Multiple Choice

Topic: classic examples of evolution Difficulty: easy

17. \_\_\_\_\_\_\_\_\_\_ and its biota were a source of inspiration to Charles Darwin as he formulated his theory of evolution by natural selection. This place also remains a mecca for biologists like Peter and Rosemary Grant who are interested in the study of evolutionary biology.

A) Antarctica D) The Galápagos Islands

B) Australia E) The California Channel Islands

C) The Orkney Islands

Answer: D

Topic: population genetics and evolution Difficulty: easy

18. Why did average beak size increase in surviving individuals of Darwin's medium ground finch (and their progeny) during a period of severe drought in the Galápagos?

A) Individuals eating the harder seeds available during the drought developed larger beaks and passed this trait on to their offspring.

B) Individuals with larger beaks could eat the harder seeds available during the drought and survived better than individuals with smaller beaks.

1. Individuals with larger beaks are always at an advantage.
2. The observed change in beak size was purely the result of chance.

Answer: B

Topic: mutation Difficulty: moderate

19. The only mutations of interest to evolutionary biologists are those that cause changes in the structure of protein products.

A) True B) False

Answer: B

Topic: mutation Difficulty: easy

20. A new protein produced by a mutant gene may or may not have properties different from those of the original protein. If its properties are altered, these properties are most likely to be \_\_\_\_\_\_\_\_\_\_ to the individual.

A) beneficial B) harmful C) neutral

Answer: B

Topic: mutation Difficulty: easy

21. Mutation is a random force in evolution that produces genetic variation independently of the fitness consequences of the genetic change for the individual that bears the mutation.

A) True B) False

Answer: A

Topic: natural selection Difficulty: moderate

22. The development of resistance to cyanide poisoning in California citrus scale is an excellent example of evolution by natural selection. Which of the following characteristics of this situation were critical to the evolutionary process?

A) There was variation in cyanide resistance among individuals.

B) There was inheritance of cyanide resistance.

C) There were differences in fitness related to variation in cyanide resistance.

D) All of the above were critical to the evolutionary process.

Answer: D

Topic: natural selection Difficulty: easy

23. Natural selection is an external force that urges organisms toward some predetermined goal.

A) True B) False

Answer: B

Topic: natural selection Difficulty: moderate

24. Which of the following is relevant to the evolutionary process?

A) how fast rabbits can run

B) whether running speed affects the ability of rabbits to leave successful offspring

C) both A and B

D) neither A nor B

Answer: B

Topic: natural selection Difficulty: easy

25. The process that creates natural selection is ecological—the interaction of individuals with their environments, including physical conditions, food resources, predators, other individuals of the same species, and so on.

A) True B) False

Answer: A

Topic: natural selection Difficulty: easy

26. When the field cricket, *Teleogryllus oceanicus*, experienced strong selective pressure from a predator that used sound to locate singing males, the frequency of males capable of producing mating calls decreased in the population. Although this adaptive response was beneficial, it also had a negative consequence. What was this negative consequence?

# A) Silent males are unable to attract mates.

B) Silent males are also deaf.

C) Silent males have defective wings and are unable to fly.

D) Silent males are unable to attract prey.

E) There was no negative consequence.

Answer: A

Topic: natural selection Difficulty: moderate

27. In the previous question, you were asked to identify a negative consequence for males unable to produce mating calls. What additional adaptive response emerged in the population that offset the negative consequence of silence?

# A) Silent males also displayed more striking coloration than their singing counterparts.

B) Silent males also engaged in more active flight displays than their singing counterparts.

C) Silent males also spent more time chasing receptive females than their singing counterparts.

D) Silent males also tended to aggregate around singing males that attracted females with their calls.

E) Silent males exhibited all of the above adaptive responses.

Answer: D

Topic: types of selection Difficulty: easy

28. Which of the following types of selection serves as a kind of genetic housekeeping, sweeping away harmful genetic variation?

A) stabilizing selection D) all of the above

B) directional selection E) none of the above

C) disruptive selection

Answer: A

Topic: types of selection Difficulty: easy

29. Which of the following types of selection results in the distribution of phenotypes in a population shifting toward a new optimum?

A) stabilizing selection D) all of the above

B) directional selection E) none of the above

C) disruptive selection

Answer: B

Topic: types of selection Difficulty: easy

30. Which of the following types of selection can lead to a bimodal distribution of phenotypes?

A) stabilizing selection D) all of the above

B) directional selection E) none of the above

C) disruptive selection

Answer: C

Topic: types of selection Difficulty: moderate

31. Weight at birth of human babies has a genetic component. In one large study, survival in a cohort of babies during the first month of life was shown to be greatest for babies of average weight at birth and least for babies with very low or very high weights at birth. Survivors of the first month of life had lower variation in weight at birth than did all babies in the cohort. Differential survival of this kind could result in \_\_\_\_\_\_\_\_\_\_ on genes controlling weight at birth.

A) stabilizing selection C) disruptive selection

B) directional selection D) no selection

Answer: A

Topic: types of selection Difficulty: easy

32. Which of the following types of selection is illustrated by the example of the peppered moth, *Biston betularia*?

A) stabilizing selection D) all of the above

B) directional selection E) none of the above

C) disruptive selection

## Answer: B

Topic: directional selection Difficulty: moderate

33. In his studies of the peppered moth, *Biston betularia*, H. B. D. Kettlewell demonstrated that the ultimate selective agent leading to changes in genotypic frequencies was:

A) predation by birds.

B) poisoning of moths caused by industrial pollution.

C) indiscriminant use of pesticides.

D) all of the above.

Answer: A

Topic: directional selection Difficulty: moderate

34. An interesting and gratifying footnote to the long-term study of the peppered moth, *Biston betularia*, in England has been the recent:

A) increase in the melanistic form.

B) stabilization of the melanistic form.

C) decline of the melanistic form.

D) demonstration that coloration in peppered moths has no selective value.

Answer: C

Topic: directional selection Difficulty: moderate

35. With the advent of pollution controls, what happened to the frequency of the melanistic form of the peppered moth in England?

A) immediate shift to a lower frequency

B) gradual shift to a lower frequency

1. immediate shift to a higher frequency
2. gradual shift to a higher frequency
3. no change

Answer: B

Topic: phenotypic plasticity Difficulty: moderate

36. During the summer months, where would you expect to find a cactus wren in early afternoon?

A) in almost any available microhabitat

B) in exposed areas with no plant cover

C) in the deep shade cast by small trees and large shrubs

D) in the nest

Answer: C

Topic: phenotypic plasticity Difficulty: moderate

37. During the summer months, cactus wrens build nests oriented to take advantage of which of the following?

A) prevailing afternoon breezes

B) shade cast by large saguaro cacti

C) reduced incidence of predation

D) ground cover that can break the fall of a nestling pushed from the nest

Answer: A

Topic: reaction norm Difficulty: easy

38. Which of the following best defines the reaction norm?

A) the observed relationship between the phenotype of an individual and density of conspecifics

1. the observed relationship between the phenotype of an individual and density of predators
2. the observed relationship between the phenotype of an individual and density of prey
3. the observed relationship between the phenotype of an individual and the environment

Answer: D

Topic: reaction norm Difficulty: moderate

39. The larvae of swallowtail butterflies are capable of surviving and growing over a range of temperatures. They exhibit faster growth as the environmental temperature increases. The responsiveness of the larval phenotype to a range of environmental temperatures is referred to as:

A) a genotype-environment interaction. D) evolutionary fitness.

B) phenotypic plasticity. E) none of the above

C) variation in fecundity.

Answer: B

Topic: reaction norm Difficulty: moderate

40. Swallowtail butterfly larvae from Alaska and Michigan each exhibit characteristic reaction norms for growth rate with respect to temperature. Although larvae from both populations exhibit increasing growth rate with increasing temperature, larvae from Alaska grow faster at lower temperatures and larvae from Michigan grow faster at higher temperatures. The specific relationship described is referred to as:

A) a genotype-environment interaction. D) evolutionary fitness.

B) phenotypic plasticity. E) none of the above.

C) variation in fecundity.

Answer: A

Topic: reaction norm Difficulty: moderate

41. When a population develops an adaptive response that results in improved performance under the prevalent environmental conditions, a shift in the reaction norm is likely to result in \_\_\_\_\_\_\_\_\_\_ performance in alternate environmental conditions.

A) improved B) reduced C) similar

Answer: B

Topic: acclimatization Difficulty: easy

42. Acclimatization is a(n) \_\_\_\_\_\_\_\_\_\_ process.

A) reversible B) irreversible

Answer: A

Topic: acclimatization Difficulty: moderate

43. Of the following plants, which is likely to achieve the same maximum photosynthetic, irrespective of the temperature to which it is acclimatized?

A) *Larrea divaricata*, a plant found in a seasonal climate

B) *Atriplex glabriuscula*, a plant found in a continuously cool climate

C) *Tidestromia oblongifolia*, a plant found in a continuously hot climate

# D) all of the above

Answer: A

Topic: acclimatization Difficulty: moderate

44. Of the following plants, which is likely to achieve a higher maximum photosynthetic when acclimatized at a low temperature?

A) *Larrea divaricata*, a plant found in a seasonal climate

B) *Atriplex glabriuscula*, a plant found in a continuously cool climate

C) *Tidestromia oblongifolia*, a plant found in a continuously hot climate

# D) all of the above

Answer: B

Topic: acclimatization Difficulty: moderate

45. Of the following plants, which is likely to achieve a higher maximum photosynthetic when acclimatized at a high temperature?

A) *Larrea divaricata*, a plant found in a seasonal climate

B) *Atriplex glabriuscula*, a plant found in a continuously cool climate

C) *Tidestromia oblongifolia*, a plant found in a continuously hot climate

# D) all of the above

Answer: C

Topic: developmental responses Difficulty: easy

46. Developmental responses are \_\_\_\_\_\_\_\_\_\_ processes.

A) reversible B) irreversible

Answer: B

Topic: developmental responses Difficulty: easy

47. Why do individuals of the African grasshopper, *Gastrimargus africanus*, have pigmentation that matches the background color of their habitat?

A) Matching coloration helps them avoid detection by would-be predators.

B) Matching coloration minimizes absorption of solar radiation.

C) Matching coloration makes them more attractive to potential mates.

D) Matching coloration alerts fewer competitors when food is discovered.

Answer: A

Topic: developmental responses Difficulty: easy

48. Late in the dry season, individuals of the African grasshopper, *Gastrimargus africanus*, are black. What habitat condition makes this coloration adaptive?

A) more intense sunlight

B) browning of the vegetation

C) blackening of the ground by fires

D) reduction of standing water in the habitat

Answer: C

Topic: reciprocal transplant experiments Difficulty: moderate

49. Which of the following was an interesting outcome of the reciprocal transplant experiments carried out by Niewiarowski and Roosenberg on fence lizards?

A) Native lizards and transplants from New Jersey performed equally well in Nebraska.

B) Nebraska lizards performed equally well in Nebraska and in New Jersey.

C) New Jersey lizards performed equally poorly in New Jersey and in Nebraska.

D) Each of the above was an interesting outcome of this experiment.

Answer: C

Topic: reciprocal transplant experiments Difficulty: hard

50. Highbush blueberry plants belonging to a particular species grow in a wide range of environments in North Carolina. Plants growing in acidic bogs are slower growing than plants on fertile, better-drained floodplains. In a reciprocal transplant study, plants from a bog were transplanted to a floodplain and plants from a floodplain were transplanted to a bog. The transplants from the bog performed better in the floodplain, but not as well as plants native to the floodplain. The transplants from the floodplain performed more poorly in the bog, about the same as plants native to the bog. What can we conclude from this experiment about the causes of differences in growth rate between the bog and floodplain populations?

A) They are genetically determined.

B) They reflect phenotypic plasticity.

C) Both of the above conclusions are correct.

Answer: C

Short Answer

Topic: molecular basis of evolution Difficulty: easy

51. The outward expression of the genotype in the individual’s structure and function is called the \_\_\_\_\_\_\_\_\_\_.

Answer: phenotype

Topic: molecular basis of evolution Difficulty: easy

52. Different forms of a particular gene are referred to as \_\_\_\_\_\_\_\_\_\_.

Answer: alleles

Topic: molecular basis of evolution Difficulty: easy

53. A diploid individual that has two different alleles of a particular gene is said to be \_\_\_\_\_\_\_\_\_\_.

Answer: heterozygous

Topic: molecular basis of evolution Difficulty: easy

5. Molecules of DNA are comprised of four kinds of subunits (adenine, thymine, cytosine, and guanine) called \_\_\_\_\_\_\_\_\_\_.

Answer: nucleotides

Topic: molecular basis of evolution Difficulty: easy

55. Certain mutations are referred to as \_\_\_\_\_\_\_\_\_\_ because the mutated coding sequence still codes for the same amino acid as the unmutated coding sequence. Such mutations have no consequences for fitness.

Answer: silent or synonymous

Topic: molecular basis of evolution Difficulty: easy

56. A diploid individual who has two different alleles of a particular gene is said to be \_\_\_\_\_\_\_\_\_\_.

Answer: heterozygous

Topic: principles of evolution Difficulty: easy

57. The \_\_\_\_\_\_\_\_\_\_ of variation is the genetic basis of evolution.

Answer: inheritance

Topic: types of selection Difficulty: easy

58. \_\_\_\_\_\_\_\_\_\_ selection can result in a bimodal distribution of phenotypes with peaks toward both ends of the original distribution.

Answer: disruptive

Topic: industrial melanism Difficulty: easy

59. Increased frequency of the dark-colored form of the moth *Biston betularia* in England was associated with industrial development leading to darkening of tree trunks. Because of this, the increased frequency of dark moths has been dubbed \_\_\_\_\_\_\_\_\_\_.

Answer: industrial melanism

Topic: genotype-environment interaction Difficulty: easy

60. Whether differences between populations are due to genetic differences, phenotypic plasticity, or genotype-environment interactions can often be revealed by \_\_\_\_\_\_\_\_\_\_ experiments.

Answer: reciprocal transplant