
AP Biology - Evolution
Hardy-Weinberg Practice Problems

When Allele Frequencies Are Given

1. Given a population in Hardy-Weinberg equilibrium with allele frequencies $A = 0.9$ and $a = 0.1$, determine the frequencies of the three genotypes AA , Aa and aa .
2. In a population that is in Hardy-Weinberg equilibrium, the frequency of the “z” allele is 0.6. What percentage of the population is heterozygous at this locus?

Recessive Traits

3. Allele W for white wool is dominant over allele w for black wool. In a sample of 900 sheep, 891 are white and 9 are black. Estimate the allelic frequencies in this sample.
4. In corn, yellow kernel color is governed by a dominant allele; white, by a recessive allele. A random sample of 1,000 kernels from a population that is in equilibrium reveals that 910 are yellow and 90 are white. What are the frequencies of the yellow and white alleles in this population? What is the percentage of heterozygotes in this population?
5. The compound phenylthiocarbamide (PTC) tastes very bitter to most persons. The inability to taste PTC is controlled by a single recessive allele. In the American white population, about 70% can taste PTC while 30% cannot (are non-tasters). Estimate the frequency of the Taster (T) and non-taster (t) alleles in this population as well as the frequencies of the diploid genotypes.
6. 1 in 1,700 US Caucasian newborns have cystic fibrosis. C for normal is dominant over c for cystic fibrosis.
 - a) What percentage of the above population has cystic fibrosis (cc)?

- b) Calculate the frequencies of the C and c alleles.
 - c) Calculate the frequencies of the normal (CC) and carrier (Cc) genotypes.
 - d) How many of the 1,700 population members are normal (CC)? Carriers (Cc)?
 - e) It has been found that a carrier is better able to survive diseases with severe diarrhea. What would happen to the frequency of the “c” if there was an epidemic of cholera or other type of diarrhea producing disease? Would “c” increase or decrease?
7. If 9% of an African population is born with a severe form of sickle-cell anemia (ss), what percentage of the population will be resistant to Malaria because they are heterozygous (Ss) for the sickle-cell gene?
8. In the U.S., 16% of the population is Rh-, due to a homozygous recessive pair of alleles. From this data determine:
- a) the frequency of the recessive allele
 - b) the frequency of the dominant allele
 - c) the percentage of homozygous dominants and heterozygotes in the population

Co-Dominant or Incomplete Dominant Traits

9. In a tropical forest there is a species of bird that has a variable tail length. Long is incompletely dominant over short. In one population of 2000 birds, 614 have long tails, 973 have medium length tails, and 413 birds have short tails.
- a) What is the frequency of each allele in the population?

 - b) Is the population in Hardy Weinberg equilibrium?
10. A botanist is investigating a population of plants whose petal color is controlled by a single gene whose two alleles are codominant. She finds 170 plant that are homozygous brown, 340 plants that are homozygous purple, and 21 plants whose petals are brown-purple. Is this population in Hardy- Weinberg equilibrium?
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