

### AP Lab 8: Population Genetics and Evolution

(Adapted from the 2001 Student Lab Manual)

*Purpose: In this lab, you will:*

1. learn about the Hardy-Weinberg law of genetic equilibrium
2. study the relationship between evolution and changes in the allele frequency by using your class to represent a sample population

*Prelab questions:*

1. What is the Hardy-Weinberg equation?
  - a. The Hardy-Weinberg equation is " $p^2+2pq+q^2=1$ " and it is used to calculate the genetic variation of a population at equilibrium by calculating the frequency of the alleles in the population.
2. Which part of the equation represents: the homozygous dominant, the heterozygotes, and the homozygous recessive?
  - a. The heterozygotes is represented by " $2pq$ "
  - b. The homozygous recessive is represented by " $q^2$ "
  - c. The homozygous dominant is represented by " $p^2$ "
3. How does the equation  $p+q=1$  relate to Hardy-Weinberg?
  - a. This relates to the Hardy-Weinberg equation because the sum of the alleles (dominant and recessive) must combine to form the genotype in 1 population, making the sum 1 (100%).
4. What are the 5 conditions for Hardy-Weinberg equilibrium to exist?
  - a. No mutation
  - b. Random mating
  - c. No natural selection
  - d. Large population size
  - e. Must be isolated; no migration or emigration

#### Exercise A: Estimating Allele Frequencies for a Specific Trait Within a Sample Population

For this exercise, you will use the class as a sample population to find the allele frequencies for PTC tasting. For a person expressing the dominant allele, T, PTC has a bitter taste. If a person is homozygous recessive, s/he cannot taste PTC.

1. Using the PTC taste-test papers, tear off a short strip and press it to your tongue tip. Tasters will sense a bitter taste.
2. Calculate the frequency of the taster population by dividing the total number of tasters by the total number of students in the class.
3. Calculate the frequency of the non-taster population by dividing the number of non-tasters by the number of students in the class.
4. Use the Hardy-Weinberg equation to determine the frequencies ( $p$  and  $q$ ) of the two alleles.

*Data for Exercise A:*

# Lab 8 Population Genetics Manual Answers

**SA Adler**



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