

Chapter 22

Descent with Modification: A Darwinian View of Life

- 1) All of the following statements are part of the Darwin-Wallace theory of natural selection EXCEPT:
 - A) Heritable variations occur in natural populations.
 - B) Characteristics that are acquired during the life of an individual are passed on to offspring.
 - C) Organisms tend to increase in numbers at a rate more rapid than the environment can support.
 - D) On average, the best adapted individuals leave more offspring.
 - E) There exists in nature a constant struggle for survival.

- 2) 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." To correct your fellow student's misconception, what would you say?
 - A) Characteristics acquired during an organism's life are 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) Overproduction of offspring leads to a struggle for survival.

- 3) Insects with wing mutations that prevent flight (e.g., the "vestigial wing" mutation in fruit flies) usually can't survive long in nature. Flightlessness is selected against. But in four of the following environments the trait could actually be selected for. In which environment would functional wings be selected?
 - A) an island where stiff winds blow some flying insects out to sea, never to return
 - B) a swamp full of frogs that can see and catch flying insects better than crawling insects
 - C) a forest full of bats that catch and eat insects while in flight
 - D) a cage with no predators, in which food is provided in high dishes
 - E) a cage with slippery walls that insects can't climb and an electrified screen on top that electrocutes insects that touch it

- 4) Darwin differed from Lamarck in his proposal that
 - A) species are not fixed.
 - B) evolution leads to adaptation.
 - C) life on Earth has had a long evolutionary history.
 - D) life on Earth did not evolve abruptly but rather through a gradual process of minute changes.
 - E) inherent variations in the population are more important in evolution than variations acquired during individual lifetimes.



- 5) What would be the best technique for determining the phylogenetic relationship among several closely related species?
- A) examining the fossil record
 - B) comparison of homologous structures
 - C) comparative embryology
 - D) comparative anatomy
 - E) DNA analysis and protein comparison
- 6) Darwin was able to formulate his theory of evolution based on several facts. Which of the following facts was unavailable to Darwin in the mid-nineteenth century?
- A) Most populations are stable in size.
 - B) Individual organisms in a population are not alike.
 - C) All populations have the potential to increase.
 - D) Natural resources are limited.
 - E) Characteristics are inherited as genes on chromosomes.
- 7) What was the prevailing notion prior to Lyell and Darwin? The Earth is
- A) 6000 years old and populations are unchanging.
 - B) 6000 years old and populations gradually change.
 - C) 6000 years old and populations changed radically after periodic catastrophes.
 - D) very old and populations are unchanging.
 - E) very old and populations gradually change.
- 8) Which of the following is an acceptable definition of evolution?
- A) a change in the phenotypic makeup of a population
 - B) a change in the genetic makeup of a population
 - C) a change in the environmental conditions
 - D) a change in the genotypic makeup of an individual
 - E) a change in the species composition of a community
- 9) Of the following anatomical structures, which is homologous to the wing of a bat?
- A) the dorsal fin of a shark
 - B) the tail of a kangaroo
 - C) the wing of a butterfly
 - D) the tail fin of a fish
 - E) the arm of a human

- 10) Anatomical structures that show similar function but dissimilar embryonic and evolutionary background are said to be
- A) homologous.
 - B) primitive.
 - C) analogous.
 - D) monophyletic.
 - E) polyphyletic.
- 11) Which of the following ideas that Darwin incorporated into his theory was proposed by Hutton?
- A) gradual geological processes
 - B) extinctions evident in the fossil record
 - C) adaptation of species to the environment
 - D) a hierarchical classification of organisms
 - E) the inheritance of acquired characteristics
- 12) Natural selection is based on all of the following EXCEPT:
- A) Variation exists within populations.
 - B) The fittest individuals leave the most offspring.
 - C) There is differential reproductive success within populations.
 - D) Populations tend to produce more individuals than the environment can support.
 - E) Individuals must adapt to their environment.
- 13) Which of the following represents an idea Darwin took from the writings of Thomas Malthus?
- A) All species are fixed in the form in which they are created.
 - B) Populations tend to increase at a faster rate than their food supply increases.
 - C) The Earth changed over the years through a series of catastrophic upheavals.
 - D) The environment is responsible for natural selection.
 - E) The Earth is more than 10,000 years old.
- 14) On which of the following did Linnaeus base his classification system?
- A) morphology and anatomy
 - B) evolutionary history
 - C) the fossil record
 - D) Only A and B are correct.
 - E) A, B, and C are correct.



- 15) Which of the following disciplines has contributed LEAST to the body of evidence for evolution?
- A) biogeography
 - B) mycology
 - C) molecular biology
 - D) taxonomy
 - E) paleontology
- 16) Which of the following did Darwin NOT understand about natural selection?
- A) the source of genetic variation
 - B) that organisms became extinct
 - C) that variation is common in populations
 - D) that competition exists in populations
 - E) that populations overproduce offspring
- 17) Which of the following was NOT part of Darwin's explanation of natural selection?
- A) Organisms commonly produce more offspring than can possibly survive.
 - B) Variations exist within each species.
 - C) Members of a species compete with each other for food and space.
 - D) New variations continually arise by mutation.
 - E) Usually the better adapted of each generation survive to reproduce.
- 18) The statement "Improving the intelligence of an adult through education will result in that adult's descendants being born with a greater native intelligence" is an example of
- A) Darwinism.
 - B) Lamarckism.
 - C) neo-Darwinism.
 - D) *scala naturae*.
 - E) natural theology.
- 19) Darwin's and Lamarck's theories of evolution both suggest that
- A) species are fixed.
 - B) the Earth is 6000 years old.
 - C) the environment creates favorable characteristics on demand.
 - D) the main mechanism of evolution is the inheritance of acquired characteristics.
 - E) the interaction of organisms with their environment is important in the evolutionary process.

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- 20) What did Charles Darwin publish in 1859?
- A) *Vestiges of Creation*
 - B) *Philosophie Zoologique*
 - C) *On the Nature of Things*
 - D) *The Growth of Biological Thought*
 - E) *On the Origin of Species by Means of Natural Selection*
- 21) The taxonomic system developed by Linnaeus is best described as
- a
 - A) binary scheme of groupings.
 - B) branching diagram of interrelationships.
 - C) hierarchy of increasingly general categories.
 - D) map that distinguishes kinship among animals.
 - E) decimal plan for sorting all living organisms.
- 22) In his publications, Darwin primarily wrote about
- A) phylogeny.
 - B) speciation.
 - C) adaptation.
 - D) macroevolution.
 - E) the origin of life.
- 23) A belief in two worlds, one ideal and one imperfect, is an idea most associated with
- A) Cuvier.
 - B) Darwin.
 - C) Lamarck.
 - D) Lyell.
 - E) Plato.
- 24) Charles Lyell was an advocate of
- A) use and disuse.
 - B) uniformitarianism.
 - C) industrial melanism.
 - D) the modern synthesis.
 - E) the inheritance of acquired characteristics.



- 25) Which of the following has provided an abundance of evidence that the Earth has had a succession of flora and fauna?
- A) population genetics
 - B) the fossil record
 - C) natural selection
 - D) creationism
 - E) catastrophism
- 26) How would one describe Darwin?
- A) gradualist
 - B) creationist
 - C) essentialist
 - D) catastrophist
 - E) geneticist
- 27) All of the following influenced Darwin as he synthesized the concept of natural selection EXCEPT
- A) Mendel's laws of inheritance.
 - B) the finches of the Galapagos.
 - C) Lyell's *Principles of Geology*.
 - D) Malthus' *An Essay on the Principle of Population*.
 - E) the results of artificial selection.
- 28) Who was the naturalist who synthesized a concept of natural selection independently of Darwin?
- A) Lyell
 - B) Mendel
 - C) Wallace
 - D) Henslow
 - E) Malthus
- 29) Which of the following elements of Darwinism is associated with Malthus?
- A) Artificial selection improves plant and animal breeds.
 - B) Differential reproductive success is the cornerstone of natural selection.
 - C) The potential for population growth exceeds what the environment can support.
 - D) Species become better adapted to their local environments through natural selection.
 - E) Favorable variations accumulate in a population after many generations of natural selection.

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- 30) Current arguments among evolutionists about evolution are mainly concerned with the
- A) mechanism of evolutionary change.
 - B) existence of vestigial organs.
 - C) importance of homologous structures.
 - D) effects of ontogeny versus phylogeny.
 - E) significance of natural versus artificial selection.
- 31) Natural selection is based on all of the following aspects EXCEPT:
- A) Variation exists within populations.
 - B) The fittest individuals leave the most offspring.
 - C) There is differential reproductive success within populations.
 - D) Populations tend to produce more individuals than the environment can support.
 - E) The environment tends to create favorable characteristics within populations.
- 32) All of the following statements are inferences of natural selection EXCEPT:
- A) There is heritable variation among individuals.
 - B) Production of offspring is unrelated to the abundance of essential resources.
 - C) Often only a fraction of offspring survive because there is a struggle for limited resources.
 - D) Individuals whose inherited characteristics best fit them to the environment will leave more offspring.
 - E) Unequal reproductive success leads to adaptations.
- 33) When single-stranded DNA from a human is mixed with single-stranded DNA from a chimpanzee, we find that about 99% of the DNA is homologous. This can best be taken as evidence that
- A) humans and chimpanzees originated in similar environments.
 - B) humans evolved from chimpanzees.
 - C) chimpanzees evolved from humans.
 - D) humans and chimpanzees are closely related.
 - E) all organisms have similar DNA.
- 34) One finds that organisms on islands are different from, but closely related to, similar forms found on the nearest continent. This is taken as evidence that
- A) island forms and mainland forms descended from common ancestors.
 - B) common environments are inhabited by the same organisms.
 - C) the islands were originally part of the continent.
 - D) the island forms and mainland forms are converging.
 - E) island forms and mainland forms share the same gene pool.



- 35) Which of the following best describes the fossil record?
- A) Similar fossils are found in varying environments at different times.
 - B) There is a progression, with older fossils being primitive and younger fossils being advanced.
 - C) Life has remained essentially unchanged since it began 6000 years ago.
 - D) All vertebrate classes make their first appearance in the fossil record in rocks of the same age.
 - E) The fossil record proves Darwin's hypothesized genetic variation in populations.
- 36) Linnaeus' concept of taxonomy is that the more closely two organisms resemble each other, the more closely related they are in a classification scheme. In evolutionary terms, the more closely related two organisms are,
- A) the more similar their habitats are.
 - B) the less similar their DNA sequences are.
 - C) the more recently they shared a common ancestor.
 - D) the less likely they are to be related to fossil forms.
- 37) "Ontogeny recapitulates phylogeny" means that development passes through stages that represent the evolutionary ancestors of the organism. Our modern view of this statement is best described by which of the following?
- A) It is generally valid.
 - B) It is interesting only from a historical perspective.
 - C) It is more accurate to say that development passes through stages that are shared with the embryonic stages of evolutionary ancestors.
 - D) It is more accurate to say that development passes through stages that are determined by adaptations to the environment.
 - E) It is more accurate to say that development passes through stages that are shared with the adult stages of evolutionary ancestors.
- 38) Ichthyosaur was an aquatic dinosaur. Fossils show us that it had a dorsal fin and a tail just as fish do, even though its closest relatives were terrestrial reptiles that had neither dorsal fins nor aquatic tails. The dorsal fins and tails of ichthyosaurs and fish are
- A) homologous.
 - B) analogous.
 - C) adaptations to a common environment.
 - D) Both A and C are correct.
 - E) Both B and C are correct.



- 39) A biologist studied a population of squirrels for 15 years. Over that time, the population was never fewer than 30 squirrels and never more than 45. Her data showed that over half of the squirrels born did not survive to reproduce, because of competition for food and predation. Suddenly, the population increased to 80. In a single generation, 90% of the squirrels that were born lived to reproduce. What inferences might you make about that population?
- A) All of the below are reasonable inferences.
 - B) The amount of available food probably increased.
 - C) The number of predators probably decreased.
 - D) The young squirrels in the next generation will show greater levels of variation than in the previous generations because squirrels that would not have survived in the past are now surviving.
 - E) Both Band C are reasonable inferences.
- 40) Evolution is a general concept. TV shows evolve in ways similar to biological systems. Given this similarity, which would NOT be a good analogy between TV shows and evolution?
- A) Shows (organisms) that are successful last for a long time; those that are not successful are canceled (become extinct).
 - B) Over a period of years, as public opinion (environment) changes, shows (organisms) change.
 - C) Successful shows (organisms) often generate (reproduce) other shows (organisms) via a process called *spin-offs*.
 - D) The characteristics of successful shows (organisms) are copied by other new shows (organisms).
 - E) Over time, different shows (organisms) may develop similar characteristics.
- 41) Which of the following pieces of evidence most strongly supports the common origin of all life?
- A) All organisms require energy.
 - B) All organisms have the same genetic code.
 - C) All organisms reproduce.
 - D) All organisms show heritable variation.
 - E) All organisms have undergone evolution.
- 42) Lungfish share a common ancestor with modern vertebrates more anciently than they share one with modern fish. Nevertheless, one might say, "If it looks like a fish and swims like a fish, it's a fish." This saying is one that embodies the taxonomic philosophy of
- A) Darwin.
 - B) Wallace.
 - C) Linnaeus.
 - D) Lyell.
 - E) Lamarck



- 43) DNA can code for mRNA, which in turn can code for protein. There is no way that this process can be reversed so that altered proteins in an individual can code for genetic material. If this reversal were possible, it would make much more plausible the theory of evolution proposed by
- A) Darwin.
 - B) Plato.
 - C) Aristotle.
 - D) Lamarck.
 - E) Linnaeus.
- 44) Ideas of which of the following men probably had the LEAST impact on the eventual publication of Darwin's *Origin of Species*?
- A) Hutton
 - B) Lyell
 - C) Wallace
 - D) Malthus
 - E) Aristotle
- 45) Many species of animals are indigenous to caves. Which of the following structures would be MOST likely to have become vestigial in these organisms?
- A) eyes
 - B) ears
 - C) teeth
 - D) legs
 - E) tail
- 46) Which of the following structures are both analogous and homologous?
- A) the legs of a cockroach and the legs of a cat
 - B) the eyes of squids and octopuses and the eyes of a horse
 - C) the forelegs of a dog and the wings of a bat
 - D) the wings of a bat and the wings of a bird
 - E) the wings of a honeybee and the wings of a bird
- 47) The human appendix is considered by many a vestigial organ. Which of the following statements would NOT be consistent with this view?
- A) The appendix can be surgically removed with no apparent ill effects.
 - B) The appendix might have been larger in fossil hominids.
 - C) The appendix has a larger blood supply compared to other parts of the digestive system.
 - D) Individuals with a larger-than-average appendix leave no more offspring than those with a below-average-sized appendix.
 - E) In a million years, the human species might completely lack an appendix.



- 48) Catastrophism was Cuvier's attempt to explain
- A) evolution.
 - B) the fossil record.
 - C) uniformitarianism.
 - D) the origin of new species.
 - E) natural selection.
- 49) Concerning our present understanding of evolutionary processes, which of the following occur by chance?
- A) natural selection
 - B) artificial selection
 - C) reproduction
 - D) variation
 - E) descent with modification
- 50) The most recent evidence for biological evolution comes from
- A) the fossil record.
 - B) studies on artificial selection.
 - C) biogeography.
 - D) comparative morphology.
 - E) molecular biology.
- 51) Australia and New Zealand are very close together geographically, yet the wide variety of marsupials indigenous to Australia is not evident in New Zealand. This is probably because
- A) Australia and New Zealand have different biogeographic origins.
 - B) marsupials are unable to survive well in New Zealand.
 - C) Australia is larger than New Zealand.
 - D) many marsupials have gone extinct in New Zealand.
 - E) most marsupials have left New Zealand for Australia over a recent land bridge.

