

KEY

97 • LABORATORY 8

3. The allele for the hair pattern called "widow's peak" is dominant over the allele for no "widow's peak." In a population of 1,000 individuals, 510 show the dominant phenotype. How many individuals would you expect of each of the possible three genotypes for this trait?

$$1000 - 510 = 490 \text{ \# of recessive}$$

$$490/1000 = 0.49 = q^2$$

$$q = 0.7$$

$$1 - 0.7 = 0.3$$

$$p = 0.3$$

$$0.09 = p^2$$

$$(0.09)(1000) = 90$$

$$q^2 = 490 \text{ people}$$

$$p^2 = 90 \text{ people}$$

$$420 = 2pq$$

$$2(0.7)(0.3) = 0.42$$

4. In the United States, about 16 percent of the population is Rh negative. The allele for Rh negative is recessive to the allele for Rh positive. If the student population of a high school in the U.S. is 2,000, how many students would you expect for each of the three possible genotypes?

$$q = \sqrt{.16} = 0.4$$

$$p = 0.6$$

$$p^2 = 0.6^2$$

$$p^2 = 0.36$$

$$q^2 = .16$$

$$q^2 = 2000 \times .16 = 320 \text{ people for } q^2$$

$$p^2 = 720 \text{ people for } p^2$$

$$2pq = 2(0.6)(0.4) = 0.48 \times 2000 = 960 \text{ people for } 2pq$$

5. In certain African countries, 4 percent of the newborn babies have sickle-cell anemia, which is a recessive trait. Out of a random population of 1,000 newborn babies, how many would you expect for each of the three possible genotypes?

$$q^2 = 0.04 \sim 0.04 \times 1000 = 40 \text{ people for } q^2$$

$$q = 0.2$$

$$p = 0.8$$

$$p^2 = 0.64$$

$$0.64 \times 1000 = 640 \text{ people for } p^2$$

$$2(0.8)(0.2) = 320 \text{ people for } 2pq$$

6. In a certain population, the dominant phenotype of a certain trait occurs 91 percent of the time. What is the frequency of the dominant allele?

$$100 - 91 = 9\% \text{ recessive phenotype} = \text{recessive genotype}$$

$$q^2 = 0.09$$

$$q = \cancel{0.2} 0.3$$

$$p + q = 1$$

$$\downarrow$$
$$p + 0.3 = 1$$

$$p = 0.7$$