How Populations Evolve

1. Which one of the following is not true about blue-footed boobies?

a) The webbed feet of boobies make great flippers to propel them through the water.

b) The booby's body and bill are streamlined, reducing friction when it dives.

c) A gland at the base of the tail secretes oil that helps make the body waterproof.

d) A gland in the bird's eye socket accumulates salt from body fluids, helping to keep the salt
levels in the bird's body from reaching dangerous levels.

e) The large flat feet of boobies help them easily walk over the rough surface of the shoreline.

2. Which one of the following was not a main idea that Darwin advanced in his works?

a) species change over time

b) living species have arisen from earlier life forms

c) modern species arose through a process known as "descent with modification"

d) new species can form by inheritance of acquired characteristics

e) new species arise by natural selection

3. Aristotle believed which of the following?

a) natural forces are at work changing the Earth's surface

b) an individual's use of a body part causes it to further evolve

c) species are fixed (permanent) and do not evolve

d) the best evidence for change within species is seen in fossils

e) None of the choices are correct.

4. The eighteenth-century French naturalist Lamarck argued for which of the following ideas?

a) Life evolves toward perfection, with chaotic and watery early forms giving way to ever
more organized and noble forms.

b) The history of life has consisted of a series of divine creations punctuated by geologic
catastrophes.

c) Species are immutable, but individuals can by their own efforts approach more closely to
their species' ideal form. Thus, by reaching for higher leaves, a giraffe can lengthen its
neck and become a more perfect giraffe.

d) Species evolve, and the characteristics an individual develops as a result of using or not using its native capacities can be passed to its young.

e) Each environment spontaneously produces the species that are fitted to it.

5. Lyell's book Principles of Geology, which Darwin read on board the H.M.S. Beagle, argued for which of the following concepts?

a) The Earth's surface is shaped mainly by occasional catastrophic events.

b) Volcanic processes were less important than sedimentary processes in creating the landscape of South America.

c) Meteorite impacts may have been a major cause of periodic mass extinctions.

d) The Earth's surface is shaped mainly by forces that act gradually and are still acting.

e) The climate of the Earth has been very different in the past than it is now.

6. Which one of the following people developed a theory of evolution identical to Darwin's?

a) Lyell

b) Wallace

c) Buffon

d) Lamarck

e) Huxley

7. The unifying theme of biology is

a) taxonomy

b) genetics

c) ecology

d) evolution

e) None of the choices are correct

8. Which one of the following did Darwin discover that led him to suspect that species in the
Americas were more closely related to each other than to species elsewhere?

a) The South American fossils he collected were more similar to North American fossils than
to living South American species.

b) The South American fossils he collected included many species that seemed less advanced
than their modem counterparts.

c) The South American fossils he collected were more similar to living South American
species than to fossils from other continents.

d) The animals he found in the Galapagos resembled South American animals more closely
than animals from other continents.

e) Many of the fossils he collected in South America belonged to species that no longer exist.

9. Which one of the following people promoted the idea about 2,500 years ago that life arose in water and that simpler forms preceded more complex ones?

a) Aristotle

b) Anaximander

c) Plato

d) Wallace

e) Buffon

10. In the 1700s, _____raised the possibility that certain fossil forms might be ancient versions of similar living species.

a) Aristotle

b) Wallace

c) Lamarck

d) Buffon

e) Lyell

11. Fossils form by which of the following processes?

a) The remains of a dead organism are sometimes turned into stone by petrification.

b) Actual organic material remains if an organism is buried in a medium that prevents
bacteria and fungi from decomposing it.

c) The hard parts of animals that are rich in minerals, such as teeth and the shells of clams,
may remain as fossils.

d) Whole organisms are sometimes preserved in ice or deep within acid bogs.

e) All of the choices are processes that can produce fossils.

12. The fossil record shows that all of the following except

a) the first life forms were eukaryotes

b) the earliest fossils of life are about 3.5 billion years old

c) younger strata are on top of older strata

d) within the vertebrates, fish were the first to evolve, followed in order by amphibians,
reptiles, mammals, and then birds

e) some fossils represent an evolutionary series of changes that provide strong documentation of evolution

13. Darwin found that Galapagos animals resembled

a) species of nearby South America less than they resembled animals on similar but distant islands

b) species of nearby South America more than they resembled animals on similar but distant islands

c) species of nearby South America less than they resembled animals in Europe

d) species of nearby South America more than they resembled animals on other Galapagos islands

e) None of the choices are correct

14. Which of the following provides evidence that modern species have evolved from prior species?

a) the fossil record

b) comparative anatomy

c) comparative embryology

d) biogeography

e) All of the choices are correct.

15. Which of the following provides evidence that vertebrates evolved from a common ancestor?

a) anatomical similarities

b) the development of gill pouches in an embryonic stage

c) the presence of *Hox* genes

d) similarities in DNA and proteins

e) All of the choices are correct.

16. Which one of the following represents two structures that are homologous?

a) the wing of a bat and the scales of a fish

b) the wing of a bat and the flipper of a whale

c) the antennae of an insect and the eyes of a bird

d) the feathers of a bird and the salt glands of a blue-footed booby

e) the legs of a fly and the wings of a bird

17. Malthus's essay led Darwin to which of the following generalizations?

a) Much of the phenotypic variation exhibited by members of a species is heritable.

b) Famine, disease, war, and similar ills are inevitable features of the human condition.

c) Evolution proceeds more rapidly when populations are repeatedly decimated (bottleneck
effect).

d) Evolution is most likely to occur when populations are subjected to strong pressures such
as famine and predation.

e) All organisms produce more offspring than their environment can support.

18. Broccoli and cabbages are both descended from the same wild mustard and can still interbreed. The existence of these two vegetables is an example of

a) speciation

b) artificial selection

c) natural selection

d) genetic drift

e) inheritance of acquired characteristics

19. Which of the following assumptions was <u>not</u> part of Darwin's theory of natural selection?

a) Traits are inherited as discrete particles.

b) The Earth is very old.

c) Populations produce more offspring than their environment can support.

d) Organisms compete for limited resources.

e) Organisms vary in heritable ways.

20. During the 1950s, a scientist named Lysenko tried to solve the food shortages in the Soviet
Union by breeding wheat that could grow in Siberia. He theorized that if you took wheat
plants and exposed them to cold, they would develop additional cold tolerance and pass it to
their offspring. His plan failed because

a) he assumed that exposure could induce a plant to exhibit cold tolerance

b) he took his wheat seeds straight to Siberia instead of exposing them incrementally to cold

c) he assumed that exposure could induce a plant to develop additional cold tolerance and that this tolerance would be passed to the plant's offspring

d) he used wheat varieties that had lost their cold tolerance as a result of disuse

21. Which one of the following is <u>not</u> true? Natural selection

a) is more of an editing process than a creative mechanism

b) is contingent upon time and place

c) results from an organism's needs

d) and evolutionary change can occur in a short time

e) can be seen to be working in organisms alive today

22. Which of the following constitutes a basic, modem definition of a <u>sexual species</u>?

a) a group of individuals living in the same place at the same time

b) a group of individuals who resemble each other, on average, more than they resemble anything else

c) a group of populations whose individuals have the potential to interbreed

d) a group of individuals who interbreed

e) the smallest unit that can engage in microevolution

23. A population is

a) applicable only to animals that reproduce asexually

b) the smallest unit that can evolve

c) a group of individuals of the same species living in the same place at the same time

d) a collection of communities

e) All of the choices are correct

24. A change in the relative frequencies of alleles in the gene pool of a population is called

a) genetic drift

b) microevolution

c) mutation

d) diversifying selection

e) directional selection

25. In the Hardy-Weinberg equation, homozygous dominant individuals in a population are represented by

a) q or p

b) p^2

c) 2pq

d) q^2

e) None of the choices are correct

26. The disease phenylketonuria (PKU) is caused by a recessive allele, and one child in 10,000 is born with the disease. Let q represent the frequency of the PKU allele. What is the value of q2? (Fetuses with PKU are no likelier than other fetuses to die before birth.)

a) 0.1

b) 0.001

c) 0.0001

d) 0.00001

e) cannot be determined from this information

27. Which of the following conditions would tend to make the Hardy-Weinberg equation accurate for predicting the gene frequencies of future generations in a population of a sexually reproducing species?

a) a small population size

b) little gene flow with surrounding populations

c) a tendency on the part of females to mate with the healthiest males

d) the existence of directional selection

e) a low rate of crossing over and genetic recombination

28. Genetic drift resulting from a disaster that drastically reduces population size is called

a) natural selection

b) gene flow

c) a bottleneck effect

d) nonrandom mating

e) a founder effect

29. A population of 1,000 birds exists on a small Pacific island. Some of the birds are yellow, a characteristic determined by a recessive allele. The others are green, a characteristic determined by a dominant allele. A hurricane on the island kills most of the birds from this population. Only ten remain, and those birds all have yellow feathers. Which of the following statements is true?

a) Assuming that no new birds come to the island and no mutations occur, future generations of this population will contain both green and yellow birds.

b) The hurricane has caused a population bottleneck.

c) This situation illustrates the principle of adaptive radiation.

d) This situation illustrates the founder effect.

e) The ten remaining birds will mate only with each other, and this will contribute to gene flow in the population.

30. Thirty people are assigned to live in a spaceship that is exploring other galaxies. The journey will take several hundred years and will be completed by the descendants of these crew
members. The gene pool of the population on this ship when it returns is most likely to reflect

a) a founder effect

b) a bottleneck effect

c) gene flow

d) mutation pressure

e) polymorphism

31. Genetic differences between populations tends to be reduced by

a) gene flow

b) mutation

c) the founder effect

d) the bottleneck effect

e) None of the choices are correct

32. The degree of adaptation that can occur in a population is limited by

a) the need of the individuals

b) the amount of genetic variation in a population

c) the kind of genetic variation in a population

d) the amount and kind of genetic variation in a population

e) None of the choices are correct

33. Which one of the following is <u>not</u> true?

a) All variation in a population is heritable.

b) Individual variation occurs in populations of all species that reproduce sexually.

c) A population is polymorphic for a characteristic if two or more morphs are present in
readily noticeable numbers.

d) A graded change in an inherited trait along a geographic continuum is called a cline.

e) Gene diversity is the average percent of gene loci that are heterozygous in a population.

34. HIV can evolve quickly because

a) it has an RNA genome that has a higher mutation rate than DNA

b) it has a generation span of about 2 days

c) it is haploid

d) All of the choices are correct

35. The genetic variation among individuals in a sexually reproducing population of a plant that does not self-pollinate is the result of

a) gene mutation

b) crossing over during meiosis

c) independent assortment of chromosomes during meiosis

d) random fertilization

e) All of the choices are correct

36. Tay-Sachs is inherited as an autosomal recessive allele. Homozygous individuals die within the first few years of life. However, there is some evidence that heterozygous individuals are more resistant to tuberculosis. Which of the following statements is true?

a) The allele for Tay-Sachs is selected against.

b) This situation is an example of heterozygote advantage.

c) This situation is an example of directional selection.

d) This situation is an example of diversifying selection.

e) Heterozygotes will be more fit than either homozygote regardless of environmental conditions.

37. Which of the following promote(s) genetic variation in a population?

a) heterozygote advantage

b) frequency-dependent selection

c) unexpressed recessive alleles in heterozygotes

d) All of the choices promote genetic variation in a population.

38. In a particular environment, there are no obvious fitness differences among individuals with dark hair and individuals with light hair. The term that best describes this situation is

a) random mating

b) random selection

c) natural selection

d) random variation

e) neutral variation

40. Certain whale species were hunted to near extinction. With a moratorium on hunting them, their population sizes have expanded. Which of the following is true?

a) Whale species have a high reproductive rate.

b) The populations may still be endangered because they may have little remaining genetic variation.

c) Hunting can "refresh" a whale species and increase its overall fitness.

d) The populations have recovered and have demonstrated that populations have the
potential to recover completely from being driven to near extinction.

e) Hunting is a form of stabilizing selection.

40. Darwinian fitness increases when an organism

a) passes on a greater proportion of its genes

b) survives many hardships

c) is stronger than the other organisms in its community

d) lives for a long time

e) is disease-free

41. An elk herd is observed over many generations. Most of the full-grown bull elk have antlers of nearly the same size, although a few have antlers that are significantly larger or smaller than this average size. The average antler size remains constant over the generations. Which of the following effects probably accounts for this situation?

a) directional selection

b) stabilizing selection

c) a bottlenecking effect that resulted in low genetic diversity

d) a founder effect that resulted in low genetic diversity

e) a high rate of gene flow

42. Long-legged cheetahs are well adapted to catching prey. The ancestor of the cheetah is
believed to have had relatively short legs. According to Darwinian views, the evolution of

long-legged cheetahs is best explained by

a) stabilizing selection
b) the theory of use and disuse
c) directional selection
d) the theory of acquired characteristics
e) heterozygote advantage

43. Mate-attracting features such as the bright plumage of a male peacock result from

a) intersexual selection
b) intrasexual selection
c) disruptive selection
d) directional selection
e) stabilizing selection

44. Natural selection and the ability to generate perfection are limited by all of the following except

a) adaptations are often compromises
b) organisms represent remodeling of ancestral conditions
c) not all evolution is adaptive
d) organisms with the greatest Darwinian fitness often don't reproduce
e) selection can only edit existing variations

45. An individual who does not finish all of a prescribed antibiotic is

a) assuring that the bacterial strain will remain sensitive to that antibiotic
b) smart to save the antibiotic for the next time the illness strikes
c) promoting genetic drift in the bacterial population
d) subjecting the bacterial population to stabilizing selection

e) adversely affecting the health of all individuals who, in the future, may be exposed to that bacterial strain

46. The Galapagos Islands are off the west coast of

a) Brazil.

b) Colombia.

c) Canada.

d) Ecuador

e) Portugal

47. The primary purpose of the 1831 voyage of the Beagle was to

a) provide Darwin with an excuse to get away from his domineering father

b) discover examples of divine creation

c) transport Darwin to the Galli pagos Islands

d) discover how species- change through time

e) survey the waters around the southern coast of South America

48. What was Darwin's job on board the Beagle?

a) ship's navigator

b) ship's naturalist

c) ship's captain

d) ship's doctor

e) ship's surveyor

49. Darwin's observations while with the Beagle led him to wonder why

a) organisms looked as they did

b) God created so many species

c) there were so few finch species

d) marine tortoises lived so long

e) he agreed to go on the voyage

50. What term is used to refer to structures that have a similar origin or ancestry even though they may be very different in appearance?

a) convergent

b) comparable

c) analogous

d) divergent

e) homologous

51. What is a mutation?

a) a gene that causes a disease

b) a random change in an organism's DNA

c) a chance change in the gene pool of a small population

d) the immigration of alleles into a gene pool

e) the emigration of alleles out of a gene pool

52. What is the result of natural selection?

a) a chance change in the gene pool of a small population

b) the entry of alleles into a population due to immigration

c) a change in the gene pool of a population due to differential reproductive success

d) a change in allelic frequencies due to mutation

e) the loss of alleles from a population due to emigration

53. What is genetic drift?

a) chance changes in the gene pool of a small population

b) the entry of alleles into a population due to immigration

c) changes in the gene pool of a population that are due to differential reproductive success

d) a change in allelic frequencies due to mutation

e) the loss of alleles from a population due to emigration

54. In a cell in which 2n = 6, the independent assortment of chromosomes during meiosis can by itself give rise to _____genetically different gametes.

a) two

b) four

c) six

d) eight

e) ten

55. In sexually reproducing organisms, the events of _____do <u>not</u> contribute to an increase in genetic variation.

a) prophase I

b) random fertilization

c) metaphase I

d) interphase

e) All of these events *do* contribute to an increase in genetic variation.