Evolutionary Analysis, 5e **(Herron/Freeman)**
Chapter 2 The Pattern of Evolution

1) In response to environmental conditions, the average beak size in a population of birds may change between successive generations. This process of change is referred to as _____.
A) macroevolution
B) sequestration
C) speciation
D) coalescence
E) microevolution
Answer: E
Section: 2.1
Skill: Knowledge/Comprehension

2) After several generations of selectively breeding mice in a laboratory, Ted Garland and his colleagues established populations of mice that voluntarily chose to run great distances on exercise wheels. The process of establishing these populations of mice is termed _____.
A) natural selection
B) artificial selection
C) population selection
D) experimental selection
E) random selection
Answer: B
Section: 2.1
Skill: Knowledge/Comprehension

3) A useless or rudimentary body part that is thought to have been important in ancestral populations but no longer has a known function is termed a(n) _____.
A) evolved structure
B) terminal structure
C) vestigial structure
D) residual structure
Answer: C
Section: 2.1
Skill: Knowledge/Comprehension

4) The coccyx, a tiny tailbone found in humans, is believed to be a _____ structure.
A) terminated
B) vestigial
C) rudimentary
D) redundant
Answer: B
Section: 2.1
Skill: Knowledge/Comprehension

5) The biological species concept, formalized by Ernst Mayr in 1942, defined a species as a _____.
A) group of individuals that inhabit the same location
B) group of individuals with similar morphological characteristics
C) population within and among which individuals actually or potentially interbreed and outside of which they do not interbreed
D) group of individuals who share similar allelic frequencies
E) population of individuals within and among which reproduction takes place frequently
Answer: C
Section: 2.2
Skill: Knowledge/Comprehension

6) Andrew Hendry and colleagues demonstrated that the process of speciation is gradual by studying the distribution and variation in gill raker length in _____.
A) brook trout
B) aquatic copepods
C) salmonids
D) threespine sticklebacks
E) razorfish
Answer: D
Section: 2.2
Skill: Application/Analysis

7) The comparative anatomist Georges Cuvier confirmed the concept of extinction in 1812 when he demonstrated that there were no extant species anatomically related to the fossilized remains of the _____.
A) mastodon
B) Irish elk
C) pygmy armadillo
D) giant vampire bat
E) Arctic lemming
Answer: B
Section: 2.3
Skill: Knowledge/Comprehension

8) The transitional fossil *Archaeopteryx* shows a combination of traits consistent with the hypothesis that it shared a common ancestor with _____.
A) dinosaurs and bats
B) hippos and whales
C) reptiles and birds
D) dinosaurs and birds
Answer: D
Section: 2.3
Skill: Knowledge/Comprehension

9) Large evolutionary changes that result in the placement of related organisms into different genera or higher-level taxa occur via the process of _____.
A) speciation
B) macroevolution
C) microevolution
D) independent evolution
E) evolutionary differentiation
Answer: B
Section: 2.3
Skill: Knowledge/Comprehension

10) Anatomical features that show an underlying structural similarity even though their superficial structure is different are termed _____ structures.
A) homoplasic
B) homologous
C) symplasic
D) dependent
Answer: B
Section: 2.4
Skill: Knowledge/Comprehension

11) Nonfunctional copies of normal genes, which lack both introns and promoters, and are important in estimating evolutionary ages of phylogenetic relationships, are _____.
A) transgenes
B) retrotransposons
C) processed retrogenes
D) processed pseudogenes
E) duplicated pseudogenes
Answer: D
Section: 2.4
Skill: Knowledge/Comprehension

12) Processed pseudogenes are useful for testing Darwin's theory of descent with modification because they _____.
A) can be utilized for examining phylogenetic relationships among asexually reproducing organisms
B) demonstrate phylogenetic relationships of divergence because they do not accumulate mutations
C) accumulate mutations at a constant rate, and thus older processed pseudogenes should be shared by a greater variety of species
D) are distributed in organisms that are found in similar environments
Answer: C
Section: 2.4
Skill: Application/Analysis

13) The concept of uniformitarianism, articulated by James Hutton in the late 1700s, states that _____.
A) the genetic code is similar among all living and extinct species
B) mutations accumulate at a constant rate in most organisms
C) current geological processes on Earth operate in the same manner as those that operated in the past
D) the rate of extinction has been constant throughout the time life has existed on Earth
Answer: C
Section: 2.5
Skill: Knowledge/Comprehension

14) The amount of time it takes for a radioactive element to decay to 50% of its daughter isotope is called _____.
A) decay rate
B) half-life
C) partial decay
D) conversion rate
E) quarter-life
Answer: B
Section: 2.5
Skill: Knowledge/Comprehension

15) Radioactive dating techniques have demonstrated that Earth was formed approximately _____ years ago.
A) 10 billion
B) 46 million
C) 4.6 million
D) 4.6 billion
Answer: D
Section: 2.5
Skill: Knowledge/Comprehension

16) The theory that species do not change over time, are created separately and independently, and that the Earth and life on Earth are young is called the _____. [four words]
Answer: theory of special creation.
Section: 2.1
Skill: Knowledge/Comprehension

17) Explain how microevolution and artificial selection are demonstrated by the wide variety of dog breeds currently in existence.
Answer: Artificial selection via breeding has led to considerable variation within dog populations. However, all dogs are believed to be descended from wolves, and despite their variation, all dogs are members of the same species.
Section: 2.1
Skill: Application/Analysis

18) Vestigial structures are found in humans, and are thought to be useless or rudimentary body parts that had an important function in ancestral species. Give two examples of vestigial structures in humans.
Answer: Vestigial structures in humans are the coccyx (tailbone and arrector pili muscles at the base of each hair follicle.
Section: 2.1
Skill: Knowledge/Comprehension

19) In Dianne Dodd's experiments with *Drosophila pseudoobscura*, different populations were established that were raised on diets of either maltose or starch. When flies from the different populations were allowed to mate, some flies mated with flies fed on a different food source, but there was a preference for mating with flies raised on the same food source. What does this phenomenon illustrate about the timescale of speciation?
Answer: The process of speciation occurs over a long period of time, and this process can be observed under defined conditions in the laboratory.
Section: 2.2
Skill: Application/Analysis

20) What is the biological species concept put forth by Ernst Mayr in 1942?
Answer: Species are populations, or groups of populations, within and among which individuals actually or potentially interbreed and outside of which they do not interbreed.
Section: 2.2
Skill: Knowledge/Comprehension

21) What was the evolutionary significance of Georges Cuvier's analysis of the fossilized Irish elk, published in 1812?
Answer: Cuvier's analysis demonstrated that extinction had a significant role in evolution, and showed that the Irish elk belonged to a lineage that had become extinct, and was not related to any other extant species such as moose or reindeer.
Section: 2.3
Skill: Application/Analysis

22) Explain the significance of *Archaeopteryx* as a transitional fossil in our understanding of phylogenetic relationships.
Answer: *Archaeopteryx* shares a common ancestor with both dinosaurs and modern birds, and indicates that birds were derived from dinosaurs. Its phylogenetic position demonstrates that birds evolved feathers first, which was followed by muscular and skeletal modifications that enabled flight in modern birds.
Section: 2.3
Skill: Application/Analysis

23) What are structural homologies?
Answer: Anatomical features that show an underlying structural similarity even though their superficial structure is different, and that provide evidence of a shared common ancestry.
Section: 2.4
Skill: Knowledge/Comprehension

24) What are two features that characterize processed pseudogenes, and how do these arise?
Answer: Processed pseudogenes contain no introns or promoters, and arise when processed mRNAs are accidentally reverse transcribed to DNA by reverse transcriptase, and then inserted back in the genome at alternate locations.
Section: 2.4
Skill: Knowledge/Comprehension

25) On what basic physical principle does radiometric dating rely?
Answer: Unstable isotopes decay into either other elements or different isotopes of the same element. Each isotope decays at a constant rate, and the resultant half-life can be used to estimate the age of rocks and once-living materials.
Section: 2.5
Skill: Knowledge/Comprehension

26) The radioactive isotope _____ has a half-life of 5,730 years, and has an effective dating range of 100 to 100,000 years.
Answer: Carbon-14
Section: 2.5
Skill: Knowledge/Comprehension

27) The age of the Earth is estimated at 4.6 billion years. When are the first unicellular organisms thought to have evolved on Earth?
Answer: 3.2 to 3.4 billion years ago
Section: 2.5
Skill: Knowledge/Comprehension

28) Compare and contrast the processes of microevolution and macroevolution.
Section: 2.0/2.1
Skill: Application/Analysis

29) Discuss how the proximal CMT1A repeat that appears near the gene coding for peripheral myelin protein-22 (PMP-22) has been used to examine the phylogenetic relationships between humans, chimpanzees, bonobos, gorillas, orangutans and several other primates, and why this repeat provides evidence that supports the theory of descent with modification and against the theory of special creation.
Section: 2.4
Skill: Application/Analysis

30) Explain and provide evidence to support uniformitarianism, and how this evidence refutes the theory of special creation.
Section: 2.5
Skill: Synthesis/Evaluation