

Lab 8: Population Genetics and Evolution

Name _____

Pd _____

Date _____

In all calculations you must show **all your work**. No work, no credit, no kidding! No fractions will be accepted as a final answer. When you express your final answer please do it in decimal form and please express it to the hundredths place. Box all final answers.

Exercise 8A: Estimating Allele Frequency for a Specific Trait within a Sample Population

Tasters	Non-Tasters	Total Students in Class

Calculate % of Tasters in your class (show work, box answer)

Calculate % of Non-Tasters in your class (show work, box answer)

Calculate allele frequency of **p** in your class (show work, box answer)

Calculate allele frequency of **q** in your class (show work, box answer)

Calculate allele frequency of **p** in North America (show work, box answer)

Calculate allele frequency of **q** in North America (show work, box answer)

Questions:

1. What is the percentage of heterozygote tasters in your class? (show work, box answer)

2. What % of the No. American population is heterozygous for the taster trait? (show work, box answer)

Exercise 8B Case 1: A Test of an Ideal Hardy-Weinberg Population (No Selection)

Calculate the **theoretical genotype frequencies** of the beginning population where $p = .5$ and $q = .5$. (show work, box answer)

AA:

Aa:

aa:

Calculate the **genotype frequencies** after five generations of mating. (show work, box answer)

AA:

Aa:

aa:

Calculate the **allele frequencies** after five generations of mating. (show work, box answer)

A:

a:

**CASE I
Hardy-Weinberg Equilibrium**

Initial Class Frequencies:

AA ____ Aa ____ aa ____

My Initial Genotype: ____

F₁ Genotype ____

F₂ Genotype ____

F₃ Genotype ____

F₄ Genotype ____

F₅ Genotype ____

Final Class Frequencies:

AA ____ Aa ____ aa ____

p ____ q ____

Exercise 8B Case 2: Selection

Calculate the **genotype frequencies** after five generations of mating.
(show work, box answer)

AA:

Aa:

aa:

CASE II Selection

Initial Class Frequencies:

AA ____ Aa ____ aa ____

My Initial Genotype: ____

F₁ Genotype ____

F₂ Genotype ____

F₃ Genotype ____

F₄ Genotype ____

F₅ Genotype ____

Final Class Frequencies:

AA ____ Aa ____ aa ____

p ____ q ____

Calculate the **allele frequencies** after five generations of mating. (show work, box answer)

A:

a:

Exercise 8B Case 3: Heterozygote Advantage

Calculate the **genotype frequencies** after five generations of mating. (show work, box answer)

AA:

Aa:

aa:

Calculate the **allele frequencies** after five generations of mating. (show work, box answer)

A:

a:

Calculate the **genotype frequencies** after ten generations of mating. (show work, box answer)

AA:

Aa:

aa:

Calculate the **allele frequencies** after ten generations of mating. (show work, box answer)

A:

CASE III

Heterozygote Advantage

Initial Class Frequencies:

AA ____ Aa ____ aa ____

My Initial Genotype: ____

F₁ Genotype ____ F₆ Genotype ____

F₂ Genotype ____ F₇ Genotype ____

F₃ Genotype ____ F₈ Genotype ____

F₄ Genotype ____ F₉ Genotype ____

F₅ Genotype ____ F₁₀ Genotype ____

Final Class Frequencies: (after five generations)

AA ____ Aa ____ aa ____

p ____ q ____

Final Class Frequencies: (after ten generations)

AA ____ Aa ____ aa ____

p ____ q ____

a:

Exercise 8B Case 4: Genetic Drift

Calculate the **genotype frequencies** after five generations of mating.
(show work, box answer)

AA:

Aa:

aa:

CASE IV Genetic Drift

Initial Class Frequencies:

AA ____ Aa ____ aa ____

p ____ q ____

My Initial Genotype: ____

F₁ Genotype ____

F₂ Genotype ____

F₃ Genotype ____

F₄ Genotype ____

F₅ Genotype ____

Final Class Frequencies:

AA ____ Aa ____ aa ____

p ____ q ____

Calculate the **allele frequencies** after five generations of mating. (show work, box answer)

A:

a:

Questions:

1. Examine the data from Case 1. Are the p and q values from the initial condition and after five generations what you expected? Explain any discrepancies or surprises. What do you think happened?

2. In Case 1, since the values of p and q changed between the 1st and 5th generation evolution must have occurred. How can this be since we tried to maintain all five Hardy-Weinberg conditions?

3. Examine the data from Case 2. Are the p and q values from the initial condition and after five generations what you expected? Explain what happened.

4. If Case 2 were a large population would it be possible to completely eliminate a deleterious recessive allele? Explain.

5. Explain how the changes in p and q frequencies in Case 2 compare with Case 1 and Case 3.

6. Think about Case 3- what is the importance of heterozygotes (the heterozygote advantage) in maintaining genetic variation in populations? Please give an example of this in a real population.

7. Examine the data from Case 4. Are the p and q values from the initial condition and after five generations what you expected? Explain what happened.

Conclusion (on a separate binder paper answer the following questions and staple it to the back)

- I am looking for about two well written paragraphs

Explain what you did in this lab. Explain what you learned in each of the four cases.

Explain what you learned in this lab. Explain each of the three parts.