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Correct Answers are located at the end of each chapter.

TRUE/FALSE - Write 'T' if the statement is true and 'F' if the statement is false.

1) A community is composed of different populations of animals and plants.
   - ◎ true
   - ◎ false

2) All tissues are composed of cells.
   - ◎ true
   - ◎ false

3) Vertical evolution, whereby living organisms evolve from a common ancestor ("tree of life"), is the only mechanism of evolution on Earth.
   - ◎ true
   - ◎ false

4) All genetic mutations are harmful to an organism.
   - ◎ true
   - ◎ false

5) The proteome, rather than genome, is most directly responsible for the structure, function, and appearance of organisms.
   - ◎ true
   - ◎ false

6) The modification of a limb that was used for walking in a preexisting ancestor to one that is used as a wing for a species today is called proteomics.
   - ◎ true
   - ◎ false

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7) A defining characteristic that distinguishes prokaryotic and eukaryotic organisms is the lack of a cell membrane in prokaryotes.
   - ◎ true
   - ◎ false

8) A bacterial infection such as pneumonia is most likely caused by organisms derived from the kingdom fungi.
   - ◎ true
   - ◎ false

9) Little scientific evidence is necessary when formulating a theory.
   - ◎ true
   - ◎ false

10) Discovery-based science and hypothesis testing are the two major scientific approaches that help us understand biology.
   - ◎ true
   - ◎ false

11) BioTIPS encourages memorization of facts to understand science.
   - ◎ true
   - ◎ false

CHECK ALL THE APPLY. Choose all options that best completes the statement or answers the question.

12) The terms male and female refer to sex and are therefore biological terms. Which characteristics are are associated with the designation of male and female?
   - A) the presence of external reproductive structures, such as vagina and penis
   - B) the chromosomal make up of the individual other than the presence of sex chromosomes
   - C) the types of hormones produced
   - D) the type of gametes produced

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MULTIPLE CHOICE - Choose the one alternative that best completes the statement or answers the question.

13) A flower on a plant represents which level of organization?

A) atom
B) cell
C) organ
D) organism
E) population

14) Boa constrictors on an island are an example of a(n)

A) cell.
B) organ.
C) organism.
D) population.
E) ecosystem.

15) Molecules are made up of

A) atoms.
B) cells.
C) organs.
D) organisms.
E) populations.

16) Which is the smallest of all levels of organization?

A) atom
B) cell
C) organ
D) organism
E) population

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17) A community of organisms interacting with their physical environment is a(n)

A) population.
B) organism.
C) biosphere.
D) ecosystem.
E) macromolecular community.

18) In multicellular organisms, cells of the same type can associate with each other to form

A) atoms.
B) molecules.
C) macromolecules.
D) tissues.
E) populations.

19) Which level of organization is present in all life forms?

A) cell
B) tissue
C) organ
D) organelle
E) colony

20) Which level of organization includes all of the others in the list?

A) cell
B) tissue
C) organ
D) organism
E) population

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21) During photosynthesis, plants take in water and carbon dioxide from the environment and use sunlight to fuel a series of chemical reactions that ultimately build small sugar molecules. Which of the core concepts of biology is exemplified by photosynthesis?

A) Evolution
B) Structure and function
C) Information flow, exchange, and storage
D) Pathways and transformations of energy and matter
E) Systems

22) The phenomenon through which populations of organisms change over time due to mutation, natural selection, and genetic exchange is

A) homeostasis.
B) growth and development.
C) reproduction.
D) biological evolution.
E) organization.

23) The protein elastin plays an important role in providing elasticity and resilience to many tissues in the body. Elastin has elastic properties because of the way the protein can change shape. In a relaxed condition, the protein has an overall coiled, or looped shape. When stretched, the protein extends into a straighter, more linear form. When the stretching force is removed, elastin recoils back into the relaxed form. Which core concept of biology does the elastin protein exemplify?

A) Evolution
B) Structure and function
C) Information flow, exchange, and storage
D) Pathways and transformations of energy and matter
E) Systems

24) Children often resemble their parents. The transmission of an eye color gene from parent to child is an example of which core concept of biology?

A) Evolution
B) Structure and function
C) Information flow, exchange, and storage
D) Pathways and transformations of energy and matter
E) Systems

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25) In the process of biological evolution, new species may evolve through exchange of genes from one species to another. This process is called
A) proteome transfer.
B) horizontal gene transfer.
C) vertical evolution.
D) vertical descent with mutation.
E) genomic sciences.

26) How does evolutionary change occur?
A) Through the modification of characteristics in a preexisting population.
B) It may involve vertical descent with mutation.
C) It may involve horizontal gene transfer.
D) All of these choices are correct.
E) None of these choices are correct.

27) A variety of finch species within the Hawaiian Islands have acquired different types of beaks needed for utilizing specific food resources. What is the likely process by which these different species of finches came about?
A) vertical descent with mutation
B) horizontal gene transfer
C) an accumulation of harmful genetic mutations

28) Changes in_____ represent the predominant cause for biological evolution.
A) homeostasis
B) growth and development
C) reproduction
D) genetic makeup
E) energy

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29) If a scientist were studying the role of different proteins in the regulation of insulin secretion from a pancreatic cell, they would be studying
A) genomics.
B) proteomics.
C) cell biology.
D) both genomics and proteomics.
E) both proteomics and cell biology.

30) Which is responsible for encoding the proteins found in a cell?
A) genome
B) proteome
C) cytoskeleton
D) evolution
E) extracellular proteins

31) The complete genetic composition of an organism is called its
A) proteome.
B) genome.
C) transcriptosome.
D) phenotype.
E) None of these choices are correct.

32) Proteins are largely responsible for the traits of living organisms, while _____ provides the blueprint for the organization, development, and function of living things.
A) DNA
B) protein
C) carbohydrate
D) lipid
E) metabolite

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33) What feature of genetic mutations can eventually lead to the evolution of new species?
A) Mutations always produce harmful effects.
B) Mutations never affect protein structure or function.
C) Mutations are not a mechanism through which biological evolution occurs.
D) Mutations always produce beneficial effects.
E) Mutations produce changes in the DNA sequence of a gene.

34) New species evolve from preexisting species by the accumulation of
A) metabolic events.
B) genetic mutations.
C) proteomes.
D) reproductive events.
E) developmental events.

35) About 9,000 years ago people generated a new plant species, *Zea mays* (maize/corn), through the domestication of a grass known as teosinte. In comparison to teosinte, modern ears of corn are much larger, have many more rows of corn grains, have softer corn grains, and do not shatter (break apart to scatter the grains). Which of the following most accurately describes the generation of corn?
A) Corn was generated through artificial selection because people selected traits in teosinte that they deemed desirable.
B) Corn was generated through natural selection because the teosinte grass naturally evolved into corn.
C) Corn was generated through natural selection because natural selection is the only mechanism of evolutionary change.
D) Corn was generated through natural selection because artificial selection requires gene-editing technologies.
E) Corn was generated through artificial selection because there was a horizontal transfer of genes from one species to another.

36) The grouping or classification of species is termed
A) genus.
B) kingdom.
C) taxonomy.
D) biology.
E) physiology.

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37) When grouping organisms, which classification is most general for a particular type of organism?
   A) Kingdom
   B) Phylum
   C) Order
   D) Family
   E) Species

38) All organisms in the Kingdom_____ can perform photosynthesis.
   A) Animalia
   B) Protista
   C) Fungi
   D) Plantae
   E) Bacteria

39) The human species is called *Homo sapiens*. The first word refers to which taxonomical grouping?
   A) Kingdom
   B) Phylum
   C) Order
   D) Genus
   E) Species

40) When considering nomenclature for scientific names, what is the difference between the two primates, *Homo sapiens* and *Homo erectus*?
   A) One is a primate but the other is not.
   B) They are animals of a different kingdom.
   C) They are animals of a different order.
   D) They are animals of a different species.
   E) They are animals of a different genus.

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41) A scientist isolates a single-celled organism from the bottom of a sulfur hot spring. When examined under the microscope, it is clear that the cell is very small and contains no nucleus. Based on this evidence alone, in what domain of life is this organism?

A) Eukarya
B) Bacteria
C) Archaea
D) Either bacteria or archaea
E) It is impossible to determine anything based on this evidence alone

42) Which domain of life contains the most multicellular organisms?

A) Archaea
B) Bacteria
C) Prokarya
D) Eukarya
E) microorganisms

43) An explanation for a biological process that is substantiated by a large body of evidence is called a

A) hypothesis.
B) theory.
C) system.
D) reductionist approach.
E) prediction.

44) Collecting data without a specific hypothesis in mind is called

A) reductionism.
B) hypothesis testing.
C) discovery-based science.
D) theoretical.
E) All of the choices are correct.

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45) What is the appropriate order of the stages of investigating whether maple trees drop their leaves in the autumn because of colder days?

1. Maple trees are grown in two greenhouses where the only variable is temperature (15°C vs. 10°C).
2. The hypothesis is rejected.
3. There is no statistical difference in the number of leaves dropped at 10°C as compared to 15°C.
4. The observation is that maple trees drop their leaves in autumn.
5. The hypothesis is that maple trees drop their leaves because of colder temperatures.

A) 1, 2, 3, 4, 5.
B) 3, 4, 5, 1, 2.
C) 5, 4, 3, 1, 2.
D) 4, 5, 1, 3, 2.
E) 3, 4, 2, 1, 5.

46) "All living organisms are composed of cells" is an example of what type of scientific statement?

A) a hypothesis
B) a theory
C) a discovery
D) a prediction
E) a fact

47) A wristwatch suddenly stops working. After replacing the battery, the watch starts working again. Which of the following statements correctly describes the situation from the perspective of the scientific method?

A) This proves that a dead battery was the reason the wristwatch stopped working.
B) This substantiates the theory that all wristwatches require functional batteries.
C) This is consistent with the hypothesis that a dead battery caused the wristwatch to stop working.
D) This leads to the prediction that a battery is required for wristwatch operation.

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48) A researcher decides to test the scientific validity of the common phrase “An apple a day keeps the doctor away". What would be a valid hypothesis to investigate this specific question?

A) Eating apples decreases the frequency of contracting a cold.
B) The daily consumption of a single apple does not change the number of visits to the doctor.
C) Eating one apple every day is good for you.
D) Apples are high in vitamin C.
E) Those who consume apples have longer lifespans than those who do not consume apples.

49) A researcher tests the hypothesis that large, daily doses of vitamin C help protect against catching the common cold. What would be the best experimental and control group to test this hypothesis?

A) *Experimental group*: takes a large dose of vitamin C daily;
Control group: takes nothing.
B) *Experimental group*: people with a cold are administered vitamin C daily;
Control group: people without a cold are not administered vitamin C.
C) *Experimental group*: takes a large dose of vitamin C daily;
Control group: takes a large weekly dose of vitamin C.
D) *Experimental group*: takes a large, daily dose of vitamin C;
Control group: takes a daily dose of a sugar pill disguised as vitamin C.

50) A researcher hypothesizes that crocodile gender is determined by the incubation temperature of the egg. The hypothesis states that an average nest temperature of 32–33°C results in the birth of male crocodiles while cooler and warmer incubation temperatures result in female crocodiles. What is a valid, testable prediction based on this hypothesis?

A) Male crocodiles will prefer temperatures of 32–33°C.
B) Incubation of any crocodile egg at 32°C will result in a male crocodile.
C) Male eggs will hatch at 32°C, while female eggs will not hatch at 32°C.
D) Male eggs will be more fragile than female eggs.
E) Crocodiles arrange the gender of offspring by manipulating incubation temperatures.

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51) A researcher hypothesizes that crocodile gender is determined by the incubation temperature of the egg. The hypothesis states that an average nest temperature of 32–33°C results in the birth of male crocodiles while cooler and warmer incubation temperatures result in female crocodiles.
The researcher determines that an average nest incubation temperature of 32–33°C results in the birth of male crocodiles, while higher and lower incubation temperatures result in female crocodiles. What is the most likely explanation for this phenomenon?

A) Incubation temperature results in a change in the crocodilian genome.
B) Incubation temperature results in a change in the crocodilian proteome.
C) Incubation temperature changes both the crocodilian genome and proteome.
D) Since this phenomenon is influenced by an external stimuli (temperature), it cannot be attributed to changes in either the genome or the proteome.

52) A researcher hypothesizes that sex in crocodiles is determined by the incubation temperature of the egg. The hypothesis states that an average nest temperature of 32–33°C results in the birth of male crocodiles while cooler and warmer incubation temperatures result in female crocodiles.
Researchers find a group of crocodiles in which an expanded incubation temperature gives rise to male crocodiles. This particular group of crocodiles hatch male crocodiles even with incubation temperatures as low as 29°C. What type of scientific approach has led to this observation?

A) discovery-based science
B) hypothesis testing
C) Both discovery-based science and hypothesis testing

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53) A researcher hypothesizes that crocodile gender is determined by the incubation temperature of the egg. The hypothesis states that an average nest temperature of 32–33°C results in the birth of male crocodiles while cooler and warmer incubation temperatures result in female crocodiles.
What is the most likely explanation for how a group of crocodiles acquired the trait in which lower incubation temperatures give rise to male crocodiles?

A) Horizontal gene transfer from a related species has introduced changes in this group's genome.
B) Horizontal gene transfer from a related species has introduced changes in this group's proteome.
C) One or more mutations in the genome have been passed through the group by vertical descent.
D) One or more mutations in the proteome have been passed through the group by vertical descent.

54) You collect data on the population size of finches on an island in the Galapagos and correlate that with the amount of rainfall. You find that finch population tends to be correlated with increased rainfall. To predict the population size with different rainfall levels you would create which type of model?

A) mathematical model
B) temporal model
C) hierarchical model
D) structural model
E) mechanistic model

55) You wish to study how a protein binds to DNA, and which specific amino acids are involved. To do this you would create which type of model?

A) mathematical model
B) temporal model
C) hierarchical model
D) structural model
E) mechanistic model

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56) Kai is a biology graduate student who is investigating how different species of bacteria move through their environment. The experiment is conducted using fluorescent labels and a special type of microscope to examine motility structures that extend out from the membrane. Which level of study best describes her investigation?

A) Population ecology
B) Community ecology
C) Anatomy and physiology
D) Molecular biology
E) Cell biology

57) Kamal is an undergraduate researcher working in a marine biology laboratory. His project involves documenting changes in the plant species, coral species, and fish species living in a coral reef habitat. In addition to surveying the species diversity, he also takes weekly measurements of water temperature, pH, salinity, and dissolved oxygen levels. Which level of study best describes his investigation?

A) Ecosystem ecology
B) Population ecology
C) Cell biology
D) Molecular biology
E) Anatomy and physiology

FILL IN THE BLANK. Write the word or phrase that best completes each statement or answers the question.

58) The variety of species in a natural environment and their genetic diversity is called_____.

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Answer Key

Test name: Chapter 01

1) TRUE
2) TRUE
3) FALSE
4) FALSE
5) TRUE
6) FALSE
7) FALSE
8) FALSE
9) FALSE
10) TRUE
11) FALSE
12) [A, C, D]
13) C
14) D
15) A
16) A
17) D
18) D
19) A
20) E
21) D
22) D
23) B
24) C
25) B
26) D
27) A
28) D
29) E
30) A
31) B
32) A
33) E
34) B
35) A
36) C
37) A

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38) D
39) D
40) D
41) D
42) D
43) B
44) C
45) D
46) B
47) C
48) B
49) D
50) B
51) B
52) A
53) C
54) A
55) D
56) E
57) A
58) biodiversity

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