

Thinking Through the Concepts

1. What is a gene pool? How would you determine the allele frequencies in a gene pool?

A gene pool is all the genes that are present in a population. Allelic frequencies are determined by adding all the alleles for a trait in a population and determining their relative proportions.

2. Define *equilibrium population*. Outline the conditions that must be met for a population to stay in genetic equilibrium.

An equilibrium population is one in which the allelic frequencies and the distribution of genotypes remain constant in succeeding generations. This can occur only if (1) there are no mutations, (2) there is no gene flow between populations, (3) the population is very large, (4) all mating must be random, and (5) there is no natural selection.

3. How does population size affect the likelihood of changes in allele frequencies by chance alone? Can significant changes in allele frequencies (that is, evolution) occur as a result of genetic drift?

Chance alone can change allelic frequencies in small populations, but not in very large populations. Genetic drift can alter allelic frequencies, but only in small populations.

4. If you measured the allele frequencies of a gene and found large differences from the proportions predicted by the Hardy-Weinberg principle, would that prove that natural selection is occurring in the population you are studying? Review the conditions that lead to an equilibrium population, and explain your answer.

This would not prove that natural selection was occurring in the population because there are other factors that could be influencing the changes in allelic frequencies.

5. People like to say that "you can't prove a negative." Study the experiment in Figure 15-1 again, and comment on what it demonstrates.

This experiment demonstrates that mutation occurs spontaneously and not in response to specific selective pressures.

6. Describe the three ways in which natural selection can affect a population over time. Which way(s) is (are) most likely to occur in stable environments, and which way(s) might occur in rapidly changing environments?

Natural selection can affect a population through directional selection, stabilizing selection, and disruptive selection. Stabilizing selection is most likely to occur in stable environments, and directional selection is most likely to occur in rapidly changing environments.

7. What is sexual selection? How is sexual selection similar to and different from other forms of natural selection?

Sexual selection involves the mate choices of females. Sexual selection often seems to work in opposition to other forms of natural selection.

8. Define *kin selection* and *inclusive fitness*. Can these concepts help explain the evolution of altruism?

Kin selection occurs when the actions of an individual increase the survival or reproductive success of its relatives. Inclusive fitness is the fitness conferred on all organisms that have a particular allele. These concepts do help explain the evolution of altruism.