

**Week 2**  
EOC Review  
***Macromolecules, Water, Photosynthesis vs Cellular Respiration***

**Benchmarks:**

SC.912.L.18.1 Describe the basic molecular structures and primary functions of the four major categories of biological macromolecules.

SC.9.12.L.18.11 Explain the role of enzymes as catalysts that lower the activation energy of biochemical reactions. Identify factors, such as pH and temperature, and their effect on enzymes activity.

SC.912.L.1.18.12 Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent

SC.912.L.18.9 Explain the interrelated nature of photosynthesis and cellular respiration

SC.912.L.18.7 Identify the reactants, products, and basic functions of photosynthesis

SC.912.L.18.8 Identify the reactants, products, and basic functions of aerobic and anaerobic cellular respiration

SC.912.L.18.10 Connect the role of adenosine triphosphate (ATP) to energy transfers within the cell.

**Summary:**

**You need to know the following:**

- The basic molecular structure and primary functions of carbohydrates, proteins, lipids, and nucleic acids.
- The role of enzymes as catalysts that lower the activation energy of biochemical reactions.
- How factors such as pH and temperature affect enzyme activity.
- The specific properties of water that contribute to Earth's suitability as an environment for life. These include: cohesive behavior, ability to moderate temperature, expansion upon freezing, versatility as a solvent, hydrogen bonding and polarity.
- How photosynthesis and cellular respiration are related (that the products of one are the reactants of the other).
- The reactants, products and basic functions of photosynthesis, aerobic, and anaerobic respiration.
- To understand how ATP is connected with energy transfers within the cell.
- That photosynthesis stores energy while cellular respiration releases energy.

**Additional Support**

- Holt McDougal Biology Interactive Reader:
  - Chapter 2, Section 2.2, 2.3, 2.4, 2.5
  - Chapter 4, Section 4.1, 4.2, 4.4
- Everglades Biology End-Of-Course Review

- Pages 39-65, 88-96
- Websites
  - <http://www.ecsd-fl.schoolloop.com/BiologyEOCReview>
  - <http://fcats.fldoe.org/eoc/>

## **Sample Questions**

### **SC.912.L.18.12: Water**

1. Water has a much higher specific heat than most other covalent compounds. What do you predict might happen if water had a low specific heat instead?

- A. Flooding would occur and animals would be forced to migrate
- B. Harmful organisms living in water would reproduce at a rapid rate
- C. Organisms that are sensitive to changes in temperature would die
- D. Plants would not have enough water to effectively carry out photosynthesis

2. Small insects can walk across the surface of calm water. Their feet push the surface of the water down slightly, somewhat like a person walking across a trampoline, but they do not break the surface. What is the best explanation for why this happens?

- A. The insects are light enough so that they do not break the hydrogen bonds holding the water molecules together
- B. The insects actually use their wings to hover slightly above the water's surface and they only skim it with their feet
- C. The insects' feet are non-polar, so they are repelled by the polar water molecules and are pushed away from the water's surface
- D. The insects are small enough to see the individual water molecules, so they are able to step carefully from one molecule to the next

3. A florist places a bouquet of white carnations in water containing blue dye. After a time, the flowers turn blue. What process helped the carnations to change color?

- A. Specific heat
- B. Surface tension
- C. Cohesion and adhesion of water molecules
- D. Formation of covalent bonds between hydrogen and oxygen molecules

4. Maria, after finding no cold sodas in the refrigerator, placed a can of soda in the freezer. She then proceeded to check her social networking site and forgot about the soda. Later that evening her brother went to get some ice and it was brown. Maria's soda can had split open. What is the best explanation for what happened?

- A. As the water cooled, it adhered to the can, causing it to split
- B. When the water froze, the space between hydrogen molecules expanded
- C. When the water froze, it weakened the molecular bonds in the aluminum can
- D. As the water cooled, the surface tension of the water decreased and the can collapsed

5. 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.

6. 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.

7. 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.

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

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

9. 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**

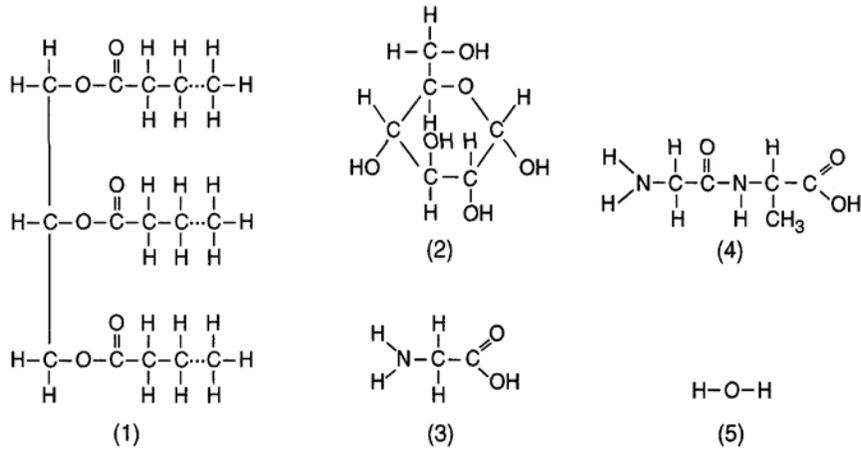
1. Two of the four principle classes of organic compounds are proteins and nucleic acids. What is the relationship between proteins and nucleic acids?

- 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

2. 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.

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

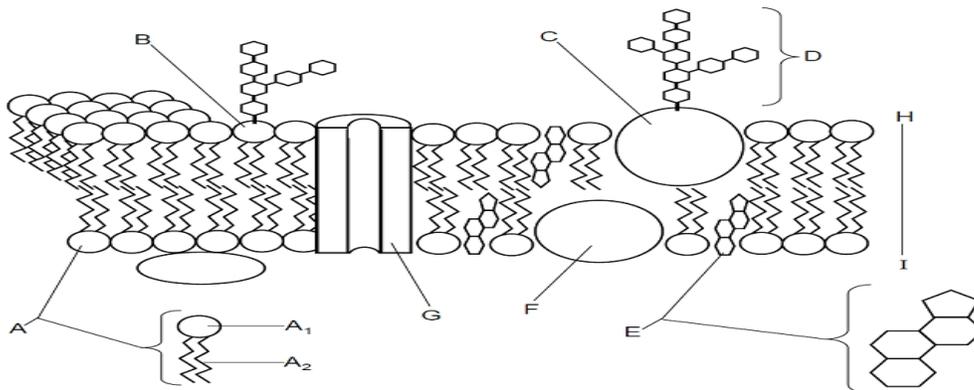


- A. 1
- B. 3
- C. 2
- D. 4

4. 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.



5. What is the building block of structure G?

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

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

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

7. Which macromolecule is not labeled on the cell membrane above?

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

8. 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.

9. 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

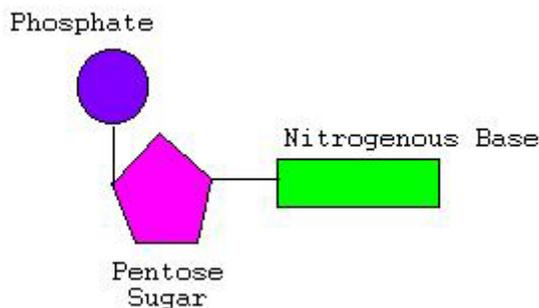
10. Many plants have waxy coatings on some surfaces. This coating reduces water loss because it is not water-permeable. This waxy coating is which of the following types of organic molecule?

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

11. 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?

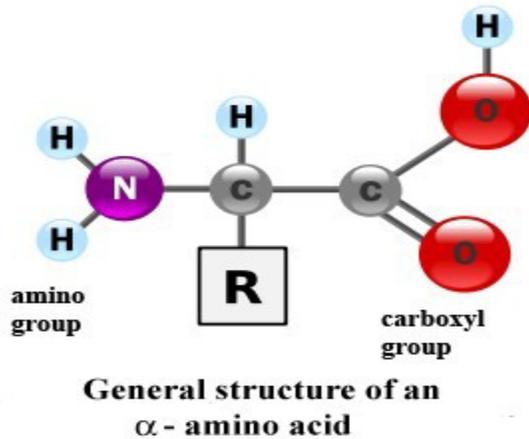
- A. polymers of smaller subunits
- B. sequence of sugars
- C. lipids of large molecules
- D. nucleotides of DNA

12. What is the function of macromolecule subunit below?



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

13. The diagram below shows a monomer a macromolecule. Which type of molecule contains these monomers?



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

### SC.912.L.18.11 Enzymes

1. 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.

2. 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.

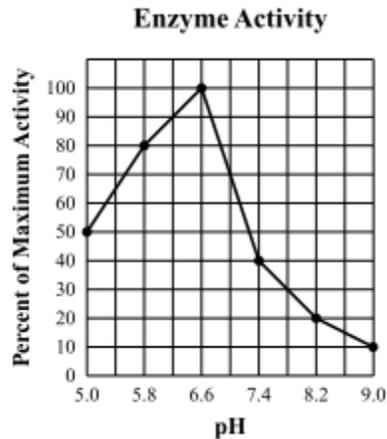
3. Meat tenderizer contains an enzyme that breaks down meat. If meat is coated with tenderizer and then placed in a refrigerator, how would the enzyme be affected?

- 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.

4. 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.

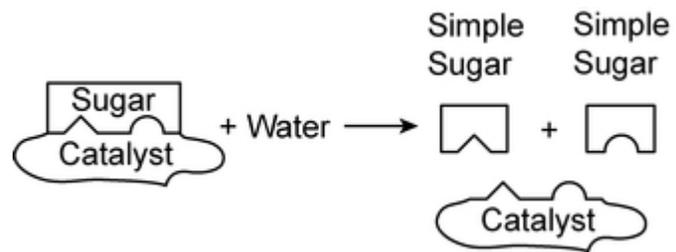
5. The graph below shows how the activity of an enzyme changes over a range of pH values.



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.

6. 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

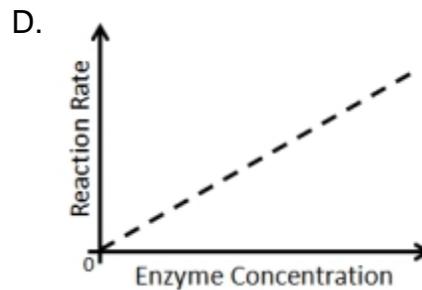
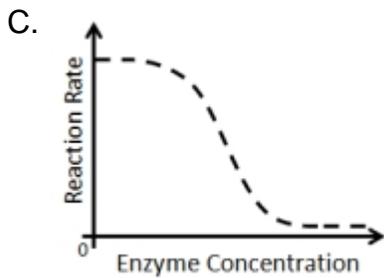
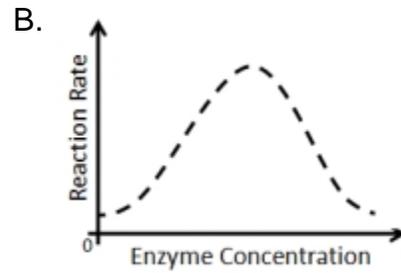
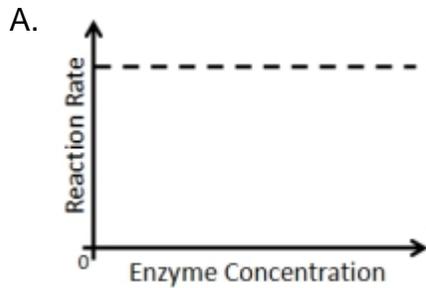
7. The human body maintains a temperature of around 98.6 degrees at all times. Enzymes are involved in almost every chemical reaction in the body. Which of the following describes the connection between these two statements?

- 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.

8. 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.

9. 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

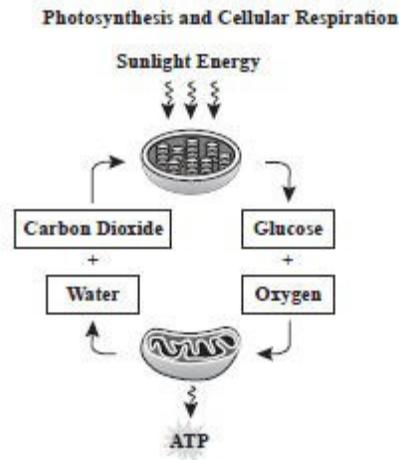
1. How are cellular respiration and photosynthesis related, in terms of energy?

- 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.

2. 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.

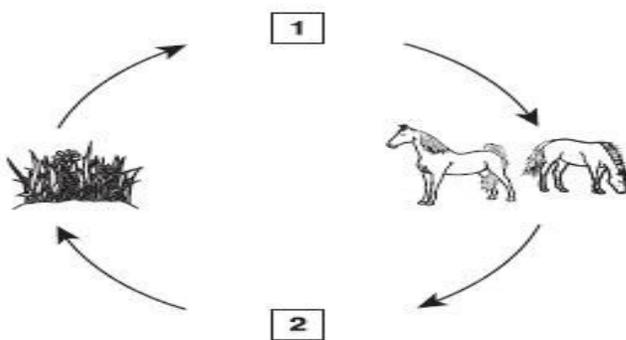
3. The diagram below shows the relationship between photosynthesis and cellular respiration and the organelles in which they occur.



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.

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



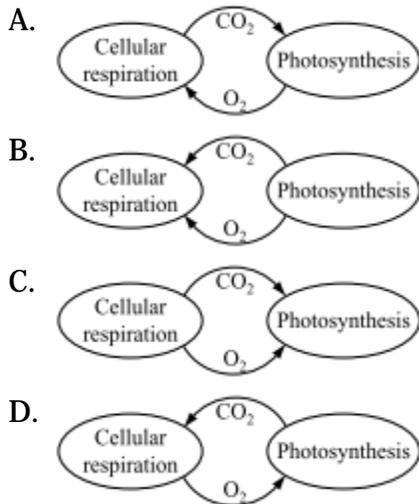
The numbered boxes in the diagram represent which of the following?

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

5. 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.

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



### SC.912.L.18.7 Photosynthesis

1. Which gas is removed from the atmosphere during photosynthesis?
- A. hydrogen
  - B. oxygen
  - C. nitrogen
  - D. carbon dioxide

2. 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.

3. 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. She 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

4. 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

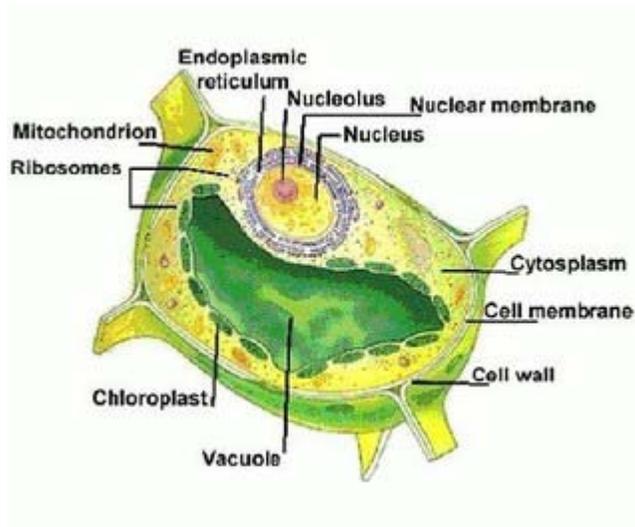
5. Which process takes place in the presence of oxygen and produces nearly 20 times as much as ATP as glycolysis alone?

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

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

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

7. Which of the following structure is where photosynthesis occurs in the cell below?



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

### SC.912.18.8 Cellular Respiration

1. Two different species of bacteria are examined. Scientists find that species X always produces  $\text{CO}_2$  and  $\text{H}_2\text{O}$  during cellular respiration. Species Y always produces ethyl alcohol and  $\text{CO}_2$ . Which conclusion can be made from these observations?

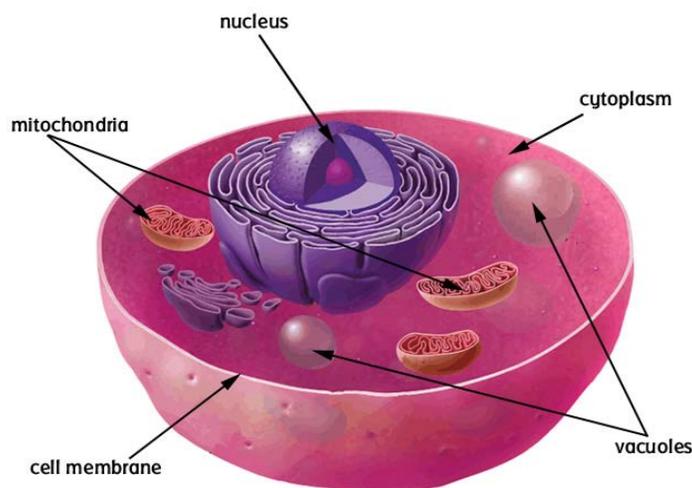
- A. Only species Y is aerobic.
- B. Only species Y is anaerobic.
- C. Both species X and Y are aerobic.
- D. Both species X and Y are anaerobic.

2. 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.

3. Which of the following structure is where cellular respiration occurs in the cell below?

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



### **SC.912.18.10 ATP**

1. 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

2. Which process do the animals in the food web 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**

1. 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