

1. Cell theory was first proposed in 1838. Evidence obtained through additional scientific investigations resulted in the current cell theory. Which statement describes a component of the original cell theory that was removed because of the new scientific knowledge?

- A. All living things are made of cells.
- B. All cells come from other preexisting cells.
- C. Cells form through spontaneous generation.
- D. Cells are the basic structural and functional units of life.

2. Which invention from the 17th century allowed for the development of modern cell theory?

- A. X-rays
- B. computers
- C. the light microscope
- D. the scanning electron microscope

3. A plant and an animal are both living things. According to the Cell Theory, what can you conclude about these two very different organisms?

- A. Plants have cells but animals do not.
- B. They are both made of one or more cells.
- C. They both come from the same kind of cell.
- D. They both come from a non-living organism.

4. The combined observations of Mattias Schleiden, Theodor Schwann and Rudolph Virchow resulted in the formation of the cell theory. Which of the following is not part of the cell theory?

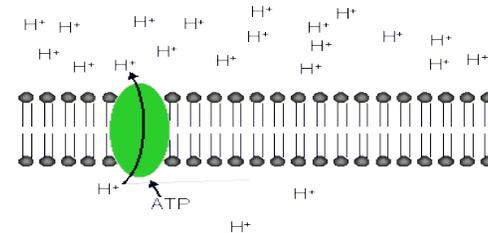
- A. All cells contain a nucleus.
- B. All cells come from other living cells.
- C. All living organisms are made of one or more cells.
- D. Cells are the basic unit of structure and function of all living things.

SC.9.12.L.14.3 Cell Structure and Function

5. There are some similarities between prokaryotic and eukaryotic cells. Which of the following structures is found in both prokaryotic and eukaryotic cells?

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

6. Look at the cross section of a cell membrane of a eukaryotic cell. H⁺ ions are being pumped from a low concentration to a high concentration.



Which of the following best describes the type of transport across the cell membrane?

- A. active transport
- B. passive transport
- C. facilitated diffusion
- D. co-transport

7. Which type(s) of cells have genetic material that is contained in a nucleus?

- A. bacteria
- B. plants only
- C. animals only
- D. both plant and animal cells

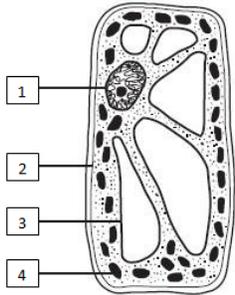
8. Which characteristic do most plants have in common?

- A. they are unicellular
- B. they are prokaryotic
- C. they produce seeds
- D. they are autotrophic

9. Which cell structure is correctly paired with its primary function?

- A. ribosome - protein synthesis
- B. mitochondrion - movement
- C. vacuole - cell division
- D. nucleus - storage of nutrients

10. The diagram below represents a cell of a green plant.



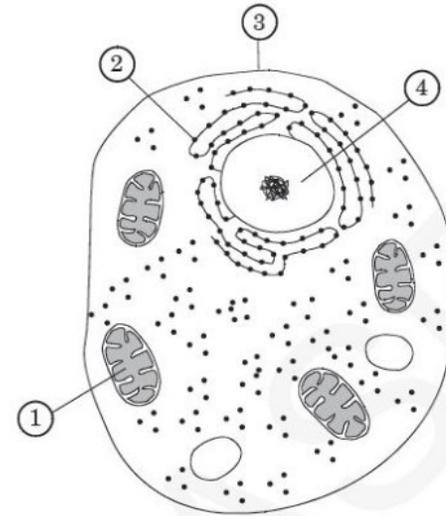
Solar energy is used to produce energy-rich compounds in which structure?

- A. 1
- B. 2
- C. 3
- D. 4

11. A person with swollen gums rinses his mouth with warm salt water, and the swelling decreases. Which of the following has occurred?

- A. The swollen gums have absorbed the saltwater solution.
- B. The saltwater solution lowers the temperature of the water in the gums.
- C. The salt in the solution has moved against the concentration gradient.
- D. The water in the gums has moved out due to the high concentration of salt in the solution.

12. The diagram below represents a cell.



Which organelle is the site where amino acids are synthesized into proteins?

- A. 1
- B. 2
- C. 3
- D. 4

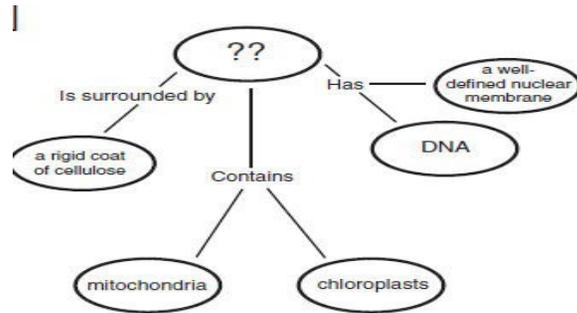
13. Joy took the notes shown below while learning about cells.

- Forms boundary between a cell and the outside environment
- Controls the movement of materials into and out of the cell
- Consists of double layer of phospholipids

She forgot to write the name of the cell structure that her class was studying that day. What structure is described in her notes?

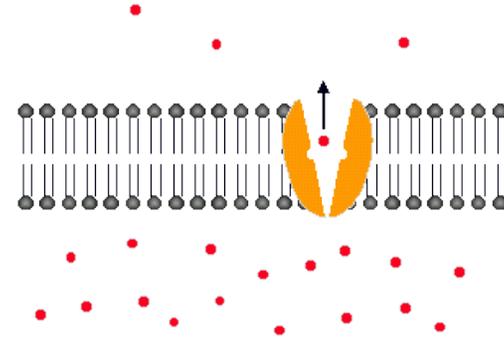
- endoplasmic reticulum
- cell membrane
- cell wall
- nucleus

14. Which of these best completes this concept map?



- an animal cell
- a prokaryotic cell
- a virus
- a plant cell

15. Look at the diagram of a cross-section of a cell membrane below.



The cell membrane controls movement of materials into and out of the cell.

The following particles are moving from high concentration to low concentration and are using a carrier protein. How would you describe this type of movement across the membrane?

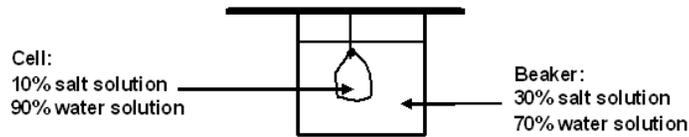
- simple osmosis
- active transport
- simple diffusion
- facilitated diffusion

16. The cell membrane of the red blood cell will allow water, oxygen, and carbon dioxide to pass through. Because other substances are blocked from entering, this membrane is called:

- perforated
- semi-permeable
- non-conductive
- permeable

17. Osmosis occurs when there is a different concentration of solute molecules on each side of the membrane. The drawing below shows a beaker containing

a 30% salt solution and a suspended cell containing a 10% salt solution.



What statement best describes the cell after 20 minutes?

- A. Water will move from the cell into the beaker, resulting in a smaller cell.
- B. Water will move from the beaker into the cell, resulting in a larger cell.
- C. Salt will move from the cell into the beaker, resulting in a smaller cell.
- D. Salt will move from the beaker into the cell, resulting in a larger cell.

18. Muscle cells are responsible for obtaining energy so the body can perform voluntary and involuntary movement. Using your knowledge about organelles and muscles, how would a muscle cell differ from other types of animal cells?

- A. The muscle cell would have larger centrioles than the other types of animal cells.
- B. The muscle cell would have more mitochondria than the other types of animal cells.
- C. The muscle cell would have a larger golgi apparatus than other types of animal cells.
- D. The muscle cell would have more endoplasmic reticulum than the other types of animal cells.

19. Cells found in plants and animals have similarities but can differ in function. Consider the following two organisms: a corn plant cell (*Zea mays*) and a camel cell (*Bactrianus ferus*). What is the best explanation for the difference in the cellular vacuole size between these two biotic organisms?

- A. The corn cells' have a small vacuole size because it does not need long term water and electrolyte storage.
- B. The camel cells' have a small vacuole size because it does not need long term water and electrolyte storage.
- C. The camel cells' have a small vacuole size because it is not in contact with toxins that need to be removed from the cell.
- D. The corn cells' have a large vacuole size because it is in contact with many toxins in the soil which need to be removed from the cell.

20. Cells can be classified into two different categories: prokaryotic and eukaryotic. Which of the following information is needed in order to determine if an organism is prokaryotic?

- A. The organism's color and mass.
- B. The organism's internal structures.
- C. If the organism is unicellular or multicellular.
- D. The methods the organism uses to feed and move.

21. A specific type of cell is being studied by a scientist. She notices the cell contains a nucleus, lysosomes, a cell membrane and cell wall. What is the correct classification of this cell?

- A. A prokaryotic animal cell
- B. A prokaryotic plant cell
- C. A eukaryotic animal cell
- D. A eukaryotic plant cell

22. Using a microscope in the science lab, Jill observed two unknown cells: Cell 1 and Cell 2. Cell 1 she identified as a plant cell and Cell 2 as an animal cell. Her teacher told her she identified the cells correctly. What did Jill most likely observe to correctly identify the cells?

- A. Cell 2 had a cell membrane and Cell 1 did not.
- B. Cell 1 had a cell wall and Cell 2 did not.
- C. Cell 2 had a chloroplast and Cell 1 did not.
- D. Cell 1 had a nucleus and Cell 2 did not.

23. Which of the following contain complex, membrane-bound organelles?

1. bacteria
2. viruses
3. eukaryotic
4. prokaryotic

- A. 1 and 2
- B. 2 and 4
- C. 3 only
- D. 4 only

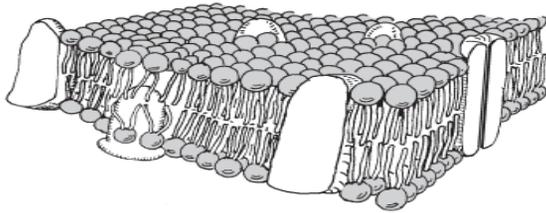
24. A lab technician needs to determine whether cells in a test tube are prokaryotic or eukaryotic. The technician has several dyes she could use to stain the cells. Four of the dyes are described in the table below:

INDICATOR DYE	TEST
acridine orange	stains DNA and RNA
osmium tetroxide	stains lipids
eosin	stains cell cytoplasm
Nile Blue	stains cell nuclei

Which dye could the technician use to determine whether the cells are prokaryotic or eukaryotic?

- A. acridine orange
- B. osmium tetroxide
- C. eosin
- D. Nile blue

25. Look at the cell membrane model below:



What is the name of the macromolecule that makes up the majority of the cell membrane?

- A. nucleotide
- B. lipid
- C. carbohydrate
- D. protein

26. What is the advantage of cells being so small?

- A. Small cells contain a greater quantity of enzymes than large cells.
- B. Small cells do not require energy and get everything they need from osmosis.
- C. The cell has a smaller surface area to volume ratio which means it can move nutrients into the cell and waste out more efficiently.
- D. The cell then has a larger surface area to volume ratio which means it can move nutrients into the cell and waste out more efficiently.

27. The rough endoplasmic reticulum is a cell structure that consists of folded membranes that contain ribosomes. What is the advantage of the folded membranes?

- A. increases surface area in order to produce more proteins
- B. decreases surface area in order to produce more proteins
- C. increases volume of the endoplasmic reticulum in order to produce more energy
- D. decreases volume of the endoplasmic reticulum in order to make more energy

28. If a cell's lysosomes were damaged, which of the following would **most likely** occur?

- A. The cell would produce more proteins than it needs.
- B. The cell would have chloroplasts that appear yellow rather than green.
- C. The cell would be less able to break down molecules in its cytoplasm.
- D. The cell would be less able to regulate the amount of fluid in its cytoplasm.

29. When *Streptococcus pneumoniae* are exposed to an antibiotic, the bacteria try to pump the antibiotic out of their cells. Which of the following mechanisms is **most likely** used by the *Streptococcus pneumoniae* to pump the antibiotic out of their cells?

- A. active transport
- B. diffusion
- C. facilitated diffusion
- D. osmosis

30. In pure water, a red blood cell from an animal will swell and burst, but a leaf cell from a plant will not. Which structure in the leaf cell is responsible for this difference?

- A. cell membrane
- B. cell wall
- C. mitochondrion
- D. nucleus

31. Which of the following functions does active transport perform in a cell?

- A. packaging proteins for export from the cell
- B. distributing enzymes throughout the cytoplasm
- C. moving substances against a concentration gradient
- D. equalizing the concentration of water inside and outside the cell

32. Carrot sticks that are left in a dish of freshwater for several hours become stiff and hard. Similar sticks left in a saltwater solution become limp and soft. From this we can deduce that the freshwater is _____ and the saltwater is _____ to the cells of the carrot sticks.

- A. hypotonic, hypertonic
- B. hypotonic, hypotonic
- C. hypertonic, hypotonic
- D. hypertonic, hypertonic

33. In an emergency trauma room, a doctor accidentally gives a patient a large transfusion of distilled water directly into one of his veins instead of blood. Predict what might happen if distilled water was given to the patient instead of blood.

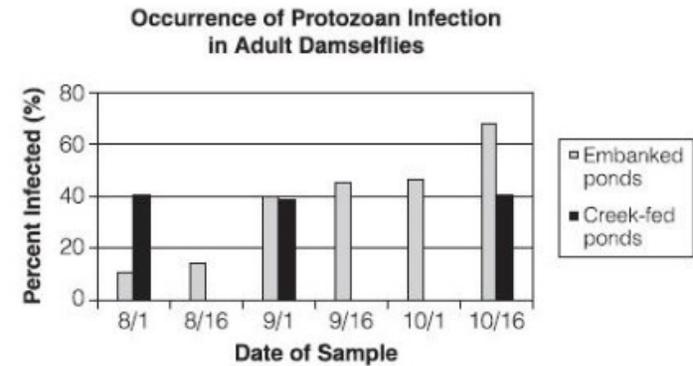
- A. have no unfavorable effect as long as the water was sterile
- B. have serious, perhaps fatal effects because there would be too much fluid for the heart to pump.
- C. have serious, perhaps fatal effects because the red blood cells would tend to shrivel
- D. have serious, perhaps fatal effects because the red blood cells would tend to burst

34. A beaker is divided into two halves, A & B, by a membrane that is freely permeable to the water and NaCl but not to protein. Side A is half-filled with a solution of 8% protein, while side B is half filled with a 2% protein solution. Predict what would happen to side A after a few hours.

- A. The number of protein molecules has increased.
- B. The number of water molecules has decreased.
- C. The number of water molecules has increased.
- D. The percentage of water has decreased.

SC.9.1.1.1 Nature of Science

35. A research group has discovered that damselflies, a type of dragonfly, are being infected by a particular type of aquatic protozoan. Both young and adult damselflies are not directly infected by the protozoan but contract the infection from the prey they eat. The graph shows the percentage of adult damselflies infected by protozoans during the summer and early fall.



Which of the following conclusions is best supported by the graph?

- A. Infection in embanked ponds increased during the sampling period.
- B. Protozoans were more common in creek-fed ponds than embanked ponds.
- C. Protozoans reproduce more quickly in embanked ponds than creek-fed ponds.
- D. Infection in creek-fed ponds remained constant throughout the sampling period.

36. An osmosis investigation was conducted using chicken eggs to represent cells with semi permeable membranes. The mass of each egg was measured to determine how much water diffused into or out of the eggs. The eggs were first soaked in vinegar to dissolve the shell. Each egg was then placed in one of three different solutions for 24 hours. The table below shows the results of the investigation.

Osmosis in Cells				
Solution	Average Mass of Eggs Before Soaking (grams)	Average Mass of Eggs After Soaking (grams)	Difference in Average Mass (grams)	Percent Change in Average Mass
Vinegar (95% water)	71.2	98.6	27.4	+38.5
Corn Syrup (5% water)	98.6	64.5	34.1	-34.6
Distilled Water (100% water)	64.5	105.3	40.8	+63.3

Based on this experiment, which of the following should be inferred about cells with semi permeable membranes?

- A. Substances other than water may also cross the cell membrane.
- B. Substances other than water may block pores in the cell membrane.
- C. Water enters the cell when placed in environments of high water concentration.
- D. Water leaves the cell when placed in environments with a low concentration of solutes

37. A Team of biology students performed an experiment to test the effects of four different solutions on a de-shelled, raw chicken egg. Each raw, unbroken chicken egg of the same size was placed in each of four different solutions. Twenty-four hours later the following results we obtained.

Effects of Unknown Solution Concentrations on the Volume of a Hen's Egg Cell		
Solution	Initial Mass of Egg	Final Mass of Egg
A	55 grams	48 grams
B	47 grams	43 grams
C	41 grams	48 grams
D	45 grams	45 grams

Using the data table above and your knowledge about the process of science, which solution would represent the control in this experiment?

- A. Solution A
- B. Solution B
- C. Solution C
- D. Solution D

38. What is the independent variable in the experiment from question #38?

- A. Solution A, B & C.
- B. Solution D only
- C. The eggs
- D. Mass

43. Water is essential for life. Its special properties make water the single most important molecule in plant life. Which of the following properties of water enable it to move from the roots to the leaves of plants?

- A. Water expands as it freezes.
- B. Water is an excellent solvent.
- C. Water exhibits cohesive behavior.
- D. Water is able to moderate temperature.

44. Large bodies of water, such as lakes and oceans, do not quickly fluctuate in temperature. What is the reason for this phenomenon?

- A. Water is an acid.
- B. Water is a versatile solvent.
- C. Water acts as a buffer.
- D. Water has a high heat capacity.

45. Many fish and aquatic plants can survive a cold winter because the layer of ice that forms at the top of the lake insulates the water below and prevents the lake from freezing solid. What unique property of water contributes to this effect?

- A. Water absorbs heat when it evaporates and forms a gas
- B. Water expands and becomes less dense when it freezes.
- C. Water molecules completely separate into ions in solutions.
- D. Water forms hydrogen bonds with ions and other polar substances.

46. Water is often called the "universal solvent" because many substances can be dissolved in water. What properties of water allow it to be such a versatile solvent?

- A. purity and polarity
- B. polarity and cohesion
- C. high heat capacity and adhesion
- D. expansion upon freezing and solvency

47. Water makes up approximately 60% of the human body and plays a vital role in regulating body temperature. Which property of water makes it good at regulating temperature?

- A. Water is a good solvent.
- B. Water exhibits strong cohesion.
- C. Water has an unusual crystalline structure.
- D. Water has a high capacity for heat.

SC.912.L.18.1 Macromolecules

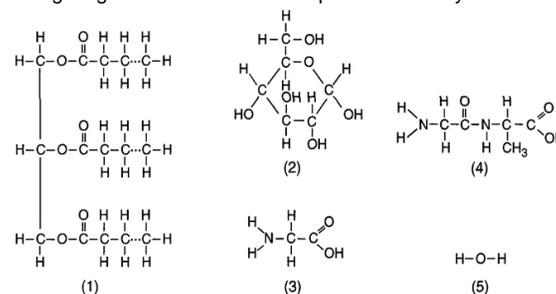
48. Two of the four principle classes of organic compounds are proteins and nucleic acids. What is the relationship between proteins and nucleic acids?

- A. Nucleic acids use proteins for energy
- B. Nucleic acids are a subset of proteins
- C. Proteins are long polymers of nucleic acids
- D. Nucleic acids contain the information to make proteins

49. Resistance to antibiotics results from variations in the genetic code of *Streptococcus pneumoniae*. Which type of molecule encodes genetic information in *Streptococcus pneumoniae*?

- A. carbohydrate
- B. fatty acid
- C. nucleic acid
- D. protein.

50. Which of the following diagrams below is an example of a carbohydrate?

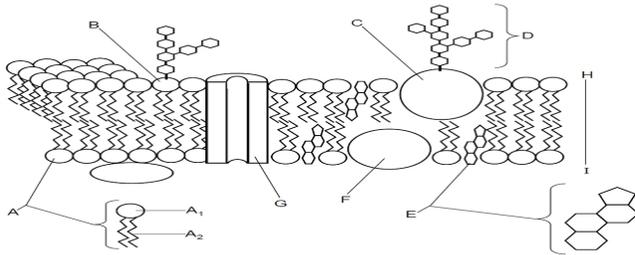


- A. 1
- B. 2
- C. 3
- D. 4

51. In living organisms, lipids function mainly as:

- A. Sources of stored energy and transmitters of genetic information
- B. Sources of stored energy and components of cellular membranes
- C. Transmitters of genetic information and catalysts of chemical reactions
- D. Catalysts of chemical reactions and components of cellular membranes

Study the diagram below of the cell membrane.



52. What is the building block of structure G?

- A. nucleotide
- B. chains of fatty acids
- C. amino acids
- D. monosaccharides

53. Which macromolecule makes up the majority of the cell membrane?

- A. nucleotide
- B. lipid
- C. protein
- D. carbohydrate

54. Which of the following macromolecule is not identified on the cell membrane above?

- A. nucleotide
- B. lipid
- C. protein
- D. carbohydrate

55. Baby food manufacturers sometimes use proteases in their products. Proteases catalyze the breakdown of the proteins in these foods, making digestion easier for infants.

Proteases are which of the following types of molecules?

- A. enzyme
- B. fatty acid
- C. carbohydrate
- D. nucleic acid.

56. Ovalbumin is a protein found in eggs. Which of the following **best** describes the molecular structure of ovalbumin?

- A. a group of six carbon atoms joined in a ring.
- B. a chain of amino acids folded and twisted into a molecule
- C. a set of three fatty acids attached to a molecule of glycerol
- D. a sequence of nitrogenous bases attached to a sugar phosphate backbone

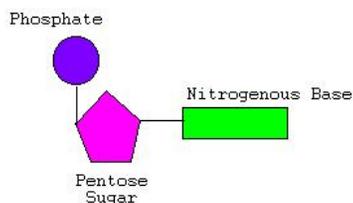
57. Many plants have waxy coatings on some surfaces. This coating reduces water loss because it is not water-permeable. This waxy coating is which of the following types of organic molecule?

- A. protein
- B. carbohydrate
- C. nucleic acid
- D. lipid

58. Like complex carbohydrates, proteins are macromolecules that serve many functions and can be chemically broken down and restructured. Both proteins and complex carbohydrates are which of the following?

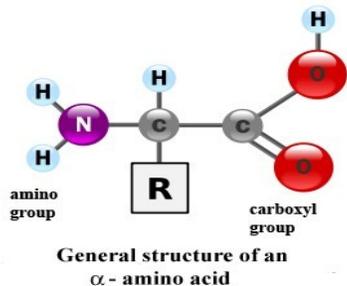
- A. polymers of smaller subunits
- B. sequence of sugars
- C. lipids of large molecules
- D. nucleotides of DNA

59. What is the function of the macromolecule subunit below?



- A. energy
- B. catalyst
- C. stores genetic information
- D. composes the majority of the cell membrane

60. The diagram below shows a monomer of a macromolecule. Which of the following macromolecules contains these monomers?



- A. carbohydrates
- B. proteins
- C. nucleic acid
- D. lipid

SC.912.L.18.11 Enzymes

61. Some bacteria live in hot springs. Their cells contain enzymes that function best at temperatures of 70 °C or higher. At the temperature of 50 °C, how will the enzymes in these bacterial cells most likely be affected?

- A. The enzymes will be destroyed by lysosomes.
- B. The enzymes will lose their bond structure and fall apart.
- C. The enzymes will require less energy to function than at 70 °C.
- D. The enzymes will not increase the rate of reactions as much as they would at 70 °C.

62. Many of the proteins in the human body are enzymes that catalyze chemical reactions. What is the relationship between enzymes and activation energy?

- A. When an enzyme catalyzes a reaction, it increases the activation energy of the reaction.
- B. When an enzyme catalyzes a reaction, it increases the activation energy of the product.
- C. When an enzyme catalyzes a reaction, it decreases the activation energy of the reaction.
- D. When an enzyme catalyzes a reaction, it does not affect the activation energy of the reaction.

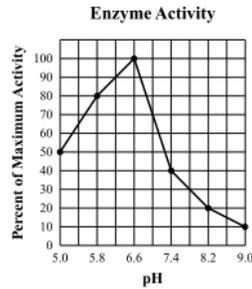
63. Meat tenderizer contains an enzyme that breaks down meat. If meat is coated with tenderizer and then placed in a refrigerator, predict how the enzyme might be affected?

- A. It would break down the meat more slowly.
- B. It would disintegrate the meat.
- C. It would break down the meat more quickly.
- D. It would change the shape of the meat.

64. As food travels through the digestive system, it is exposed to a variety of pH levels. The stomach has a pH of 2 due to the presence of hydrochloric acid (HCl), and the small intestine has a pH ranging from 7 to 9. HCl converts pepsinogen into pepsin, an enzyme that digests proteins in the stomach. Which of the following most likely happens to pepsin as it enters the small intestine?

- A. It becomes inactive.
- B. It begins to replicate.
- C. Its shape changes to engulf large proteins.
- D. Its activity increases to digest more proteins.

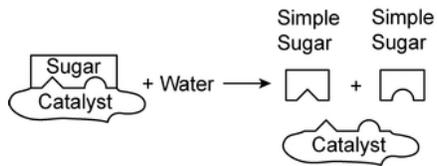
65. The graph below shows how the activity of an enzyme changes over a range of pH values.



Which of the following conclusions can be drawn from this graph?

- A. The optimum pH of the enzyme is 6.6.
- B. The optimum pH of the enzyme is 5.8
- C. The enzyme's activity continually increases as pH increases from 5.0 to 9.0
- D. The enzyme's activity is greater around pH of 8.0 than around pH of 5.0.

66. The diagram below illustrates a biochemical process that occurs in organisms.



What is another name for the substance labeled "catalyst"?

- A. Enzyme
- B. inorganic compound
- C. Hormone
- D. Antibody

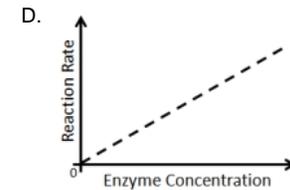
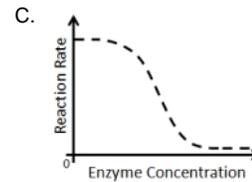
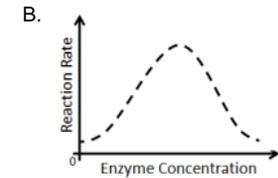
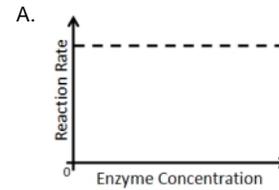
67. The human body maintains a temperature of around 98.6 degrees at all times. Enzymes are involved in almost every chemical reaction in the body. Which of the following describes the connection between these two statements?

- A. Enzymes function best at a specific temperature.
- B. The body needs to be warm to prevent hypothermia.
- C. The body is kept relatively warm to prevent too much enzyme action.
- D. There is no connection between the two statements.

68. Which of the following **best** explains why enzymes are necessary for many cellular reactions?

- A. Enzymes supply the oxygen necessary for the reactions.
- B. Enzymes change reactants from solid to liquids during the reactions.
- C. The reactions take up too much space in the cell if the enzymes are missing.
- D. The reactions are too slow to meet the needs of the cell if enzymes are missing.

69. A student is investigating how reaction rate changes over a range of enzyme concentrations. The student uses excess reactants. Which of the following best represents the relationship between enzyme concentration and reaction rate?

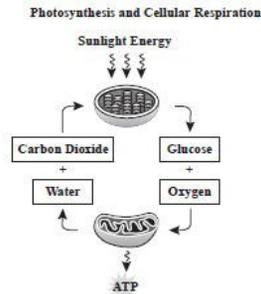


SC.L.18.9 Photosynthesis & Cellular Respiration

70. How are cellular respiration and photosynthesis related, in terms of energy?
- A. The energy captured in photosynthesis is used to power cellular respiration.
 - B. The energy transformed in cellular respiration is used to power photosynthesis.
 - C. Photosynthesis and respiration perform the same task in terms of energy transformation.
 - D. Energy is not involved in either photosynthesis or cellular respiration.

71. In which way are photosynthesis and cellular respiration different?
- A. Cellular respiration stores ATP, while photosynthesis releases ATP.
 - B. Cellular respiration produces oxygen, while photosynthesis uses oxygen.
 - C. Photosynthesis releases energy, while cellular respiration stores energy.
 - D. Photosynthesis used carbon dioxide, while cellular respiration produces carbon dioxide.

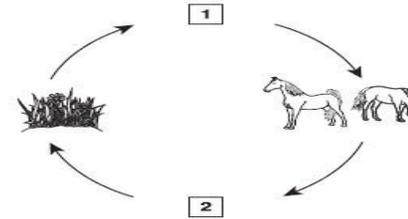
72. The diagram below shows the relationship between photosynthesis and cellular respiration and the organelles in which they occur.



Which statement describes how photosynthesis and cellular respiration are interrelated?

- A. Oxygen is produced during cellular respiration and stored during photosynthesis.
- B. Carbon dioxide and water released by cellular respiration are used in photosynthesis.
- C. Photosynthesis releases the energy that is stored during the process of cellular respiration.
- D. Glucose is used during cellular respiration to produce food that is broken down during photosynthesis.

73. A diagram representing the relationship between photosynthesis and cellular respiration is shown below.



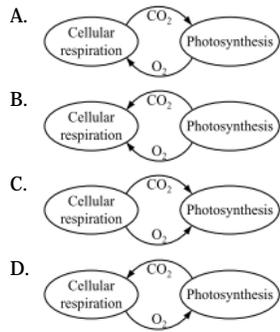
The numbered boxes in the diagram represent which of the following?

- A. 1 - water; 2 - nitrogen
- B. 1 - nitrogen; 2 - oxygen
- C. 1 - oxygen; 2 - carbon dioxide
- D. 1 - carbon dioxide; 2 - water

74. Two test tubes were filled with a solution of bromthymol blue. A student exhaled through a straw into each tube, and the bromthymol blue turned yellow. An aquatic green plant was placed into each tube, and the tubes were corked. One tube was placed in the dark, and one was placed in direct sunlight. The yellow solution in the tube in sunlight turned blue, while the one in the dark remained yellow. Which statement best explains why the solution in the tube placed in sunlight returned to a blue color?

- A. Oxygen was produced by photosynthesis.
- B. Carbon dioxide was removed by photosynthesis.
- C. Carbon dioxide was produced by respiration.
- D. Oxygen was removed by respiration.

75. Which of the following diagrams accurately represents the use of gases in both cellular respiration and photosynthesis?



SC.912.L.18.7 Photosynthesis

76. Which gas is removed from the atmosphere during photosynthesis?

- A. hydrogen
- B. oxygen
- C. nitrogen
- D. carbon dioxide

77. A potted plant is placed inside a clear, sealed vacuum container that has water pumped into it on a regular basis. The container is placed in the sun and the plant's growth is monitored. Which statement best describes what will most likely happen to the plant over time?

- A. The plant will grow faster because it is sheltered from the wind.
- B. The plant will die because it does not have oxygen for photosynthesis.
- C. The plant will die because it does not have carbon dioxide for photosynthesis.
- D. The plant will grow at a slower rate because it requires more water.

78. Mike has four aquatic plants of the same size and the same species. He submerges the plants in a separate beaker filled with 200 ml of water. He then sets each beaker under a different intensity of light. Mike observes that, of the four plants, the plant in the beaker under the most intense light gives off the most gas bubbles in a 20 minute period.

Which of the following statements best explains Mike's observations?

- A. Cells decompose most quickly under the most intense light.
- B. Water evaporates from plants faster under the most intense light.
- C. Photosynthesis occurs at the highest rate under the most intense light.
- D. Gases in the leaves of plants expand most under the most intense light

79. Which of the following are the reactants of photosynthesis?

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

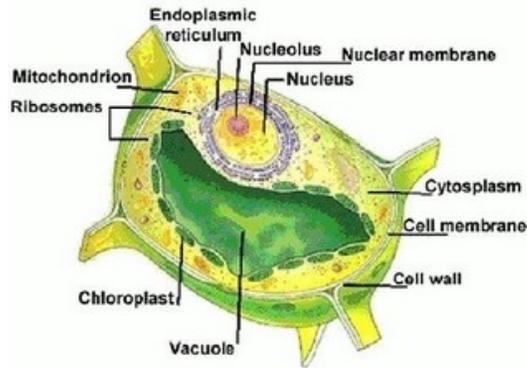
80. Which process takes place in the presence of oxygen and produces nearly 20 times as much as ATP as glycolysis alone?

- A. photosynthesis
- B. lactic acid fermentation
- C. aerobic respiration
- D. alcoholic fermentation

81. If a plant died from lack of food, which structure is most likely missing or damaged?

- A. flower
- B. root
- C. stem
- D. leaves

82. Which of the following structures is where photosynthesis occurs in the cell below?



- A. nucleus
- B. chloroplast
- C. mitochondria
- D. endoplasmic reticulum

SC.912.18.8 Cellular Respiration

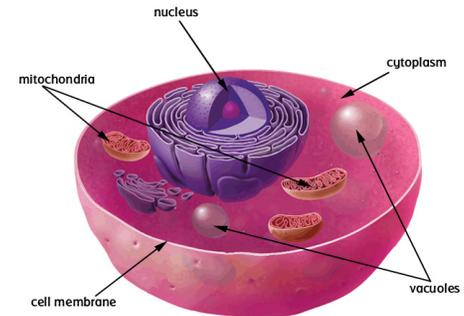
83. Two different species of bacteria are examined. Scientists find that species X always produces CO₂ and H₂O during cellular respiration. Species Y always produces ethyl alcohol and CO₂. Which conclusion can be made from these observations?

- A. Only species Y is aerobic.
- B. Only species Y is anaerobic.
- C. Both species X and Y are aerobic.
- D. Both species X and Y are anaerobic.

84. A weightlifter is using heavy weights in short bursts for a competition. Because his muscle cells are not able to take in enough oxygen to make very much ATP the weightlifter begins to get fatigue in his muscles. Which of the following processes is most likely going on in the muscles of the weightlifter as he competes in his event?

- A. As the cells run out of oxygen they switch to anaerobic respiration, which allows the cell to make small amounts of ATP in the absence of oxygen.
- B. As the cells run out of oxygen, they die off gradually and the weightlifter's muscles have fewer contracting muscle cells.
- C. The cells will never run out of oxygen if the weightlifter is breathing.
- D. As the cells run out of oxygen, they will continue to make the same amount of ATP, since oxygen is not required to make ATP.

85. Which of the following structures is where cellular respiration occurs in the cell below?



- A. nucleus
- B. cytoplasm
- C. mitochondria
- D. vacuoles

SC.912.18.10 ATP

86. What function does ATP carry out in living things?

- A. aids in protein folding and coiling
- B. used to capture and transfer energy
- C. identifies DNA start sequences for transcription
- D. helps maintain the fluidity of cell membranes

87. Which process do animals use to convert energy from food into ATP?

- A. cellular respiration
- B. osmosis
- C. photosynthesis
- D. transcription

SC.N.1.1.1 Practice of Science

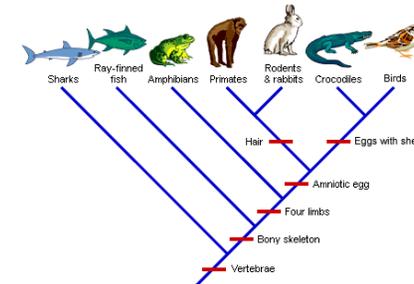
88. Carmen conducted an experiment to determine if listening to different types of music would affect a person's pulse. Her hypothesis was that pulse rate would change with different types of music. Each person listened to seven different selections of music for 30 seconds each. Each person's pulse was taken before the music and then after each 30-second interval of music. The pulses were taken again after the music selections were completed. Based on her experiment, Carmen concluded that a person's pulse rate changed when the person listened to different types of music.

Which component is missing from Carmen's experiment?

- A. a question
- B. a hypothesis
- C. a control group
- D. a description of the experiment

SC.912.L.15.6: Classification

89. Based upon the information shown in the cladogram below, which trait would most likely be observed in ray-finned fish?



- A. amniotic egg
- B. bony skeleton
- C. four limbs
- D. hair

90. Mushrooms are a type of fungus. What characteristic of fungi makes them different from plants?

- A. Fungal cells are eukaryotic.
- B. Fungi are multicellular.
- C. Fungi are heterotrophic.
- D. Fungi have cell walls.

91. The Florida Panther was once considered to be a subspecies of cougars and given a special trinomial taxonomy of *Puma concolor coryi*. Current scientists however, have studied the Florida Panther and removed the subspecies classification to only *Puma concolor*. Which of the following would **most likely** explain why the classification of the Florida Panther changed.

- A. New genetic evidence suggests a much closer relationship between the Florida Panther and other cougars.
- B. Shared features between the Florida Panther and other cougars were also found in newly discovered organisms in the world.
- C. Advanced technologies have shown a large difference in cell structure between the Florida Panther and other cougars.
- D. Trinomial naming conventions are no longer used by longer used by scientists because only the genus and species are important in taxonomy.

92. In 1990, Carl Woese introduced the three domain system for classifying living things, after the advancement of DNA analysis allowed for a comparison of species genetic code. Which of the following is the best explanation for why domains were added to the previous system of classification?

- A. The old system of classification was wrong and needed to be corrected.
- B. New species are evolving too quickly to keep up with the old system of classification.
- C. Domains have always been included, they were just made official recently.
- D. Some organisms, which were previously characterized together, were determined to be genetically very different.

93. Many protists are single-celled organisms, as are bacteria. However, protists and bacteria are in different biological kingdoms. Which of the following comparisons of protists and bacteria is NOT true?

- A. Both protists and bacteria can be motile.
- B. Both protists and bacteria are microorganisms.
- C. Protists and bacteria may be photosynthetic
- D. Protists are prokaryotes, while bacteria are eukaryotes.

SC.912.L.14.7: PLANTS

94. Terrestrial plants have stomata on the surface of their leaves. Stomata are surrounded by two guard cells that change shape in response to environmental factors and open or close the stoma. Which of the following best explains how the structure of the leaf is used in processes that occur in plants?

- A. Water enters the plant through the surface of the leaf for transpiration
- B. Gases for photosynthesis are exchanged through the surface of the leaf.
- C. Energy for cellular reproduction is absorbed through the surface of the leaf.
- D. Carbon dioxide enters the plant through the surface of the leaf for cellular reproduction.

95. Plant cells that are specialized for cell division are most likely found in what part of the plant?

- A. root tips
- B. leaf epidermis
- C. stem epidermis
- D. vascular tissue

96. If the xylem of a young tree is damaged, which process is first affected?

- A. performing photosynthesis
- B. transporting sugar to the roots
- C. transporting carbon dioxide to the leaves
- D. absorbing water from the soil

97. A plant species lives in an area with limited sunlight. Which physiological adaptation would be most useful to the plant?

- A. colorful flowers
- B. large leaves
- C. deep roots
- D. thin cuticle

98. What is the main function of leaves?

- A. Leaves provide support for growth and a place to store food.
- B. Leaves provide a place for photosynthesis to occur.
- C. Leaves absorb water and minerals and transport nutrients to the stem.
- D. Leaves create a barrier that prevents water in the plant's tissues from evaporating.

99. The cambium is a section of cells in a plant that can become either part of the xylem or phloem, depending on the growth and needs of the plant. If the cambium of a particular plant was damaged, what would be the most likely effect on the plant?

- A. The plant would lose its ability to carry out photosynthesis.
- B. the plant would have uncontrolled growth.
- C. The plant would not experience any change in physiology.
- D. The plant would not be able to transport nutrients and water.

100. Which structure in the leaf controls the opening and closing of the stoma?

- A. cuticle
- B. epidermis
- C. guard cell
- D. spongy mesophyll

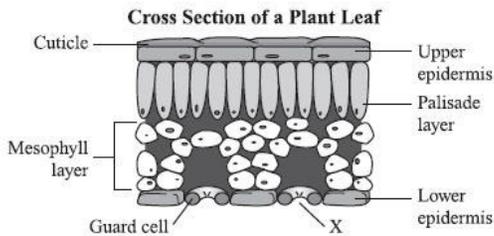
101. Which statement describes the role of flowers in plant survival?

- A. Flowers can absorb carbon dioxide for sugar production.
- B. Flowers produce oxygen through cellular respiration.
- C. Flowers contain cells that carry out photosynthesis.
- D. Flowers contain cells that produce gametes.

102. What is the main purpose of seeds in plants that have them?

- A. To protect and distribute the zygote.
- B. To entice animals to eat the plant.
- C. To be fertilized by other plants.
- D. To store water for the mother plant.

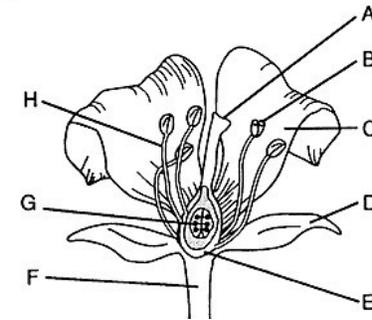
103. The diagram below shows a cross section of a plant leaf.



How does the structure marked X contribute to the survival of the plant?

- A. It allows the intake of gases necessary for photosynthesis.
- B. It allows the intake of minerals necessary for plant growth.
- C. It allows the intake of sunlight necessary for ATP production.
- D. It allows the intake of sugars necessary for plant reproduction.

104. The diagram below represents a flower, the reproductive structure of some plants. Most flowers have both male and female structures for fertilization and reproduction.



Which structure is represented by the letter A in the diagram above?

- A. the stamen, a male structure which produces pollen
- B. the pistil, a female structure which collects pollen and passes it to the ovary
- C. the sepal, a modified leaf used for protection of the flower
- D. the petals, decorative structures which attract pollinators

105. Jake conducted an experiment with four bean plants. They were placed next to one another on a sunny windowsill. He gave each plant equal amounts of different types of water. The plants were given tap water, distilled water, flavored water, or carbonated water. He made the following observations after three weeks.

PLANT EXPERIMENT OBSERVATIONS		
Plant	Type of Water Given Daily	Final Observations
A	Tap	All leaves have turned brown and fallen off. No change in height recorded. Plant appears dead.
B	Distilled	Plant is 3 centimeters taller at the end of experiment. Leaves are green. Plant appears healthy.
C	Flavored	New green leaves have appeared. No change in height recorded. Plant appears healthy.
D	Carbonated	Leaves appear yellow. Many leaves have fallen, others are drooping. Plant does not appear healthy.

Based on his results, Jake concluded that tap water is not good for plants. How can Jake change his experimental design to improve the validity of his results?

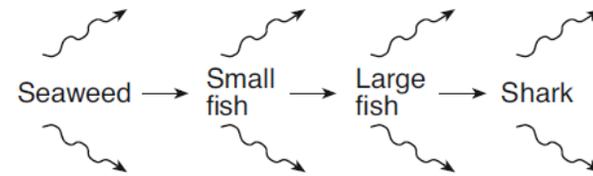
- A. carry out multiple trials, and increase the number of plants that are given each type of water
- B. establish a control group that includes different types of plants
- C. establish another dependent variable to generate more data
- D. carry out multiple trials that include fewer plants, and increase the types of water given to the plants

SC.912.L.17.9 Food Webs and Energy Transfer

106. Coyotes are opportunistic predators that are found throughout most of North America. They typically feed on small mammals, insects, and fruits and vegetables. They are known for their dietary adaptability. The best description of their role in the food web would be:

- A. An herbivore
- B. A carnivore
- C. An omnivore
- D. A primary producer

107. A food chain is illustrated below:



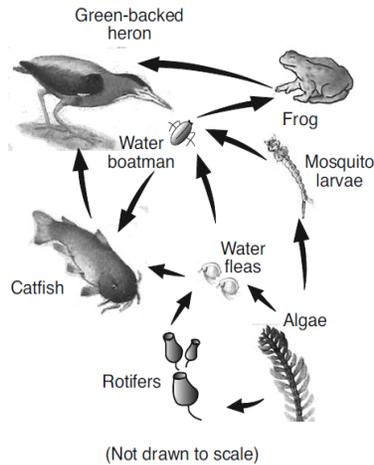
The arrows represented as most likely indicate

- A. Energy released from metabolism into the environment as heat.
- B. Oxygen released from metabolism produced by cellular respiration.
- C. The absorption of energy from the environment that has been created.
- D. The transport of glucose away from the organism through photosynthesis.

108. If several species of carnivores are removed from an ecosystem, the most likely effect on the ecosystem will be:

- A. An increase in the kinds of autotrophs
- B. A decrease in the number of abiotic factors
- C. A decrease in stability among populations
- D. An increase in the rate of succession

109. A pond ecosystem is shown in the diagram below.



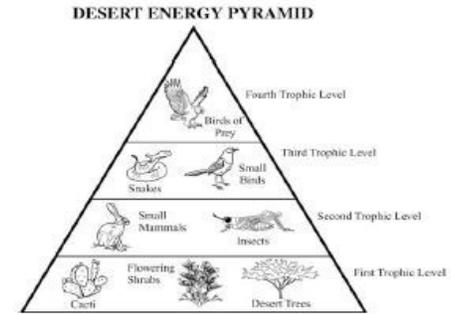
Which statement describes an interaction that helps maintain the dynamic equilibrium of this ecosystem?

- A. The frogs make energy available to this ecosystem through the process of photosynthesis.
- B. The algae directly provide food for both the rotifers and the catfish.
- C. The green-backed heron provides energy for the mosquito larvae.
- D. The catfish population helps control the populations of water boatman and waterfleas.

110. Why is a mushroom considered a heterotroph?

- A. It creates different types of food.
- B. It makes food through photosynthesis.
- C. It makes food through chemosynthesis.
- D. It obtains nutrients from its environment.

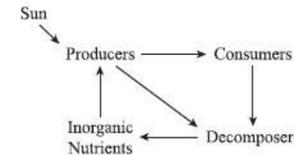
111. A team of ecologists observed feeding patterns of several populations in the desert. The energy pyramid shown below depicts the feeding patterns the ecologist observed.



Which of the following best explains the difference in the amount of available energy in the trophic levels of the desert ecosystem?

- A. There is less energy available in the producers because their tissues are less dense than those at higher trophic levels.
- B. There is more energy available in the second trophic level because less energy is needed for hunting compared to the higher trophic levels.
- C. There is more available energy in the birds of prey because they have greater muscle mass for storing energy than organisms in lower trophic levels have.
- D. There is less available energy in the fourth trophic level because of the loss of energy through metabolism in each of the lower trophic levels.

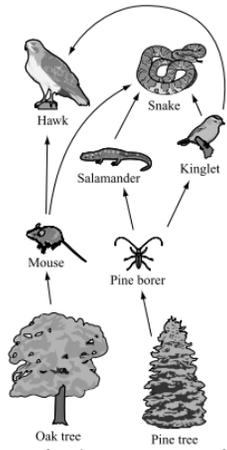
112. The diagram below shows the cycling of nutrients in an ecosystem.



The removal of which of the following groups would cause an immediate decrease in the amount of energy flowing through the system?

- A. Producers
- B. Consumers
- C. Decomposers
- D. Inorganic nutrients

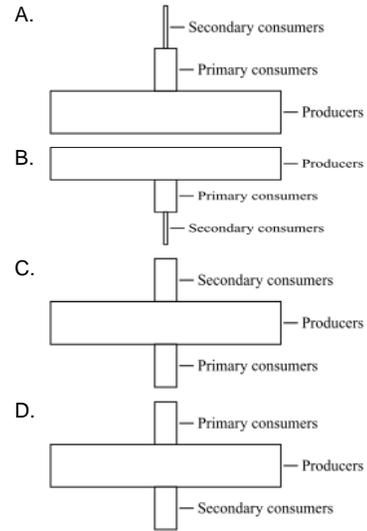
113. A food web is shown below.



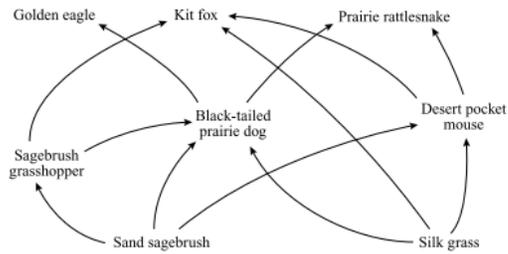
Which of the following organisms compete for the mouse as a food source?

- A. hawk and snake
- B. snake and kinglet
- C. oak tree and pine tree
- D. pine borer and salamander

114. Which of the following energy pyramids shows the correct placement of trophic levels?



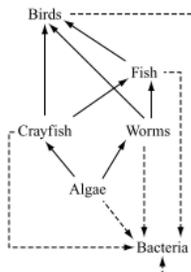
115. Part of a desert food web is diagrammed below.



Which of the following will **most likely** result if all of the primary consumers are removed from this ecosystem?

- A. Prairie rattlesnakes will become herbivores.
- B. Golden eagle and kit fox populations will decrease.
- C. Sagebrush grasshoppers will consume soil bacteria.
- D. Silk grass and sand sagebrush populations will decrease.

116. Part of a marsh food web is shown below.



Which of the following statements correctly describes organisms in this food web?

- A. The birds are producers.
- B. The algae are consumers.
- C. The worms are carnivores.
- D. The bacteria are decomposers.

SC.912.L.17.2 Abiotic Aquatic Factors

117. Jill made the table below during her research on aquatic zones and living organisms.

Characteristics of Aquatic Zones	
Intertidal	Air, sun and water exposure; crashing waves
Neritic	Water depth less than 200 m; lots of sunlight; warm water
Benthic	Very deep water; no light; cold water except near thermal vents that emit heat and chemicals.

Based on Jill's observations, which conclusion could you draw?

- A. Organisms in the intertidal zone must be able to withstand very cold water.
- B. There are no producers in the benthic zone that rely on photosynthesis.
- C. Organisms in the benthic zone must be able to tolerate large amounts of oxygen.
- D. The warm water and abundant sunlight in the neritic zone limits the plankton population.

SC.912.L.17.5 Interdependence & Population

118. Competition between two species occurs when:

- A. Mold grows on a tree that has fallen in the forest
- B. Chipmunks and squirrels eat sunflower seeds in a garden
- C. A crow feeds on the remains of a rabbit killed on the road
- D. A lion stalks, kills and eats an antelope

119. Which statement represents a characteristic of an ecosystem that is *not* likely to sustain itself?

- A. The sun provides the needed energy.
- B. Energy is transferred from plants to animals.
- C. There are more consumers than producers.
- D. There are interactions between biotic and abiotic factors.

120. When an environment has reached its carrying capacity for a certain population, which of the following is true?

- A. Growth and immigration rate is equal to death and emigration rate.
- B. Growth and immigration rate is greater than death and emigration rate.
- C. Growth and immigration rate is less than death and emigration rate.
- D. Growth rate is exponential.

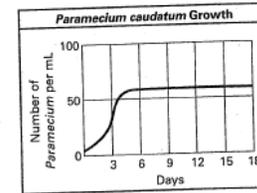
121. The common brushtail possum is a marsupial native to Australia. This possum was introduced to New Zealand where it had no natural predators and had an abundant food supply. Which of these likely occurred a few years after the introduction of this possum to New Zealand?

- A. The possums became extinct.
- B. The possums developed shorter life spans.
- C. The possum population grew to a larger size.
- D. The possum population evolved into a different species.

122. Angel was trying to explain carrying capacity to her mother. Which of the following descriptions is accurate? Carrying capacity is:

- A. the maximum number of individuals that an ecosystem can sustain.
- B. the ability of an environment to accommodate a growing population.
- C. the number of predators that an area can sustain over the long term.
- D. the maximum number of species that can co-exist in an area.

123. You have been studying population growth of a species of *Paramecium*, a single celled organism for 18 days. Your data is shown in the graph below. Food was occasionally added to the test tube in which the paramecia were grown.



According to the diagram, what is the carrying capacity of the test-tube environment as long as food is added?

- A. about 10 paramecia
- B. about 50 paramecia
- C. about 65 paramecia
- D. about 100 paramecia

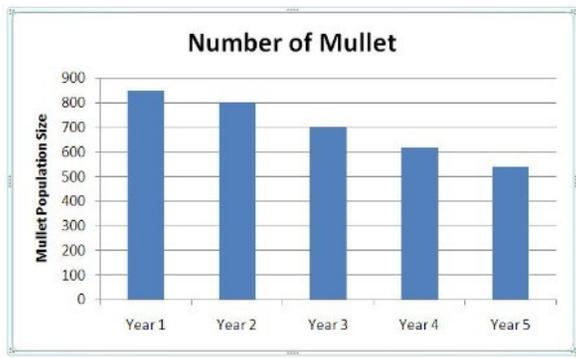
124. Jenn is studying a population of fish found in a pond that has a decreasing carrying capacity. Which of the following factors would **not** decrease the carrying capacity of her fish?

- A. drought
- B. flooding
- C. food shortages
- D. a freeze

125. An animal population decreases from 800 individuals to 600 individuals. Which of the following could explain this change in population size?

- A. The population size of the animal's predator increased.
- B. The emigration rate of the animals from the population decreased.
- C. The number of breeding pairs in the animal's population increased.
- D. The number of species competing with the animal for food decreased.

126. Mullet are local estuarine fish that move in schools and feed on plankton and plant matter. Natural predators of the mullet include spotted sea trout, sharks, pelicans and dolphins. The graph below shows how the number of mullet in an area has changed over time.



Based on the data, one student concludes that a new predator was introduced into the area during this time period. Which of the following is a likely alternate explanation for the change in the mullet population?

- A. mullet prey increased in the area
- B. mullet parasites decreased in the area
- C. the temperature of the area increased
- D. the amount of aquatic plants in the area decreased

127. The pea weevil is a type of insect. The table below shows the average time it takes for pea weevil eggs to hatch at different temperatures.

Temperature (°C)	Average Hatching Time (days)
11	38
14	20
16	16
18	10
22	10
24	7
25	5
27	5
28	7

Based on the data, which of the following conditions would promote the highest population growth rate in pea weevils?

- A. cold springs with temperatures from 11°C to 16°C
- B. moderate summers with temperatures from 25°C to 27°C
- C. heat waves in which the temperature is sustained well above 28°C
- D. overnight frosts after which the temperature warms from 0°C to 11°C

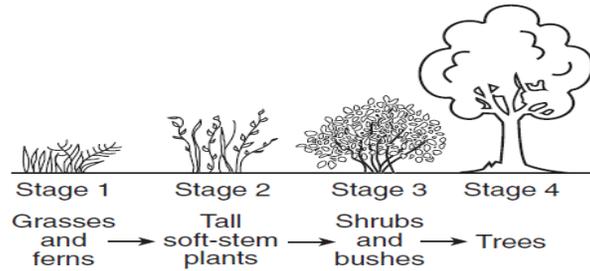
128. On remote islands, immigration and emigration usually do not have a large effect on population sizes. A bird population on a remote island remains at a relatively constant size year after year.

Which of the following **most likely** describes the birthrate and the death rate for this population?

- A. Birthrate and death rate are both zero
- B. Birthrate and death rate are close to equal.
- C. Birthrate is significantly less than death rate.
- D. Birthrate is significantly greater than death rate.

SC.912.L.17.4 Changes in an Ecosystem

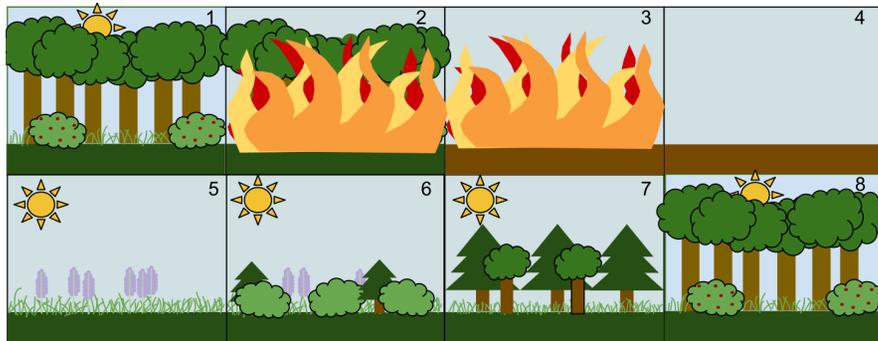
129. Changes in an ecosystem over a long period of time are shown in the diagram below.



These changes will most likely lead to a:

- A. stable ecosystem that can last for many years
- B. loss of heterotrophs that cannot be recovered
- C. long-term rise in environmental temperatures
- D. forest consisting of only producers and decomposers

130. The diagram below shows how an area progresses over time after a forest fire.



What process is illustrated by the diagram in boxes 4-8 after the forest fire?

- A. pioneer speciation
- B. primary succession
- C. secondary succession
- D. ecosystem boundaries

131. A biologist compares how different ecosystems undergo succession. She divides the series of events that happen during primary and secondary succession into three different stages. Which feature might be used to distinguish secondary succession from primary succession?

- A. the lack of pioneer species in the second stage
- B. the presence of pioneer species in the final stage
- C. the presence of trees and large plants in the final stage
- D. the presence of soil and organic matter in the first stage.

132. After a volcano erupts and destroys an ecosystem, a few organisms are able to begin growing from the decaying organic matter left behind. What do we call those first organisms that are able to grow in little or no soil that first appear?

- A. adaptors
- B. pioneer species
- C. non-vascular plants
- D. decomposers

SC.912.L.17.20: Human Impact

133. One way that humans could have a positive impact on local environments is to:

- A. generate waste products as a result of technological advances
- B. use resources that are renewable
- C. increase planting large areas of one crop
- D. increase the use of pesticides

134. Environmentalists are hoping to protect endangered organisms by calling for a reduction in the use of pesticides, because loss of these organisms would:

- A. increase the mutation rate in plants
- B. cause pesticides to become more toxic to insects
- C. reduce biodiversity in various ecosystems
- D. decrease the space and resources available to other organisms

135. After the Aswan High Dam was built on the Nile River, the rate of parasitic worm infection doubled in the human population near the dam. As a result of building the dam, the flow of the Nile changed. This changed the habitat, which resulted in an increase in its population of a certain aquatic snail. The snails, which were infected, released larvae of the worm. These larvae then infected humans. This situation best illustrates that:

- A. the influence of humans on a natural system is always negative in the long term
- B. the influence of humans on a natural system can have unpredictable negative impacts
- C. human alteration of an ecosystem does not need to be studied to avoid ecological disaster
- D. human alteration of an ecosystem will cause pollution and loss of finite resources

136. One way humans can promote the survival of organisms in an ecosystem is to:

- A. decrease diversity in plant habitats
- B. introduce new consumers to control autotrophs
- C. release extra CO₂ into the atmosphere to help autotrophs
- D. learn about the interactions of population

137. Some people see the benefit of wind energy as a clean alternative to fossil fuels for energy production. Others believe it is dangerous for migratory birds. These opinions best illustrate that decisions about alternate energy sources:

- A. will usually favor older methods of energy production over newer methods
- B. must be made by weighing the risks and costs against the benefits
- C. must be made by taking into account the present needs of the citizens without looking toward the future
- D. should be the responsibility of each individual

138. A builder is proposing a new housing development in an area of western Massachusetts. Construction of the housing development will destroy the wetland habitat in the area.

Which of the following would be the **most likely** consequence of the wetland's destruction?

- A. The wetland plant species would disperse to adjacent meadow habitats.
- B. The populations of wetland animals would be unable to survive in that area.
- C. The wetland animal species would survive by interbreeding with non-wetland species.
- D. The populations of wetland plants would evolve to disperse seeds by wind rather than water.

139. New fuels are being produced by converting corn and grasses into compounds containing alcohols that can be broken down for energy in various engines. The purpose of this research is to

- A. reduce the use of nonrenewable resources.
- B. increase the rate of air pollution.
- C. reduce the rate of homeostasis in organisms.
- D. cause a loss of biodiversity in the rain forests.

140. The presence of wastes, such as plastic bags and motor oil, in lakes and streams miles away from developed areas suggests that:

- A. ecosystems are interconnected and human action can alter ecosystem equilibrium.
- B. recycling programs have failed to conserve biotic resources.
- C. natural processes can alter ecosystem stability.
- D. direct harvesting practices have led to irreversible destruction of ecosystems.

141. DDT and other pesticides used over 50 years ago are still affecting the environment today. Scientists have found these substances in recent glacier runoff. Glacier runoff occurs during the summer, when precipitation that has fallen on glaciers during the winter is released. Ice layers from existing glaciers have been analyzed. The results of this analysis show that the concentrations of DDT and other pesticides were highest about 10 years after the use of these substances was banned.

This information shows that:

- A. DDT and other pesticides cause glacier runoff during the summer.
- B. it takes humans over 50 years to analyze a glacier.
- C. precipitation helps to break down pesticides.
- D. the decision of one human generation may have an impact on future generations.

142. When fertilizers run off farmland into streams and ponds, the nitrogen content of the water increases. This can lead to rapid growth of algae. How can this process affect other organisms in the water?

- A. Oxygen is used up as algae is decomposed, reducing the amount available to other organisms.
- B. The water becomes better able to support aerobic organisms.
- C. The algae provide food for fishes and other organisms, leading to decreased algae populations.
- D. The extra nitrogen provides additional food for the other organisms, increasing their population.

143. Whaling was a very profitable profession until whale populations crashed. The global community came together to enact a ban on whaling. However, Japan and Norway have not agreed to stop whaling. Which of the following is the most likely consequence of their decision?

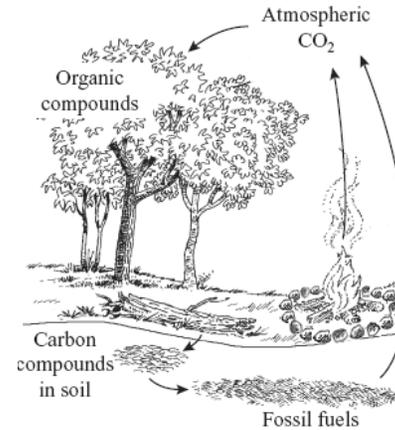
- A. The whale populations are bouncing back very successfully and are unaffected by Japan and Norway continuing to whale.
- B. The whale populations are not rebounding as quickly as they might if all of the countries agreed not to hunt whales.
- C. The whale populations have mutated into new kinds of organisms.
- D. The whales are getting better at avoiding capture.

SC.912.E.7.1: Carbon and Water Cycles

144. Leaves fall from deciduous trees in autumn. The carbon in these leaves is returned to the atmosphere through which of the following processes?

- A. condensation
- B. decomposition
- C. photosynthesis
- D. transpiration

145. The diagram below shows part of the carbon cycle.



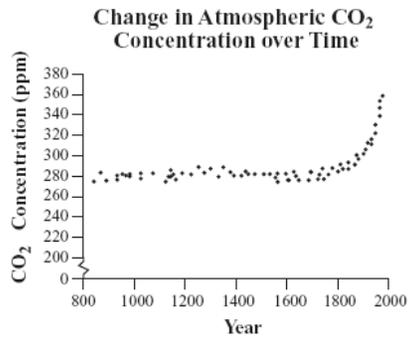
If many trees are removed from a forest by logging, what is the most immediate effect on the carbon cycle in that forest?

- A. increase in the rates of decomposition
- B. increase in the rates of atmospheric carbon dioxide
- C. decreased combustion of fossil fuel
- D. increase production of organic compounds

146. The water cycle would **not** occur if which of the following were missing?

- A. bacteria
- B. autotrophs
- C. carbon dioxide
- D. solar energy

147. A graph of atmospheric carbon dioxide concentration over time is shown below.



Scientists are investigating the cause of the large increase in atmospheric carbon dioxide concentration since about 1800. Which of the following provides the **best** explanation for the increase?

- A. eruptions of large volcanoes
- B. use of fossil fuels by humans
- C. natural fluctuations of climate
- D. photosynthesis by phytoplankton

SC.912.L.16.1 Mendel's Law of Segregation and Independent Assortment

148. In pea plants, the trait for tall stems is dominant over the trait for short stems. If two heterozygous tall plants are crossed, what percentage of the offspring would be expected to have the same phenotype as the parents?

- A. 100%
- B. 75%
- C. 50%
- D. 25%

149. Hemophilia is a sex-linked, recessive trait. Which of the following describes the probability of hemophilia in the offspring of a man who does not have hemophilia and a woman whose father is a hemophiliac? [Hint: Create a Punnett Square to determine your answer]

- A. Each of their sons will have hemophilia.
- B. None of their daughters will have hemophilia.
- C. Their sons have a 25% chance of having hemophilia.
- D. There is a 50% chance that their daughters will have hemophilia.

150. Alleles for the A and B blood cell antigens are codominant. The condition where no antigens are present on the blood cells (type O blood) is a recessive trait. Using the table below, determine which set of parents can most likely produce a child with type O blood?

Genotypes	Phenotype
I ^A I ^A or I ^A i	A
I ^B I ^B or I ^B i	B
I ^A I ^B	AB
ii	O

- A. one parent with type AB blood, and the other parent with type A blood
- B. one parent with type AB blood and the other parent with type O blood
- C. one parent with heterozygous type A blood, and the other parent with type O blood
- D. one parent with homozygous type A blood, and the other parent with homozygous type B blood

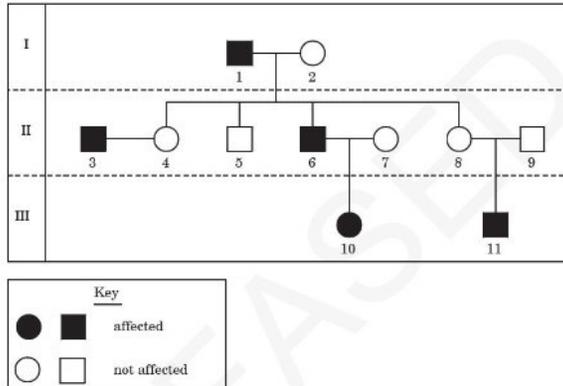
151. One of the parents of a child has phenylketonuria (PKU), which is caused by autosomal recessive alleles. The other parent does not have the PKU alleles. What is the chance that the couple will have a child with phenylketonuria? [Hint: Create a Punnett Square to determine your answer]

- A. 0%
- B. 50%
- C. 75%
- D. 100%

152. Hitchhiker's thumb (H) is dominant to no hitchhiker's thumb (h). A woman who does not have hitchhiker's thumb marries a man who is heterozygous for hitchhiker's thumb. What is the probable genotypic ratio of their children?

- A. 0% Hh: 100% hh
- B. 50% Hh: 50% hh
- C. 75% Hh: 25% hh
- D. 100% Hh: 0% hh

153. This diagram shows a pedigree for a recessive genetic disorder.



What is the genotype of individual 6?

- A. $X^H X^H$
- B. $X^H X^h$
- C. $X^H Y$
- D. $X^h Y$

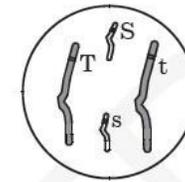
154. Two parent Holstein (black-and-white) cattle have multiple offspring. The fur ranges from black only, white only, and black and white. Which process best explains the variations in the offspring?

- A. independent assortment
- B. sex linkage
- C. dominance
- D. gene linkage

155. A human baby boy inherits a recessive allele from his mother. In which circumstance would he most likely show the trait coded for by the recessive allele?

- A. The baby inherits the dominant allele from his father.
- B. The allele is on an autosomal chromosome and the baby is a twin.
- C. The allele is on the X chromosome.
- D. The allele is on the Y chromosome.

156. This diagram shows a diploid cell with two pairs of homologous chromosomes.



Due to independent assortment, what is the possible genetic make-up of gametes produced by this organism?

- A. SsTt
- B. Ss, Tt
- C. S, s, T, t
- D. ST, St, sT, st

157. The table below lists the trials for fruit color where allele R exhibits incomplete dominance over allele R₁.

Genotype	Phenotype
R R	Red
R ₁ R ₁	Yellow
R R ₁	Orange

Heterozygous fruit have orange phenotypes. What percent of offspring are expected to have an orange phenotype if the parent plants are orange (RR₁) and yellow (R₁R₁)?

- A. 25%
- B. 50%
- C. 75%
- D. 100%

158. In guinea pigs, black coat color (B) is dominant over white coat color (b) and short hair (S) is dominant over long hair (s). Based upon the dihybrid cross shown below, what is the phenotype for letter X?

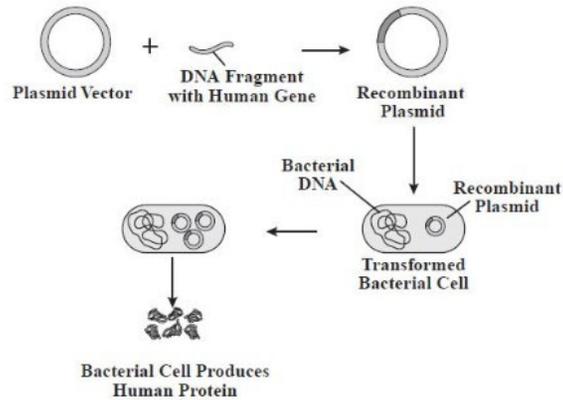
		Guinea pig female				
		Gametes	<i>BS</i>	<i>Bs</i>	<i>bS</i>	<i>bs</i>
Guinea pig male	<i>BS</i>	<i>BBSS</i>	<i>BBsS</i>	<i>BbSS</i>	<i>BbSs</i>	
	<i>Bs</i>	<i>BBSs</i>	<i>BBss</i>	X	<i>Bbss</i>	
	<i>bS</i>	<i>BbSS</i>	<i>BbSs</i>	<i>bbSS</i>	<i>bbSs</i>	
	<i>bs</i>	<i>BbSs</i>	<i>Bbss</i>	<i>bbSs</i>	<i>bbss</i>	

- A. brown coat, long hair
- B. black coat, short hair
- C. black coat, long hair
- D. black coat, long hair

SC.912.L.16.3 DNA Replication

159. What is the relationship between DNA and protein in a cell?
- A. DNA is made up of proteins that are synthesized in the cell.
 - B. Protein is composed of DNA that is stored in the cell.
 - C. DNA controls the production of protein in the cell.
 - D. The cell is composed only of DNA and protein.
160. The individuality of an organism is determined by the
- A. sequence of nitrogenous bases in deoxyribonucleic acid
 - B. number of amino acids in a cell
 - C. position of the ribosomes on the endoplasmic reticulum
 - D. number of nitrogenous bases in a codon
161. If 20% of a DNA sample is made up of thymine, T, what percentage of the sample is made up of cytosine, C?
- A. 15%
 - B. 30%
 - C. 35%
 - D. 50%
162. A medical test indicates that a patient has a defective protein. This condition is most likely due to a change in the directions coded in the:
- A. number of nitrogen bases
 - B. number of phosphate molecules
 - C. sequence of sugar molecules
 - D. sequence of subunits in DNA

163. Genes for medically important proteins can be cloned and inserted into bacteria, as shown in the diagram below.



Why can bacteria recognize a human gene and then produce a human protein?

- A. DNA replication in bacteria and humans is the same.
- B. Bacterial cells contain the same organelles as human cells.
- C. The basic components of DNA are the same in humans and bacteria.
- D. Bacterial cells and human cells contain the same kind of chromosomes.

164. Which choice describes DNA after replication has taken place?

- A. one molecule with two original strands and one molecule with two new strands
- B. two molecules, each with one original and one new strand
- C. two molecules, each with two new strands
- D. two molecules, each with two old strands

165. At what point in the cell cycle does DNA replication occur and why?

- A. before a cell divides, to provide each of the two resulting cells with a complete set of DNA instructions
- B. before a cell divides, to ensure that the DNA will fit into the resulting cells
- C. during cell division, to ensure that the DNA will fit into the resulting cells
- D. after a cell divides, to provide each of the two resulting cells with a complete set of DNA instructions

166. Four different segments of a DNA molecule are represented below.

Segment 1	Segment 2	Segment 3	Segment 4
T-A-G-G-C	G-C-T-C-A	G-A-T-T-A	C-A-A-T-G
A-T-C-C-G	C-C-A-C-T	C-C-A-A-T	G-T-T-A-C

There is an error in the DNA in which molecule?

- A. segment 1 only
- B. segment 3 only
- C. segment 2 and 3
- D. segment 2 and 4

167. The sequence of DNA below is part of a gene. How many amino acids are coded for by this segment?

5' ATCAGCGCTGGC 3'

- A. 4
- B. 8
- C. 12
- D. 20

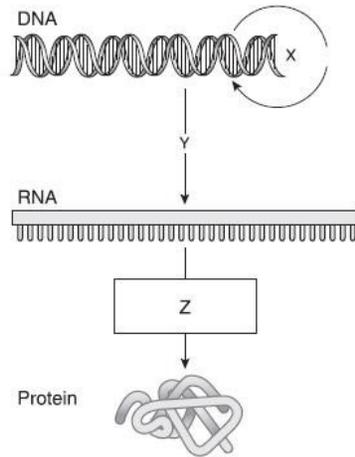
168. A scientist puts nucleotide chains of UUUUUU in a test tube under conditions allowing protein synthesis. Soon the test tube is full of polypeptide chains composed only of the amino acid phenylalanine. What does this experiment indicate?

- A. The amino acid phenylalanine is composed of uracil.
- B. UUU codes for the amino acid phenylalanine.
- C. Protein synthesis malfunctions in test tubes.
- D. Most proteins contain only one type of amino acid.

169. Which of the following would most likely cause a mutation?

- A. the placement of ribosomes on the endoplasmic reticulum
- B. the insertion of a nucleotide into DNA
- C. the movement of transfer RNA out of the nucleus
- D. the release of messenger RNA from DNA

170. A diagram of a cellular process is shown below.



Which of the following identifies the process shown at point Z?

- A. Translation
- B. Translocation
- C. Replication
- D. Transcription

171. Which of the following carries amino acids to the site of protein synthesis?

- A. mRNA
- B. rRNA
- C. tRNA
- D. nRNA

172. During transcription the DNA base sequence is transcribed into a complimentary mRNA sequence. A codon table like the one shown below lists the amino acids coded for by particular triads of mRNA bases. A segment of DNA has undergone a mutation in which one nucleotide has been changed. The original sequence was ACG and the new sequence is ACA. Use the codon table to determine whether or not this mutation will cause a change in the phenotype of the organism.

Codons Found in Messenger RNA

		Second Base				
		U	C	A	G	
First Base	U	Phe Phe Leu Leu	Ser Ser Ser Ser	Tyr Tyr Stop Stop	Cys Cys Stop Trp	U C A G
	C	Leu Leu Leu Leu	Pro Pro Pro Pro	His His Gln Gln	Arg Arg Arg Arg	U C A G
	A	Ile Ile Ile Met	Thr Thr Thr Thr	Asn Asn Lys Lys	Ser Ser Arg Arg	U C A G
	G	Val Val Val Val	Ala Ala Ala Ala	Asp Asp Glu Glu	Gly Gly Gly Gly	U C A G

- A. yes, the phenotype of the organism would change because a new amino acid will be coded for.
- B. yes, the phenotype of the organism would change because any change in the DNA sequence will cause a change in phenotype.
- C. Even though the DNA sequence changed, the sequence still codes for the same amino acid, so no change in phenotype will occur.
- D. It is impossible to determine if a change in phenotype will occur using only the DNA sequence.

SC.912.L.16.17: Mitosis vs. Meiosis

173. Mitosis and meiosis are processes involved in cellular reproduction. Which of the following describes an event that results from mitosis but NOT meiosis?

- A. two stages of cell division
- B. replication of cellular genetic material
- C. daughter cells that are identical to the parent cell
- D. four daughter cells that are produced from each parent cell

174. How are sexual reproduction and asexual reproduction different from each other?

- A. sexual reproduction requires two parents and asexual reproduction requires only one parent
- B. asexual reproduction requires two parents and sexual reproduction requires only one parent
- C. mutation rates are lower in sexual reproduction than in asexual reproduction
- D. asexual reproduction occurs only in multicellular organisms

175. Which type of reproduction leads to increased genetic variation on a population?

- A. Parthenogenesis
- B. Asexual reproduction
- C. Sexual reproduction
- D. Vegetative reproduction

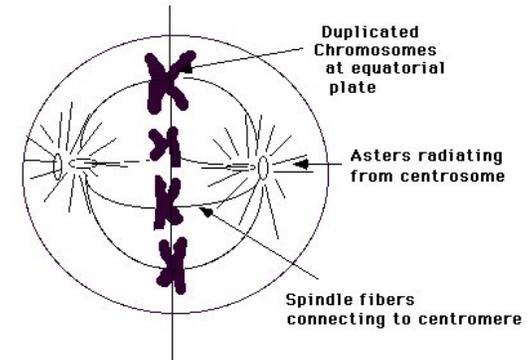
176. Which of the following phrases best describes cancer?

- A. absence of cyclins in the DNA
- B. multiple gene mutations on a chromosome of DNA
- C. uncontrolled cell growth caused by mutations in genes that control the cell cycle
- D. presence of genetic defects caused by hereditary disorders

177. Which of the following best describes meiosis?

- A. It is carried out in all tissues that require cell replacement.
- B. It occurs only in cells in the reproductive structures of organisms.
- C. It happens in all tissues except the brain and spinal cord.
- D. It is the first stage of mitosis.

178. Which of the following phases of mitosis is represented by the diagram below?



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

179. A scientist wants to change the DNA of a sexually reproducing organism and have the new DNA present in every cell of the organism. In order to do this after fertilization, she would change the DNA in which of the following?

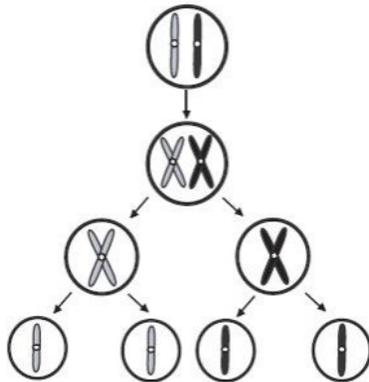
- A. zygote
- B. placenta
- C. testes of the father
- D. ovaries of the mother

180. Which row in the chart below indicates the correct process for each event indicated?

Row	Formation of Egg	Formation of Sperm	Growth of Embryo
(1)	mitosis	mitosis	meiosis
(2)	mitosis	meiosis	mitosis
(3)	meiosis	mitosis	meiosis
(4)	meiosis	meiosis	mitosis

- A. row 1
- B. row 2
- C. row 3
- D. row 4

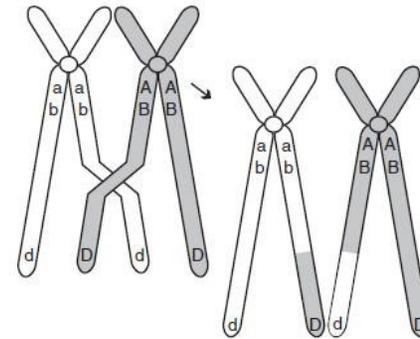
181. The diagram below shows a cellular process that occurs in organisms.



What is the name of this process?

- A. meiosis
- B. mitosis
- C. endocytosis
- D. phagocytosis

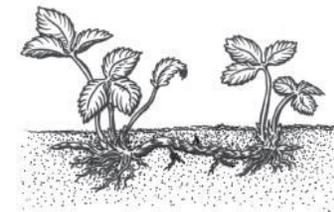
182. The diagram below shows homologous chromosomes during prophase I of meiosis.



Which of the following correctly describes the process being illustrated?

- A. mutation in which the DNA content of the gene is altered
- B. segregation of sister chromatid
- C. condensation and segregation of alleles
- D. crossing-over in which alleles are exchanged

183. The diagram below shows two strawberry plants.



Plant 1 Plant 2

Plant 2 is produced asexually from Plant 1. If the leaf cells of Plant 1 have 56 chromosomes, how many chromosomes will be found in the leaf cells of Plant 2?

- A. 14
- B. 28
- C. 56
- D. 112

SC.912.L.16.10: Biotechnology

184. Genetic screening is a procedure where a person's DNA is analyzed to identify a genetic predisposition to lethal diseases. One advantage of genetic screening is that it allows doctors to prevent and treat diseases before patients have symptoms. Which of the following is a **disadvantage** of genetic screening?

- A. Genetic screening results could be used to determine inheritance patterns in families.
- B. The likelihood of a child contracting an inheritable disease could be predicted by genetic screening.
- C. A doctor could combine a patient's current symptoms with genetic screening results to diagnose and treat the patient.
- D. Insurance companies could drop a patient's medical coverage based on potential medical issues projected by genetic screening.

185. Animal "pharming" is becoming more popular as the demand for human proteins and vaccines continues to grow. Animal "pharming" is the process of using transgenic animals to produce human drugs such as insulin and human growth hormone. Transgenic animals are animals which have been genetically transformed by splicing and inserting foreign genes into their chromosomes. If successful, the inserted gene can enable an animal to make certain proteins in its milk, blood, sperm, or eggs. Which of the following is NOT true about transgenic animals?

- A. Transgene DNA may insert itself into the genome in a way that disrupts the animal's normal gene function.
- B. Transgenic animals cannot pass their ability to produce the desired drug to its offspring.
- C. Transgenic animals can produce the desired drug at high levels without endangering its own health.
- D. Transgenic animals can be easily tested for the new gene.

186. In October of 1990, the US Department of Energy's Office of Science and the US National Institute of Health began the process of mapping the human genome. This process was referred to as The Human Genome Project and was intended to identify the 20,000 – 25,000 genes of the human genome. A working draft of the genome was announced in 2000 and a complete one in 2003. Which of the following describes the main benefit of completing The Human Genome Project?

- A. Cloning humans
- B. Designing new human genes
- C. Patenting specific human genes
- D. Identifying genetically-based diseases

187. Genetic engineering has both positive and negative outcomes. One of the most common areas where genetic engineering is used is in agriculture. If farmers plant more genetically modified crops, which of the following negative outcomes could occur?

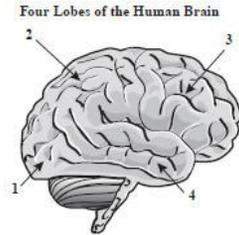
- A. An increase in the use of pesticides
- B. A decrease in genetic diversity of the crops
- C. An increase in the contamination of the water supply
- D. A decrease in crop productivity

188. Rice, the most popular food crop in the world, can be successfully grown only in certain places. If trends in climate change continue, the areas in which rice currently grows will be significantly reduced. Which of the following is the best way that biotechnology can keep the harvest of rice from decreasing?

- A. Identifying new areas with soil fertile enough for rice production.
- B. Developing clean energy sources to reduce carbon dioxide production worldwide.
- C. Seeing clouds with dry ice to produce more rainfall where it is needed.
- D. Genetically engineering rice crops that are tolerant to change in the environment.

SC.912.L.14.26: Major Parts of the Brain

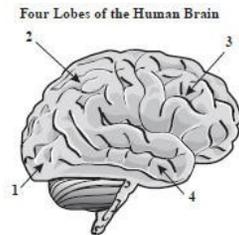
189. The illustration below shows four lobes of the human brain.



What lobe is designated by label 2?

- A. temporal
- B. parietal
- C. occipital
- D. frontal

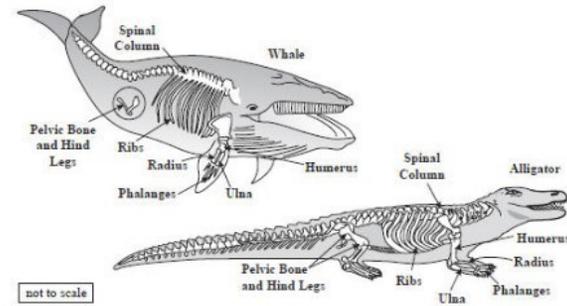
190. Which lobe of the brain is designated by number 4?



- A. occipital lobe
- B. parietal lobe
- C. frontal lobe
- D. temporal lobe

SC.912.L.15.1 Evolution

191. The scientific theory of evolution is supported by different types of evidence. The diagrams below show the skeletons of two different animal species. How does comparing the skeletons of these animals provide support for the scientific theory of evolution?

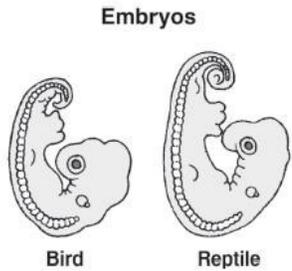


- A. It provides information about the organisms' habitats.
- B. It shows possible common ancestry between organisms.
- C. It provides information to determine the organisms' ages.
- D. It shows possible chromosomal similarities between organisms.

192. According to fossil records, the horses that lived 50 million years ago were much smaller, weaker and slower than modern horses. Which process is most likely responsible for the changes that have led to the increased size, strength, and speed in horses?

- A. commensalism
- B. inbreeding
- C. migration
- D. evolution by natural selection

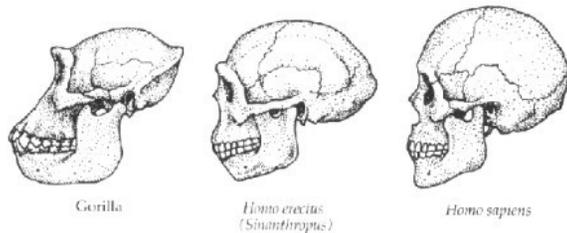
193. The diagram illustrates an embryonic stage of two organisms.



Which of the following can be determined by observing the embryos shown in the diagram?

- A. The organisms share a common ancestry.
- B. The organisms belong to the same genus.
- C. The organisms are native to the same geographic areas.
- D. The organisms will grow into anatomically similar adults.

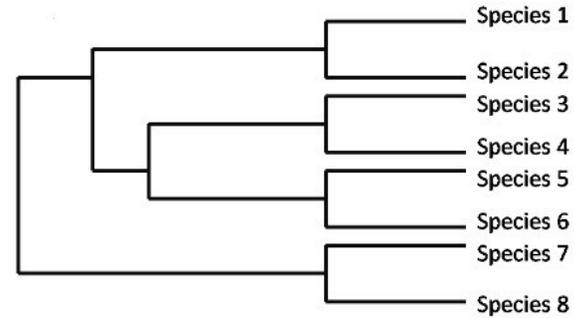
194. Scientists have found evidence that about 2.4 million years ago a gene regulating jaw muscles mutated and may have led to the more graceful human jaw we see today. The diagram below shows the skulls of 3 hominid species.



Which statement below most closely explains the link between jaw size and hominid evolution?

- A. The jaws of hominids evolved to be smaller and less protruding over time.
- B. The jaws of hominids evolved to be larger and more protruding over time.
- C. There appears to be no change in the jaws of hominids over time.
- D. The jaws of hominids changed over time due to a change in brain size.

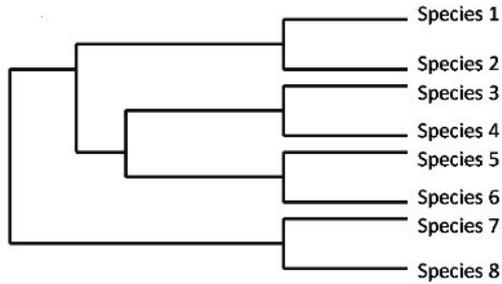
195. Scientists are studying the evolutionary history of a group of plants in the United States, and they developed an evolutionary tree, as shown below.



Which statement can be inferred from the evolutionary tree?

- A. Species 1 is most closely related to Species 8.
- B. Species 2 is most closely related to Species 3.
- C. Species 3 is most closely related to Species 7.
- D. Species 5 is most closely related to Species 6.

196. Scientists are studying the evolutionary history of a group of plants in the United States, and they developed an evolutionary tree, as shown below.



What information about the organisms best helps the scientists to determine the evolutionary relationships among them?

- A. DNA sequences
- B. Anatomical features
- C. Habitat types
- D. Reproductive Strategies

SC.912.L.15.8: Origin of Life

197. One of the accepted scientific theories describing the origin of life on Earth is known as chemical evolution. According to this theory, which of the following events would need to occur first for life to evolve?

- A. onset of photosynthesis
- B. origin of genetic material
- C. Synthesis of organic molecules
- D. formation of the plasma membrane

198. Which types of organisms developed first due to the early environmental conditions on Earth?

- A. prokaryotic and aerobic
- B. prokaryotic and anaerobic
- C. eukaryotic and aerobic
- D. eukaryotic and anaerobic

199. The Miller-Urey experiment of 1953 was designed to test the hypothesis that lightning supplied the energy needed to turn atmospheric gases into organic molecules such as amino acids. Which of the following describes why the Miller-Urey theory is widely accepted today?

- A. Amino acids spontaneously form from molecules in the atmosphere today.
- B. Organic molecules are present today in extremely high concentrations.
- C. The process of synthesizing organic molecules from a mixture of gases has been successfully modeled in the laboratory.
- D. No other alternative hypotheses have been introduced.

200. Endosymbiosis is a proposed theory of the origin of eukaryotic cells. Which of the following explains why cells that contained mitochondria-like organelles had an evolutionary advantage?

- A. They were able to photosynthesize
- B. They had more DNA
- C. They were able to make more use of available energy
- D. They were immune to bacterial invasion.

SC.912.L.15.13: Natural Selection

201. Over time, the climate of an island became drier, which resulted in changes to the populations of various island finch species. Finch populations with a certain beak shape were able to forage for food. The population of those not having that beak shape decreased. Which of the following describes a necessary condition for these changes in the finch populations to occur?

- A. fewer mutations
- B. limited resources
- C. limited beak variations
- D. underproduction of offspring

202. Which of these would have the least effect on natural selection in a subspecies of giraffes that is geographically isolated from other subspecies of giraffes?

- A. available niches
- B. existing predators
- C. chromosome number
- D. available food resources

203. Mutations within a DNA sequence are:

- A. natural processes that produce genetic diversity
- B. natural processes that always affect the phenotype
- C. unnatural processes that always affect the phenotype
- D. unnatural processes that are harmful to genetic diversity

204. Which of the following best illustrates natural selection?

- A. An organism with favorable genetic variations will tend to survive and breed successfully.
- B. A population monopolizes all of the resources in its habitat, forcing other species to migrate.
- C. A community whose members work together utilizing all existing resources and migratory routes.
- D. The largest organisms in a species receive the only breeding opportunities.

205. A small population of chimpanzees lives in a habitat that undergoes no changes for a long period. How will genetic drift probably affect this population?

- A. It will accelerate the appearance of new traits.
- B. It will promote the survival of chimpanzees with beneficial traits.
- C. It will increase the number of alleles for specific traits.
- D. It will reduce genetic diversity.

206. A small portion of the population that is geographically isolated from the rest of the population runs the risk of decreased.

- A. genetic drift
- B. mutation rate
- C. natural selection
- D. genetic variation

207. In his book *On the Origin of the Species*, Charles Darwin described how species change over time. Which of the following is NOT part of his observations that describes the mechanisms of natural selection?

- A. Organisms produce more offspring than can survive.
- B. Disease and natural disaster will limit population growth.
- C. Species today descended with modifications from ancestral species.
- D. Organisms with advantages will survive and reproduce.

208. Theodosius Dobzhansky discovered that successful species tend to have a wide variety of genes that do not appear to be useful to the species in its present environment. What did this discovery help explain about genetics and the changes that occur in a species over time?

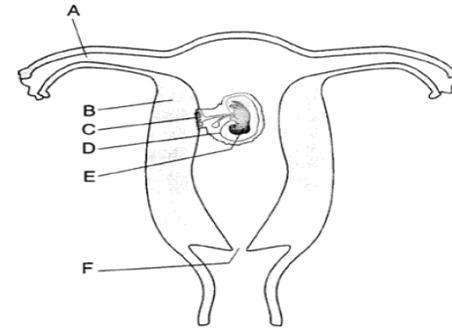
- A. Environments with more organisms tend to have more successful species.
- B. Species with greater genetic diversity adapt more easily to changing environments.
- C. Changing environments prevent species from adapting and surviving.
- D. Species in a stable environment are more resistant to a changing environment.

SC.912.L.16.13: Reproduction and Fetal Development

209. Sexual reproduction is vital to the propagation of the human race. Which of the following sequences represents the correct order of events in the formation of a human fetus?

- A. Zygote → Blastocyst → Embryo → Fertilization
- B. Fertilization → Zygote → Blastocyst → Embryo
- C. Blastocyst → Embryo → Differentiation → Zygote
- D. Fertilization → Growth → Differentiation → Zygote

210. The diagram below shows a fetus implanted in a female uterus.



Fertilization of the egg most likely occurred in which of the following structures?

- A. 1
- B. 2
- C. 5
- D. 6

211. The drinking of alcoholic beverages by a pregnant woman is harmful to the development of her fetus. This is most damaging early in the first trimesters of pregnancy because during this time

- A. the lungs of the fetus become functional.
- B. alcohol can easily enter the mouth of the fetus.
- C. many of the essential organs of the fetus are forming.
- D. the fetus cannot excrete wastes.

212. Which of the following describes fertilization?

- A. Cell differentiation to form a blastula
- B. Formation of germ layers in a deuterostome
- C. A sperm joining an egg to form a zygote
- D. Sperm and egg production

213. Abnormalities present in the cells that line the uterus may prevent the production of offspring by directly interfering with which process?

- A. The development of the embryo.
- B. The differentiation of gametes into zygotes.
- C. The secretion of estrogen by the ovary.
- D. The production and release of egg cells.

214. Sperm are created through meiosis in an area of the testes called the seminiferous tubules. Through which structure do the sperm travel to exit the testes?

- A. vas deferens
- B. seminiferous tubules
- C. scrotum
- D. epididymis

215. Which of the following is true of a zygote?

- A. It forms into a blastocyst
- B. It is an unfertilized egg
- C. It produces haploid male gametophytes
- D. It is made up of only one cell

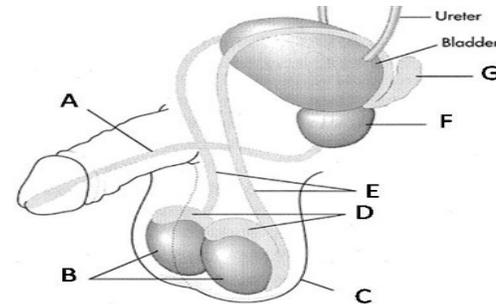
216. What is the human embryo called after the eighth week of development?

- A. a zygote
- B. an infant
- C. a fetus
- D. a morula

217. Which of the following events occurs during the first trimester?

- A. heart beat begins
- B. lungs fully developed
- C. bones become solid
- D. fetus moves, kicks and swallows

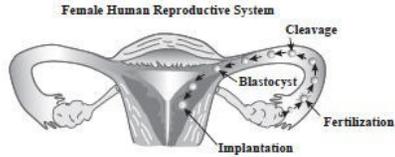
218. Below is a diagram of the male reproductive system.



Which structure is represented by the letter D?

- A. scrotum
- B. testes
- C. prostate gland
- D. epididymis

219. A fertilized egg undergoes several stages before it is successfully implanted. The diagram below shows these stages as the fertilized egg travels through the female reproductive system.



In which of the following structures of the female human reproductive system is the blastocyst implanted during normal human development?

- A. ovary
- B. uterus
- C. vagina
- D. amniotic sac

SC.912.L.14.36: Blood Flow

220. The rate at which blood flows through the human body changes in response to many factors. Which statement describes one of these factors and its effect on blood flow?

- A. A high viscosity of blood causes an increased resistance in the blood vessels and leads to slow blood flow.
- B. A low blood pH decreases the rate of diffusion through the blood vessels and leads to slow blood flow.
- C. The changing of the shape of red blood cells to a crescent shape decreases resistance and lead to a faster blood flow.
- D. The narrowing of blood vessels increases pressure and leads to a faster blood flow.

221. Cardiovascular disease runs in Jim's mother's family. Jim is only 17 but knows that his mom and grandparents all have high blood pressure. Which of the following best describes the connection between cardiovascular disease and age?

- A. As people age, their blood vessels become more elastic leading to less cardiovascular disease.
- B. As people age, the heart becomes more efficient with each pump, increasing cardiac output.
- C. As people age, blood pressure decreases leading to more cardiovascular disease.
- D. As people age, plaque builds up in the arteries increasing vessel resistance, which leads to disease.

222. Jim was told that he might need to go on medication if his blood pressure continues to be high. What causes blood pressure?

- A. cholesterol in the blood
- B. stress that exercise puts on heart muscle
- C. contraction of the ventricles in the heart
- D. removal of oxygen from the blood

SC.912.L.14.52: Immune

223. How do human diseases caused by bacteria and diseases caused by viruses react to antibiotics?

- A. Neither responds to antibiotics.
- B. Both respond to antibiotics.
- C. Viral diseases respond to antibiotics; bacterial diseases do not.
- D. Bacterial diseases respond to antibiotics; viral diseases do not.

224. Vaccines are weakened forms of disease causing microorganisms, which are given to patients to prevent disease. After the vaccine is administered, what response to the vaccine is triggered in the body?

- A. Secretion of antigens by lymphocytes.
- B. Absorption of histamines throughout the body.
- C. Production of temporary resistance to the disease.
- D. Production of antibodies providing active immunity.

225. Scientists developed a vaccine to protect humans from the H1N1 virus, which caused 17,000 deaths in 2009. Which of the following persons would most likely contract the H1N1 virus?

- A. A person who did not receive the vaccine and has a weakened immune system due to other conditions.
- B. A person who received the vaccine and has a weakened immune system due to other conditions.
- C. A person who did not receive the vaccine but has a normal immune system.
- D. A person who received the vaccine and has a normal immune system.