

Name _____

Regents Biology

Off Site
Learning Packet

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North Salem High School

MISSION: *Engage students to continuously learn, question, define and solve problems through critical and creative thinking.*

Life Functions

and

Cytology

(cells) (study of)
(pp.77 - 90)

If you have any problems – please come in for extra help after school.

**Collea / Oliver
Room W-19**

Assignment #1

"Substituted Sammy": An Exercise in Defining Life

[1] Sammy was a normal, healthy boy. There was nothing in his life to indicate that he was any different from anyone else. He attended North Salem and worked part-time at Outhouse Orchards. One day at work, he had an accident while trimming apple trees and cut off his right hand. It was replaced with an artificial hand that looked and operated almost like a real one.

[2] Soon afterward, Sammy's friends dared him to the hot chip challenge which ended up permanently burning and destroying his digestive tract. The entire digestive tract had to be surgically removed and replaced with an elastic, permeable silicone tube. Sammy was fed through this tube for the rest of his life.

[3] Everything looked good for Sammy until he was involved in a serious car accident on his way to the Danbury Mall because he was texting and driving. Both of his legs and his good arm were crushed and had to be amputated. His ear ring got stuck in the tire and was cut off as well. Artificial legs enabled Sammy to walk again while an artificial arm replaced the real arm. Plastic surgery and the use of silicone polymers enabled doctors to rebuild the outer ear.

[4] Over the next several years Sammy was plagued with numerous internal disorders. First, his girlfriend broke his heart (literally). Luckily for Sammy, a donor heart was available for a heart transplant. Then, he developed a kidney infection, and the only way he could survive was to use a kidney dialysis machine as no donor could be found for a kidney transplant.

[5] It was now obvious that Sammy had become a medical phenomenon. He had artificial limbs. nourishment was supplied to him through his feeding tube. All metabolic wastes material were removed by the kidney dialysis machine. The transplanted heart that pumped his blood to carry oxygen and food to his cells began to fail. He was immediately placed on a heart-lung machine. This supplied oxygen and removed carbon dioxide from his blood as circulated it throughout his body.

[6] The doctors consulted bioengineers at Fordham University about Sammy. Because almost all of his life-sustaining functions were being carried on by machines, it might be possible to compress all of these machines into one mobile unit which could be controlled by electrical impulses from the brain. This unit would be equipped with mechanical arms to enable him to perform basic tasks. A mechanism to create a flow of air over his vocal cords enabled him to speak. To do all this, they would have to amputate his head at the neck and attach it to this machine. Sammy consented, and the operation was complete success.

[7] Sammy functioned well for a few years. However, slow deterioration of his brain cells was observed and was diagnosed as terminal. The medical team immediately began to download his brain onto a simple flash drive and insert into an android that looked, spoke and acted just like Sammy. Upon recovery, Sammy left the hospital with complete assurance that he would never return with any more biologic illnesses.

1. Make a **claim** as to whether or not Sammy is still alive at the end of the story?

2. At what point in the story ([1] - [7]) did Sammy stop being alive? Support your claim with **evidence** from the story. Cite specific examples in the story and use the characteristics of life to help explain your answer.

3. List and briefly describe at least 4 of the characteristics of life that Sammy lost.

- a. _____
- b. _____
- c. _____
- d. _____

6. If you could invent one "science gizmo," what would it be? Do you think your invention would lead to any discoveries that would change our understanding of science?

7. Can you describe another time when collaboration between scientists lead to something great?

Assignment #3

Directions: Go to Collea's Corner to watch the below mentioned Ted-Ed video and then answers the questions below.

Cell vs. Virus

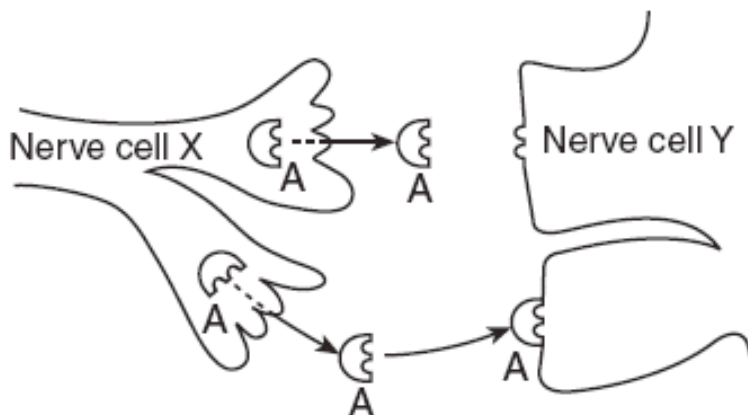
- Shannon Stiles

Background Information:

All living things are made of cells. In the human body, these highly efficient units are protected by layer upon layer of defense against icky invaders like the cold virus. Shannon Stiles takes a journey into the cell, introducing the microscopic arsenal of weapons and warriors that play a role in the battle for your health.

1. Every living on Earth is made of _____.
2. Each cell in your body is surrounded by a _____.
3. Cell membranes are made up of _____.
4. The job of the cell membrane is to _____.
5. Cell membranes are _____ which means it lets some things and out but blocks others.
6. Cell membranes are covered with tiny projections called _____.

Ex: Neurotransmitters binding to receptors on an adjacent nerve cell membrane.



7. Only plant cells have a _____.
8. Antibodies are _____.
9. The nucleus of the cell contains an important molecule found in all cells. This molecule is “*the blueprint of life*” and is called -
 (a) sugar. (b) protein. (c) ATP. (d) DNA.
10. Proteins, like antibodies, are made inside of the cell. Proteins are made by the cell’s -
 (a) golgi apparatus. (b) ribosomes. (c) nucleus. (d) DNA.
11. Once a protein is made, it needs to be able to leave the cell. The structure that packages the protein in a vesicle and directs it to the cell membrane is known as the -
 (a) golgi apparatus. (b) ribosome. (c) mitochondria. (d) nucleus.
12. Cells need energy to perform all of their functions. Where in the cell is energy made?
 (a) golgi apparatus (b) nucleus (c) mitochondria (d) nucleus
13. The mitochondria creates a high energy molecule called _____.

14. In the space below, write the complete chemical equation for cellular respiration. **NOTES**



15. Plant cells have _____ that allow to make energy a different way.

16. Sugar is a form of _____ energy.

17. In the space below, write the complete chemical equation for photosynthesis. **NOTES**



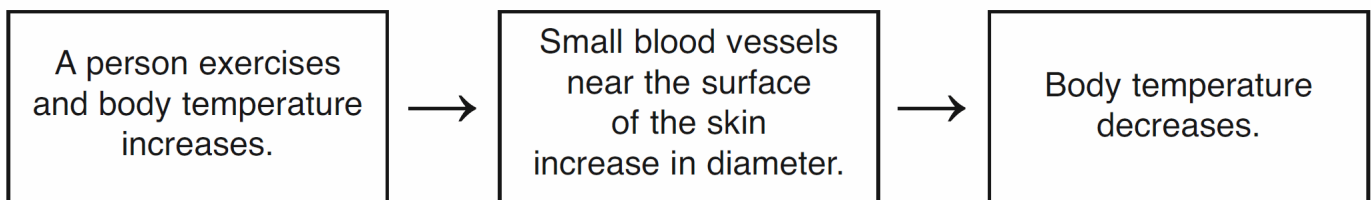
18. Notice anything about the chemical equation for respiration and photosynthesis?

Assignment #4

Directions: Answer each of the following questions as completely and as accurately as possible

- ___1. Which are the four most abundant *elements* in living cells?
(a) carbon, oxygen, nitrogen, sulfur (c) carbon, hydrogen, oxygen, nitrogen
(b) carbon, oxygen, sulfur, phosphorus (d) carbon, sulfur, hydrogen, magnesium
- ___2. Which formula represents an *organic* compound?
(a) $Mg(OH)_2$ (b) $NaCl$ (c) $C_{12}H_{22}O_{11}$ (d) NH_3
- ___3. An organelle differs from an organ in that an organelle -
(a) is a substructure/part of a cell. (c) contains one specific type of tissue.
(b) is larger than an organ. (d) cannot be stained
- ___4. The *absorption* of fluids by various cells of the human body is part of the life function known as -
(a) excretion. (c) transport.
(b) respiration. (d) growth.
- ___5. The life function of transport directly involves those activities used to -
(a) absorb and distribute materials. (c) obtain and hydrolyze materials.
(b) release energy from food. (d) produce cellular waste products.
- ___6. Nutrition involves those activities by which organisms -
(a) remove cellular waste products
(b) obtain and process materials needed for other activities
(c) exchange gases with their environment
(d) absorb and circulate materials
- ___7. Which life process is classified as *autotrophic* in some organisms and *heterotrophic* in other organisms?
(a) hormonal regulation (c) nutrition
(b) anaerobic respiration (d) transport

- ___8. Respiration is best described as a process by which -
 (a) necessary nutrients are circulated
 (b) hydrogen is used to synthesize glucose
 (c) metabolic wastes are absorbed
 (d) chemical energy is converted into a usable form
- ___9. Which term is defined as *all the chemical reactions* that are required to sustain life?
 (a) metabolism (c) nutrition
 (b) regulation (d) synthesis
- ___10. One characteristic of all living things is that they -
 (a) develop organ systems. (c) produce identical offspring.
 (b) maintain internal stability. (d) synthesize only inorganic matter.
- ___11. Which process includes the other three?
 (a) synthesis (c) metabolism
 (b) excretion (d) nutrition
- ___12. In which process are simple materials chemically *combined* to form more complex materials?
 (a) synthesis (c) metabolism
 (b) excretion (d) nutrition
- ___13. Which activity is an example of the life process known as synthesis?
 (a) An organic compound is broken down and energy is released.
 (b) Starch is formed by the chemical bonding of glucose molecules.
 (c) A large molecule is broken down into smaller molecules.
 (d) Oxygen moves into a cell through the cell membrane.
- ___14. The diagram below represents an activity that occurs in the human body.



This diagram best illustrates -

- (a) metabolism. (c) nutrition.
 (b) homeostasis. (d) synthesis.

Assignment #5

Directions: Answer each of the following questions as completely and as accurately as possible

- ___1. According to the cell theory, which statement is correct?
 - (a) Viruses are true cells.
 - (b) Cells are basically unlike in structure.
 - (c) Mitochondria are found only in plant cells.
 - (d) Cells come from preexisting cells.

- ___2. Which statement describes an exception to the cell theory?
 - (a) Mitochondria and chloroplasts are self-reproducing structures.
 - (b) All cells must come from preexisting cells.
 - (c) Cells are the basic unit of structure in living things.
 - (d) Cells are the basic unit of function in living things.

- ___3. Viruses are exceptions to the cell theory, but they have some characteristics of living things. What is one of these characteristics?
 - (a) They are made up of many specialized cells.
 - (b) They contain genetic material.
 - (c) They reproduce by mitosis.
 - (d) They contain chlorophyll.

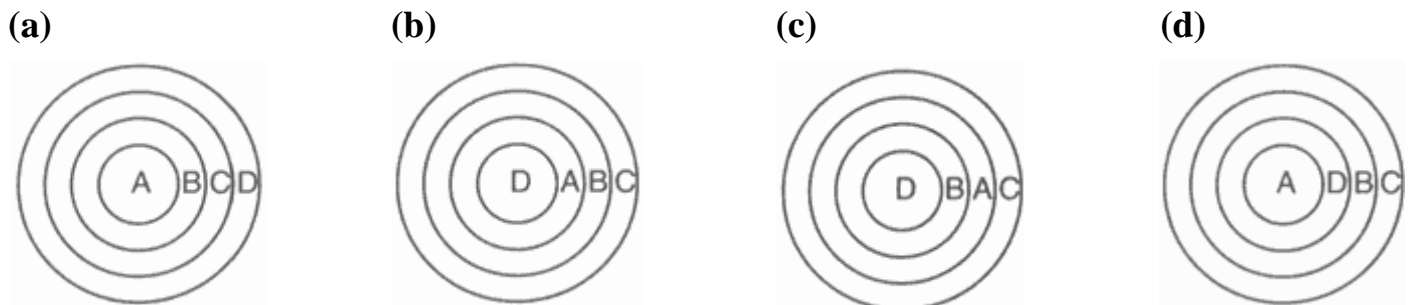
- ___4. Which cell organelles are considered the sites of aerobic respiration in both plant and animal cells?
 - (a) mitochondria
 - (b) chloroplasts
 - (c) centrosomes
 - (d) nuclei

- ___5. Intracellular transport of materials is most closely associated with which cell organelle?
 - (a) cell membrane
 - (b) ribosome
 - (c) cell wall
 - (d) endoplasmic reticulum

- ___6. The ribosome is an organelle that functions in the process of -
 - (a) excretion
 - (b) protein synthesis
 - (c) photosynthesis
 - (d) cellular respiration

- ___7. Which organelle is present in the cells of a bean plant but not present in the cells of a mouse?
- (a) cell wall (c) mitochondria
(b) cell membrane (d) nucleus
- ___8. The mitochondria is to the cell as -
- (a) the motor is to a car (c) the windshield is to a car
(b) the door is to a car (d) the seatbelt is to a car
- ___9. What is the main function of a vacuole in a cell?
- (a) storage (c) coordination
(b) synthesis of molecules (d) release of energy
- ___10. Which diagram best represents the locations of the structures in the list below?

A - cell
B - tissue
C - organ
D - organelle



- ___11. Muscle cells in athletes often have more mitochondria than muscle cells in non-athletes. Based on this observation, it can be inferred that the muscle cells in athletes -
- (a) have a smaller demand for cell proteins than the muscle cells of non-athletes.
(b) reproduce less frequently than the muscle cells of non-athletes.
(c) have nuclei containing more DNA than nuclei in the muscle cells of non-athletes.
(d) have a greater demand for energy than the muscle cells of non-athletes.
- ___12. Within a cell, where is the DNA chiefly found?
- (a) cell wall (c) plasma membrane
(b) ribosomes (d) nucleus

- ___13. Unlike animal cells, _____ and _____ are found only in plant cells.
 (a) chloroplasts . . . cell walls (c) cell membranes. . . chloroplasts
 (b) chloroplasts . . . mitochondria (d) nucleus. . . cell walls
- ___14. The function of chloroplasts is to carry out the process of -
 (a) cellular respiration. (c) lipid synthesis.
 (b) photosynthesis. (d) intracellular digestion.
- ___15. Which structure is a boundary between the living cell and its environment?
 (a) ribosome (c) mitochondria
 (b) cell membrane (d) vacuole
- ___16. Which structure carries out a similar function in both plant and animal cells?
 (a) cell wall (b) chloroplast (c) plasma membrane
- ___17. Which are the main structural components of a cell membrane?
 (a) proteins and carbohydrates (c) lipids and cellulose
 (b) amino acids and proteins (d) proteins and lipids
- ___18. What is the main structural components of a cell wall?
 (a) proteins (c) cellulose
 (b) amino acids (d) glucose
- ___19. The diagram below represents an incomplete sequence of levels of organization.
 organelles → tissues → organs → organ systems → organism
 This sequence can be completed correctly by inserting
 (a) "cells " between organelles and tissues
 (b) "proteins " between tissues and organs
 (c) "populations " between organs and organ systems
 (d) "molecules " between organ systems and organisms
- ___20. A brick is to house as a cell is to -
 (a) an organ system. (c) an organ.
 (b) a tissue. (d) an organism.

