1. What is the name for the nonliving parts of an ecosystem?

- A. biotic factors
- B. biome factors
- C. abiotic factors
- D. aerobic factors

2. An enzyme is a biomolecule that increases the rate of a chemical reaction. An enzyme is a kind of __________.

- A. translator
- B. inhibitor
- C. ribosome
- D. catalyst

3. Which of the following recycle matter through an ecosystem?

I. the water cycle
II. the carbon cycle
III. the nitrogen cycle

- A. I and II only
- B. I, II, and III
- C. I and III only
- D. II and III only

4. Which of the following reasons best explains why a scientist would want to replicate Gregor Mendel's pea plant experiment?

- A. to test the conclusions of prior investigations
5. Examine the diagram of the enzyme catalase below:

![Diagram of enzyme catalase]

How does the structure of this enzyme help with its function?

- **A.** The enzyme's active site can change shape in order to match any substrates in need of a catalyst.
- **B.** The enzyme's shape fits its substrate's shape, thus allowing the enzyme to catalyze the appropriate reaction.
- **C.** The enzyme is much larger than its substrate, thus allowing the catalyzed chemical reaction to take place inside the enzyme.
- **D.** The enzyme's substrate is a mirror image of the enzyme, thus allowing it to reverse any reactions initiated by the enzyme.

6. The human appendix is a structure that suggests that humans evolved from plant-eating ancestors.

- **A.** behavioral
- **B.** embryonic
- **C.** essential
- **D.** vestigial
7. The figures above show four vertical cuts through different canyons. The top layer is the youngest layer, and the bottom layer is the oldest. In the layers are fossils of shellfish. Which cut would be possible evidence that a circular shellfish evolved from a hexagonal shellfish?

- A. Cut W
- B. Cut Y
- C. Cut Z
- D. Cut X

8. Each of the cells shown below is in a different stage of mitosis.

In what order does a cell go through the pictured stages?

- A. X → Y → V → W → U → Z
- B. V → Y → Z → W → U → X
- C. X → U → W → Z → Y → V
- D. V → Z → W → U → X → Y
9. Through the process of meiosis, sex cells are produced that are

- A. identical with a full set of genetic information.
- B. unique with a full set of genetic information.
- C. identical with a half set of genetic information.
- D. unique with a half set of genetic information.

10. All living organisms use energy. They also grow and reproduce. What is another characteristic of all living organisms?

- A. All living organisms consist of many cells with specialized organelles.
- B. All living organisms are composed of one or more cells.
- C. All living organisms must consume food in order to acquire nutrition.
- D. All living organisms can produce glucose through photosynthesis.

11. Janice is studying patterns of water usage. She has collected the following data:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Average Amount of Water Used by American Households (L)</th>
</tr>
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<tr>
<td>Bathing (per bath)</td>
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<td>Showering (per minute)</td>
<td>19</td>
</tr>
<tr>
<td>Flushing toilet (per flush)</td>
<td>19</td>
</tr>
<tr>
<td>Washing clothes (per load)</td>
<td>72</td>
</tr>
<tr>
<td>Washing dishes (per load)</td>
<td>61</td>
</tr>
</tbody>
</table>

Which of the following is an observation that Janice has made?

- A. On average, it takes 61 L of water to wash a load of dishes.
- B. Showers are better for the environment than baths.
- C. Each American probably uses about 420 L of water a day.
- D. Americans need to conserve the amount of water they use.

12. Which of the following types of passive transport involves the movement of molecules via special transport proteins?

- A. simple diffusion
- B. osmosis
13. A(n) _______ is a tentative, testable statement about the natural world that is capable of being supported or refuted by scientific evidence, whereas a(n) _______ is a well-established and highly-reliable explanation of a natural phenomenon.

- A. theory; hypothesis
- B. opinion; theory
- C. hypothesis; theory
- D. hypothesis; opinion

14. Speciation occurs during the evolutionary development, or phylogeny, of a species. In which of the following situations will speciation occur?

- A. When two populations are reproductively isolated.
- B. When a population becomes interbred.
- C. When a population becomes extinct.
- D. When two populations merge to become one population.

15. In the carbon cycle, carbon is taken in by plants

- A. as carbon dioxide in the process of photosynthesis.
- B. as water vapor in the process of photosynthesis.
- C. as carbon dioxide in the process of decomposition.
- D. as ammonia in the process of assimilation.

16. Which of the following best describes the process of diffusion?

- A. Diffusion is the movement of molecules from an area of lower concentration to one of higher concentration by random molecular motion.
- B. Diffusion is the movement of molecules from an area of higher concentration to one of lower concentration by random molecular motion.
- C. Diffusion is the movement of molecules from an area of higher concentration to one of lower concentration caused by an input of energy to the system.
- D. Diffusion is the movement of molecules from an area of lower concentration to one of higher concentration by random molecular motion.
concentration caused by an input of energy to the system.

17. Examine the diagram of the enzyme below:

How does the structure of this enzyme help with its function?

- A. Since the enzyme is larger than the substrate, catalytic reactions can occur within the enzyme itself.
- B. The enzyme's active site is amorphous and can change its shape to fit any substrate.
- C. Since the enzyme's shape matches the substrate's shape, it catalyzes only reverse reactions.
- D. The enzyme's shape complements the substrate's shape, so it only catalyzes specific reactions.

18. ________ are RNA and protein complexes that are found in all cells. These complexes help cells during protein translation by joining amino acids together to form polypeptides.

- A. Ribosomes
- B. Vacuoles
- C. Chloroplasts
- D. Lysosomes

19. All species have a certain amount of genetic diversity within their populations. How is genetic diversity important to the concept of natural selection?

- A. The more genetic diversity a species has, the less likely it is that natural selection will occur.
- B. Without genetic diversity, natural selection cannot occur.
- C. Genetic diversity controls the speed at which natural selection is able to occur.
- D. Genetic diversity decreases the generation time of species, which contributes to rapid natural selection.

20. 
Examine the Punnett square above. The letters represent the genotypes of a male and a female pear tree. What are the possible genetic variations that occur in their offspring?

A. BB, Bb
B. only BB
C. BB, Bb, and bb
D. only Bb

21. As the human population continues to grow, use technology, and consume resources, they often modify the ecosystems around them. In which of the following ways can humans counteract negative influences they might have on the environment?

A. Humans can use cleaner alternate energy sources.
B. Humans can recycle or reuse materials.
C. Humans can use public transportation systems.
D. all of these

22. Materials are able to move across a cell membrane through one of two methods: active transport or passive transport. What is the difference between active transport and passive transport?

A. Active transport requires the cell to expend energy, while passive transport does not.
B. Active transport requires the cell to form vesicles, while passive transport requires the use of membrane pumps.
C. Active transport is the only form of transport that requires the use of protein carriers.
D. Passive transport is the only form of transport that requires the use of protein carriers.

23. Which of the following is true about plants and cellular energy?

A. Plants can both use light energy to produce food molecules and obtain cellular energy from the bonds of these food molecules during cellular respiration.
B. Plants use light energy to produce food molecules during cellular respiration, and obtain cellular energy from the bonds of these food molecules during photosynthesis.
C. Plants use light energy to produce food molecules during photosynthesis, and obtain cellular energy from the bonds of these food molecules during cellular respiration.
D. Plants can both use light energy to produce food molecules and obtain cellular energy from the
24. A polymer is a large molecule that forms when smaller molecules known as monomers bond covalently in a repeating pattern. There are many biological polymers such as nucleic acids, proteins, and starches. What are the monomer units that make up starches?

- A. amino acids
- B. nucleotides
- C. fatty acids
- D. glucose

25. The human body contains approximately 70% water by weight. Water is found inside and outside of cells, and it is able to carry nutrients into and around cells in addition to carrying wastes away from cells. Why is water able to do this?

- A. Water is an ionic solution.
- B. Water is a nonpolar covalent compound.
- C. Water is very acidic.
- D. Water is able to dissolve many substances.

26. During photosynthesis, plant cells take in carbon dioxide, CO₂, and release oxygen, O₂. How is this different from cellular respiration?

- A. During cellular respiration, oxygen is inhaled and CO₂ and H₂O are exhaled.
- B. During cellular respiration, cells use ATP to convert insulin into glucose and CO₂.
- C. During cellular respiration, the mitochondria form CO₂ during the process of fermentation.
- D. During cellular respiration, cells use oxygen to break down glucose and release CO₂, H₂O, and ATP.

27. Which of the following interactions is an example of symbiosis?

- A. a population of hummingbirds migrates during the summer
- B. a tropical bird performs a courtship dance for a mate
- C. an insect acts as a pollinator for a plant species
D. a mother bear feeds and protects her cubs

28. When a group of cells work together, such as in bones, muscles, or nerves, they are known as _______.

- A. an organelle
- B. an organism
- C. a tissue
- D. an organ

29. What is the ultimate source of energy for all ecosystems?

- A. plants
- B. the Sun
- C. secondary consumers
- D. primary consumers

30. ______ is a source of genetic variation that involves the swapping of sections of chromosomes during meiosis.

- A. Transcription
- B. Fertilization
- C. Crossing over
- D. Translation

31. Which of the following organelles contains most of the cell's DNA?

- A. mitochondrion
- B. nucleus
- C. lysosome
- D. ribosome

32. Hardwood trees, such as oaks, maples, and birches, are most commonly found in ______ biomes.

- A. arctic tundra
- B. grassland
33. The duck-billed platypus has 52 chromosomes in its body cells. When the platypus's body cells divide by mitosis, how many chromosomes will each daughter cell have?

- A. 104
- B. 52
- C. 156
- D. 26

34. An increased greenhouse effect and the depletion of the ozone layer are two examples of

- A. processes that have positive effects on all organisms on Earth.
- B. processes that have no effect on the atmosphere.
- C. processes triggered by human activities that have impacted the natural balance of the Earth's atmosphere.
- D. naturally-occurring processes that have caused changes in the atmosphere during the past century.

35. Suppose that the temperature in the ecosystem below dips below freezing.

What would happen to the fish swimming in the lake?
A. Ice would form on the surface of the lake and insulate the fish.
B. The fish would die because the lake would freeze solid.
C. Ice would only form on the bottom of the lake, so the fish would be okay.
D. The fish would move more rapidly to increase their body temperature.

36. What does the following diagram illustrate?

- Algae → Minnows → Salmon → Bear

A. a food web
B. a food pyramid
C. a food chain
D. a trophic level

37. Which of the following processes returns carbon to the atmosphere?

A. respiration
B. evaporation
C. transpiration
D. photosynthesis

38. Sugars such as glucose, fructose, and ribose are examples of ________.

A. lipids
B. proteins
C. nucleic acids
D. carbohydrates

39. Which of the following best describes a carbohydrate?

- Carbohydrates always consist of a five-carbon sugar, a nitrogenous base, and one or more phosphate groups and are used to store genetic information.

- Carbohydrates are composed of amino acid monomers and are involved in cell signaling, cell transport, immune responses, and the cell cycle.
Carbohydrates are organic macromolecules that are insoluble in water and have the ability to store
C. energy for extended periods of time.

Carbohydrates are organic macromolecules that are made up of carbon, hydrogen, and oxygen
D. atoms and are used for energy storage or as structural molecules.

40. The Human Genome Project has determined the sequence of base pairs in the human body. How does this project directly impact our understanding of genetic diseases?

A. It makes it easier to find the genes causing diseases.
B. It provides a cure for all diseases.
C. It explains the cause of all genetic diseases.
D. all of these

41. Select the list below that would best exemplify an ecosystem.

A. a warm, humid climate with plenty of rainfall
B. bees and wasps around a group of purple cornflowers
C. a school of sunfish
D. a nest of mockingbirds, some bullfrogs, a pond, and a sandy shore

42. The fluid mosaic model shown above describes the structure and function of

A. chloroplasts.
B. chromosomes.
C. nuclei.
D. cell membranes.
43. The first commercial application of genetic engineering was the use of bacteria to make insulin, a medicine needed by diabetics. Before the use of genetically-engineered bacteria, insulin had to be harvested from the pancreases of slaughtered animals.

How has genetic engineering most likely improved the lives of diabetics?

A. It has made insulin cheaper and more readily available.
B. It has made the incidence of diabetes decrease.
C. It has made it easier for diabetics to inject themselves with insulin.
D. It has made the demand for insulin decrease.

44. During meiosis, each diploid parent cell divides _______ and produces _______ haploid daughter cells.

A. once; two
B. once; four
C. twice; four
D. twice; two

45. The cytoplasm and two nuclei that are formed during mitosis are separated into two identical daughter cells during _______.

A. interphase
B. cytokinesis
C. meiosis
D. prophase

46. In 1996, a group of scientists from Scotland used a somatic (non-sex) cell of an adult sheep to produce an identical copy of that sheep. The process through which a genetically identical cell or organism is produced is known as _______.

A. carbon copying
B. vector analysis
C. xeroxing
D. cloning
47. Which of the following occurs during the interphase stage of the cell cycle?

   I. DNA is replicated.
   II. The cell divides.
   III. The cell grows in size.

   - A. I and III only
   - B. II only
   - C. I and II only
   - D. I, II, and III

48. When cells perform photosynthesis, they transform energy from one form to another. Which of the following is true about the transformation process?

   I. Chlorophyll absorbs light from the Sun.
   II. Oxygen is given off as a by-product.
   III. Low-energy carbon molecules, such as CO₂, are formed.
   IV. Chemical potential energy is stored in carbohydrate bonds.

   - A. II and IV only
   - B. I, II, and III only
   - C. I, II, and IV only
   - D. I and II only

49. How does the size of a eukaryotic organism normally compare to the size of a prokaryotic organism?

   - A. Eukaryotes and prokaryotes are both usually very small organisms.
   - B. Eukaryotes are usually much smaller than prokaryotes.
   - C. Eukaryotes and prokaryotes are both usually very large organisms.
   - D. Eukaryotes are usually much larger than prokaryotes.

50. The diagram below shows an energy pyramid.
Which of the following best explains why the number of organisms at each level decreases while moving up the energy pyramid?

A. The animals at higher levels are more competitive, so fewer animals survive.

B. The animals at each level have more predators, so they produce more offspring.

C. The animals at higher levels move more than animals at lower levels, so they require more energy.

D. The animals at each level use energy, so only a small amount of their energy is available to the next level.

---

51. The diagram below illustrates a process that can occur during cell division and results in an alteration in the composition of a chromosome. Each letter in the diagram represents a specific gene on the chromosome.

The diagram shows that a part of the chromosome is left out and the resulting chromosome is shorter than normal. This known as

A. chromosome deletion.

B. chromosome translocation.

C. chromosome nondisjunction.

D. chromosome inversion.

---

52. At the beginning of cellular respiration, energy is stored in the bonds of ________ molecules. At the end of the cellular respiration process, energy is stored in the bonds of ________ molecules.
53. Diffusion is the spontaneous movement of a substance from an area of _______ concentration to an area of _______ concentration.

A. high; similar
B. low; similar
C. lower; higher
D. higher; lower

54. The structure of a certain blood protein was compared among four organisms. Each organism was compared to each of the other organisms. The level that any two protein structures match can be found at intersection of the rows and columns.

| Comparison: Percentage Match of Blood Protein Structure Among Four Organisms |
|-----------------------------|-----------|-----------|-----------|-----------|
| Organism | A | B | C | D |
| A | Not Applicable | 76% | 65% | 60% |
| B | 76% | Not Applicable | 85% | 51% |
| C | 65% | 85% | Not Applicable | 77% |
| D | 60% | 51% | 77% | Not Applicable |

Based on the data, which of the following organisms are most closely related by evolution?

A. C and B
B. D and C
C. A and B
D. B and D

55. Which choice below shows the organization of the biosphere from the most specific category to the broadest category?

A. organism → community → population → biome → ecosystem
B. organism → population → community → biome → ecosystem
C. organism → community → population → ecosystem → biome
D. organism → population → community → ecosystem → biome

56. Which of the following is a true statement about science?

A. Scientific knowledge is continually being extended, refined, and revised.
B. Scientific ideas are able to be modeled during investigations.
C. Science can be defined as a body of knowledge about the natural world.
D. all of these

57. A cheetah hunts, kills, and eats a gazelle. This interaction is an example of _______.

A. mutualism
B. predation
C. commensalism
D. parasitism

58. Evolution is the fundamental concept underlying all of biology and is supported by multiple forms of scientific evidence. Which of the following supports evolution?

A. fossil records
B. molecular biology
C. comparative embryology
D. all of these

59. All living organisms contain carbon atoms. Which of the following is an important characteristic of carbon?

A. Carbon atoms can bond with many other kinds of atoms to form very stable molecules.
B. Carbon atoms can bond with any other atom, but they cannot form bonds with other carbon atoms.
C. Carbon atoms are highly reactive and form unstable bonds with any available atom.
D. Carbon atoms are very stable and do not easily form bonds with other atoms.
60. Which of the following is true about scientific theories?

I. New research is often done to learn more about existing scientific theories.

II. Scientific theories can be revised, changed, or even rejected.

III. Scientific theories are considered to be facts and cannot ever be modified.

IV. New scientific theories can be formed to explain new phenomena.

- A. I and IV only
- B. III only
- C. I, II, and IV only
- D. I, II, III, and IV

61. Which hereditary rule explains why a self-fertilizing parent that is heterozygous for the A locus (Aa) can produce offspring that are AA or aa?

- A. codominance
- B. principle of segregation
- C. principle of independent assortment
- D. dominance

62. Cell theory states that

- A. All of these answers are correct.
- B. new cells are produced by existing cells.
- C. cells are the basic unit of structure and function in living things.
- D. all living things are composed of cells.

63. Plants transfer nitrogen in the nitrogen cycle

- A. through combustion.
- B. through assimilation.
- C. through respiration.
- D. through transpiration.
64. An increase in the atmospheric levels of carbon dioxide (CO₂) is the biggest contributor to which of the following?

- A. ozone depletion
- B. wind storms
- C. global warming
- D. El Nino

65. Membrane organelles known as _______ contain enzymes specialized to break down ingested materials, secretions, and wastes.

- A. lysosomes
- B. ribosomes
- C. vacuoles
- D. chloroplasts

66. Select the list below that would best exemplify a population.

- A. a warm, humid climate with plenty of rainfall
- B. a nest of mockingbirds, some bullfrogs, a pond, and a sandy shore
- C. a school of sunfish
- D. bees and wasps around a group of purple cornflowers

67. Cells use __________ to take in large molecules or other cells.

- A. passive transport by diffusion
- B. active transport by carrier proteins
- C. active transport by endocytosis
- D. passive transport by osmosis

68. A farmer plants two species of grass with similar nutrient needs on the same small plot of land. What kind of interaction will most likely occur between the two species?

- A. competition
- B. mutualism
69. How does DNA help with the transfer of genetic material from parents to offspring?

A. Proteins bind to DNA, which activates them and forces them to express certain traits.
B. Enzymes break down DNA, releasing amino acids that join to form proteins and express various traits.
C. DNA is mutated by a chemical passed from parents to offspring to form proteins that express traits.
D. Genes in DNA code for the production of proteins, which cause traits to be expressed.

70. Which of the following is an example of natural selection?

A. A species of corn is genetically modified to produce a natural insecticide, resulting in an increase in crop growth and a decrease in insect population.
B. An aloe vera plant species possessing a trait for extra thick leaves survives a long drought in a desert, and an aloe vera species that has thinner leaves does not.
C. Owls sleep during the day, and doves sleep during the night.
D. A farmer breeds a certain cow that produces more milk than his other cows to produce more cows that produce a lot of milk.

71. Food webs and food chains are two different ways that ecologists illustrate the interrelatedness of organisms in an ecosystem. What is the relationship between a food web and food chain?

A. Food chains are only used to illustrate organisms that consume only one kind of organism rather than multiple kinds of organisms, as illustrated in a food web.
B. Food webs illustrate all the organisms in an ecosystem dependent on one food chain.
C. Food chains illustrate only one trophic level of a food web.
D. Food webs illustrate multiple interrelated food chains.

72. The nucleotide of DNA is one large molecule composed of three smaller molecules. Which of the following sets of molecules bond together to form a nucleotide?

A. a purine, a pyrimidine, and a five-carbon sugar
B. adenine, thymine, and cytosine
C. deoxyribose, a nitrogen base, a phosphate group
D. a nitrogen atom, a phosphate atom, and a five-carbon sugar

73. Comparative biochemistry is the study of similarities and differences in ______ among organisms.

A. DNA sequence
B. vestigial structures
C. development
D. homologous structures

74. Nearly all mammals have seven cervical (neck) vertebrae. This fact implies that

A. all animals can turn their heads the same amount.
B. all mammals have to stretch their necks to obtain food.
C. all mammals descended from a common ancestor.
D. predators prefer to eat animals with either six or eight cervical vertebrae.

75. In the 19th century, Gregor Mendel performed a series of experiments on pea plants that led to the establishment of the field of genetics. He determined that genetic information is passed from a parent to its offspring during reproduction. He did not know how this information was stored or transmitted from one organism to another.

Almost 100 years later, Oswald Avery did experiments on mice using virulent pneumonia and discovered that the transmission of genetic characteristics from parent to offspring is done through the inheritance of DNA molecules.

A few years after Avery determined that DNA was the molecule used for the storage and transmission of genetic information, James Watson and Francis Crick used data from X-ray studies to create an accurate model of the structure of DNA.

Based on the paragraphs above, it can be concluded that

A. scientific research is always done separately and independently of all other scientific knowledge.
B. once a scientific theory has been established there cannot ever be any new scientific research done on the subject.
C. scientific knowledge has not changed at all over the past two centuries.
76. What role do ATP and NADH play in living cells?

- A. They also store and transfer information.
- B. They are involved in cell-to-cell signaling.
- C. They provide structural support to cell membranes.
- D. They store and transfer energy.

77. In order for cells to function properly, the enzymes that they contain must also function properly. What can be inferred using the above information?

- A. Cells do not function well at pH's that are too high or too low.
- B. Cells can function equally as well at all pH's.
- C. Cells function best at low pH's.
- D. Cells function best at high pH's.

78. The diagram below shows a food chain.

\[ \text{Grass} \rightarrow \text{Rabbit} \rightarrow \text{Weasel} \rightarrow \text{Fox} \rightarrow \text{Fungi} \]

Which population would most likely increase if the weasel was removed from the food chain?

- A. grass
- B. rabbit
- C. fox
- D. fungi
79. Mrs. Smith has blood type A. Her father has blood type A, and her mother has blood type B. If Mr. Smith has blood type AB, what is the probability that they will have a child with blood type AB?

- A. 25%
- B. 50%
- C. 100%
- D. 0%

80. Science can best be defined as

- the development of new technologies and products in order to promote the interests of public companies.
- the construction of explanations and predictions about any topic through the use of biased opinions.
- the study of the economic and social structure of human society through the use of public opinion.
- the construction of testable explanations and predictions about the natural world through the use of evidence.

81. In a population of a species of field mice, favorable traits in the mice are likely to _______ over time, and unfavorable traits are likely to _______ over time.

- A. decrease, increase
- B. increase, decrease
- C. decrease, decrease
- D. increase, increase

82. Peas, beans, and peanuts are all examples of legumes. Legumes are a specific type of plant which possess nodules on their roots, as shown below.
What is the purpose of these nodules?

A. The nodules contain chemicals which repel insects, like ants and beetles.
B. The nodules contain bacteria which can convert atmospheric nitrogen into ammonia.
C. The nodules store plant sugars which are created during the process of photosynthesis.
D. The nodules contain pumps which allow water to enter the roots using reverse osmosis.

83. Which of a cell's organelles releases energy stored in food?

A. chloroplasts
B. endoplasmic reticulum
C. lysosomes
D. mitochondria

84. Which of the following organelles plays a role in the disposal of cellular waste and is responsible for processing, sorting, and modifying proteins?

A. plasma membrane
B. mitochondrian
C. Golgi apparatus
D. ribosome

85. Nucleic acids, proteins, and other large biological molecules are known as polymers because

A. they all contain only ionic bonds.
B. they contain many small, repeating subunits bonded together.
C. they are the base units used in the formation of plastics.
D. they all have the capability of functioning as enzymes.

86. It has been found that the tenderness of beef can be predicted by analyzing a cow's genes. So, commercial tests are now available for farmers to be able to determine which of their cows possess the "tough" gene and which possess the "tender" gene. If a farmer routinely tests his cattle and only allows cows with the "tender" gene to mate, what is he doing?

A. selective breeding
B. genetic bias
87. Adenosine triphosphate, or ATP, is primarily used as ______ in living organisms.

- A. a source of energy
- B. a reproductive enzyme
- C. a muscle relaxing hormone
- D. a blood coagulant

88. A science class is studying solubility, so they perform a lab to answer the question, "How does temperature affect the solubility of sugar in water?" The results of their experiment appear below.

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>Grams of sugar that dissolved in 100 g water</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>180</td>
</tr>
<tr>
<td>20</td>
<td>205</td>
</tr>
<tr>
<td>40</td>
<td>240</td>
</tr>
<tr>
<td>60</td>
<td>280</td>
</tr>
<tr>
<td>80</td>
<td>360</td>
</tr>
<tr>
<td>100</td>
<td>490</td>
</tr>
</tbody>
</table>

Which of the following conclusions best answers the experimental question?

- A. The solubility of sugar in water increases with an increase in temperature.
- B. The solubility of sugar in water is 490 g sugar/100 g water at 100°C.
- C. All of these statements are valid answers to the experimental question.
- D. Sugar is composed of carbon, hydrogen, and oxygen atoms covalently bonded together.

89. Janice is studying patterns of water usage. She has collected the following data:

<table>
<thead>
<tr>
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<th>Average Amount of Water Used by American Households (L)</th>
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</tr>
<tr>
<td>--------------------------------</td>
<td>------------------------</td>
</tr>
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<td>72</td>
</tr>
<tr>
<td>Washing dishes</td>
<td>61</td>
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</table>

Which of the following is an inference that can be made from this data set?

- **A.** Bathing requires more water than washing a load of clothes.
- **B.** Six minute showers are better for the environment than baths.
- **C.** If Americans were to wash their clothes and dishes by hand, they would conserve more water.
- **D.** On average, it takes 19 L of water to flush a toilet.

90. Which of the following sequences represents the proper levels of organization (from simplest to most complex) in multicellular organisms?

- **A.** whole organisms, organ systems, organs, tissues, cells, organelles
- **B.** organelles, cells, tissues, organs, organ systems, whole organisms
- **C.** whole organisms, tissues, organ systems, organs, cells, organelles
- **D.** organelles, tissues, cells, organs, organ systems, whole organisms

91. Natural selection operates on populations over many generations. Which of the following allows natural selection to occur?

- **A.** the unequal ability of individuals to survive and reproduce
- **B.** the ability for populations to change quickly from one trait to the next
- **C.** the old age of the individuals which causes them to die
- **D.** the desire and the advantage of a population to remain constant

92. Atoms of what element form the backbone of large, complex molecules such as sugars and fats?

- **A.** oxygen
- **B.** carbon
- **C.** sodium
93. AB blood type is an example of _________.

- A. incomplete dominance
- B. polygenic inheritance
- C. independent assortment
- D. codominance

94. A scientist performed an experiment on mice. Her results are posted below.

<table>
<thead>
<tr>
<th>Experiment Group</th>
<th>Duration of Cigarette Smoke Exposure</th>
<th>Number of Cases of Lung Cancer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0 days</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>500 days</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>1,000 days</td>
<td>27</td>
</tr>
<tr>
<td>4</td>
<td>1,500 days</td>
<td>32</td>
</tr>
</tbody>
</table>

After analyzing her results, she stated that a mouse must be exposed to more than 500 days of cigarette smoke before the mouse can get lung cancer. Do you agree with the scientist's conclusions?

- A. Yes; there is no evidence to support the idea that a mouse can get lung cancer without being exposed to cigarette smoke for more than 500 days.
- B. Yes; the majority of the lung cancer cases were the result of more than 500 days of cigarette smoke exposure.
- C. No; there is no evidence to support the idea that cigarette smoke exposure will lead to lung cancer in mice.
- D. No; some mice may have developed lung cancer in less than 500 days of cigarette smoke exposure.

95. Which of the following describes the fundamental difference between prokaryotic and eukaryotic cells?

- A. Eukaryotic cells are the only type of cells that can possess a cell wall.
- B. Eukaryotic cells are only found in protists, bacteria, and viruses.
C. Prokaryotic cells do not have a true nucleus or membrane-bound organelles.

D. Prokaryotic cells are all viruses and rely on the infection of a host cell to replicate.

96. Which of the following organelles convert solar energy into glucose and oxygen?

- A. chloroplasts
- B. endoplasmic reticuli
- C. vacuoles
- D. mitochondria

97. 

_Bacterial Growth Rates According to Temperature_

<table>
<thead>
<tr>
<th>Temperature (degrees Celsius)</th>
<th>Time for the population to double (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>844</td>
</tr>
<tr>
<td>15</td>
<td>627</td>
</tr>
<tr>
<td>20</td>
<td>221</td>
</tr>
<tr>
<td>25</td>
<td>132</td>
</tr>
<tr>
<td>30</td>
<td>58</td>
</tr>
<tr>
<td>35</td>
<td>24</td>
</tr>
<tr>
<td>40</td>
<td>71</td>
</tr>
</tbody>
</table>

Ali performed an experiment to see which temperature a certain species of bacteria multiplies the fastest. Ali recorded his results in the table above. Using Ali's evidence, what temperature allows this species of bacteria to multiply most rapidly?

- A. 35°C
- B. 10°C
- C. 40°C
- D. 25°C

98. Sometimes, during the process of replication, the DNA code is copied incorrectly, and an incorrect nucleotide is attached to the new strand of DNA.
This incorrect copy is known as a
- A. codon.
- B. mutation.
- C. protein.
- D. duplicate.

99. Sarah is doing an experiment on pea plants. She is studying the color of the pea plants. Sarah has noticed that many pea plants have purple flowers and many have white flowers.

Sarah crosses a homozygous white flower and a homozygous purple flower. The cross results in all purple flowers.

What is true of the color of pea plants?
- A. White flowers are dominant to purple flowers.
- B. White flowers and purple flowers are codominant.
- C. Purple flowers and white flowers are recessive to red.
- D. Purple flowers are dominant to white flowers.

100. The cell membrane is a highly selective barrier that controls the movement of substances in and out of the cell. In fact, polar molecules are unable to go across unless

- A. they react with other substances to become nonpolar.
- B. they are enclosed in water-filled vesicles.
- C. they pass through channels in the cell membrane.
- D. they are broken down into smaller pieces.
101. If the water concentration inside a cell is higher than the water concentration outside the cell, water flows out of the cell. This method of molecular transport is called

- A. exocytosis.
- B. endocytosis.
- C. a sodium pump.
- D. osmosis.

102. Eukaryotic cells contain organelles that harvest energy from organic compounds to make ATP. ATP is the main form of energy used by cells. Which cell organelles are responsible for making most of the cell's ATP?

- A. lysosomes
- B. chloroplasts
- C. mitochondria
- D. endoplasmic reticulum

103. Which of the following are reactants in the process of cellular respiration?

- A. glucose and oxygen
- B. glucose and water
- C. carbon dioxide and oxygen
- D. carbon dioxide and water

104. Fur seals and sea lions have similar body shapes and features. Based on their anatomy, they seem to have a relatively recent common evolutionary ancestor.

What further evidence would best substantiate that the two animals have a recent common ancestor?

- A. The animals have very similar sequences in their DNA.
- B. Ten million year old fossils are found of both animals.
- C. Both animals live in the Pacific Ocean.
- D. The animals are members of different taxonomic kingdoms.

105. A certain type of flower has two alleles for color (blue, purple), and two alleles for stem height (tall, short). A tall blue flower and a short purple flower are crossed, resulting in tall blue flowers, short blue flowers, tall purple flowers, and short purple flowers.

What law does this example help to prove?
106. The diagram below represents a stage of mitosis in which the chromosomes line up in the middle of the cell.

What is the name of this phase of mitosis?

- A. metaphase
- B. anaphase
- C. prophase
- D. telophase

107. Protein molecules are composed of long chains of ________.

- A. DNA
- B. RNA
- C. amino acids
- D. ribosomes

108. A ________ is a kind of lipid that can store energy for a long period of time. These lipids are made up of long chains of carbon and oxygen atoms bonded to a backbone structure.

- A. carbohydrate
- B. nucleic acid
- C. fat
- D. protein
109. Almost no species ever reaches its biotic potential—the population size that the species could produce if all individuals survived and produced offspring. Anything that prevents the species from reaching its biotic potential is called a

- A. symbiote.
- B. producer.
- C. limiting factor.
- D. capacity limiter.

110. The large, grazing mammals typical of specific _______ biomes known as savannas include elephants, zebras, and giraffes.

- A. grassland
- B. taiga
- C. temperate forest
- D. desert

111. The sequence of bases on one strand of a DNA molecule is ATTGCCCATG. What will be the sequence on the complementary strand?

- A. TAACGGGTAC
- B. ATTGCCCATG
- C. CGGTAAACGT
- D. GCCATTTGCA

112. Biotechnology is used in a variety of areas from agriculture to pharmaceuticals to fuels. How is the use of biotechnology in agriculture beneficial to the environment?

- A. Genetically altered crops are more delicious.
- B. Genetically altered crops are unable to reproduce.
- C. Genetically altered crops require less pesticide.
- D. Genetically altered crops produce less carbon dioxide.
113. Over the past generations, there has been a great deal of deforestation to accommodate the increase in the human population. Which statement describes one of the main impacts of deforestation?

- A. decrease in sea levels
- B. decrease in animal populations
- C. decrease in global warming
- D. decrease in carbon monoxide emissions

114. Which of the following is the only cell organelle that is capable of converting light energy into chemical energy?

- A. chloroplast
- B. endoplasmic reticulum
- C. vacuole
- D. mitochondrion

115. How could an apple farmer increase the number of genotypes and phenotypes present in his next apple crop?

- A. Cross plants that have very different characteristics.
- B. Cross plants that have the same characteristics.
- C. Make genetic clones of plants using asexual reproduction.
- D. It would be impossible for a farmer to increase the genetic variation of plants.

116. Some organisms have favorable traits that are well-suited to the environment at hand. Organisms with this advantage are more likely to thrive, reproduce, and pass their traits to future generations than organisms without favorable traits.

This process is known as

- A. mimicry.
- B. geographic isolation.
- C. reproductive isolation.
- D. natural selection.

117. A scientific theory is best defined as

- A. a widely accepted explanation for a scientific phenomenon that is supported by extensive amounts
of data.

B. a universal truth that does not need scientific evidence to support it.
C. an educated guess about how a scientific phenomenon works.
D. a testable statement that suggests an explanation for a scientific phenomenon.

118.

<table>
<thead>
<tr>
<th>Species</th>
<th>Nucleotide sequence of gene ABX</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>TAC ATA CGC GGG ACC TTT AGT GGG GCC CCC ACT</td>
</tr>
<tr>
<td>B</td>
<td>TAC ATA CCC CCG ACC TAT CGC GGG GCG CCC ACT</td>
</tr>
<tr>
<td>C</td>
<td>TAC ATA CCC CCG ACC TTT CGC GGG GCG CCC ACT</td>
</tr>
<tr>
<td>D</td>
<td>TAC ATA CGG GGG AAA TTT CGC TTT GCG CGC ACT</td>
</tr>
</tbody>
</table>

The gene sequences of four species for a blood protein encoded by gene ABX are shown in the table above. Which of the species are most closely related?
A. Species B and Species D
B. Species A and Species B
C. Species B and Species C
D. Species C and Species D

119. White-tailed deer are considered to be an overpopulated species in the central United States. Which of these events probably contributed the most to white-tailed deer exceeding their carrying capacity?

A. a large increase in available grassland
B. the occurrence of a genetic mutation that prevented breeding
C. a large decrease in predators, such as wolves
D. the water supply in the habitat remained steady

120. The leg of an iguana and the wing of a bird look different, but they have similar functions and likely evolved from the same distant ancestor. Structures such as these are said to be _______.

A. heterogeneous
B. homologous
C. vestigial
Answers

1. C
2. D
3. B
4. A
5. B
6. D
7. D
8. B
9. D
10. B
11. A
12. C
13. C
14. A
15. A
16. B
17. D
18. A
19. B
20. A
21. D
22. A
23. C
24. D
25. D
26. D
27. C
28. C
29. B
30. C
31. B
32. C
33. B
34. C
35. A
36. C
37. A
38. D
39. D
40. A
41. D
42. D
43. A
44. C
45. B
46. D
47. A
48. C
49. D
106. A
107. C
108. C
109. C
110. A
111. A
112. C
113. B
114. A
115. A
116. D
117. A
118. C
119. C
120. B