

EXERCISE 1: THE THEORY OF EVOLUTION - POPULATION GENETICS

Once you have completed this exercise, you should be able to:

1. List the levels of complexity in the hierarchy of biological structure.
2. List the conditions for a population to be in Hardy-Weinberg equilibrium.
3. Write and apply the Hardy-Weinberg equation: $p^2 + 2pq + q^2 = 1$.
4. Calculate allele frequencies and genotype frequencies for a trait within a sample population.
5. Given simulation data, describe the effects of predation on allele frequencies of a population.
6. Describe how selection may affect the evolution of populations.
7. Define genetic drift and explain how it impacts small populations.
8. Explain the bottleneck effect and the founder effect as mechanisms of genetic drift.
9. Given simulation data, describe the effects of genetic drift on allele frequencies and genotype frequencies of a population.
10. Describe the effect of genetic drift on the genotypic frequency of a mutated allele.
11. Describe the basis for the blood diseases malaria and sickle-cell anemia.
12. Explain why some deleterious alleles can persist in a population.
13. Define extinction and fixation of alleles in a population.
14. Explain heterozygote advantage and how it may maintain alleles in a population.
15. Define and identify the following key terms:

- population
- gene pool
- allele frequency
- genotype frequency
- evolution
- natural selection
- adaptation
- genetic drift
- bottleneck effect
- founder effect
- malaria
- sickle-cell anemia