Name _____ Class _____ Date _____

Chapter 16

Evolution of Populations

Section 16–1 Genes and Variation (pages 393–396)

This section describes the main sources of inheritable variation in a population. It also explains how phenotypes are expressed.

Darwin's Ideas Revisited (page 393)

1. Is the following sentence true or false? Mendel's work on inheritance was published after Darwin's lifetime.

_____

2. Which two important factors was Darwin unable to explain without an understanding of heredity? _____

_____

_____

3. List the three fields that collaborate today to explain evolution.

a. _____ **b.** _____ **c.** _____

Gene Pools (page 394)

4. A collection of individuals of the same species in a given area is a(an) _____.

5. The combined genetic information of all members of a particular population is a(an) _____.

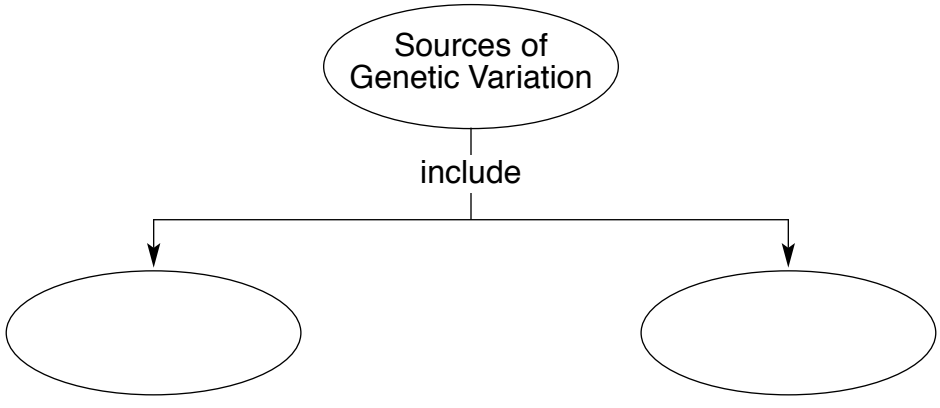
6. Is the following sentence true or false? A gene pool typically contains just one allele for each inheritable trait.

_____

7. The number of times that an allele occurs in a gene pool compared with the number of times other alleles occur is called the _____ of the allele.

Sources of Genetic Variation (pages 394–395)

8. Complete the concept map.



9. What is a mutation? _____

_____

10. Why do mutations occur? _____

_____

_____

11. Circle the letter of each choice that is true about mutations.

a. They can be limited to a single base of DNA.

b. They always affect lengthy segments of a chromosome.

c. They always affect an organism's phenotype.

d. They always affect an organism's fitness.

12. Is the following sentence true or false? Most inheritable differences are due to gene shuffling that occurs during the production of gametes. _____

13. Circle the letter of each choice that is true about sexual reproduction.

a. It is a major source of variation in many populations.

b. It can produce many different phenotypes.

c. It can produce many different genetic combinations.

d. It can change the relative frequency of alleles in a population.

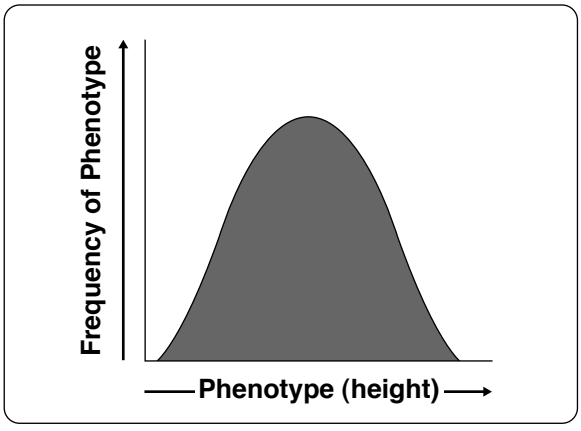
Single-Gene and Polygenic Traits **(pages 395–396)**

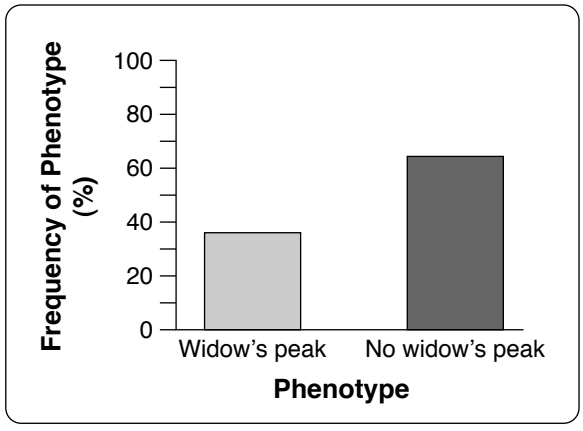
14. Is the following sentence true or false? The number of phenotypes produced for a given trait depends on how many genes control the trait. _____

15. Is the following sentence true or false? Most traits are controlled by a single gene. _____

16. Label the two graphs to show which one represents a single-gene trait and which one represents a polygenic trait.

_____ _____





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Reading Skill Practice

When you read about related concepts, making a graphic organizer such as a Venn diagram can help you focus on their similarities and differences. Make a Venn diagram comparing and contrasting single-gene and polygenic traits. For more information on Venn diagrams, see Appendix A of your textbook. Do your work on a separate sheet of paper.

Section 16–2 Evolution as Genetic Change (pages 397–402)

This section explains how natural selection affects different types of traits. It also describes how populations can change genetically by chance as well as the conditions that prevent populations from changing genetically.

Natural Selection on Single-Gene Traits (pages 397–398)

1. Is the following sentence true or false? Natural selection on single-gene traits cannot lead to changes in allele frequencies.

_____

2. If a trait made an organism less likely to survive and reproduce, what would happen to the allele for that trait? _____

_____

_____

3. If a trait had no effect on an organism's fitness, what would happen to the allele for that trait? _____

_____

_____

Natural Selection on Polygenic Traits (pages 398–399)

4. List the three ways that natural selection can affect the distributions of phenotypes.

a. _____ **c.** _____

b. _____

Match the type of selection with the situation in which it occurs.

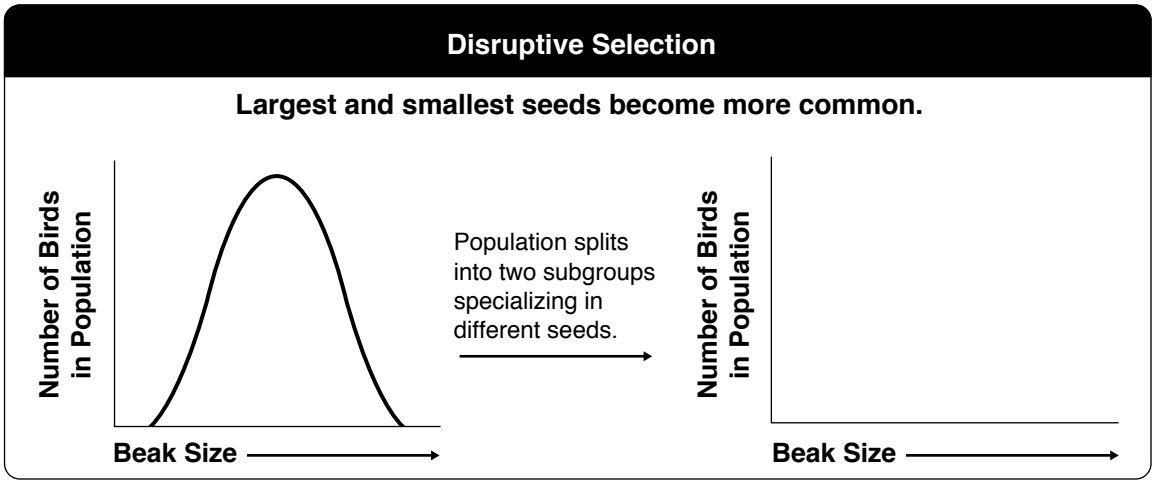
Type of Selection	Situation
_____ **5.** Directional	**a.** Individuals at the upper and lower ends of the curve have higher fitness than individuals near the middle.
_____ **6.** Stabilizing	**b.** Individuals at one end of the curve have higher fitness than individuals in the middle or at the other end.
_____ **7.** Disruptive	**c.** Individuals near the center of the curve have higher fitness than individuals at either end.

8. An increase in the average size of beaks in Galápagos finches is an example of _____ selection.

9. Is the following sentence true or false? The weight of human infants at birth is under the influence of disruptive selection.

_____

10. Draw the missing graph to show how disruptive selection affects beak size.



Genetic Drift (page 400)

11. Is the following sentence true or false? Natural selection is the only source of evolutionary change. _____

12. Random change in allele frequencies in small populations is called _____.

13. A situation in which allele frequencies change as a result of the migration of a small subgroup of a population is known as the _____.

14. What is an example of the founder effect? _____

_____

_____

Evolution Versus Genetic Equilibrium (pages 401–402)

15. What does the Hardy-Weinberg principle state? _____

_____

_____

16. The situation in which allele frequencies remain constant is called _____.

17. List the five conditions required to maintain genetic equilibrium.

a. _____ **d.** _____

b. _____ **e.** _____

c. _____

18. Why is large population size important in maintaining genetic equilibrium? _____

Section 16–3 The Process of Speciation (pages 404–410)

This section explains how species evolve and describes the process of speciation in the Galápagos Islands.

Introduction (page 404)

1. What is speciation? _____

Isolating Mechanisms (pages 404–405)

2. Is the following sentence true or false? Individuals in different species can have the same gene pool. _____

3. What does it mean for two species to be reproductively isolated from each other? _____

4. What must happen in order for new species to evolve? _____

5. List three ways that reproductive isolation occurs.

a. _____ **c.** _____

b. _____

6. When does behavioral isolation occur? _____

7. Is the following sentence true or false? Eastern and Western meadowlarks are an example of behavioral isolation.

_____

8. When does geographic isolation occur? _____

9. Abert and Kaibab squirrels in the Southwest are an example of _____ isolation.

10. Is the following sentence true or false? Geographic barriers guarantee the formation of new species. _____

11. What is an example of temporal isolation? _____

Testing Natural Selection in Nature (pages 406–407)

12. Is the following sentence true or false? The basic mechanisms of evolutionary change cannot be observed in nature.

_____

13. Circle the letter of each hypothesis about the evolution of Galápagos finches that was tested by the Grants.

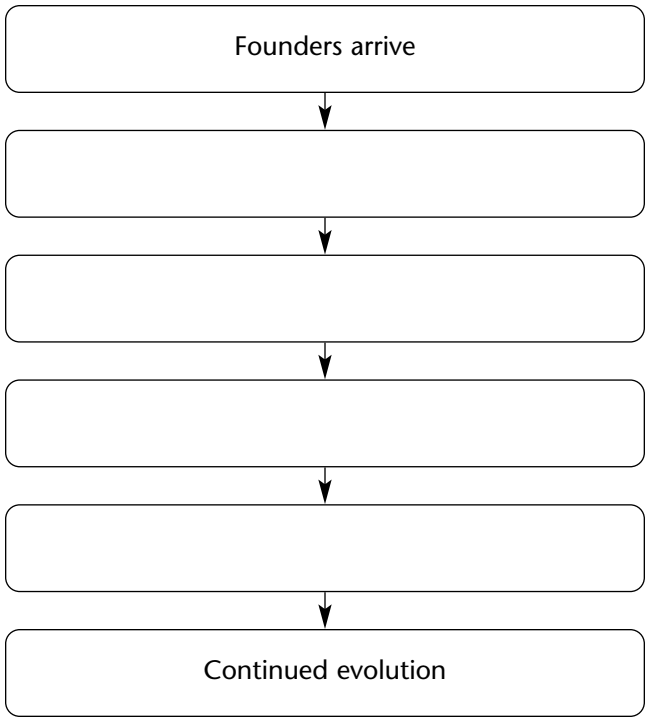
- **a.** The finches' beak size and shape has enough inheritable variation to provide raw material for natural selection.
- **b.** The different finch species are the descendants of a common mainland ancestor.
- **c.** Differences in the finches' beak size and shape produce differences in fitness that cause natural selection to occur.
- **d.** The evolution of the finches is proceeding slowly and gradually.

14. Circle the letter of each observation that was made by the Grants.

- **a.** Differences in beak size were more important for survival during the wet season.
- **b.** When food for finches was scarce, individuals with the largest beaks were less likely to survive.
- **c.** Big-beaked birds tended to mate with small-beaked birds.
- **d.** Average beak size increased dramatically.

Speciation in Darwin's Finches (pages 408–410)

15. Complete the flowchart to show how speciation probably occurred in the Galápagos finches.



16. How could differences in beak size lead to reproductive isolation? ____________________
____
____
____

17. Is the following sentence true or false? During the dry season, individual birds that are most different from each other have the highest fitness. ______________

WordWise

Test your knowledge of vocabulary terms from Chapter 16 by solving the clues. Then, copy the numbered letters in order to reveal the hidden message.

Clues	**Vocabulary Terms**
Type of isolation that prevents eastern and western meadowlarks from interbreeding	__ __(1) __ __ __(2) __ __(3) __ __ __(4)
Type of selection that acts against individuals of an intermediate type	__ __ __ __ __(5) __ __(6) __(7) __ __
Term that means the formation of new species	__ __ __ __ __ __ __ __ __(8) __(9)
Type of selection that causes an increase in individuals at one end of the curve	__ __(10) __ __ __ __ __ __ __ __ __
Type of selection that keeps the center of the curve at its current position	__(11) __ __ __ __ __ __ __ __ __ __(12)
Kind of pool that contains all the genetic information in a population	__ __(13) __(14) __(15)
Type of isolation that prevents species from interbreeding	__ __ __ __ __ __ __ __ __(16) __(17) __ __
Type of isolation that led to the evolution of the Kaibab squirrel	__ __ __ __ __ __ __ __ __ __(18)
Type of equilibrium that occurs when allele frequencies do not change	__ __ __ __ __ __ __(19)
Name of the principle stating that allele frequencies will remain constant unless factors cause them to change	__(20) __(21) __ __ __ - __ __ __ __(22) __ __ __ __(23)
Type of trait produced by more than one gene	__ __ __ __ __ __(24) __ __ __

Hidden Message:

__(1) __(2) __(3) __(4) __(5) __(6) __(7) __(8) __(9)   __(10) __(11)   __(12) __(13) __(14) __(15) __(16) __(17) __(18)

__(19) __(20) __(21) __(22) __(23) __(24) .