Hardy-Weinberg Practice
AP Biology

Name: Key

1. In a population of 200 mice, 98 are homozygous dominant for brown fur (BB), 84 are heterozygous (Bb), and 18 are homozygous recessive for white fur (bb).
   a. The genotype frequencies of this population are 0.49 BB, 0.42 Bb, and 0.09 bb.
   b. The allele frequencies of this population are 0.7 B allele and 0.3 b allele.

2. Use the allele frequencies you determined in question #1 to predict the genotype frequencies of the next generation.
   a. B (p) = 0.7 b (q) = 0.3
   b. BB = $p^2$= 0.49 Bb = 2pq 0.42 bb = $q^2$ = 0.09

3. In a population that is in Hardy-Weinberg equilibrium for two alleles, C and c, 16% of the population show a recessive trait. Assuming C is dominant to c, what percent show the dominant trait?
   84 %

4. The allele frequencies in a population are A= 0.6 and a = 0.4. Predict the genotype frequencies for the next generation.
   AA 0.36 Aa 0.48 aa 0.16
   a. What would the allele frequencies be for the generation you predicted? A 0.6 a 0.4.
   b. Suppose you are able to determine the actual genotype frequencies in the population and find that these frequencies differ significantly from what you predicted. What would such a result indicate?
   The population is evolving

5. Sixty flowering plants are planted in a flowerbed. Forty of the plants are red-flowering homozygous dominant. Twenty of the plants are white-flowering homozygous recessive. The plants naturally pollinate and reseed themselves for several years. In a subsequent year, 178 red-flowered plants, 190 pink-flowered plants, and 52 white-flowered plants are found in the flowerbed. Use a chi-square analysis to determine if the population is in Hardy-Weinberg equilibrium. *(Round your answers to three decimal places.)*

   **Step 1**: Find the allele frequencies in the original population
   p= 80/120 0.667 q= 40/120 0.333

   **Step 2**: Use the equation $p^2 + 2pq + q^2 = 1$ to find the predicted genotype frequencies of the population once it has reached Hardy-Weinberg equilibrium.
   $p^2$= 0.445 2pq = 0.444 q2= 0.111

**Step 3**: Fill in the data table and figure out the Chi-square value

| | Observed | Expected *(round to the nearest whole number)* | (o-e) | $(o-e)^2$ | $(o-e)^2/e$ |
|---|---|---|---|---|---|
| $p^2$ | 178 | 187 | -9 | 81 | 0.433 |
| 2pq | 190 | 186 | 4 | 16 | 0.086 |
| $q^2$ | 52 | 47 | 5 | 25 | 0.532 |

Chi Square = 1.049

**Step 4:** Compare your chi-square value to the chi-square table to find your p-value.

| CHI-SQUARE TABLE | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Degrees of Freedom | | | | | | | | |
| p | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 0.05 | 3.84 | 5.99 | 7.82 | 9.49 | 11.07 | 12.59 | 14.07 | 15.51 |
| 0.01 | 6.64 | 9.21 | 11.34 | 13.28 | 15.09 | 16.81 | 18.48 | 20.09 |

2 degrees of freedom

**Step 5:** Determine if your population is in Hardy-Weinberg equilibrium.

The p-value is not on the chart. This means that the difference between the observed and expected is not statistically significant. The flower population appears to be in Hardy-Weinberg equilibrium and is not evolving.