

1. In a population of 200 mice, 98 are homozygous dominant for brown coat color (BB), 84 are heterozygous (Bb), and 18 are homozygous recessive (bb).

- The allele frequencies of this population are _____ B allele _____ b allele
- The genotype frequencies of this population are _____ BB _____ Bb _____ bb

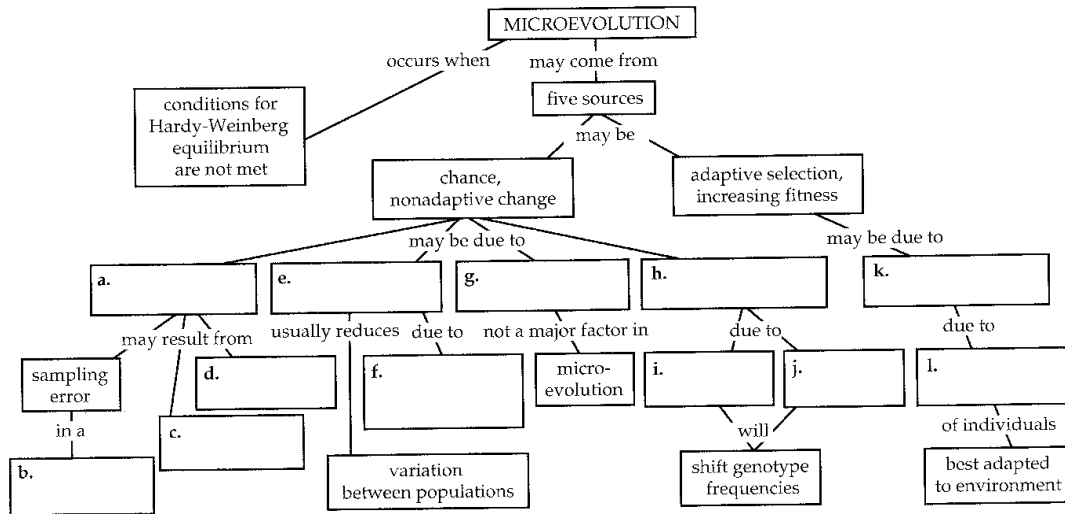
2. Use the allele frequencies you determined in question 1 to predict the genotype frequencies of the next generation.

B (p) = _____
 BB = p² = _____
 bb = q² = _____
 b (q) = _____
 Bb = 2pq = _____

3. Practice using the Hardy-Weinberg equation so that you can easily determine genotype frequencies from allele frequencies and vice versa.

- The allele frequencies in a population are A = 0.6 and a = 0.4. Predict the genotype frequencies for the next generation
 AA _____ Aa _____ aa _____
- What would the allele frequencies be for the generation you predicted in a?
- Suppose that one gene locus determines stripe pattern in skunks. SS skunks have two broad stripes; Ss skunks have two narrow stripes; ss skunks have white speckles down their backs. A sampling of a population of skunks found 65 broad-striped skunks, 14 narrow-striped, and 1 speckled skunk. What are the allele frequencies for S and s?
 S _____ s _____

4. Fill in the following concept map that summarizes the five sources of microevolution, or create your own concept map to help you review microevolution.



- What is a major source of genetic variation for bacteria and microorganisms?
- What is the major source of genetic variation for plants and animals?
- Explain why your answers to a and b are different.
- A gene locus has two alleles, B and b. The genotype BB has a relative fitness of 0.5 and bb has a relative fitness of 0.25
 - What is the relative fitness of the genotype Bb?
 - If a new generation has 100 BB individuals, how many Bb and bb would you expect to find?
 Bb _____ bb _____
 - What might account for the different relative fitness values for these genotypes?
- What is the Hardy-Weinberg theorem? Define the variables of the Hardy-Weinberg equation. Make sure you can use this equation to determine allele frequencies and predict genotype frequencies.
- It seems that natural selection would work toward genetic unity; the genotypes that are most fit produce the most offspring, increasing the frequency of adaptive alleles and eliminating less beneficial alleles from the population. Yet there remains a great deal of variability within the populations of a species. Describe some of the factors that contribute to this genetic variability.
- You collect 100 samples from a large butterfly population. Fifty specimens are dark brown, 20 are speckled, and 30 are white. Coloration in this species of butterfly is controlled by one gene locus: BB individuals are brown, Bb are speckled, and bb are white. What are the allele frequencies for the coloration gene in this population? Is this population in Hardy-Weinberg equilibrium? Explain your answer.

MULTIPLE CHOICE. Choose the one alternative that best completes the statement or answers the question.

- 11) The decrease in the size of plants on the slopes of mountains as altitudes increase is an example of 11) _____
A) relative fitness.
B) a cline.
C) genetic drift.
D) speciation.
E) a bottleneck.
- 12) Which of the following is likely to have been produced by sexual selection? 12) _____
A) a male lion's mane
B) bright colors of female flowers
C) camouflage coloration in animals
D) the ability of desert animals to concentrate their urine
E) different sizes of male and female pine cones
- 13) A change in the frequencies of alleles in the gene pool of a small population arising from chance events is called 13) _____
A) gene flow.
B) differential reproduction.
C) genetic drift.
D) mutation pressure.
E) selection.
- 14) Through time, the movement of people on Earth has steadily increased. This has altered the course of human evolution by increasing 14) _____
A) gene flow.
B) nonrandom reproduction.
C) mutations.
D) geographical isolation.
E) genetic drift.

Use the following information to answer the questions below. In a hypothetical population of 1000 people, tests of blood type genes show that 100 have the genotype AA, 600 have the genotype AB, and 300 have the genotype BB.

- 15) What is the frequency of the B allele? 15) _____
A) .002 B) .001 C) .100 D) .400 E) .600
- 16) If there are 4000 children produced by this generation, how many would be expected to have AB blood? 16) _____
A) 2000 B) 960 C) 100 D) 1920 E) 2400

Use the following information to answer the questions below. A large population of laboratory animals has been allowed to breed randomly for a number of generations. After several generations, 49 percent of the animals display a recessive trait (aa), the same percentage as at the beginning of the breeding program. The rest of the animals show the dominant phenotype, with heterozygotes indistinguishable from the homozygous dominants.

- 17) What is the estimated frequency of allele a in the gene pool? 17) _____
A) 0.49 B) 0.07 C) 0.30 D) 0.51 E) 0.70
- 18) Genetic recombination is a critical process in evolution. This statement is supported by the continuous existence of which of the following in evolving populations? 18) _____
A) sex
B) bacterial conjugation
C) exchange of chromosome regions in meiosis (crossing over)
D) a and c
E) a, b, and c
- 19) Over a period of time, the frequency of an allele in a population decreases from 0.01 to 0.003. Which of the following might explain this change? 19) _____
A) The allele is disadvantageous when homozygous.
B) Migrants entering the population had a lower frequency of that allele than did current members of the population.
C) One member of the population who was homozygous recessive for the allele accidentally died.
D) a and b are correct.
E) a, b, and c are correct.
- 20) In a population that is in Hardy-Weinberg equilibrium, the frequency of the allele a is 0.3. What is the percentage of the population that is heterozygous for this allele? 20) _____
A) 42 B) 3 C) 30 D) 21 E) 9
- 21) Which of the following statements best summarizes organic evolution as it is viewed today? 21) _____
A) It is goal directed.
B) It is the differential survival and reproduction of the most fit phenotypes.
C) It represents the result of selection for acquired characteristics.
D) It is synonymous with the process of gene flow.
E) It is the descent of humans from the present-day great apes.
- 22) Which of the following is correct about a population that has a lethal recessive allele? 22) _____
A) The homozygous recessive genotype of this allele has a relative fitness of 0 and a selection coefficient of 1.
B) This allele will ultimately bring about the extinction of this population.
C) The allele inevitably will mutate to a nonlethal state.
D) The allele eventually will be removed from the population by natural selection.
E) The heterozygous genotype of this allele has a relative fitness of 0 and a selection coefficient of 0.5.

- 23) In a population with two alleles, A and a, the frequency of a is 0.6. What would be the frequency of heterozygotes if the population is in Hardy-Weinberg equilibrium? 23) _____
 A) 0.64 B) 0.36 C) 0.16 D) 0.48 E) 0.4
- 24) In a large, sexually reproducing population, the frequency of an allele changes from 60% to 20%. From this change, one can most logically assume 24) _____
 A) that there is no sexual selection.
 B) that the allele is linked to a detrimental allele.
 C) that the allele mutates readily.
 D) that random processes have changed allelic frequencies.
 E) that the allele reduces fitness.
- 25) The frequency of the a allele in Population 1 is 0.3. The frequency of the a allele in Population 2 is 0.8, and the frequency of the a allele in Population 3 is 0.4. For which of the following would gene flow cause the greatest change in allelic frequencies? 25) _____
 A) if some members of Population 3 joined Population 2
 B) if some members of Population 3 joined Population 1
 C) if some members of Population 2 joined Population 3
 D) if some members of Population 2 joined Population 1
 E) if some members of Population 1 joined Population 3

The following questions refer to the following terms. Each term may be used once, more than once, or not at all.

- a. calorie
- b. temperature
- c. heat of vaporization
- d. buffer
- e. mole

- 26) If two of the original colonists died before they produced offspring, the ratios of genotypes could be quite different in the subsequent generations. This is an example of 26) _____
 A) stabilizing selection.
 B) diploidy.
 C) genetic drift.
 D) gene flow.
 E) diversifying selection.
- 27) The gene pool can best be described as the 27) _____
 A) total number of gene loci that occur in each species.
 B) genes only found in isolated populations.
 C) total aggregate of genes in a population at any time.
 D) group of genes responsible for polygenic traits.
 E) group of genes not described by the Hardy-Weinberg theorem.

- 28) All of the following statements about balanced polymorphism are correct EXCEPT: 28) _____
- A) It can be caused by frequency-dependent selection.
 - B) It is maintained by natural selection.
 - C) It occurs in populations at a Hardy-Weinberg equilibrium.
 - D) It results from the perpetuation of genetic variation.
 - E) It is associated with heterogeneous environments.
- 29) Which of the following is one important evolutionary feature of the diploid condition? 29) _____
- A) Genes are more resistant to mutation in diploid cells.
 - B) Recombination can only occur in diploid organisms.
 - C) Only diploid organisms can reproduce sexually.
 - D) Diploid organisms are more likely to successfully clone than are haploid organisms.
 - E) Diploid organisms express less of their genetic variability than haploid organisms.
- 30) Gene frequencies in a gene pool may shift randomly and by chance. This is called 30) _____
- A) natural selection.
 - B) genetic drift.
 - C) adaptive radiation.
 - D) climatic shift.
 - E) artificial selection.