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**Chapter 02  
Population Genetics**

**Multiple Choice Questions**

1. The first person to publish a theory that species change over time was
  - A. Plato
  - B. Lamarck
  - C. Darwin
  - D. Wallace
  - E. Mendel

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01*

*Topic: Evolutionary Ecology*

2. Charles Robert Darwin
  - A. had a thorough understanding of genetics.
  - B. sailed on a three year survey around the world.
  - C. examined fossil beds in China.
  - D. formulated a theory of natural selection.
  - E. knew little of geological change.

*Bloom's Level: 1. Remember*

Chapter 02 - Population Genetics

*Learning Outcome: 02.01*

*Topic: Evolutionary Ecology*

3. Malthus proposed that because the earth was not overrun by humans they must be limited by

- A. food shortage, disease, war.
- B. natural selection.
- C. survival of the fittest.
- D. evolution.
- E. Adaptation.

*Bloom's Level: 1. Remember*  
*Learning Outcome: 02.01*  
*Topic: Evolutionary Ecology*

4. Over long periods of time, natural selection leads to

- A. mutation.
- B. adaptation.
- C. hybridization.
- D. dominance.
- E. true breeding lines.

*Bloom's Level: 1. Remember*  
*Learning Outcome: 02.01*  
*Topic: Evolutionary Ecology*

5. In polluted areas \_\_\_\_\_ forms of peppered moths are \_\_\_\_\_ conspicuous to birds on \_\_\_\_\_ tree trunks.

- A. normal; more; lichen-covered
- B. melanic; less; lichen-covered
- C. melanic; less; dark-colored
- D. melanic; more; dark-colored
- E. all the above statements are false

*Bloom's Level: 2. Understand*  
*Learning Outcome: 02.01*  
*Topic: Evolutionary Ecology*

6. An individual with two identical copies of a gene is said to be
- A. homozygous
  - B. heterozygous
  - C. dominant
  - D. recessive
  - E. segregated

*Bloom's Level: 2. Understand*  
*Learning Outcome: 02.01*  
*Topic: Evolutionary Ecology*

7. What is NOT one of the nucleotide bases that make-up double-stranded DNA base pairs?
- A. Adenine
  - B. Proline
  - C. Thymine
  - D. Guanine
  - E. Cytosine

*Bloom's Level: 1. Remember*  
*Learning Outcome: 02.02*  
*Topic: Evolutionary Ecology*

8. When a chromosome breaks in two places and the middle segment turns around and reattaches with the same pieces, we call this a(n)
- A. Duplication
  - B. Transversion
  - C. Deletion
  - D. Inversion
  - E. Translocation

*Bloom's Level: 1. Remember*  
*Learning Outcome: 02.02*  
*Topic: Evolutionary Ecology*

9. The Hardy-Weinberg equation states that  $p^2 + 2pq + q^2 = 1$ ; the genotype frequency of heterozygotes is represented by

- A.  $p^2$
- B.  $2pq$
- C.  $q^2$
- D.  $p^2 + q^2$
- E.  $p^2 + 2pq$

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.03*

*Topic: Evolutionary Ecology*

10. In a population of 100 four-o'clock flowers there are 40 red-flowered plants ( $C^R C^R$ ), 38 pink-flowered plants ( $C^R C^W$ ), and 22 white-flowered plants ( $C^W C^W$ ). What is the frequency of the  $C^W$  allele in this population?

- A.** 0.41 or 41%
- B. 0.6 or 60%
- C. 0.4 or 40%
- D. 0.09 or 9%
- E. 0.52 or 52%

*Bloom's Level: 4. Analyze*

*Learning Outcome: 02.03*

*Topic: Evolutionary Ecology*

11. The percentage of individuals exhibiting a recessive disease in a population is 0.04, which is 4% based on a Hardy-Weinberg equilibrium. What percentage of individuals would be expected to be heterozygous carriers?

- A. 48
- B. 40
- C. 60
- D. 24
- E. 4

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.03*

*Topic: Evolutionary Ecology*

12. In the Hardy-Weinberg equation, the letters  $p$  and  $q$  represent

- A. frequencies of alleles in a population.
- B. the number of individuals of different phenotypes in a population.
- C. the number of individuals of different genotypes in a population.
- D. the frequencies of individuals of different genotypes in a population.
- E. the square of individuals of different genotypes in a population.

*Bloom's Level: 4. Analyze*

*Learning Outcome: 02.03*

*Topic: Evolutionary Ecology*

13. Below is a list of phenomenon that can occur in a population, which of these would violate the conditions for the Hardy-Weinberg equation?

- A. The population is large.
- B. Mating is nonrandom.
- C. Migration does not occur between different populations.
- D. Natural selection is not occurring.
- E. No new mutations arise.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.03*

*Topic: Evolutionary Ecology*

14. If a population does not satisfy the Hardy-Weinberg equilibrium model, what may you assume about that population?
- A. Evolutionary mechanisms are effecting the population.
  - B. Evolution is not occurring.
  - C. No new mutations are occurring, only nonrandom mating.
  - D. No migration is occurring.
  - E. Evolutionary mechanisms are affecting the population and evolution is occurring.

*Bloom's Level: 5. Evaluate*

*Learning Outcome: 02.03*

*Topic: Evolutionary Ecology*

15. If a population is not in Hardy-Weinberg equilibrium, this implies that
- A. the population is going extinct.
  - B. the population is very ancient.
  - C. one or more of the conditions required for equilibrium are being violated.
  - D. the population is abnormal.
  - E. one or more of the conditions required for equilibrium are being violated and the population is evolving.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.03*

*Topic: Evolutionary Ecology*

16. A large effective population size is important so that a species
- A. can maintain an adequate range.
  - B. does not change its trophic relationship.
  - C. will not lose large amounts of genetic diversity in the near future.
  - D. can minimize edge effects.
  - E. can remain endemic to a small area.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.04*

*Topic: Evolutionary Ecology*

17. In which plant mating system would genetic variability decline slowest?

- A. self fertilization.
- B. mating with brothers or sisters.
- C. mating with cousins.
- D. mating with second cousins.
- E. mating with unrelated individuals.

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.04*

*Topic: Evolutionary Ecology*

18. A recent genetic analysis has shown that at one point, as few as \_\_\_\_\_ Florida panthers were alive.

- A. 6
- B. 20
- C. 40
- D. 80
- E. 120

*Bloom's Level: 5. Evaluate*

*Learning Outcome: 02.04*

*Topic: Evolutionary Ecology*

19. The decline in the numbers of greater prairie chickens in Illinois in the late 20<sup>th</sup> century was a striking example of

- A. genetic drift.
- B. inbreeding.
- C. an extinction vortex.
- D. a and b
- E. b and c

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.04*

*Topic: Evolutionary Ecology*



20. Inbreeding and small population size of a threatened species can combine to form a downward spiral from which a species cannot easily recover. This is known as a(n)
- A. extinction vortex
  - B. random change of allele frequencies.
  - C. random mutation.
  - D. accelerated evolution of new traits.
  - E. Bottleneck effect.

*Bloom's Level: 2. Understand*  
*Learning Outcome: 02.01*  
*Topic: Evolutionary Ecology*

21. Studies on the Glanville fritillary butterfly in Finland showed that just one generation of brother-sister mating causes
- A. increased number of eggs to be laid.
  - B. increased hatching of eggs.
  - C. reduced caterpillar survival.
  - D. increased caterpillar parasitism.
  - E. increased genetic variability.

*Bloom's Level: 1. Remember*  
*Learning Outcome: 02.04*  
*Topic: Evolutionary Ecology*

22. Robert Lacey showed that in a population of 120 individuals, at least \_\_\_\_\_ immigrant(s) every generation would be sufficient to counter genetic drift.
- A. 0.1
  - B. 0.5
  - C. 1**
  - D. 2
  - E. 5

*Bloom's Level: 1. Remember*  
*Learning Outcome: 02.04*  
*Topic: Evolutionary Ecology*

23. Elephant seals have a smaller effective population size than real population size due to the effects of
- A. inbreeding.
  - B. genetic drift.
  - C. a harem mating structure.
  - D. an extinction vortex.
  - E. All of these

*Bloom's Level: 1. Remember*  
*Learning Outcome: 02.04*  
*Topic: Evolutionary Ecology*

### **True / False Questions**

24. The best explanation for species distributions is that each region supports the fauna and flora best adapted to it.  
**FALSE**

*Bloom's Level: 1. Remember*  
*Learning Outcome: 02.01*  
*Topic: Evolutionary Ecology*

25. The inheritance of acquired characteristics suggests that a person who became strong through lifting weights would pass this trait on to his or her children.  
**TRUE**

*Bloom's Level: 1. Remember*  
*Learning Outcome: 02.01*  
*Topic: Evolutionary Ecology*

26. Alfred Russel Wallace was a co-discoverer of evolutionary theory.

**TRUE**

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.01*

*Topic: Evolutionary Ecology*

### Matching Questions

27. Match the type of chromosome mutation with its effect.

- |                  |  |          |
|------------------|--|----------|
| 1. Duplication   | loss of part of the chromosome   | <b>2</b> |
| 2. Deletion      | added amount of some genes   | <b>1</b> |
| 3. Inversion     | chromosome breakage, re-positioning and re-fusing<br>the exchange of segments between two non-homologous | <b>3</b> |
| 4. Translocation | chromosomes  | <b>4</b> |

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.02*

*Topic: Evolutionary Ecology*

28. Match the scientist with their discovery

- |            |                             |          |
|------------|-----------------------------|----------|
| 1. Darwin  | natural selection           | <b>1</b> |
| 2. Mendel  | theory of population growth | <b>3</b> |
| 3. Malthus | transformism                | <b>4</b> |
| 4. Lamarck | inheritance                 | <b>2</b> |

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.01*

*Topic: Evolutionary Ecology*

29. Match the continents with their fauna

- |                  |  |          |
|------------------|--|----------|
| 1. South America | sloths, anteaters, armadillos, monkeys with prehensile tails | <b>1</b> |
| 2. Australia     | zebra, giraffes, lions, baboons, okapi, armadillo            | <b>3</b> |
| 3. Africa        | bats, Tasmanian devil, wombat, duck-billed platypus, echidna | <b>2</b> |

*Bloom's Level: 2. Understand*

*Learning Outcome: 02.04*

*Topic: Evolutionary Ecology*

30. Match the following names with their definitions.

- |                              |   |          |
|------------------------------|---|----------|
| 1. Allee effect              | mating between closely related individuals  | <b>4</b> |
| 2. Effective population size | random changes in allele frequencies over time  | <b>3</b> |
| 3. Genetic drift             | the number of individuals that contribute genes to future populations                       | <b>2</b> |
| 4. Inbreeding                | the likelihood that, in a small population, some individuals will fail to mate successfully | <b>1</b> |

*Bloom's Level: 1. Remember*

*Learning Outcome: 02.04*

*Topic: Evolutionary Ecology*