

## **CHAPTER 22.1: Darwin, Natural Selection, and the Hardy-Weinberg Equation**

1. How did the observations during his voyage on the Beagle influence Darwin's theories?

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2. Why were the Galápagos Islands so important to Darwin's observations?

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3. What are the elements for the formation of new species?

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4. What was Wallace's role in evolutionary theory?

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5. What influence did Malthus have on both Darwin and Wallace?

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6. Identify the two principles of Lamarck's theory of evolution.

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7. Distinguish between Lamarck's concept of evolution and Darwin's.

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8. What is the raw material of evolution?

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9. Population genetics puts a mathematical approach to the study of microevolution. Define each of the terms commonly used in population genetics:

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_

10. List the five conditions that must be met by a population for genotypes to remain unchanged from generation to generation (i.e., a population in H-W equilibrium).

- a. \_\_\_\_\_
- b. \_\_\_\_\_
- c. \_\_\_\_\_
- d. \_\_\_\_\_
- e. \_\_\_\_\_

11. Assuming a population is in Hardy-Weinberg equilibrium, write the equation that describes genotype frequencies.

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12. In reference to the Hardy-Weinberg Principle, define the following:

- a.  $p^2$  - \_\_\_\_\_
- b.  $2pq$  - \_\_\_\_\_
- c.  $q^2$  - \_\_\_\_\_

13. What is the value of using the Hardy-Weinberg equation when researching evolution in a population?

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14. Work out these practice problems. Assuming H-W equilibrium, find both the allele and genotype frequencies.

- a. In *Drosophila*, the allele for normal length wings is dominant over the allele for vestigial wings. In a population of 1,000 individuals, 160 show the recessive phenotype.

i. allele frequencies:

dominant allele (**W**) = \_\_\_\_\_

recessive allele (**w**) = \_\_\_\_\_

ii. genotype frequencies:

**WW** = \_\_\_\_\_

**Ww** = \_\_\_\_\_

**ww** = \_\_\_\_\_

- b. The allele for the hair pattern called "widow's peak" is dominant over the allele for no "widow's peak". In a population of 1,000 individuals, 360 show the dominant phenotype.

i. allele frequencies:

dominant allele (\_\_\_) = \_\_\_\_\_

recessive allele (\_\_\_) = \_\_\_\_\_

ii. genotype frequencies:

(\_\_\_) = \_\_\_\_\_

(\_\_\_) = \_\_\_\_\_

(\_\_\_) = \_\_\_\_\_

15. Explain "heterozygote advantage" and give an example.

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