

Biology 375 – Evolution
Fall 2007 – Dr. Carey – Exam 2

1. Define: (3 pts each)
 - A. product law of probability
 - B. autozygous alleles

2. What did Sewall Wright say would be the optimum population structure for the most rapid and sustained adaptive evolution? Explain the general logic behind his conclusion. (15 pts)

3. A natural population of frogs consists of 49% brown and 51% green animals. Tests indicate that skin color is based on a single autosomal gene, with green alleles dominant to brown. Given this information, determine:
 - A. the frequencies of the 2 color alleles in the population (4 pts)
 - B. the frequencies of the 3 possible genotypes in the population (6 pts)
 - C. what basic assumption did you have to make about the population in order to calculate the above frequencies? Why is it probably a safe assumption to make? (6 pts)

4. We have 2 populations that live in adjoining ranges. Both are small in size. In population 1 the frequency of allele Z is 0.32; in population 2 it is 0.45. Both populations inhabit identical environments and meiosis is normal.
 - A) One generation later we sample the populations and find that the frequency of allele Z in population 1 is 0.38; in population 2 it is 0.51. Given these frequency changes and the above information, what 2 evolutionary forces are the most likely causes of the frequency changes in the 2 populations? Give your rationales for choosing the 2 that you did, and for eliminating the others. (14 pts)

 - B) Assuming that all factors remain constant, how might you test further to determine which 1 of your 2 possible evolutionary forces actually did cause the change? (10 pts)

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5. We have the following distribution of genotypes in a population:

	BB	BC	CC
Population size	150	300	50

Calculate the gene and genotype frequencies for the population. Is the population in a Hardy/Weinberg equilibrium? Why or why not? All else being equal, would you consider the population to be inbred or outbred? Why? (18 pts)

6. Using the data from the population in question 5: In this population we find that BB individuals on average produce 2 offspring, BC also produce 2 offspring, and CC produce 8 offspring.
- Calculate the fitnesses and selection coefficients for each genotype (6 pts)
 - Calculate the average fitness of the population (4 pts)
 - Calculate the gene frequencies (p and q) in the next generation of this population (6 pts)
 - What will be the gene and genotype frequencies in this population when it reaches its selective equilibrium? (5 pts)