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Chapter 2: Biology and Evolution

Multiple Choice

1. How do anthropologists classify the Nez Perce story about Coyote and Wishpoosh?

   A. apocalyptic myth
   B. salvation myth
   C. children's myth
   D. creation myth

   ANS: D TYPE: Applied
   PG: 31

2. Where are the Nez Perce located?
   A. eastern Oregon and Idaho
   B. Washington and western Montana
   C. Tennessee and eastern Kentucky
   D. Massachusetts and New York

   ANS: A TYPE: Factual
   PG: 31

3. Evolution can be described as:

   A. an anti-Creationist account of the origin of life
   B. the foundation of culture in contemporary society
   C. the major organizing principle of the biological sciences
   D. the major organizing principle of the social sciences

   ANS: C TYPE: Conceptual
   PG: 32

4. What is the difference between evolution and theories of evolution?

   A. evolution is a fact, but some people prefer to see it as theory
   B. biologists accept evolution as a fact, but theories explain how it works
   C. evolution explains all change and the theories explain contemporary change
   D. there is no difference between these two

   ANS: B TYPE: Conceptual
   PG: 32

5. Which of the following statements is false?

A. evolution explains diversity through scientific language using hypotheses
B. evolution explains diversity through scientific language using theories
C. evolution can explain diversity and creation myths cannot
D. creation myths and evolutionary accounts do not differ

ANS: D TYPE: Applied
PG: 32

6. Which scientist developed the *Systema Naturae*?

A. Aristotle
B. Carolus Linnaeus
C. Jean Lamarck
D. Charles Darwin

ANS: B TYPE: Factual
PG: 32

7. Which of the following best describes the "Great Chain of Being" approach?

A. a creation myth discovered by the Greeks in the 1st century AD
B. an early scientific description of the inanimate world based on form
C. a classification of animate life-forms only, with humans at the very top
D. a categorization of animate and inanimate forms based on observable similarities

ANS: D TYPE: Applied
PG: 32

8. The "Great Chain of Being" was first developed by:

A. Herodotus
B. Aristotle
C. Galileo
D. Sophocles

ANS: B TYPE: Factual
PG: 32

9. What was unique about the "system of nature" classification when it was first proposed?

   A. Aristotle classified humans just below angels
   B. von Linné classified humans just below angels
   C. Linnaeus classified humans with other primates
   D. Aristotle classified humans with other primates

   ANS: C TYPE: Conceptual
   PG: 32

10. A reproductively isolated population or group capable of interbreeding to produce fertile offspring is a:

   A. genus
   B. category
   C. family
   D. species

   ANS: D TYPE: Factual
   PG: 32

11. How would you best describe a genus?

   A. a group of like species
   B. a subdivision of species
   C. a sub-species
   D. archaic forms of species

   ANS: A TYPE: Conceptual
   PG: 32

12. *Homo* describes a human _____.

   A. order
   B. homology
   C. genus
   D. species

   ANS: C TYPE: Factual
   PG: 32

13. Charles Darwin was hired as a _____ on the *H.M.S Beagle*.

   A. botanist

B. navigator
C. traveling companion
D. medical doctor

ANS: C TYPE: Factual
PG: 32

14. Darwin's theory was known as the theory of:

A. natural selection
B. natural variation
C. animal evolution
D. circumnavigation

ANS: A TYPE: Factual
PG: 35

15. Which of the following is not a criterion that Linneaus used to determine classification of species?

A. sequence of bodily growth
B. body function
C. prior classification
D. body structure

ANS: C TYPE: Applied
PG: 33

16. Anatomical features that have evolved from a common ancestral feature are called:

A. homologies
B. taxonomy
C. morphology
D. adaptation

ANS: A TYPE: Factual
PG: 33

17. Animals with a generalized anatomy, relatively large brain, and grasping hands and feet are known as:

A. chordates
B. mammals
C. vertebrates
D. primates

ANS: D TYPE: Applied
PG: 33

18. Of those listed below, which is the widest (most broad) taxonomic category?

A. family
B. order
C. phylum
D. species

ANS: C TYPE: Applied
PG: 33

19. The comparison of the anatomical structures of wings on a bat to the wings on a butterfly is an example of:

A. homology
B. taxonomy
C. analogy
D. phylogeny

ANS: C TYPE: Applied
PG: 34

20. The comparison of the anatomical structures of a human arm to the wing of a bat is an example of:

A. homology
B. taxonomy
C. analogy
D. phylogeny

ANS: A TYPE: Applied
PG: 34

21. Invoking natural events, such as the Great Flood in the Book of Genesis, to account for species disappearance is an example of:

A. exploitation
B. system of nature
C. Great Chain of Being
D. catastrophism

ANS: D TYPE: Applied
PG: 34

21. What kind of theory is "catastrophism"?

A. 17th-century scientific hypothesis
B. 18th-century scientific theory
C. 19th-century humanistic idea
D. 20th-century scientific concept

ANS: C TYPE: Factual
PG: 34

22. Who proposed that animal populations remained stable over time because of the high proportion of animal offspring not surviving to maturity?

A. Gregor Mendel
B. Charles Darwin
C. Thomas Malthus
D. Charles Lyell

ANS: C TYPE: Factual
PG: 35

23. Who was responsible for providing the principles of heredity?

A. Gregor Mendel
B. Charles Lyell
C. Thomas Malthus
D. Charles Darwin

ANS: A TYPE: Factual
PG: 35

24. Today, Darwin's evolutionary theory is supported by data from all of the following except:

A. population genetics
B. comprehensive understanding of heredity
C. molecular genetics
D. proto-genetics

ANS: D TYPE: Applied
PG: 35

25. What was different (or unique) about Gregor Mendel's approach to gardening?

A. he was a scientist and worked to create commercial plants

B. he took systematic notes and was able to identify patterns of heredity
C. he bred garden plants to obtain higher yields
D. he worked to breed garden plants in order to obtain better varieties

ANS: B TYPE: Conceptual
PG: 35

26. The principle that variants of genes for a particular trait retain their separate identities through the generations is called:

A. natural selection
B. law of segregation
C. law of heredity
D. law of independent assortment

ANS: B TYPE: Factual
PG: 35

27. A portion of the DNA molecule containing a sequence of base pairs that encodes a particular protein is known as a:

A. gene
B. allele
C. double helix
D. chromosome

ANS: A TYPE: Factual
PG: 35

28. Most of the advances in heredity at the molecular level have occurred during what time period?

A. latter part of the 20th century
B. early part of the 20th century
C. latter part of the 19th century
D. early part of the 19th century

ANS: A TYPE: Factual
PG: 35

29. Mendel discovered that inheritance was particulate, not:

A. blended
B. separated
C. molded
D. selected

ANS: A TYPE: Conceptual
PG: 35

30. The cellular structures that contain genetic information are called:

A. alleles
B. genes
C. chromosomes
D. heritable units

ANS: C TYPE: Factual
PG: 36

31. Alleles are:

A. the cell nucleus
B. structures that carry specific proteins
C. alternate forms of a single gene
D. pieces of DNA

ANS: C TYPE: Factual
PG: 36

32. Sex cell division is called:

A. independent assortment
B. segregation
C. meiosis
D. mitosis

ANS: C TYPE: Factual
PG: 36

33. Which of the following is not one of the four base pairs?

A. glucosamine
B. cytosine
C. adenine
D. thymine

ANS: A TYPE: Factual
PG: 36

34. Geneticists believe that humans have approximately how many functioning genes?

A. 1,062
B. 25,000
C. 15,000
D. scientists have no idea how many genes humans have

ANS: B TYPE: Factual
PG: 37

35. Which of the following represents an existing base pair?

A. guanine and adenine
B. thymine and guanine
C. guanine and cytosine
D. cytosine and thymine

ANS: C TYPE: Applied
PG: 38

36. Cell division that involves exact replication of parent cells is called:

A. mitosis
B. mitochondriosis
C. meiosis
D. cloning

ANS: A TYPE: Applied
PG: 38

37. During meiosis, genes are divided into:

A. 2 new cells
B. 4 new cells
C. 6 new cells
D. 8 new cells

ANS: B TYPE: Applied
PG: 38

38. What does Rayna Rapp's bio-cultural study of reproduction illustrate?

A. the phenomenon of aggression among non-human primates
B. the effect of genetic drift on rates of sickle-cell anemia transmission
C. the complex interplay between biological knowledge and cultural practices
D. the genetic similarity between humans and chimpanzees

ANS: C TYPE: Factual
PG: 39

39. Which of the following is not routinely associated with new reproductive technologies, such as genetic testing?

A. a shift in cultural practices surrounding pregnancy
B. potential to label disabled people as undesirable
C. increased incidence of genetic assessments
D. lowered incidence of pregnancy

ANS: D TYPE: Conceptual
PG: 39

40. Can some physical traits be dominant, while others are recessive?

A. only during a mutation
B. sometimes
C. no
D. yes

ANS: D TYPE: Conceptual
PG: 39-40

41. If a young man has Type A blood, this is his:

A. DNA
B. genome
C. phenotype
D. genotype

ANS: C TYPE: Applied
PG: 40

42. If a young woman has blue eyes, this is her:

A. DNA
B. genome
C. phenotype
D. genotype

ANS: C TYPE: Applied
PG. 40

43. Since Type O Blood is co-dominant, a woman with Type O blood knows that OO is her:

A. DNA
B. genome
C. phenotype
D. genotype

ANS: D TYPE: Applied
PG. 40

44. A person's hair color is determined by at least two genes. Hair color is an example of:

A. polygenetic inheritance
B. genotype
C. genome
D. DNA

ANS: A TYPE: Applied
PG: 40

45. An example of polygenetic inheritance is:

A. blood type
B. skin color
C. weight
D. sex

ANS: B TYPE: Applied
PG: 40

46. Chimpanzees and humans share what percentage of DNA similarity?

A. 90%
B. 95%
C. 97%
D. 98%

ANS: D TYPE: Factual
PG: 41

47. The chimp's genome is estimated to be _____ % larger than the human's.

A. 50
B. 75
C. 10

D. 25

ANS: C TYPE: Factual
PG: 41

48. All of the following are evolutionary forces except:

A. genetic drift
B. gene flow
C. genetic cloning
D. mutation

ANS: C TYPE: Conceptual
PG: 42

49. In evolutionary terms, what kind of force is mutation?

A. negative because mutation decreases chances for survival
B. positive because it provides variation for selection
C. neutral because variation does not matter in the long run
D. mutation cannot be evaluated in these terms

ANS: B TYPE: Conceptual
PG: 42

50. What variable force is most important to adaptation over time?

A. founder's effect
B. genetic drift
C. random mutation
D. gene flow

ANS: C TYPE: Conceptual
PG: 42

51. The average rate of mutation per million is:

A. 100
B. 20
C. 1000
D. 30

ANS: D TYPE: Factual
PG: 42

52. The main structural protein for skin, bones, and teeth is:

A. thymine
B. adenine
C. collagen
D. guanine

ANS: C TYPE: Applied
PG: 42

53. Chance fluctuations of allele frequencies in the gene pool of a population are evidences of:

A. genetic drift
B. gene flow
C. mutation
D. directional selection

ANS: A TYPE: Factual
PG: 43

54. Founder's Effect is a type of:

A. gene flow
B. genetic drift
C. natural selection
D. environmental selection

ANS: B TYPE: Applied
PG: 43

55. A small group of people with several colorblind individuals move from the mainland move to a previously uninhabited, secluded island. Two hundred years later 5% of the people of the island have colorblindness. This is an example of:

A. founder effects
B. population bottleneck
C. mutation
D. gene flow

ANS: A TYPE: Applied
PG: 43

56. A painful disease in which oxygen-carrying red blood cells change into abnormal shapes is called:

A. anemia

B. natural blood selection
C. Trisomy 21
D. sickle-cell anemia

ANS: D TYPE: Factual
PG: 43

57. Interbreeding allows for

A. gene flow
B. genetic drift
C. founder's effect
D. guanine

ANS: A TYPE: Applied
PG: 44

58. What is the evolutionary force that has kept populations from developing into separate species?

A. founder's effect
B. mutation
C. random genetic drift
D. gene flow

ANS: D TYPE: Factual
PG: 44

59. Adaptation can best be described as:

A. an inherited form of anemia caused by a mutation
B. dominant characteristics in the gene pool
C. a series of beneficial adjustments to the environment
D. the introduction of alleles from the gene pool of a non-native population

ANS: C TYPE: Factual
PG: 44

60. Sickle-cell anemia is found in highest frequencies in populations from:

A. western Africa
B. central Arica
C. southern Africa
D. Scandinavia

ANS: B TYPE: Factual

PG: 44

61. Why does a bulky body tend to conserve more heat than a slender one?

A. it has less surface area relative to volume
B. it has more surface area relative to volume
C. it has more fat regulation
D. it is more layered, with fat covering muscles

ANS: A TYPE: Applied
PG: 44

62. Scientists have found that carrying sickle-cell anemia (meaning, one is heterozygous) protects the individual from:

A. chicken pox
B. malaria
C. pneumonia
D. common cold

ANS: B TYPE: Factual
PG: 45

63. The allele for sickle-cell anemia is found primarily in areas where there are large populations of mosquitoes bearing:

A. falciparum malaria
B. parasitic dysentery
C. smallpox
D. yellow fever

ANS: A TYPE: Applied
PG: 46

64. The continuous gradation over space in the form or frequency of a genetic trait is known as a:

A. homozygote
B. polygene
C. cline
D. adaptive trait

ANS: C TYPE: Factual
PG: 46

65. In humans, climatic adaptation involves:

A. body build only
B. body build and cultural adaptation
C. diet only
D. none of the above

ANS: B TYPE: Conceptual
PG: 47

66. _____ is the formation of a new species and _____ focuses on the evolutionary relationships between species.

A. Macroevolution/microevolution
B. Macroevolution/speciation
C. Speciation/microevolution
D. Speciation/macroevolution

ANS: D TYPE: Factual
PG: 47

67. Speciation through adaptation is generally believed to occur at a pace called:

A. homeobox adaptation
B. punctuated equilibria
C. Darwinian gradualism
D. adaptive evolution

ANS: C TYPE: Applied
PG: 47

68. A sustained directional shift in a population's average characteristics is called:

A. cladogenesis
B. genetic drift
C. anagenesis
D. speciation

ANS: C TYPE: Factual
PG: 47

69. If two populations of primates were separated for a substantially long period of time by geographical changes, causing them, over time, to begin developing characteristics that distinguished them from each other, it could result in:

A. allelic homogeneity

B. gene flow
C. anagenesis
D. cladogenesis

ANS: D TYPE: Applied
PG: 47

70. What do we call the factors that separate two breeding populations?

A. fission factors
B. isolating factors
C. punctuated equilibria
D. cladogenesis

ANS: B TYPE: Factual
PG: 47

True/False

71. Evolution is the central organizing principle of the biological sciences.

ANS: True TYPE: Factual
PG: 32

72. Historical processes can shape evolutionary theory.

ANS: True TYPE: Conceptual
PG: 32

73. Humans are primates.

ANS: True TYPE: Factual
PG: 32

74. The "system of nature" is an approach to classify all of animate and inanimate nature.

ANS: False TYPE: Factual
PG: 32

75. Genera are subdivisions of species.

ANS: False TYPE: Factual
PG: 32

76. Humans are hominids.

ANS: True TYPE: Factual
PG: 33

77. Taxonomy is an ancient form of classification created by Linnaeus that is no longer used today.

ANS: False TYPE: Conceptual
PG: 33

78. A bat's wing is analogous to a human hand.

ANS: False TYPE: Applied
PG: 34

79. A bat's wing is homologous to a butterfly's wing.

ANS: False TYPE: Applied
PG: 34

80. Even prior to Darwin's publication, many European naturalists accepted the idea that life had evolved.

ANS: True TYPE: Conceptual
PG: 34

81. Readings from a book by Sir Charles Lyell contributed to Darwin's creation of a theory of evolution.

ANS: True TYPE: Applied
PG: 34

82. Darwin published *On the Origin of Species* in 1885.

ANS: False TYPE: Factual
PG: 34

83. Mendel published his findings in a respectable scientific journal, but no one understood their significance until after his death.

ANS: True TYPE: Factual
PG: 35

84. Mendel discovered that offspring inherit a blending of traits from mother and father.

ANS: False TYPE: Applied
PG: 35

85. Genes are particulate, meaning that they are separate structures rather than portions of DNA.

ANS: False TYPE: Conceptual
PG: 35

86. _____ provides the instruction for the thousands of proteins that keep us healthy every day.

ANS: DNA TYPE: Factual
PG: 35

87. The complete sequence of human DNA is called the genome.

ANS: True TYPE: Factual
PG: 37

88. Rice has more genes than humans.

ANS: True TYPE: Factual
PG: 37

89. If two body cells merge in meiosis, the result is a cell with 46 pairs of chromosomes.

ANS: False TYPE: Applied
PG: 38

90. In the search for disease cures, scientists often predict an individual's genotype.

ANS: False TYPE: Conceptual
PG: 40

91. The laws of chance tell us that two random sequences from species that have no ancestry in common will match at about one in every four sites.

ANS: True TYPE: Factual
PG: 41

92. The only source of new genetic material is random drift.

ANS: False TYPE: Factual
PG: 42

93. New mutations arise continuously.

ANS: True TYPE: Factual
PG: 42

94. Founder effects are a kind of genetic drift.

ANS: True TYPE: Conceptual
PG: 43

95. The existence of Homo sapiens as an interbreeding species is due to gene flow.

ANS: True TYPE: Applied
PG: 44

96. Speciation can occur without branching.

ANS: True TYPE: Conceptual
PG: 47

Fill in the Blank

97. A group of like species is a _____.

ANS: genus TYPE: Factual
PG: 30

98. _____ is a major organizing principle of biological science.

ANS: Evolution TYPE: Conceptual
PG: 32

99. _____ are the smallest working units of biological classification systems.

ANS: Species TYPE: Factual
PG: 32

100. The science of classification is called _____.

ANS: taxonomy TYPE: Factual
PG: 33

101. The human hand and the bat wing are _____ structures

ANS: homologous TYPE: Applied
PG: 34

102. The bat's wing and the butterfly's wing are _____ structures.

ANS: analogous TYPE: Applied
PG: 34

103. James Watson and Francis _____ discovered the existence of DNA in 1953.

ANS: Crick TYPE: Factual
PG: 34

104. A sequence of chemical bases on a molecule of DNA constitutes a recipe for making _____.

ANS: proteins TYPE: Applied
PG: 35

105. When a gene contains identical alleles it is referred to as _____.

ANS: homozygous TYPE: Factual
PG: 39

106. In the A-B-O blood system, an individual with type O has an OO _____.

ANS: genotype TYPE: Applied
PG: 39

107. When an individual tells you he has blood Type A, he is telling you his _____.

ANS: phenotype TYPE: Applied
PG: 40

108. An individual's composite physical characteristics are known as the _____.

ANS: phenotype TYPE: Factual
PG: 40

109. When neither allele is dominant, it is referred to as _____.

ANS: co-dominance TYPE: Factual
PG: 40

110. Blood Type AB is an example of a _____ because in this case neither are dominant.

ANS: co-dominant TYPE: Factual
PG: 40

111. The blood protein that carries oxygen is called _____.

ANS: hemoglobin TYPE: Factual
PG: 40

112. Heritable variation constitutes the raw material of _____.

ANS: evolution TYPE: Applied
PG: 42

113. The ultimate source of evolutionary change is _____.

ANS: mutation TYPE: Conceptual
PG: 42

114. When an existing population splits up into two, the kind of genetic drift that occurs is called _____.

ANS: founder effects TYPE: Factual
PG: 43

115. Adaptation is the outcome of _____.

ANS: natural selection TYPE: Applied
PG: 44

116. Heterozygotes for sickle-cell anemia are protected against _____.

ANS: malaria TYPE: Factual
PG: 45

117. Anthropologists study biological diversity in terms of _____.

ANS: clines TYPE: Factual
PG: 46

118. _____ is responsible for the creation of new species over time.

ANS: Evolution TYPE: Conceptual
PG: 47

119. _____ is responsible for all that humans share as well as the array of diversity in our world.

ANS: evolution TYPE: Conceptual
PG: 48

Short Answer

120. By what criteria did Linnaeus establish his classificatory system?

ANS: Linnaeus based his classification on body structure, body function, and sequence of body growth.
PG: 32
TYPE: Factual

121. Distinguish analogies from homologies.

ANS: Analogies identify anatomical features of similar function across species and homologies are structures possessed by two different organisms that arise in similar fashion and pass through similar stages during embryonic development but which have different functions.
PG: 33
TYPE: Factual

122. Describe the theory of natural selection.

ANS: There exists natural variation and the capacity for population to exceed capacity; thus, there is a struggle for existence in which nature selects the most advantageous variations so that species can evolve.
PG: 35
TYPE: Conceptual

123. What were the problems that plagued Darwin's theory of natural selection throughout his career?

ANS: The two problems were to explain how variation arose in the first place, and what the mechanism of heredity between generations was.
PG: 35
TYPE: Factual

124. Describe Mendel's "law of segregation."

ANS: This law states that pairs of genes separate and keep their individuality and are passed on to the next generation, unaltered.
PG: 35
TYPE: Applied

125. Distinguish between genotype and phenotype.

ANS: Genotype is the genetic composition for a trait, while the phenotype is the expressed physical characteristic.
PG: 40
TYPE: Factual

126. What is evolution?

ANS: It is descent with modification in which evolutionary forces such as genetic drift, gene flow, natural selection, and mutation all work to create natural variation, the raw materials for change. It is changes in allele frequencies in populations.
PG: 42
TYPE: Factual

127. Choose one kind of evolutionary force and describe it.

ANS: Students may choose and describe mutation, gene flow, genetic drift, or natural selection.
PG: 42
TYPE: Applied

128. What is adaptation and what is its role in natural selection?

ANS: Adaptation is a series of beneficial adjustments to the environment which can change the organism over time.
PG: 42
TYPE: Applied

129. Genetic drift and gene flow can be easily confused because of the similarities in their names. What is the difference between genetic drift and gene flow?

ANS: Genetic drift refers to chance fluctuations of allele frequencies of a population and can be seen in both founder's effect and population bottlenecks where a small group of people is isolated from a larger population and there is an increase in the expression of a certain gene. By contrast, gene flow refers to the introduction of alleles of one population into another. An example here would be an immigrant population who interbreeds with the existing population.
PG: 42-44
TYPE: Factual

130. What is sickle-cell anemia and how is it adaptive?

ANS: This is a disease of mis-shapen red blood cells that clog the circulatory system. It is primarily carried by those of African ancestry who come from areas where malaria rates are high and carriers of sickle cell have an ability to better survive malaria.
PG: 44-46
TYPE: Applied

131. Describe some of the genetic variation that is most common to people native to colder regions of the world.

ANS: Individuals adapted to colder regions of the world tend to have bulkier bodies, a lower density of sweat glands, some circulatory system modifications, and shorter stature.
PG: 46
TYPE: Applied

132. What are some factors that increase the frequency of gene flow?

ANS: Interbreeding, migration, geographical and social factors can increase gene flow.
PG: 47
TYPE: Conceptual

133. Compare and contrast cladogenesis with anagenesis.

ANS: Both are processes of speciation, but in cladogenesis, the original species branches out and separates, and in anagenesis, the original species itself changes over time into a new species.
PG: 47
TYPE: Applied

Essay

113. Creationism has changed shape over the past decade. Discuss some of the major disagreements between Creationism and evolution. Has your study of evolution in this chapter changed your understanding of this debate?

114. While human populations are subject to the same laws of natural selection as other species, humans also have extensive and elaborate culture. Choose and discuss two examples of cultural processes that complicate simple environmental adaptation.

115. Discuss the history of the concept of evolution. How did the development of this concept reflect the great changes occurring in science over the centuries?

116. Describe how each of the four evolutionary forces contributes to an organism's adaptation.