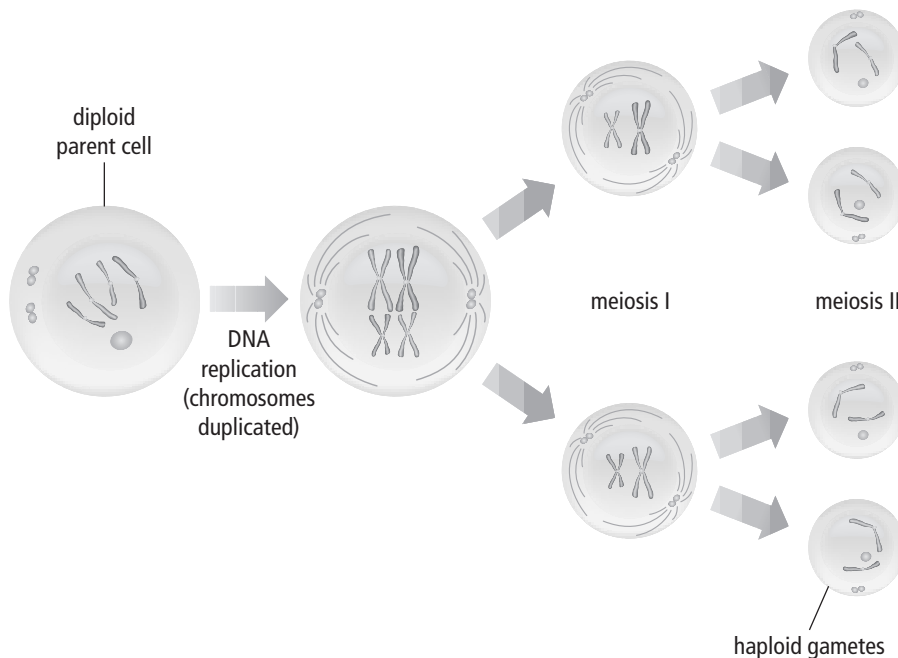
What happens during meiosis?

Examine the diagram below. During meiosis, each chromosome in a cell is duplicated once and then the cell divides twice. The first division of the cell is called meiosis I. Meiosis I is similar to mitosis, but each pair of chromosomes includes one chromosome from each parent. These matching chromosomes are called **homologous chromosomes**. Meiosis I starts with a diploid cell and finishes with two haploid cells.

Each of the two haploid cells undergoes a second division called meiosis II. Meiosis II starts with two haploid cells and ends with four haploid cells. So the overall process of meiosis starts with one diploid cell and ends with four haploid cells. ✓

✓ Reading Check

2. In meiosis, how many haploid gamete cells result from one diploid parent cell?
- _____



Use with textbook pages 188–190.

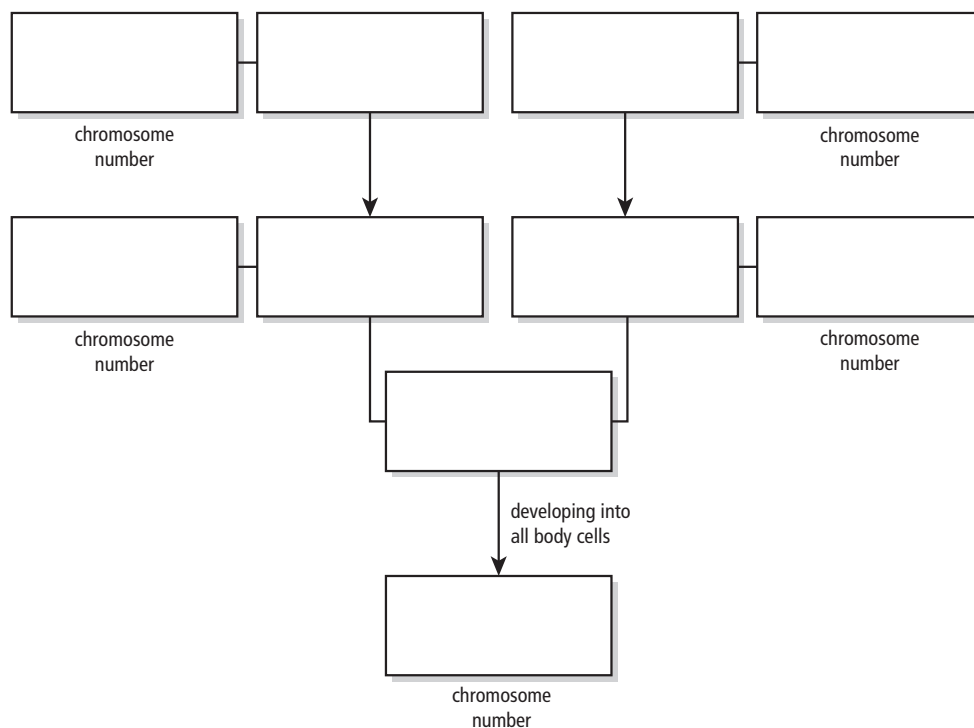
The role of gametes

1. Complete the table to show the number of chromosomes for different organisms. The table has been partially completed to help you.

Organism	Diploid number (2n)	Haploid number (n)
human		
fruit fly	8	
black bear		38
peanut	20	
chimpanzee		48

2. Use the terms in the box below to fill in the blanks in the meiosis flow chart. You can use each term more than once. You will not need to use every term.

Choices for chromosome number	Choices for other blanks
diploid haploid	egg cell female parent fertilization male parent sperm cell



Use with textbook pages 191–193.

What happens in meiosis?

Vocabulary

2	fertilization
3	gametes
4	haploid
23	meiosis
46	meiosis I
body cell	meiosis II
chromosome	mitosis
diploid	zygote
embryo	

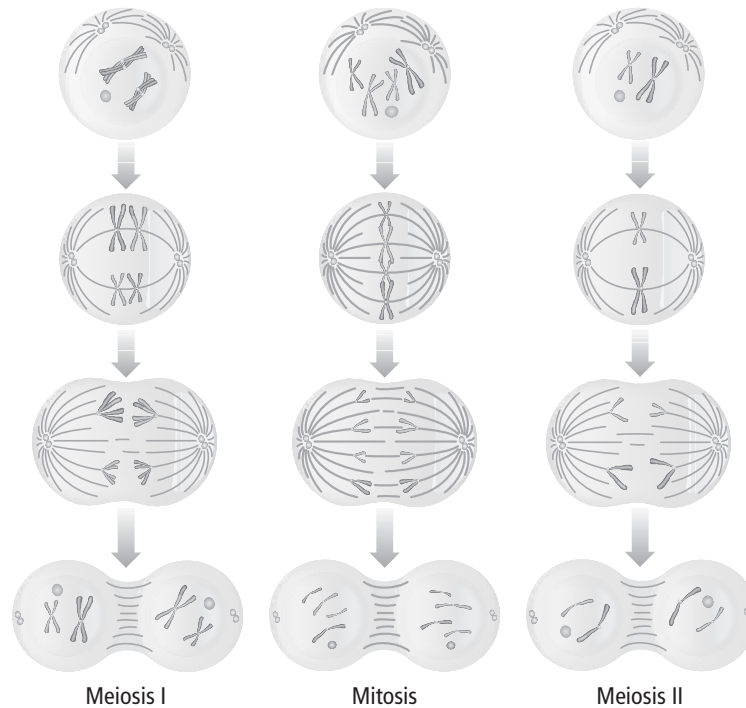
Use the terms in the vocabulary box to fill in the blanks. You can use each term more than once. You will not need to use every term.

1. Female and male organisms produce specialized cells called _____ that are necessary for reproduction. Eggs are the _____ from female parents. Sperm are the _____ from male parents.
2. During sexual reproduction, the gametes from the two parents combine during a process called _____ to form a new cell called a _____.
3. As the zygote undergoes repeated _____ and cell division, it matures into a(n) _____.
4. A human diploid body cell has _____ pairs of chromosomes.
5. Human gamete cells have a total of _____ chromosomes. Gametes are said to be _____.
6. During meiosis, each _____ in a cell is duplicated once and then the cell divides twice.
7. The first division of the cell is called _____, which starts with a diploid cell and finishes with two haploid cells.
8. Each of the two haploid cells undergoes a second division called _____, which starts with two haploid cells and ends with four haploid cells.
9. Meiosis starts with one _____ cell and ends with _____ haploid cells.

Use with textbook page 194.

Comparing meiosis and mitosis

Examine the following diagrams showing mitosis and meiosis. Notice what happens to the chromosomes in each illustration. Then answer the questions that follow.



1. How is meiosis I similar to mitosis?

2. How is meiosis I different from mitosis?

3. How is meiosis II similar to mitosis?

4. How is meiosis II different from mitosis?

Use with textbook pages 188–202.

Meiosis

Match each Term on the left with the best Descriptor on the right. Each Descriptor may only be used once.

Term	Descriptor
1. _____ diploid number	A. matching chromosomes
2. _____ embryo	B. process in which gametes from two parents combine
3. _____ fertilization	C. two sets of chromosomes
4. _____ gametes	D. produces offspring that are genetically different from each other
5. _____ genetic diversity	E. develops from a zygote
6. _____ haploid number	F. new diploid cell formed by the process of fertilization
7. _____ homologous chromosomes	G. the process of mitosis
8. _____ sexual reproduction	H. variety in a species
9. _____ zygote	I. one set of chromosomes
	J. specialized cells; sperm from males and eggs from females

Circle the letter of the best answer.

10. Human body cells have

- A.** 17 chromosomes
- B.** 23 chromosomes
- C.** 46 chromosomes
- D.** 92 chromosomes

11. The process of meiosis produces gametes with _____ as body cells.

- A.** the same number of chromosomes
- B.** one quarter the number of chromosomes
- C.** half the number of chromosomes
- D.** double the number of chromosomes

12. Sexual reproduction

I.	always produces identical offspring
II.	requires two parents
III.	increases genetic diversity

- A.** I and II only
- B.** I and III only
- C.** II and III only
- D.** I, II, and III

13. Meiosis I

- A.** starts with a diploid cell and ends with two haploid cells
- B.** starts with a haploid cell and ends with two diploid cells
- C.** starts with two diploid cells and ends with a haploid cell
- D.** starts with a two haploid cells and ends with a diploid cell

14. Meiosis II

- A.** starts with two haploid cells and ends with four haploid cells
- B.** starts with two diploid cells and ends with four haploid cells
- C.** starts with four diploid cells and ends with two haploid cells
- D.** starts with four haploid cells and ends with two haploid cells