Webster County Schools

95 CLARK AVENUE – EUPORA, MS 39744

Office of Curriculum

662-258-5551, Extension 15

packets@webstercountyschools.org

Biology

Packet 2

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For Additional Online Resources, please see the Link to the following resources on the Curriculum page on www.webstercountyschools.org:

MDE Learning-at-Home Resources for Districts

The resources contained on this website contain materials and tools that may be used to provide additional resources to parents or students. This information is only intended to be a general summary of information provided to the public. The Mississippi Department of Education does not endorse or promote any commercial products or services. The views and opinion of authors expressed do not necessarily reflect those of the MDE, and they may not be used for advertising or product endorsement purposes. Please make sure that you choose the tool(s), resource(s) or material(s) that are developmentally appropriate and best fit the needs of your students, school, or district.

Resources have been divided into the following categories:

- Internet Services
- Multiple Content Area Resources
- Arts (Dance, Music, Theatre, Visual Arts) Resources
- Career Pathway Experiences (CPE) Alternative Resources
- English Language Arts Resources
- Mathematics Resources
- Science Resources
- Social Studies Resources
- World Language Resources
- Counselor Resources
- English Learner Resources
- Virtual Learning Resources

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At-Home Learning Packet Schedule:

- Packet 2- April 20, 2020
- Packet 3- May 4, 2020
- Packet 4- May 18, 2020

Life, Cells & Viruses

Question 1 .

In the 1800s, the work of Rudolf Virchow and others led to third tenet of cell theory. What contribution to cell theory did Rudolf Virchow make?

A. After seeing evidence of cell division, he argued that all cells arise only from pre-existing cells.

B. After observing cells in plants, he concluded that all life is made of one or more cells.

C. After seeing evidence of photosynthesis, he concluded that energy flow occurs within cells.

D. After observing cells in animals, he concluded that the cell is most basic unit of life.

Question 2 .

In 2018, researchers discovered a new type of virus called the Tupanvirus. They made the following observations about this virus.

Observation 1	Observation 2	Observation 3
uses amoebas as host cells	contains many of the genes needed to build its own proteins and copy its DNA	if taken into a non-host cell, causes the cell to destroy itself

Information courtesy of Abrahao et al., 2018. Nature Communications. Licensed under CC BY 4.0.

How could this information support the argument that viruses could be living organisms?

A. Observation 3 shows that viruses must be able to take in and use energy.

B. Observation 2 suggests that viruses are incapable of evolving over time.

C. Observation 2 suggests that viruses may have once had the ability to reproduce outside of a host.

D. Observation 3 shows that viruses are unable to respond to and interact with their environments.

Question 3 .

Directions: Drag the tiles to the correct boxes to complete the pairs.

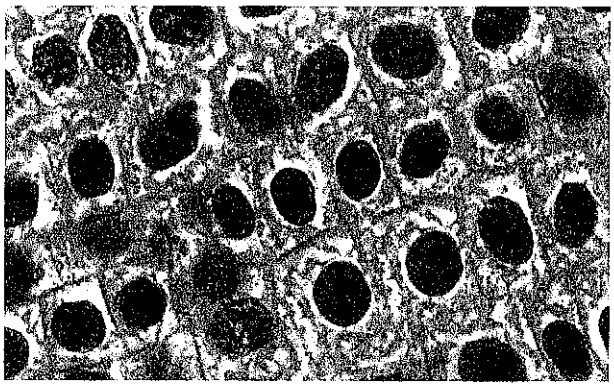
Diego is comparing the hierarchical organization of his school system to the hierarchical organization of systems within organisms. Match each part of a school system to the part of an organism that shares a similar level of organization.

tissue | cell | organ system | organ

school system	⟷
school	⟷
class	⟷
student	⟷

Question 4 .

The image below shows an onion root viewed under a microscope.



Which of the three primary tenets of cell theory does this image best demonstrate?

A. Living organisms are composed of one or more cells.

B. All cells contain DNA in their nuclei.

C. New cells only arise from pre-existing cells.

D. Cells of different organisms have similar composition.

Question 5 .

What contribution did Robert Hooke make to the development of cell theory?

A. He suggested that all living organisms are made up of cells.

B. He first observed and described cells in plant tissues.

C. He determined that cells can arise spontaneously.

D. He first proposed that cells can only arise from pre-existing cells.

Question 6 .

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

A. All living organisms must consume food in order to acquire nutrition.

B. All living organisms can produce glucose through photosynthesis.

C. All living organisms are composed of one or more cells.

D. All living organisms consist of many cells with specialized organelles.

Question 7 .

The table below describes some of the components of the vertebrate nervous system.

Component	Description
Neuron	A cell that is specialized to send signals. Neurons have a cell body connected to a long projection called an axon, which transmits signals.
Glial Cells	Cells that provide support and protection for neurons.
Grey matter	A collection of neuron cell bodies and glial cells.
White matter	A collection of neuron axons and glial cells.
Brain	A collection of grey and white matter that coordinates nervous system activity.
Spinal cord	A collection of grey and white matter that transmits information between the brain and the body.

Which of the following best describes levels of organization in the vertebrate nervous system?

A. Grey and white matter are organs made up of tissues, and they form the brain, which is an organ system.

B. Glial cells make up neurons, which are tissues, and these form the brain and spinal cord, which work together to transmit information through the body.

C. Grey and white matter are tissues, and they form the brain and spinal cord, which are organs that work together to perform a function.

D. The brain and spinal cord are tissues made up of cells, and these form grey and white matter, which are organs.

Question 8 .

As Darla is walking along the beach, she encounters something she's never seen before. When she touches the object, it appears to move away from her. This observation makes Darla wonder if the object is alive.

Which of the following positive test results could provide Darla with another piece of evidence that the object is alive?

A. presence of oxygen

B. presence of ions

C. presence of water

D. presence of DNA

Question 9 .

In 1987, scientists isolated an unknown biological particle from the sand of a river. The particle had the following characteristics:

- is single-celled
- cannot function in the presence of oxygen
- has circular DNA
- uses inorganic substances like metals for energy
- reproduces without a host cell

Based on the given information, is it likely that the particle is classified as living or nonliving?

A. living, because the particle has DNA

B. living, because the particle uses energy and reproduces on its own

C. nonliving, because the particle does not need oxygen or food

D. nonliving, because the particle cannot transmit genetic material to offspring

Question 10 .

Arteries are tube-like organs of the circulatory system. They have three distinct layers. The middle layer contains smooth muscle tissue, which contracts and relaxes to push blood through the artery. It also contains elastic connective tissue that gives the artery flexibility and helps to regulate blood pressure.

Which statement describes how the tissues in this layer relate to the artery's function?

A. The two tissues lack cells, but their position in the middle layer allows each tissue to perform their specific functions.

B. The two tissues are made up of the same types of cells, allowing each tissue to perform all the functions of the artery.

C. The two tissues contain different types of cells, allowing each tissue to perform different functions for the artery.

D. The two tissues contain identical cells, but the shapes of two tissues allow them to perform different functions.

Explanations

1. Rudolf Virchow examined evidence obtained by another researcher, Robert Remak, showing that new cells arise through **cell division.** After seeing this evidence, **he argued that all cells arise only from pre-existing cells.** This conclusion formed the third tenet of cell theory.

2. A living organism must be able to reproduce on its own. According to Observation 2, the Tupanvirus contains almost all of the genes needed to replicate on its own. One explanation for this observation is that Tupanvirus has lost the ability to reproduce outside of a host cell over time. So, **observation 2 suggests that viruses may have once had the ability to reproduce outside of a host**. This supports the argument that viruses may be living organisms that have changed over time.

3. Students make up classes, classes make up schools, and schools make up school systems. This is analogous to how cells make up tissues, tissues make up organs, and organs make up organ systems.

school system	organ system
↑	↑
school	organ
↑	↑
class	tissue
↑	↑
student	cell

4. The image shows that an organized arrangement of cells makes up the onion root. So, this image demonstrates that **living organisms are composed of one or more cells,** which is one of the tenets of cell theory.

5. In the 1600s, Robert Hooke built an improved version of the microscope and used it to perform detailed microscopic studies of organisms. Through this work, he **first observed and described cells in plant tissues.** His discoveries laid the foundation for the development of cell theory.

6. **All living organisms are composed of one or more cells.**

   All of the other listed characteristics are true of *some* living organisms but not *all* living organisms. For example, only plants and some microorganisms perform photosynthesis, and only eukaryotes contain specialized membrane-bound organelles.

7. Tissues are made up of cells. According to the table, grey and white matter are made up of neurons and glial cells.This indicates that **grey and white matter are tissues**. These tissues **form the brain and spinal cord.**

   An organ is a group of tissues that performs a specific function. The brain coordinates nervous system activity, and the spinal cord transmits information throughout the brain and the body. So, the brain and spinal cord **are organs that work together to perform a function.** These organs form part of an organ system.

8. All living organisms must

   - have an organized structure,
   - obtain and use energy,
   - excrete waste materials,
   - respond to stimuli and maintain homeostasis,
   - grow, reproduce and pass on genetic information

   Therefore, **the presence of DNA** is another piece of evidence that the object is alive.

9. Most biologists agree on several characteristics that must be met for an organism to be classified as living. These include the presence of cells, the ability to reproduce on its own, and a way to get and use energy. Since **the particle uses energy and reproduces on its own,** it is likely that the particle is classified as **living**.

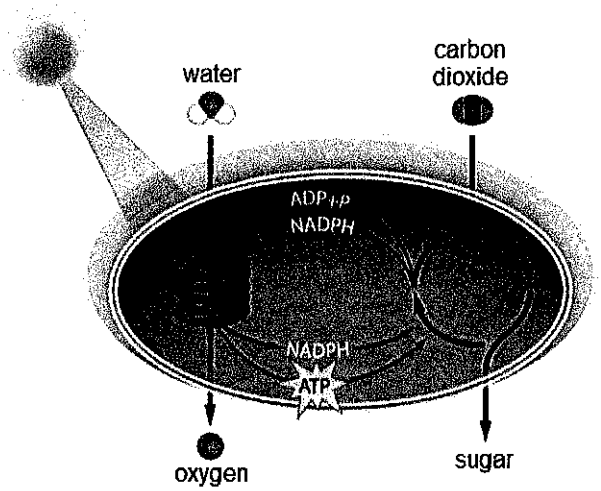
10. Tissues are sheets of similar cells that perform a specific function for the body. Organs can contain several different types of tissue.

In arteries, the muscle cells that make up smooth muscle tissue give strength to movement and allow the artery to contract and relax. The cells in elastic connective tissue give flexibility to the artery, so it can regulate blood pressure. Therefore, **the two tissues contain different types of cells, allowing each tissue to perform different functions for the artery.**

Photosynthesis

Question 1 .

The image below shows photosynthesis occurring within a plant cell.



Which best describes what happens during the light independent reactions in this image?

A. Energy from the Sun is used to produce ATP and NADPH and to convert water into oxygen gas.

B. Energy is released when bonds in water are broken and stored when bonds in ATP form.

C. Energy is released when bonds in ATP are broken and stored when bonds in sugar form.

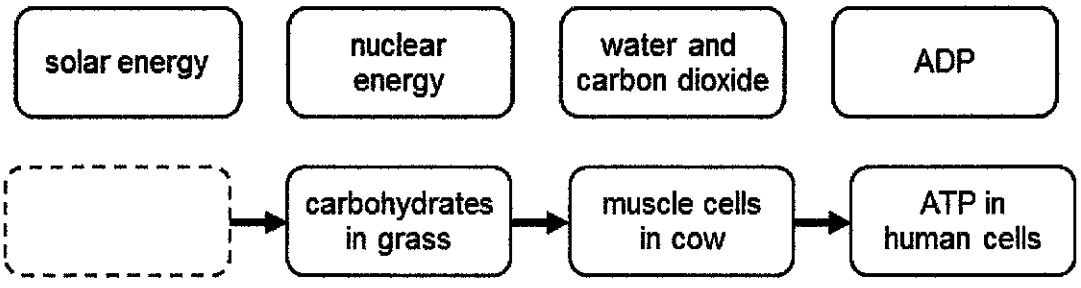
D. Energy from ATP and NADPH is used to break down sugar into carbon dioxide gas.

Question 2 .

Directions: Drag the correct tile to the empty box in the diagram.

The food an animal eats provides the energy needed for that animal's life processes.

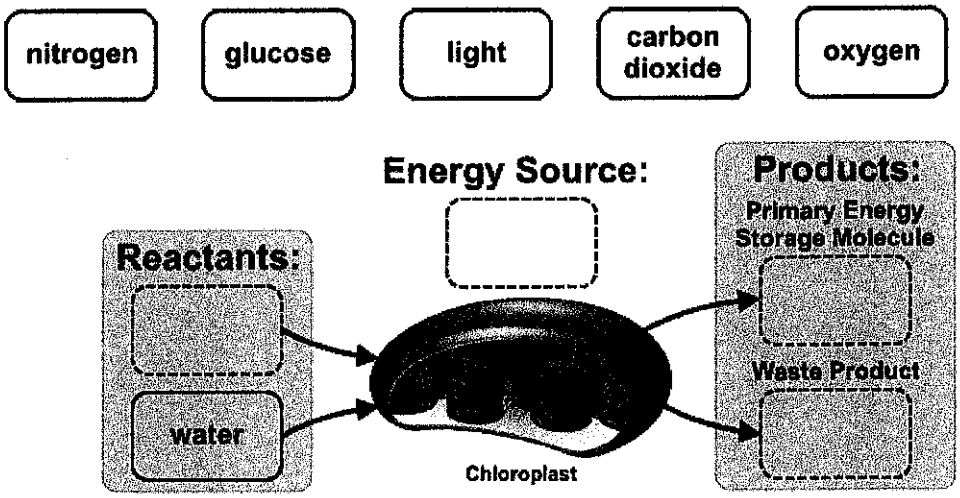
The following diagram shows an example of how energy can flow through the environment to a human's cells. Which energy source would most appropriately fill the first box?



Question 3 .

Directions: Drag each correct label to its location on the diagram. Not all labels will be used.

A diagram that models the process of photosynthesis is shown below. Complete the diagram by filling in the missing labels.



Question 4 .

During photosynthesis, radiant energy from the Sun is transferred to plants and other photosynthetic organisms. The chloroplasts in the cells of these organisms then transform the radiant energy into chemical potential energy stored in the bonds of

A. protein molecules.

B. water molecules which then evaporate through openings called stomata.

C. highly condensed carbon compounds such as carbohydrates.

D. carbon dioxide.

Question 5 .

Directions: Select each correct answer. More than one answer may be correct.

When cells perform photosynthesis, they transform energy from one form to another. Which of the following takes place during photosynthesis?

Chemical potential energy is stored in the bonds of carbohydrate molecules.

Chlorophyll absorbs light from the Sun.

Low-energy carbon molecules, such as CO_2, are formed.

Oxygen is given off as a by-product.

Question 6 .

During the process of photosynthesis, chlorophyll within the leaves of plants captures light energy from the Sun to produce simple sugars. What gas is released into the air as a byproduct of photosynthesis?

A. oxygen

B. carbon dioxide

C. argon

D. nitrogen

Question 7 .

Photosynthesis occurs in two sets of reactions within the chloroplast: light-dependent reactions and light-independent (dark) reactions.

Light-independent reactions occur in the stroma, or the thick fluid located between the grana, of chloroplasts. What is the main purpose of photosynthetic light-independent (dark) reactions?

A. to make electrons leave the chlorophyll and phosphorylate ADP to form ATP

B. to use CO_2, energy, and H^+ ions from ATP and NADPH to make glucose sugar

C. to split water to release oxygen into the air

D. to split water to release hydrogen ions and form NADPH

Question 8 .

During photosynthesis, plants capture light energy from the Sun to break the bonds in reactants, such as carbon dioxide and water, and form carbon-containing molecules, such as glucose. The carbon-containing molecules can then be used

A. to assemble larger molecules, such as DNA, proteins, and fats.

B. to synthesize essential amino acids.

C. to produce inorganic compounds, such as sulfuric acid.

D. all of these

Question 9 .

The light reactions of photosynthesis occur when light energy is absorbed by the chloroplasts of cells of photosynthetic organisms. Which of the following is produced during the light reactions?

A. light

B. carbon dioxide

C. chemical energy in the form of glucose

D. chemical energy in the form of ATP and NADPH

Question 10 .

Directions: Select each correct answer.

During photosynthesis, plants take in light energy from the Sun, carbon dioxide from the air, and water through their roots. Which of the following is a product of photosynthesis?

glucose sugar

oxygen

nitrogen

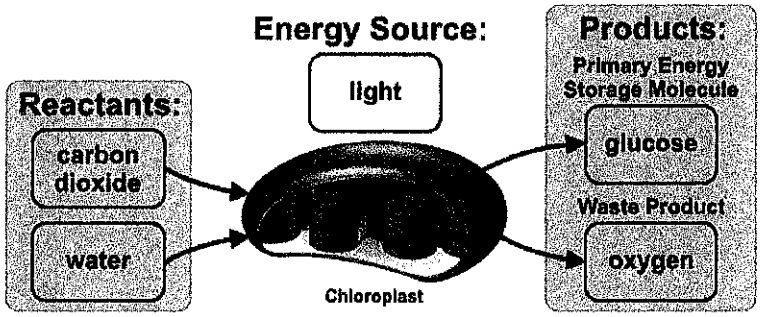
proteins

Explanations

1. During the light independent reactions of photosynthesis, sugar molecules are produced using carbon dioxide from the atmosphere. This process requires the energy that was captured during the light dependent reactions by the formation of ATP and NADPH. The energy stored by ATP **is released when bonds in ATP are broken**. Then, this released energy is **stored when bonds in sugar form.**

2. **Solar energy** is the initial source of energy for most ecosystems.
Solar energy powers chemical reactions in a plant cell's chloroplasts, allowing photosynthesis to occur. Photosynthesis results in carbohydrates, which are stored in the plant cells. When an animal consumes a plant, the animal obtains energy from the stored carbohydrates. Then, when humans eat plant or animal products, they obtain energy in the form of carbohydrates, proteins, and fats.

3. The completed diagram is shown below.



During photosynthesis, **light** energy from the Sun is transformed into the chemical energy stored in **glucose**. This chemical energy is released when animals, plants, and other organisms break glucose down into smaller molecules.

4. Chloroplasts in photosynthetic organisms convert radiant energy from the Sun into **condensed carbon compounds such as carbohydrates**. The plants then either convert these carbohydrates into structural or storage materials, or use them to generate ATP for cellular processes.

5. The process of photosynthesis begins when **radiant light energy from the Sun is absorbed** by a green pigment in plants called chlorophyll. Carbon from carbon dioxide is then captured by the plant and used to build higher-energy carbon molecules, such as glucose. **Oxygen is given off as a by-product.** The end result of photosynthesis is that **chemical potential energy is stored in the bonds of glucose molecules**, and these bonds can be broken to fuel the production of ATP. The energy stored in ATP can then be used to perform cellular work.

6. During the process of photosynthesis, plants use light energy from the Sun to convert carbon dioxide and water into simple sugars (glucose) and **oxygen** gas. The oxygen is released into the air as a by-product of photosynthesis.

7. The light-dependent reactions of photosynthesis must occur in the presence of light. The light-independent (dark) reactions of photosynthesis, however, can occur in the presence of absence of light.

   During the light-independent reactions, known together as the *Calvin Cycle*, plants **use CO_2 from the air as well as energy and H^+ ions from ATP and NADPH to make glucose sugar**.

8. The cellular processes of photosynthesis and respiration involve the transformation of matter and energy.

   Carbon-containing molecules, such as glucose, that are formed as a product of photosynthesis can be used **to assemble larger molecules, such as DNA, proteins, and fats**.

   Furthermore, energy that is released when these molecules react with oxygen during cellular respiration can be used to fuel other life processes.

9. The light reactions of photosynthetic organisms take place on the thylakoid membranes of chloroplasts. Energy from light is absorbed by colored pigments, such as chlorophyll, and passed to electrons, which drives the formation of ATP from ADP and NADPH from $NADP^+$. Therefore, the light reactions produce **chemical energy in the form of ATP and NADPH**.

10. During photosynthesis, plants take in light energy from the Sun, carbon dioxide from the air, and water through their roots to produce **sugar** (in the form of glucose) and **oxygen**.
The sugar molecules can then be used to make amino acids and other simple, carbon-containing, organic molecules for assembly into larger biological molecules, such as proteins, DNA, complex carbohydrates, and fats.