

## CHAPTER 22.2-22.6: Mechanisms of Evolution

1. Why is genetic variation important to evolution?

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2. How does each of the following break Hardy-Weinberg assumptions?

a. mutation: \_\_\_\_\_

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b. gene flow: \_\_\_\_\_

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c. genetic drift: \_\_\_\_\_

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d. nonrandom mating: \_\_\_\_\_

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3. How does genetic drift apply to each of the following? Give an example of each.

a. Founder Effect: \_\_\_\_\_

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b. Bottleneck Effect: \_\_\_\_\_

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4. What is the H-W assumption that is broken when genetic drift occurs? Explain.

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5. Define fitness (as it is used in evolutionary biology).

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6. "Only selection regularly produces **adaptive** evolutionary change, but the genetic constitution of populations, and thus the course of evolution, can also be affected by mutations, gene flow, nonrandom mating, and genetic drift." Explain the distinction.

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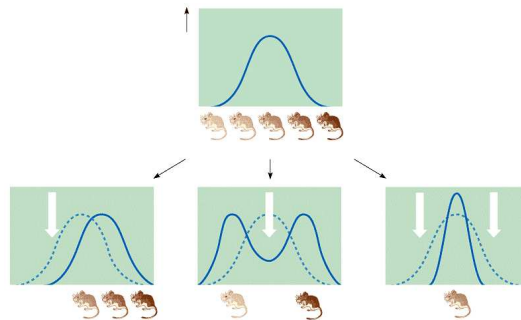
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7. Distinguish between the three types of selection illustrated in these graphs of the distribution of coat color in mice.



8. Describe two examples of documented cases of selection in natural populations which have resulted in evolutionary change of a population.

a. \_\_\_\_\_

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b. \_\_\_\_\_

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9. What is the role of neutral alleles in a population?

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10. Describe three ways that humans have influenced evolution of life?

a. \_\_\_\_\_

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b. \_\_\_\_\_

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c. \_\_\_\_\_

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11. For each of the following, give an example or describe what is meant by the statement.

a. Natural selection cannot fashion perfect organisms: \_\_\_\_\_

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b. Adaptations are often compromises: \_\_\_\_\_

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c. Not all evolution is adaptive: \_\_\_\_\_

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d. Selection can only edit existing variations: \_\_\_\_\_

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**END OF CHAPTER 22 MULTIPLE CHOICE**

1. Garter snakes that are resistant to TTX move more slowly than those that are susceptible to the toxin. Their reduced speed is an example of
  - A) an adaptation.
  - B) genetic drift.
  - C) natural selection.
  - D) a trade-off.
  - E) none of the above
  
2. Which of the following is not true?
  - A) Darwin and Wallace were both influenced by Malthus.
  - B) Wallace proposed a theory of evolution by natural selection that was similar to Darwin's.
  - C) Malthus claimed that because human population growth would outstrip any increases in food production, famine was a likely result.
  - D) Darwin realized that all populations had the capacity for rapid increases in numbers.
  - E) All of the above are true.
  
3. The phenotype of an organism is
  - A) the type specimen of its species in a museum.
  - B) its genetic constitution, which governs its traits.
  - C) the chronological expression of its genes.
  - D) the physical expression of its genotype.
  - E) the form it achieves as an adult.
  
4. The appropriate unit for defining and measuring genetic variation is the
  - A) cell.
  - B) individual.
  - C) population.
  - D) community.
  - E) ecosystem.
  
5. Which statement about allele frequencies is not true?
  - A) The sum of all allele frequencies at a locus is always 1.
  - B) If there are two alleles at a locus and we know the frequency of one of them, we can obtain the frequency of the other by subtraction.
  - C) If an allele is missing from a population, its frequency in that population is 0.
  - D) If two populations have the same gene pool for a locus, they will have the same proportion of homozygotes at that locus.
  - E) If there is only one allele at a locus, its frequency is 1.

6. Which of the following is not required for a population at Hardy–Weinberg equilibrium ?
- A) There is no migration between populations.
  - B) Natural selection is not acting on the alleles in the population.
  - C) Mating is random.
  - D) The frequency of one allele must be greater than 0.7.
  - E) All of the above conditions must be met.
7. The fitness of a genotype is a function of the
- A) average rates of survival and reproduction of individuals with that genotype.
  - B) individuals that have the highest rates of both survival and reproduction.
  - C) individuals that have the highest rates of survival.
  - D) individuals that have the highest rates of reproduction.
  - E) average reproductive rate of individuals with that genotype.
8. Laboratory selection experiments with fruit flies have demonstrated that
- A) bristle number is not genetically controlled.
  - B) bristle number is not genetically controlled, but changes in bristle number are caused by the environment in which the fly is raised.
  - C) bristle number is genetically controlled, but there is little variation on which natural selection can act.
  - D) bristle number is genetically controlled, but selection cannot result in flies having more bristles than any individual in the original population had.
  - E) bristle number is genetically controlled, and selection can result in flies having more bristles than any individual in the original population had.
9. Disruptive selection maintains a bimodal distribution of bill size in the West African seedcracker because
- A) bills of intermediate shapes are difficult to form.
  - B) the birds' two major food sources differ markedly in size and hardness.
  - C) males use their large bills in displays.
  - D) migrants introduce different bill sizes into the population each year.
  - E) older birds need larger bills than younger birds.
10. Which of the following is not a reason why trade-offs constrain evolution?
- A) All adaptations impose both fitness costs and benefits.
  - B) Sexual selection for large size and weaponry shortens the life span of their possessors.
  - C) Changes in allele frequencies may be influenced by events that occur very infrequently.
  - D) Ability to consume toxic prey may reduce mobility.
  - E) Adaptations can evolve only if the fitness benefits they confer exceed the costs they impose.