

- \_\_\_\_\_ 1) During a study session about evolution, one of your fellow students remarks, "The giraffe stretched its neck while reaching for higher leaves; its offspring inherited longer necks as a result." Which statement is most likely to be helpful in correcting this student's misconception?
- A) Characteristics acquired during an organism's life are generally not passed on through genes.
  - B) Spontaneous mutations can result in the appearance of new traits.
  - C) Only favorable adaptations have survival value.
  - D) Disuse of an organ may lead to its eventual disappearance.
  - E) If the giraffes did not have to compete with each other, longer necks would not have been passed on to the next generation.
- \_\_\_\_\_ 2) Natural selection is based on all of the following *except*
- A) genetic variation exists within populations.
  - B) the best-adapted individuals tend to leave the most offspring.
  - C) individuals who survive longer tend to leave more offspring than those who die young.
  - D) populations tend to produce more individuals than the environment can support.
  - E) individuals adapt to their environments and, thereby, evolve.
- \_\_\_\_\_ 3) Which of the following represents an idea that Darwin learned from the writings of Thomas Malthus?
- A) Technological innovation in agricultural practices will permit exponential growth of the human population into the foreseeable future.
  - B) Populations tend to increase at a faster rate than their food supply normally allows.
  - C) Earth changed over the years through a series of catastrophic upheavals.
  - D) The environment is responsible for natural selection.
  - E) Earth is more than 10,000 years old.
- \_\_\_\_\_ 4) Given a population that contains genetic variation, what is the correct sequence of the following events, under the influence of natural selection?
1. Well-adapted individuals leave more offspring than do poorly adapted individuals.
  2. A change occurs in the environment.
  3. Genetic frequencies within the population change.
  4. Poorly adapted individuals have decreased survivorship.
- A) 2 → 4 → 1 → 3
  - B) 4 → 2 → 1 → 3
  - C) 4 → 1 → 2 → 3
  - D) 4 → 2 → 3 → 1
  - E) 2 → 4 → 3 → 1
- \_\_\_\_\_ 5) The role that humans play in artificial selection is to
- A) determine who lives and who dies.
  - B) create the genetic variants, which nature then selects.
  - C) choose which organisms breed, and which do not.
  - D) train organisms to breed more successfully.
  - E) perform artificial insemination.

- \_\_\_\_\_ 6) Currently, two extant elephant species (X and Y) are placed in the genus *Loxodonta*, and a third species (Z) is placed in the genus *Elephas*. Thus, which statement should be true?
- A) Species X and Y are not related to species Z.
  - B) Species X and Y share a greater number of homologies with each other than either does with species Z.
  - C) Species X and Y share a common ancestor that is still extant (in other words, not yet extinct).
  - D) Species X and Y are the result of artificial selection from an ancestral species Z.
  - E) Species X, Y, and Z share a common ancestor, but nothing more can be claimed than this.
- \_\_\_\_\_ 7) DDT was once considered a "silver bullet" that would permanently eradicate insect pests. Today, instead, DDT is largely useless against many insects. Which of these would have been required for this pest eradication effort to be successful in the long run?
- A) Larger doses of DDT should have been applied.
  - B) All habitats should have received applications of DDT at about the same time.
  - C) The frequency of DDT application should have been higher.
  - D) None of the individual insects should have possessed genomes that made them resistant to DDT.
  - E) DDT application should have been continual.
- \_\_\_\_\_ 8) Of the following anatomical structures, which is homologous to the bones in the wing of a bird?
- A) cartilage in the dorsal fin of a shark
  - B) bones in the hind limb of a kangaroo
  - C) chitinous struts in the wing of a butterfly
  - D) bony rays in the tail fin of a flying fish
  - E) bones in the flipper of a whale
- \_\_\_\_\_ 9) Structures as different as human arms, bat wings, and dolphin flippers contain many of the same bones, these bones having developed from very similar embryonic tissues. How do biologists interpret these similarities?
- A) by identifying the bones as being homologous structures
  - B) by the principle of convergent evolution
  - C) by proposing that humans, bats, and dolphins share a common ancestor
  - D) Three of the statements above are correct.
  - E) Two of the statements above are correct.
- \_\_\_\_\_ 10) During an individual organism's lifetime, which of these is most likely to help the organism respond properly to changes in its environment?
- A) microevolution
  - B) change in allele or gene frequency
  - C) change in gene expression
  - D) change in average heterozygosity
- \_\_\_\_\_ 11) If, on average, 46% of the loci in a species' gene pool are heterozygous, then the average homozygosity of the species should be
- A) 23%.
  - B) 46%.
  - C) 54%.
  - D) There is not enough information to say.

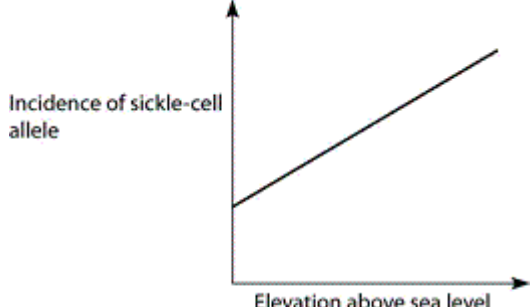
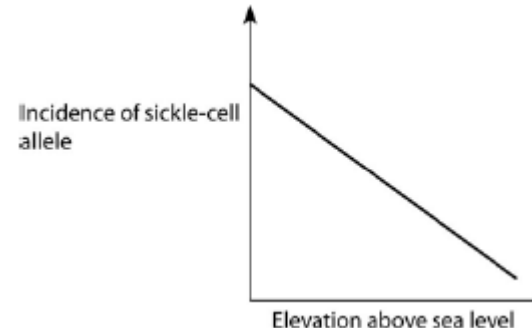
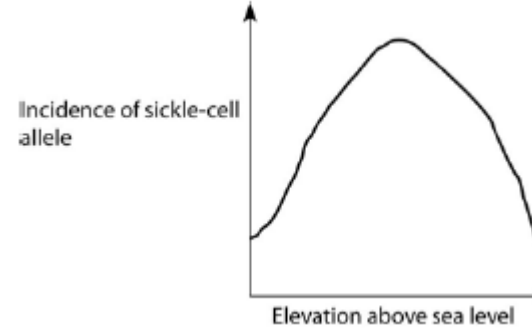
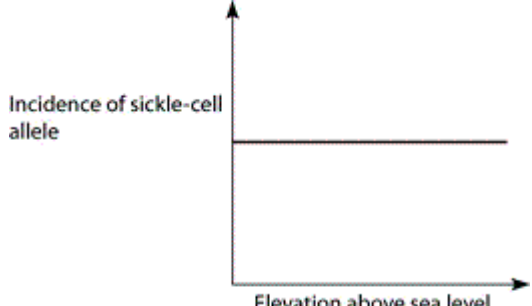
- \_\_\_\_\_ 12) Although each of the following has a better chance of influencing gene frequencies in small populations than in large populations, which one most consistently requires a small population as a precondition for its occurrence?
- A) mutation
  - B) nonrandom mating
  - C) genetic drift
  - D) natural selection
  - E) gene flow
- \_\_\_\_\_ 13) Hardy–Weinberg equilibrium *must* occur in populations wherein
- A) an allele remains fixed.
  - B) no genetic variation exists.
  - C) natural selection is not operating.
  - D) All three of the responses above are correct.
  - E) Only two of the responses above are correct.
- \_\_\_\_\_ 14) In a Hardy–Weinberg population with two alleles,  $A$  and  $a$ , that are in equilibrium, the frequency of the allele  $a$  is 0.3. What is the percentage of the population that is homozygous for this allele?
- A) 0.09
  - B) 0.49
  - C) 0.9
  - D) 9.0
  - E) 49.0
- \_\_\_\_\_ 15) In a Hardy–Weinberg population with two alleles,  $A$  and  $a$ , that are in equilibrium, the frequency of allele  $a$  is 0.1. What is the frequency of individuals with  $AA$  genotype?
- A) 0.20
  - B) 0.32
  - C) 0.42
  - D) 0.81
  - E) Genotype frequency cannot be determined from the information provided.
- \_\_\_\_\_ 16) Swine are vulnerable to infection by bird flu virus and human flu virus, which can both be present in an individual pig at the same time. When this occurs, it is possible for genes from bird flu virus and human flu virus to be combined, thereby producing a genetically distinctive virus, which can subsequently cause widespread disease.

The production of new types of flu virus in the manner described above is most similar to the phenomenon of

- A) bottleneck effect.
- B) founder effect.
- C) natural selection.
- D) gene flow.
- E) sexual selection.

- \_\_\_\_\_ 17) In the wild, male house finches (*Carpodus mexicanus*) vary considerably in the amount of red pigmentation in their head and throat feathers, with colors ranging from pale yellow to bright red. These colors come from carotenoid pigments that are found in the birds' diets; no vertebrates are known to synthesize carotenoid pigments. Thus, the brighter red the male's feathers are, the more successful he has been at acquiring the red carotenoid pigment by his food-gathering efforts (all other factors being equal). During breeding season, one should expect female house finches to prefer to mate with males with the brightest red feathers. Which of the following is true of this situation?
- A) Alleles that promote more efficient acquisition of carotenoid-containing foods by males should increase over the course of generations.
  - B) Alleles that promote more effective deposition of carotenoid pigments in the feathers of males should increase over the course of generations.
  - C) There should be directional selection for bright red feathers in males.
  - D) Three of the statements are correct.
  - E) Two of the statements are correct.
- \_\_\_\_\_ 18) Which of the following statements best summarizes evolution as it is viewed today?
- A) It represents the result of selection for acquired characteristics.
  - B) It is synonymous with the process of gene flow.
  - C) It is the descent of humans from the present-day great apes.
  - D) It is the differential survival and reproduction of the most-fit phenotypes.
- \_\_\_\_\_ 19) Most Swiss starlings produce four to five eggs in each clutch. Starlings producing fewer, or more, than this have reduced fitness. Which of the following terms best describes this situation?
- A) artificial selection
  - B) directional selection
  - C) stabilizing selection
  - D) disruptive selection
  - E) sexual selection
- \_\_\_\_\_ 20) The recessive allele that causes phenylketonuria (PKU) is harmful, except when an infant's diet lacks the amino acid phenylalanine. What maintains the presence of this harmful allele in a population's gene pool?
- A) heterozygote advantage
  - B) stabilizing selection
  - C) diploidy
  - D) balancing selection

21) Anopheles mosquitoes, which carry the malaria parasite, cannot live above elevations of 5,900 feet. In addition, oxygen availability decreases with higher altitude. Consider a hypothetical human population that is adapted to life on the slopes of Mt. Kilimanjaro in Tanzania, a country in equatorial Africa. Mt. Kilimanjaro's base is about 2,600 feet above sea level and its peak is 19,341 feet above sea level. If the incidence of the sickle-cell allele in the population is plotted against altitude (feet above sea level), which of the following distributions is most likely, assuming little migration of people up or down the mountain?

- A) 
- B) 
- C) 
- D) 

Use this information to answer the following questions.

A large population of laboratory animals has been allowed to breed randomly for a number of generations. After several generations, 25% 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.

- \_\_\_\_\_ 22) What is the most reasonable conclusion that can be drawn from the fact that the frequency of the recessive trait ( $aa$ ) has not changed over time?
- A) The population is undergoing genetic drift.
  - B) The two phenotypes are about equally adaptive under laboratory conditions.
  - C) The genotype  $AA$  is lethal.
  - D) There has been a high rate of mutation of allele  $A$  to allele  $a$ .
  - E) There has been sexual selection favoring allele  $a$ .
- \_\_\_\_\_ 23) What is the estimated frequency of allele  $A$  in the gene pool?
- A) 0.25
  - B) 0.50
  - C) 0.75

Use the following information to answer the following questions.

In those parts of equatorial Africa where the malaria parasite is most common, the sickle-cell allele constitutes 20% of the  $\beta$  hemoglobin alleles in the human gene pool.

- \_\_\_\_\_ 24) What should be the proportion of heterozygous individuals in populations that live here?
- A) 0.04
  - B) 0.16
  - C) 0.20
  - D) 0.32
  - E) 0.80
- \_\_\_\_\_ 25) If the sickle-cell allele is recessive, what proportion of the population should be susceptible to sickle-cell anemia under typical conditions?
- A) 0.04
  - B) 0.16
  - C) 0.20
  - D) 0.32
  - E) 0.80
- \_\_\_\_\_ 26) You are maintaining a small population of fruit flies in the laboratory by transferring the flies to a new culture bottle after each generation. After several generations, you notice that the viability of the flies has decreased greatly. Recognizing that small population size is likely to be linked to decreased viability, the best way to reverse this trend is to
- A) cross your flies with flies from another lab.
  - B) reduce the number of flies that you transfer at each generation.
  - C) transfer only the largest flies.
  - D) change the temperature at which you rear the flies.
  - E) shock the flies with a brief treatment of heat or cold to make them more hardy.

- \_\_\_\_\_ 27) What is true of macroevolution?
- A) It is the same as microevolution, but includes the origin of new species.
  - B) It is evolution above the species level.
  - C) It is defined as the evolution of microscopic organisms into organisms that can be seen with the naked eye.
  - D) It is defined as a change in allele or gene frequency over the course of many generations.
  - E) It is the conceptual link between irritability and adaptation.
- \_\_\_\_\_ 28) Which of the various species concepts distinguishes two species based on the degree of genetic exchange between their gene pools?
- A) phylogenetic
  - B) ecological
  - C) biological
  - D) morphological
- \_\_\_\_\_ 29) There is still some controversy among biologists about whether Neanderthals should be placed within the same species as modern humans or into a separate species of their own. Most DNA sequence data analyzed so far indicate that there was probably little or no gene flow between Neanderthals and *Homo sapiens*. Which species concept is most applicable in this example?
- A) phylogenetic
  - B) ecological
  - C) morphological
  - D) biological
- \_\_\_\_\_ 30) Two species of frogs belonging to the same genus occasionally mate, but the offspring fail to develop and hatch. What is the mechanism for keeping the two frog species separate?
- A) the postzygotic barrier called hybrid inviability
  - B) the postzygotic barrier called hybrid breakdown
  - C) the prezygotic barrier called hybrid sterility
  - D) gametic isolation
- \_\_\_\_\_ 31) Rocky Mountain juniper (*Juniperus scopulorum*) and one-seeded juniper (*J. monosperma*) have overlapping ranges. If pollen grains (which contain sperm cells) from one species are unable to germinate and make pollen tubes on female ovules (which contain egg cells) of the other species, then which of these terms are applicable?
- 1. sympatric species
  - 2. prezygotic isolation
  - 3. postzygotic isolation
  - 4. allopatric species
  - 5. habitat isolation
  - 6. reduced hybrid fertility
- A) 1 and 2
  - B) 2 and 4
  - C) 1, 3, and 6
  - D) 2, 4, and 5
  - E) 1, 2, 5, and 6

- \_\_\_\_\_ 32) Two closely related populations of mice have been separated for many generations by a river. Climatic change causes the river to dry up, thereby bringing the mice populations back into contact in a zone of overlap. Which of the following is not a possible outcome when they meet?
- A) They interbreed freely and produce fertile hybrid offspring.
  - B) They no longer attempt to interbreed.
  - C) They interbreed in the region of overlap, producing an inferior hybrid. Subsequent interbreeding between inferior hybrids produces progressively superior hybrids over several generations.
  - D) They remain separate in the extremes of their ranges but develop a persistent hybrid zone in the area of overlap.
  - E) They interbreed in the region of overlap, but produce sterile offspring.
- \_\_\_\_\_ 33) Among known plant species, which of these have been the *two* most commonly occurring phenomena that have led to the origin of new species?
- 1. allopatric speciation
  - 2. sympatric speciation
  - 3. sexual selection
  - 4. polyploidy
- A) 1 and 3
  - B) 1 and 4
  - C) 2 and 3
  - D) 2 and 4
- \_\_\_\_\_ 34) According to the concept of punctuated equilibrium,
- A) natural selection is unimportant as a mechanism of evolution.
  - B) given enough time, most existing species will branch gradually into new species.
  - C) a new species accumulates most of its unique features as it comes into existence.
  - D) evolution of new species features long periods during which changes are occurring, interspersed with short periods of equilibrium, or stasis.
  - E) transitional fossils, intermediate between newer species and their parent species, should be abundant.
- \_\_\_\_\_ 35) Speciation
- A) occurs at such a slow pace that no one has ever observed the emergence of new species.
  - B) occurs only by the accumulation of genetic change over vast expanses of time.
  - C) must begin with the geographic isolation of a small, frontier population.
  - D) and microevolution are synonymous.
  - E) can involve changes to a single gene.



**AP Biology Unit 1 Practice Exam: Evolution  
Answer Section**

**MULTIPLE CHOICE**

- |            |        |                                 |
|------------|--------|---------------------------------|
| 1) ANS: A  | PTS: 1 | TOP: Concept 22.1               |
| 2) ANS: E  | PTS: 1 | TOP: Concept 22.2               |
| 3) ANS: B  | PTS: 1 | TOP: Concept 22.2               |
| 4) ANS: A  | PTS: 1 | TOP: Concept 22.2               |
| 5) ANS: C  | PTS: 1 | TOP: Concept 22.2               |
| 6) ANS: B  | PTS: 1 | TOP: Concept 22.2  Concept 22.3 |
| 7) ANS: D  | PTS: 1 | TOP: Concept 22.3               |
| 8) ANS: E  | PTS: 1 | TOP: Concept 22.3               |
| 9) ANS: E  | PTS: 1 | TOP: Concept 22.3               |
| 10) ANS: C | PTS: 1 | TOP: Concept 23.1               |
| 11) ANS: C | PTS: 1 | TOP: Concept 23.1               |
| 12) ANS: C | PTS: 1 | TOP: Concept 23.1  Concept 23.3 |
| 13) ANS: E | PTS: 1 | TOP: Concept 23.2               |
| 14) ANS: D | PTS: 1 | TOP: Concept 23.2               |
| 15) ANS: D | PTS: 1 | TOP: Concept 23.2               |
| 16) ANS: D | PTS: 1 | TOP: Concept 23.3               |
| 17) ANS: D | PTS: 1 | TOP: Concept 23.4               |
| 18) ANS: D | PTS: 1 | TOP: Concept 23.4               |
| 19) ANS: C | PTS: 1 | TOP: Concept 23.4               |
| 20) ANS: C | PTS: 1 | TOP: Concept 23.4               |
| 21) ANS: B | PTS: 1 | TOP: Concept 23.1  Concept 23.4 |
| 22) ANS: B | PTS: 1 | TOP: Concept 23.2               |
| 23) ANS: B | PTS: 1 | TOP: Concept 23.2               |
| 24) ANS: D | PTS: 1 | TOP: Concept 23.2               |
| 25) ANS: A | PTS: 1 | TOP: Concept 23.2               |
| 26) ANS: A | PTS: 1 | TOP: Concept 23.3               |
| 27) ANS: B | PTS: 1 | TOP: Concept 24.1               |
| 28) ANS: C | PTS: 1 | TOP: Concept 24.1               |
| 29) ANS: D | PTS: 1 | TOP: Concept 24.1               |
| 30) ANS: A | PTS: 1 | TOP: Concept 24.1               |
| 31) ANS: A | PTS: 1 | TOP: Concept 24.1               |
| 32) ANS: C | PTS: 1 | TOP: Concept 24.2               |
| 33) ANS: D | PTS: 1 | TOP: Concept 24.2               |
| 34) ANS: C | PTS: 1 | TOP: Concept 24.4               |
| 35) ANS: E | PTS: 1 | TOP: Concept 24.4               |