

**Chapter 11 Introduction to Genetics**

**Section 11-1 The Work of Gregor Mendel**

(pages 263-266)



**Key Concepts**

- What is the principle of dominance?
- What happens during segregation?

**Gregor Mendel's Peas (pages 263-264)**

1. The scientific study of heredity is called \_\_\_\_\_.
2. Circle the letter of each sentence that is true about Gregor Mendel's peas.
  - a. The male parts of pea flowers produce eggs.
  - b. When pollen fertilizes an egg cell, a seed for a new plant is formed.
  - c. Pea plants normally reproduce by self-pollination.
  - d. Seeds that are produced by self-pollination inherit their characteristics from two different plants.
3. What does it mean when pea plants are described as being true-breeding?

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4. To perform his experiments, how did Mendel prevent pea flowers from self-pollinating and control their cross-pollination? \_\_\_\_\_

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**Genes and Dominance (pages 264-265)**

*Match the term with its definition.*

Terms	Definitions
_____ 5. genes	a. Specific characteristics that vary from one individual to another
_____ 6. hybrids	b. The offspring of crosses between parents with different traits
_____ 7. traits	c. Chemical factors that determine traits
_____ 8. alleles	d. The different forms of a gene

9. State the principle of dominance. \_\_\_\_\_

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10. Is the following sentence true or false? An organism with a recessive allele for a particular form of a trait will always exhibit that form. \_\_\_\_\_

11. Circle the letters of the traits controlled by dominant alleles in Mendel's pea plants.

- a. tall                      b. short                      c. yellow                      d. green

**Segregation (pages 265-266)**

12. How did Mendel find out whether the recessive alleles were still present in the F<sub>1</sub> plants? \_\_\_\_\_

13. About one fourth of the F<sub>2</sub> plants from Mendel's F<sub>1</sub> crosses showed the trait controlled by the \_\_\_\_\_ allele.

14. Circle the letter of each sentence that is true about Mendel's explanation of the results from his F<sub>1</sub> cross.

a. Mendel assumed that a dominant allele had masked the corresponding recessive allele in the F<sub>1</sub> generation.

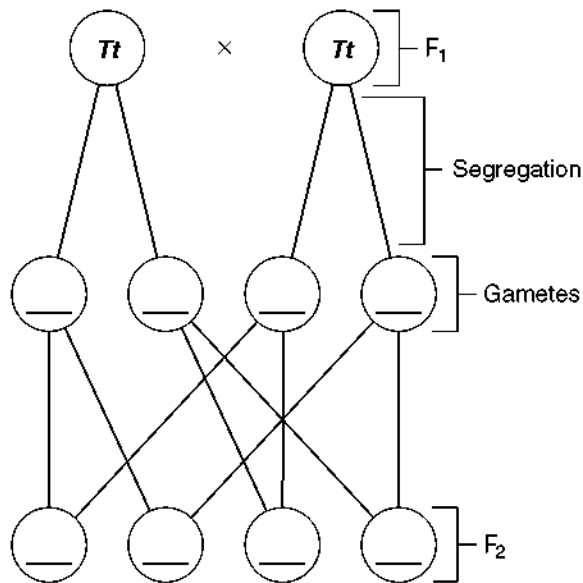
b. The trait controlled by the recessive allele never showed up in any F<sub>2</sub> plants.

c. The allele for shortness was always inherited with the allele for tallness.

d. At some point, the allele for shortness was segregated, or separated, from the allele for tallness.

15. What are gametes? \_\_\_\_\_

16. Complete the following diagram to show how alleles segregate during the formation of gametes.



17. In the diagram above, the dominant allele is represented by \_\_\_\_\_ and the recessive allele is represented by \_\_\_\_\_

## Section 11-2 Probability and Punnett Squares

(pages 267-269)



### Key Concepts

- How do geneticists use the principles of probability?
- How do geneticists use Punnett squares?

### Genetics and Probability (page 267)

1. The likelihood that a particular event will occur is called \_\_\_\_\_.
2. Circle the letter of the probability that a single coin flip will come up heads.  
 a. 100 percent    b. 75 percent    c. 50 percent    d. 25 percent
3. Is the following sentence true or false? The past outcomes of coin flips greatly affect the outcomes of future coin flips. \_\_\_\_\_
4. Why can the principles of probability be used to predict the outcomes of genetic crosses? \_\_\_\_\_  
 \_\_\_\_\_

### Punnett Squares (page 268)

5. How do geneticists use Punnett squares? \_\_\_\_\_  
 \_\_\_\_\_
6. Complete the Punnett square to show the possible gene combinations for the F<sub>2</sub> offspring.

**PUNNETT SQUARE FOR  $Tt \times Tt$**

	<b>T</b>	<b>t</b>
<b>T</b>		
<b>t</b>		

Match the terms with the definitions.

_____	<b>Terms</b>	<b>Definitions</b>
_____	7. genotype	a. Organisms that have two identical alleles for a particular trait ( $TT$ or $tt$ )
_____	8. homozygous	b. Organisms that have two different alleles for the same trait ( $Tt$ )
_____	9. phenotype	c. Physical characteristic of an organism (tall)
_____	10. heterozygous	d. Genetic makeup of an organism ( $Tt$ )

11. Is the following sentence true or false? Homozygous organisms are true-breeding for a particular trait. \_\_\_\_\_
12. Is the following sentence true or false? Plants with the same phenotype always have the same genotype. \_\_\_\_\_

### Probability and Segregation (page 269)

13. Circle the letter of each sentence that is true about probability and segregation.
- a. In an  $F_1$  cross between two hybrid tall pea plants ( $Tt$ ),  $\frac{1}{2}$  of the  $F_2$  plants will have two alleles for tallness ( $TT$ ).
  - b. The  $F_2$  ratio of tall plants to short plants produced in a cross between two hybrid tall pea plants ( $Tt$ ) is 3 tall plants for every 1 short plant.
  - c. Mendel observed that about  $\frac{3}{4}$  of the  $F_2$  offspring showed the dominant trait.
  - d. Segregation occurs according to Mendel's model.
14. In Mendel's model of segregation, what was the ratio of tall plants to short plants in the  $F_2$  generation? \_\_\_\_\_

### Probabilities Predict Averages (page 269)

15. Is the following sentence true or false? Probabilities predict the precise outcome of an individual event. \_\_\_\_\_
16. How can you be sure of getting the expected 50 : 50 ratio from flipping a coin?  
\_\_\_\_\_
17. The \_\_\_\_\_ the number of offspring from a genetic cross, the closer the resulting numbers will get to expected values.
18. Is the following sentence true or false? The ratios of an  $F_1$  generation are more likely to match Mendelian predicted ratios if the  $F_1$  generation contains hundreds or thousands of individuals. \_\_\_\_\_

### Reading Skill Practice

Taking notes helps the reader focus on the main ideas and the vocabulary of the reading. Take notes while rereading Section 11-2. Note the main ideas and the highlighted, boldface terms in the order in which they are presented. You may copy the ideas word for word or summarize them using your own words. Do your work on a separate sheet of paper.

## Section 11-3 Exploring Mendelian Genetics

(pages 270-274)



### Key Concepts

- What is the principle of independent assortment?
- What inheritance patterns exist aside from simple dominance?

### Independent Assortment (pages 270-271)

1. In a two-factor cross, Mendel followed \_\_\_\_\_ different genes as they passed from one generation to the next.
2. Write the genotypes of the true-breeding plants that Mendel used in his two-factor cross.

**Phenotype**

**Genotype**

a. round yellow peas

\_\_\_\_\_

b. wrinkled green peas

\_\_\_\_\_

3. Circle the letter that best describes the F<sub>1</sub> offspring of Mendel's two-factor cross.
  - a. Homozygous dominant with round yellow peas
  - b. Homozygous recessive with wrinkled green peas
  - c. Heterozygous dominant with round yellow peas
  - d. Heterozygous recessive with wrinkled green peas

4. Is the following sentence true or false? The genotypes of the F<sub>1</sub> offspring indicated to Mendel that genes assort independently.

\_\_\_\_\_

5. How did Mendel produce the F<sub>2</sub> offspring? \_\_\_\_\_

\_\_\_\_\_

6. Circle the letter of the phenotypes that Mendel would expect to see if genes segregated independently.

a. round and yellow

b. wrinkled and green

c. round and green

d. wrinkled and yellow

7. What did Mendel observe in the F<sub>2</sub> offspring that showed him that the alleles for seed shape segregate independently of those for seed color? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

8. What were the phenotypes of the F<sub>2</sub> generation that Mendel observed? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

9. What was the ratio of Mendel's F<sub>2</sub> generation for the two-factor cross? \_\_\_\_\_

10. Complete the Punnett square below to show the predicted results of Mendel's two-factor cross.

**MENDEL'S TWO-FACTOR CROSS**  
*RrYy x RrYy*

	<i><b>RY</b></i>	<i><b>Ry</b></i>	<i><b>rY</b></i>	<i><b>ry</b></i>
<i><b>RY</b></i>				
<i><b>Ry</b></i>				
<i><b>rY</b></i>				
<i><b>ry</b></i>				

11. State Mendel's principle of independent assortment. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**A Summary of Mendel's Principles (page 272)**

12. Circle the letter of each sentence that is true about Mendel's principles.
- a. The inheritance of biological characteristics is determined by genes that are passed from parents to their offspring.
  - b. Two or more forms of the gene for a single trait can never exist.
  - c. The copies of genes are segregated from each other when gametes are formed.
  - d. The alleles for different genes usually segregate independently of one another.
13. When two or more forms of the gene for a single trait exist, some forms of the gene may be \_\_\_\_\_ and others may be \_\_\_\_\_.

**Beyond Dominant and Recessive Alleles (pages 272-273)**

14. Is the following sentence true or false? All genes show simple patterns of dominant and recessive alleles. \_\_\_\_\_

15. Complete the table of the different patterns of inheritance.

**PATTERNS OF INHERITANCE**

Type	Description	Examples
	One allele is not completely dominant over another. The heterozygous phenotype is somewhere in between the two homozygous phenotypes.	
	Both alleles contribute to the phenotype of the organism.	
	Genes have more than two alleles.	
	Two or more genes control a trait.	

**Applying Mendel’s Principles (page 274)**

16. List three criteria Thomas Hunt Morgan was looking for in a model organism for genetic studies.

a. \_\_\_\_\_

b. \_\_\_\_\_

c. \_\_\_\_\_

17. Is the following sentence true or false? Mendel’s principles apply not just to pea plants but to other organisms as well. \_\_\_\_\_

**Genetics and the Environment (page 274)**

18. Characteristics are determined by interaction between genes and the

\_\_\_\_\_.