Name: ________________________________ Period: __________________________

HARDY-WEINBERG WORKSHEET

EQUATIONS: $p + q = 1$ $p^2 + 2pq + q^2 = 1$

1. What is the Hardy-Weinberg symbol for the frequency of the dominant allele? ________________

2. What is the Hardy-Weinberg symbol for the frequency of the recessive allele? ________________

3. What is the Hardy-Weinberg symbol for the frequency of the homozygous dominant genotype? ________

4. What is the Hardy-Weinberg symbol for the frequency of the heterozygous genotype? _____________

5. What is the Hardy-Weinberg symbol for the frequency of the homozygous recessive genotype? ________

6. If the allele frequency of "r" is 0.75, what is the allele frequency of "R"? ____________________

7. If the allele frequency of "R" is 0.15, what is the allele frequency of "r"? ____________________

8. In a population the homozygous dominant individuals make up 81% of the population, heterozygous individuals make up 18%, and homozygous recessive individuals make up 1%. What is the frequency of the "p" allele?

9. Tay-Sachs disease is caused by a recessive allele. The frequency of this allele is 0.1 in a population of 3,600.
   a. What is the frequency of the dominant allele?

   b. How many people in this population will have Tay-Sachs?

   c. How many people in this population are Tay-Sachs carriers (heterozygous)?

10. Cystic fibrosis is caused by a recessive allele. The frequency of this allele is 0.1 in a population of 2,500.
   a. What is the frequency of the dominant allele?

   b. How many people in this population will have cystic fibrosis?

   c. How many people in this population are cystic fibrosis carriers (heterozygous)?

11. Huntington's disease is a dominant allele disorder. While looking at his family's pedigree, Parker noticed that 64 out of his 100 relatives were affected by this disorder.
   a. What is the value of "q^2"?

   b. What is the value of "2pq"?

   c. How many people are homozygous dominant in Parker's family pedigree?

   d. How many people are heterozygous in Parker's family pedigree?

Name Period Date

SECTION **11.4** | HARDY-WEINBERG EQUILIBRIUM

Reinforcement

KEY CONCEPT Hardy-Weinberg equilibrium provides a framework for understanding how populations evolve.

The Hardy-Weinberg model shows that if there are no forces of evolution acting on a population, the allele frequencies will remain constant—in equilibrium—from generation to generation. If a real population matches this model, that population is said to be in **Hardy-Weinberg equilibrium.** There are five conditions required for a population to stay in Hardy-Weinberg equilibrium:

- Very large population: No genetic drift can occur.
- No emigration or immigration: No gene flow can occur.
- No mutations: No new alleles can be formed in the gene pool.
- Random mating: No sexual selection can occur.
- No natural selection: All alleles must be equally advantageous for survival.

The Hardy-Weinberg equation can be used to predict genotype frequencies in a population. The phenotype frequencies must be known, and from these the allele and genotype frequencies can be predicted. If real genotype frequencies do not match the predicted frequencies, the population is not in Hardy-Weinberg equilibrium; it is evolving.

Hardy-Weinberg equilibrium confirms that there are five factors that can lead to evolution: genetic drift, gene flow, mutation, sexual selection, and natural selection. In nature, at least one of these factors is likely to be acting on a population at any given time. Therefore, populations are rarely in equilibrium. In nature, populations evolve.

1. What does the Hardy-Weinberg model show?

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2. What conditions are required for a population to stay in Hardy-Weinberg equilibrium?

____

____

3. What can be predicted by the Hardy-Weinberg equation?

____

4. What can be concluded if real population data do not match those predicted by the Hardy-Weinberg equation?

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5. Why do real populations rarely reach Hardy-Weinberg equilibrium?

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