

Chapter

10

Mendel and Meiosis

Reinforcement and Study Guide

Section 10.1 Mendel's Laws of Heredity

In your textbook, read why Mendel succeeded.

Complete each statement.

- Mendel was the first person to succeed in predicting how traits are _____ from generation to generation.
- Mendel used _____ plants in his experiments.
- In peas, both male and female sex cells—_____—are in the same flower.
- _____ occurs when the male gamete fuses with the female gamete.
- Mendel used the process called _____ when he wanted to breed one plant with another.
- Mendel carefully _____ his experiments and the peas he used.
- Mendel studied only one _____ at a time and analyzed his data mathematically.

In your textbook, read about Mendel's monohybrid crosses.

Refer to the table of pea-plant traits on the right. Then complete the table on the left by filling in the missing information for each cross. The first one is done for you.

Parent Plants	F ₁ generation	
	Offspring	Appearance
8. round × wrinkled $RR \times rr$	Rr	round
9. yellow × green $YY \times yy$	a.	b.
10. axial × terminal $AA \times \underline{\hspace{1cm}}$	Aa	a.
11. tall × short $\underline{\hspace{1cm}} \times \underline{\hspace{1cm}}$	Tt	a.
12. inflated × constricted $\underline{\hspace{1cm}} \times ii$	a.	b.

Pea-Plant Traits		
Trait	Dominant	Recessive
seed shape	round (R)	wrinkled (r)
seed color	yellow (Y)	green (y)
flower position	axial (A)	terminal (a)
plant height	tall (T)	short (t)
pod shape	inflated (I)	constricted (i)

Section 10.1 Mendel's Laws of Heredity

In your textbook, read about phenotypes and genotypes and Mendel's dihybrid crosses.

If the statement is true, write true. If it is not, rewrite the underlined part to make it true.

13. A pea plant with the genotype TT has the same phenotype as a pea plant with genotype tt . _____
14. When Mendel crossed true-breeding pea plants that had round yellow seeds with true-breeding pea plants that had wrinkled green seeds, some of the offspring had round yellow seeds because round and yellow were the dominant forms of the traits. _____
15. When Mendel allowed heterozygous F_1 plants that had round yellow seed to self-pollinate, he found that some of the F_2 plants had wrinkled green seeds. _____
16. The law of independent assortment states that genes for different traits are inherited independently of each other. _____

In your textbook, read about Punnett squares and probability.

The Punnett square below is for a dihybrid cross between pea plants that are heterozygous for seed shape (Rr) and seed color (Yy). Complete the Punnett square by recording the expected genotypes of the offspring. Then answer the questions.

	RY	Ry	rY	ry
RY				
Ry				
rY				
ry				

17. Use the chart on the previous page to determine the phenotypes of the offspring. Record the phenotypes below the genotypes in the Punnett square. Is an offspring produced by the cross more likely to have wrinkled seeds or round seeds? _____
18. What is the probability that an offspring will have wrinkled yellow seeds? _____

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Mendel and Meiosis, continued

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Section 10.2 Meiosis

In your textbook, read about genes, chromosomes, and numbers.

Examine the table. Then answer the questions.

Chromosome Numbers of Some Common Organisms

Organism	Body Cell ($2n$)	Gamete (n)
Human	46	23
Garden pea	14	7
Fruit fly	8	4
Tomato	24	12
Dog	78	39
Chimpanzee	48	24
Leopard frog	26	13
Corn	20	10

1. What is the diploid number of chromosomes in corn?

2. What is the haploid number of chromosomes in corn?

3. Is the chromosome number related to the complexity of the organism?

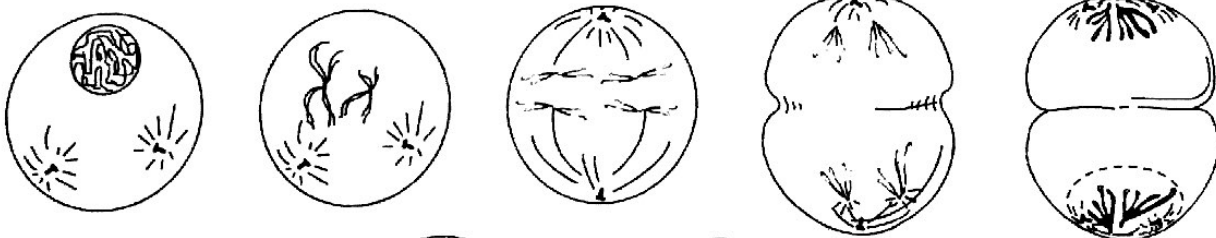
4. How many pairs of chromosomes do humans have?

5. What process maintains a constant number of chromosomes within a species?

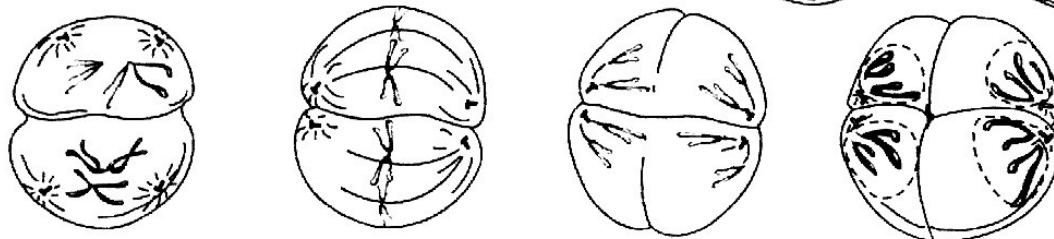
In your textbook, read about the phases of meiosis.

Label the diagrams below. Use these choices: Metaphase I, Metaphase II, Interphase, Telophase I, Telophase II, Anaphase I, Anaphase II, Prophase I, Prophase II.

6. _____ 7. _____ 8. _____ 9. _____ 10. _____



11. _____ 12. _____ 13. _____ 14. _____



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The following statements describe interphase and and meiosis I. Identify each phase. Then place them in sequential order using the numbers 1 through 5. Use 1 for the phase that occurs first and 5 for the phase that occurs last.

Statement	Name of Phase	Sequence
15. Homologous chromosomes line up at the equator in pairs.	a.	b.
16. The cell replicates its chromosomes.	a.	b.
17. Homologous chromosomes separate and move to opposite ends of the cell.	a.	b.
18. The spindle forms, and DNA coils up and homologous chromosomes come together in a tetrad; crossing over may occur.	a.	b.
19. Events occur in the reverse order from the events of prophase I. Each cell has only half the genetic information; however, another cell division is needed because each chromosome is still doubled.	a.	b.

In your textbook, read about how meiosis provides for genetic variation and about mistakes in meiosis.

For each statement below, write **true** or **false**.

- _____ **20.** Reassortment of chromosomes can occur during meiosis by crossing over of nonsister chromatids or by independent segregation of homologous chromosomes.
- _____ **21.** Genetic recombination is a major source of variation among organisms.
- _____ **22.** The random segregation of chromosomes during meiosis explains Mendel's observation that genes for different traits are inherited independently of each other.
- _____ **23.** Nondisjunction always results in a zygote with an extra chromosome.
- _____ **24.** Down syndrome is a result of polyploidy.
- _____ **25.** Mistakes in meiosis can occasionally be beneficial.