Chapter 8: Evolution and Natural Selection

1) A population is:

a) a group of species that shares the same habitat.
b) a group of individuals of the same species that lives in the same general location and has the same genotypes.
c) a group of individuals of related species that lives in the same general location and has the potential to interbreed.
d) a group of individuals of the same species that has the potential to interbreed.
e) a group of individuals of the same species that lives in the same general location and has the potential to interbreed.

2) Which aspect of Darwin’s experience on the HMS Beagle was MOST important as an inspiration for his later development of the theory of evolution by natural selection?

a) He was the “gentleman companion” for the ship’s captain, who was an ardent evolutionist.
b) He first gained a love of nature onboard.
c) He was able to go ashore in areas of the world that had plant and animal life very different from what he knew in England.
d) He was able to observe life in and on the ocean as never before.
e) He was able to meet people from other cultures who already had an advanced idea of evolution by natural selection.

3) Thomas Malthus’s 1798 work, Essay on the Principle of Population, greatly influenced Darwin. Which of the following statements best summarizes Malthus’s idea?

a) Animals are able to pass to their offspring characteristics that were acquired in their lifetimes.
b) Individuals with better competitive abilities are more likely to survive and pass their genes to the next generation.
c) Isolated populations of organisms, such as Darwin’s finches on the Galápagos Islands, tend to differentiate into new species to fill different niches.
d) The size of human populations, like animal populations, is directly determined by the carrying capacity of the environment.
e) People reproduce much more quickly than their resources do. This results in competition for food and space, and in suffering and death.

4) Evolution occurs:

a) by altering physical traits but not behavioral traits.
b) only when the environment is changing.
c) only via natural selection, genetic drift, migration, or mutation.
d) almost entirely because of directional selection.
e) only through natural selection.

5) All of the following statements are true about mutations EXCEPT:

a) Mutations are almost always random with respect to the needs of the organism.
b) The origin of genetic variation is mutation.
c) The mutation rate can be affected by genetic drift.
d) A mutation is any change in an organism’s DNA.
e) Most mutations are harmful or neutral to the organism in which they occur.
6) Genetic drift has the greatest effects for populations:
   a) that are very small.
   b) that are undergoing stabilizing selection.
   c) that are in large.
   d) that are undergoing directional selection.
   e) with a high degree of gene exchange with other populations.

7) Natural selection can only act on traits:
   a) that reduce mortality.
   b) that confer a reproductive advantage.
   c) that are acquired in an individual’s lifetime.
   d) that are heritable.
   e) that are adaptive.

8) Human birth weight is a classic example of the result of:
   a) stabilizing selection.
   b) disruptive selection.
   c) genotype by environment interaction.
   d) genetic drift.
   e) directional selection.

9) Prior to the 19th century, most scholars thought that the world was less than 10,000 years old. Based on geological and radiometric evidence, however, scientists now believe the age of Planet Earth is closer to:
   a) 20,000 years old.
   b) 100,000 years old.
   c) 1 million years old.
   d) 50 million years old.
   e) 4 billion years old.

10) Which of the following is an example of a vestigial structure?
    a) molars in bats that consume a completely liquid diet
    b) eye sockets in eyeless cave-dwelling fish
    c) pelvic bones in whales
    d) All of the above are examples of vestigial structures.
    e) Only a) and b) are examples of vestigial structures.

**Chapter 10: The Origin and Diversification of Life on Earth**

11) The classic experiments performed in the 1950s by Harold Urey and Stanley Miller were the first to show that:
    a) simple organic molecules, such as amino acids, could form spontaneously in the laboratory under chemical conditions mimicking those of primitive earth.
    b) water (H₂O) could be separated into atmospheric oxygen and H₂ gas.
    c) cosmic microwave background radiation (CMB), a type of electromagnetic radiation, fills the entire universe and provides support for the “big bang” model of the origin of the universe.
    d) naturally occurring antibiotics, such as penicillin, could be used to treat bacterial diseases.
    e) the average bill size of a population of Darwin’s finches changed with environmental conditions, proving that microevolution can occur within a human lifetime.
12) Life arose from non-life around ________ years ago.
   a) 4 billion
   b) 400 billion
   c) 4 million
   d) 4 thousand
   e) 4 trillion

13) Polyploidy as a mechanism of speciation occurs most commonly in which of the following life forms?
   a) salamanders
   b) polychaete worms
   c) molluscs
   d) plants
   e) fungi

14) A phylogenetic tree:
   a) shows the similarities between different taxa.
   b) is a hypothesis about evolutionary relationships.
   c) can illustrate selection pressures that have acted on taxa.
   d) shows the number of character changes that have occurred between taxa.
   e) must be rooted to properly convey evolutionary relationships.

15) Sequencing DNA from different organisms has been a breakthrough for phylogenetics because:
   a) we can now build heat-tolerant animals.
   b) we now have a method to determine the relatedness of organisms that leave no fossils.
   c) it has reduced the impact of antibiotic resistance in bacteria.
   d) we can now recreate genomes from the past.
   e) All of the above are correct.

16) The difference between macroevolution and microevolution is that:
   a) they take place on different time scales.
   b) microevolution has been proven, whereas macroevolution is very speculative.
   c) microevolution involves changes to individuals within a population, whereas macroevolution involves changes to all of the individuals within a population.
   d) microevolution occurs in prokaryotes, whereas macroevolution takes place among eukaryotes.
   e) macroevolution occurs with physical structures, whereas microevolution occurs with physiological traits.

17) The pace of evolution in which there is little change for long periods of time interrupted by short periods with major changes is called:
   a) microevolution.
   b) punctuated equilibrium.
   c) adaptive radiation.
   d) macroevolution.
   e) convergent evolution.
Chapter 11: Animal Diversification

18) Which of the following is FALSE?

   a) Animals are multicellular.
   b) Animals do not undergo mitosis in the haploid stage.
   c) Animals eat other organisms.
   d) Animal cells lack cell walls.
   e) Animals are not all descended from a common ancestor.

19) Which of the following are chordates?

   a) frogs
   b) humans
   c) fish
   d) All of the above are chordates.
   e) Only a) and c) are chordates.

20) Which four features do humans share with tunicates?

   a) vertebrae; lungs; amniotic egg; four-chambered heart
   b) notochord; dorsal hollow nerve cord; pharyngeal slits in the embryonic stage; jaws
   c) notochord; vertebrae; lungs; amniotic egg
   d) vertebrae; bony skeleton; lungs; amniotic egg
   e) notochord; dorsal hollow nerve cord; pharyngeal slits in the embryonic stage; a postanal tail in the embryonic stage

21) Why is the amniotic egg considered a key evolutionary innovation?

   a) It greatly increases the survival probabilities of eggs in a terrestrial environment.
   b) It has a shell with a single membrane.
   c) It enables eggs to float in an aquatic medium.
   d) It extends embryonic development.
   e) It prohibits external fertilization, thereby facilitating the evolutionary innovation of internal fertilization.

Chapter 12: Plant and Fungi Diversification

22) Which of the following was a significant new challenge plants faced in moving to land that they had not faced in their aquatic environment?

   a) desiccation
   b) light availability
   c) predation
   d) nutrient availability
   e) the need for osmotic regulation

23) In what order do the following taxa appear in the fossil record?

   a) fish, amphibians, land plants, invertebrates
   b) invertebrates, fish, land plants, amphibians
   c) land plants, invertebrates, fish, amphibians
   d) land plants, invertebrates, amphibians, fish
   e) invertebrates, amphibians, fish, land plants
24) Which is the best brief description of the vascular system of the very first terrestrial plants?

a) The first plants did not develop a vascular system.
b) The first plants had only long, needle-like leaves from which water could evaporate easily.
c) The first plants developed specialized vessel cells that conducted water.
d) The first plants had a very basic vascular system with a simple method of internal transport.
e) None of the above is correct.

25) What major evolutionary innovation makes ferns different from their ancestors?

a) the alternation between haploid and diploid generations
b) embryos encased in seeds
c) vascular tissue
d) the production of pollen
e) flowers