

Answer Sheet for Hardy-Weinberg Equilibrium

HW1) In a population of squirrels, the fur color is controlled by a single gene. The dominant allele R gives red fur and the recessive allele r gives black fur. By doing genetic testing, it was found that 35% of the fur color alleles in the population are R allele. In other words, the dominant allele frequency $R_f = 0.35$. What is the recessive allele frequency r_f ? (In other words, what is the percent of the alleles in the population are the r allele)?

65%

HW2) You are studying a population of beetles. You have determined from previous studies that one gene controls wing length and that the allele for Long wing is the dominant allele. The population has 210 short wing (ll) beetles, 1000 long wing Ll beetles, and 870 long wing (LL) beetles.

a) What is the allele frequency l_f of the recessive allele?

0.34 (1420/4160)

b) What is the allele frequency L_f of the dominant allele?

0.66 (2740/4160)

HW3) A population of birds has 3072 short beaked and 27000 long beaked birds. The beak length is controlled by a single gene. The allele for long beak is known to be the dominant allele. The population is in Hardy-Weinberg equilibrium.

a) What is the allele frequency of the recessive allele?

$q_f = 0.32$

b) What is the allele frequency of the dominant allele?

$Q_f = 0.68$

c) How many birds are homozygous dominant?

13,905 birds are QQ

d) How many birds are heterozygous?

13,087 birds are Qq

HW4) In the US, about 1 in 30,000 babies are born with the recessive genetic disorder cystic fibrosis.

a) What is the genotype of the babies born with cystic fibrosis?

qq (homozygous recessive)

b) What is the allele frequency of the allele for cystic fibrosis?

q_f (recessive cystic fibrosis allele frequency) = 0.0058

c) What is the frequency of the dominant allele?

Q_f (dominant healthy allele frequency) = 0.9942

d) What % of the population are carriers for cystic fibrosis?

Het_f (heterozygous (carriers) Qq genotype frequency) = 0.0115

So 1.15% of the population are carriers of cystic fibrosis

e) What % of the population are healthy non-carriers?

HD_f (homozygous dominant (healthy non-carriers) QQ genotype frequency) = 0.988. So 98.8% of the population are healthy non-carriers of cystic fibrosis