

### 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 And Evolution Hardy Weinberg Problems Answers

**Siddappa N.Byrareddy**



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### **Table of Contents Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers**

1. Understanding the eBook Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers
  - The Rise of Digital Reading Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers
  - Advantages of eBooks Over Traditional Books
2. Identifying Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers
  - Exploring Different Genres
  - Considering Fiction vs. Non-Fiction
  - Determining Your Reading Goals
3. Choosing the Right eBook Platform
  - Popular eBook Platforms
  - Features to Look for in an Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers
  - User-Friendly Interface
4. Exploring eBook Recommendations from Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers

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---

- Personalized Recommendations
  - Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers User Reviews and Ratings
  - Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers and Bestseller Lists
5. Accessing Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers Free and Paid eBooks
    - Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers Public Domain eBooks
    - Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers eBook Subscription Services
    - Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers Budget-Friendly Options
  6. Navigating Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers eBook Formats
    - ePub, PDF, MOBI, and More
    - Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers Compatibility with Devices
    - Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers Enhanced eBook Features
  7. Enhancing Your Reading Experience
    - Adjustable Fonts and Text Sizes of Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers
    - Highlighting and Note-Taking Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers
    - Interactive Elements Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers
  8. Staying Engaged with Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers
    - Joining Online Reading Communities
    - Participating in Virtual Book Clubs
    - Following Authors and Publishers Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers
  9. Balancing eBooks and Physical Books Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers
    - Benefits of a Digital Library
    - Creating a Diverse Reading Collection Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers
  10. Overcoming Reading Challenges
    - Dealing with Digital Eye Strain
    - Minimizing Distractions
    - Managing Screen Time
  11. Cultivating a Reading Routine Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers
    - Setting Reading Goals Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers
    - Carving Out Dedicated Reading Time

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---

12. Sourcing Reliable Information of Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers
  - Fact-Checking eBook Content of Lab 8 Population Genetics And Evolution Hardy Weinberg Problems Answers
  - Distinguishing Credible Sources
13. Promoting Lifelong Learning
  - Utilizing eBooks for Skill Development
  - Exploring Educational eBooks
14. Embracing eBook Trends
  - Integration of Multimedia Elements
  - Interactive and Gamified eBooks

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