

# BIO 213—Principles of Evolution

## *Hardy-Weinberg Practice Problems*

In all these problems, AA will designate individuals that are homozygous dominant, Aa will be heterozygous, and aa will be homozygous recessive.

- Which of the following genotype frequencies does *not* represent a population in Hardy-Weinberg equilibrium for this gene:
  - AA:0.04, Aa:0.84, aa:0.12
  - AA:0.09, Aa:0.42, aa:0.49
  - AA:0.25, Aa:0.50, aa:0.25
  - AA:0.60, Aa:0.48, aa:0.16
  - AA:0.81, Aa:0.18, aa:0.01
- A population contains 456 individuals of the AA genotype, 34 individuals of the Aa genotype, and 112 individuals of the aa genotype. An exhaustive study has shown that  $p = 0.785714286$ . Thus,  $q = \underline{\hspace{2cm}}$ .
  - q cannot be determined, since the population is not in Hardy-Weinberg equilibrium.
  - 0.0
  - 0.214285714
  - 0.214825514
  - 0.785714286
- You have created an artificial population containing 300 plants with red flowers (AA) and 300 plants with white flowers (aa). Assuming that all the conditions of the Hardy-Weinberg Equilibrium are true, what will be the genotype frequencies of the next generation?
  - AA:0.04, Aa:0.84, aa:0.12
  - AA:0.09, Aa:0.42, aa:0.49
  - AA:0.25, Aa:0.50, aa:0.25
  - AA:0.60, Aa:0.48, aa:0.16
  - The frequencies cannot be determined from the information given.
- A population contains 84 individuals with the dominant phenotype (either AA or Aa) and 16 with the recessive (aa). Is this population in Hardy-Weinberg Equilibrium?
  - Yes
  - No
  - It cannot be determined from the information given

5. A population contains 150 individuals with the AA genotype, 4 individuals with the Aa genotype, and 164 individuals with the aa genotype. What kind of selection is going on?
  - a. None: the population is in Hardy-Weinberg Equilibrium
  - b. Directional: the recessive phenotype is at a disadvantage
  - c. Directional: the dominant phenotype is at a disadvantage
  - d. Stabilizing (overdominance): the heterozygotes are advantaged over the homozygotes
  - e. Disruptive (underdominance): the heterozygotes are disadvantaged relative to the homozygotes.
6. For  $p = 0.1, 0.2, 0.3, \dots, 0.9$ , calculate the genotype frequencies of the next generation, assuming Hardy-Weinberg Equilibrium.

Answers: 1a, 2c, 3c, 4c, 5e, 6:

AA	Aa	aa
0.01	0.18	0.81
0.04	0.32	0.64
0.09	0.42	0.49
0.16	0.48	0.36
0.25	0.50	0.25
0.36	0.48	0.16
0.49	0.42	0.09
0.64	0.32	0.04
0.81	0.18	0.01