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| **Regents**  **Biology**  Off Site  Learning Packet  Assignment #1: \_\_\_\_\_  Assignment #2: \_\_\_\_\_  Assignment #3: \_\_\_\_\_  Assignment #4: \_\_\_\_\_  Assignment #5: \_\_\_\_\_  Assignment #6: \_\_\_\_\_  Assignment #7: \_\_\_\_\_  Assignment #8: \_\_\_\_\_  Crossword Puzzle: \_\_\_\_\_ | **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 sign up 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. After he completed high school in North Salem, he obtained a job in a factory operating a printing press. On this job he had an accident and lost his 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 his entire digestive tract. The entire digestive tract had to be surgically removed and replaced with an elastic 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. Both of his legs and his good arm were crushed and had to be amputated. His ear ring got stuck in the tire and so he lost his right ear. Artificial legs enabled Sammy to walk again, and an artificial arm replaced the real arm. Plastic surgery and the use of silicone polymers enabled doctors to rebuild the ear.

**[4]** Over the next several years Sammy was plagued with 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 malfunction, and the only way he could survive was to use a kidney dialysis machine as no donor could be found to give him 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 and 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 at the neck and attach his head to the machine, which would then supply all nutrients to his brain. Sammy consented, and the operation was successfully performed.

**[7]** Sammy functioned well for a few years. However, slow deterioration of his brain cells was observed and was diagnosed as terminal. So the medical team that worked with Sammy began to program his brain. A miniature computer was developed and housed in a machine that was humanlike in appearance, movement, and mannerisms. Sammy was once again able to leave the hospital with complete assurance that he would not return with biologic illnesses.

**1.** By the end of this story does Sammy still have the necessary characteristics to be considered a living organism? Explain your answer.

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**2.** At what point in the story (**[1]** - **[7]**) do you consider Sammy to have ceased living a life that we could recognize as a human life? Cite specific examples in the story and use the characteristics of life to help explain your answer.

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**3.** List and briefly describe at least 5 of the characteristics of life that Sammy lost.

**a**.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**b**. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**c**. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**d**. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**e**. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Assignment #2**

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

***The Wacky History of the Cell Theory***

- Lauren Royal-Woods

**Background Information:**

Scientific discovery isn't as simple as one good experiment. The weird and wonderful history of the cell theory illuminates the twists and turns that came together to build the foundations of cell biology.

**1.** Scientists can **only** make discoveries in a laboratory with white lab coats and science gizmos that go beep.

**(A)** True **(B)** False

**2.** There are three parts to the cell theory. Which is NOT one of those parts?

**(a)** All organisms are composed of one or more cells.

**(b)** The cell is the basic unit of structure and organization in organisms.

**(c)** Cells spontaneously arise from carbon and nutrients carried in the bloodstream.

**(d)** All cells come from pre-existing cells.

**3.** Anton van Leeuwenhoek made his own version of the microscope and discovered something very odd when he looked at the gunk on his teeth. What did he discover?

**(a)** Cells **(b)** Bacteria **(c)** Cavities **(d)** Influenza

**4.** Who named the cell?

**(a)** Robert Hooke **(c)** Mr. Collea

**(b)** Theodor Schwann **(d)** Ms. Oliver

**5.** Which scientist realized that, by studying samples under a microscope, all animals are made up of cells?

**(a)** Rudolf Virchow **(c)** Anton van Leeuwenhoek

**(b)** Theodor Schwann **(d)** Isaac Newton

**6.** Why do you think there were so many heated debates around the development of the cell theory?

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**7.** 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?

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**8.** Can you describe a time when collaboration (*working with others as a team*) worked well for you?

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**Assignment #3**

**Directions**: Go to Collea’s Corner to watch the below mentioned Ted-Ed video and

then answers the questions below.

***At What Moment Are You Dead***

- Randall Hayes

**Background Information:**

*For as far back as we can trace our existence, humans have been fascinated with death and resurrection. But is resurrection really possible? And what is the actual difference between a living creature and a dead body anyway? Randall Hayes delves into the scientific theories that seek to answer these age-old questions.*

**1.** Dead bodies are cold. Would heating them up restore them to life?

**(a)** Yes, because it would restore movement to the molecules inside the body.

**(b)** Yes, because bodies need energy, and heat is a form of energy.

**(c)** No, this would probably make them rot faster (*and smell worse!)*

**(d)** No, because heat is a waste product and does nothing useful.

**2.** How does a defibrillator work?

**(a)** It recharges the heart like a battery.

**(b)** It ignites the fuel inside the heart muscle cells like a spark plug.

**(c)** The electrical pulse turns on the muscle cells like a switch so they start beating.

**(d)** It synchronizes the still beating heart cells so they work together.

**3.** What sort of energy do cells run on?

**(a)** Light energy **(c)** Electrical energy

**(b)** Chemical energy (ATP) **(d)** Kinetic energy

**4.** Atoms and molecules diffuse -

**(a)** from high to low concentration. **(c)** from high energy to low energy.

**(b)** from low to high concentration. **(d)** from low energy to high energy.

**5.** What is Cryonics? (Google it!)

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**Assignment #4**

**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 \_\_\_cells\_\_\_\_\_\_\_\_\_\_\_\_.

**2.** Each cell in your body is surrounded by a \_\_\_\_\_cell membrane\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

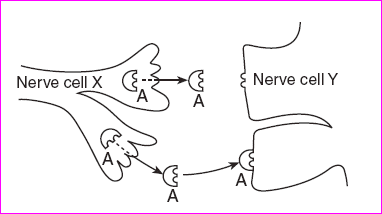
**3.** Cell membranes are made up of \_\_\_\_\_\_\_\_\_\_\_fats and proteins \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

**4.** The job of the cell membrane is to \_surround and protect the cell\_\_\_\_\_\_\_\_\_\_\_\_.

**5.** Cell membranes are \_\_\_\_\_semipermeable\_ which means it lets some things and out but blocks others.

**6.** Cell membranes are covered with tiny projections called \_\_\_\_receptors\_\_\_\_\_.

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



**7.** Only plant cells have a \_\_\_\_cell wall\_\_\_\_.

**8.** Antibodies are \_\_\_proteins that attack and kill viruses\_\_\_\_\_\_\_.

**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 \_\_ATP\_.

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

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| **Raw Materials** |
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| **Products** |
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**15.** Plant cells have \_\_\_\_chloroplast\_\_\_\_\_ that allow to make energy a different way.

**16.** Sugar is a form of \_chemical-bond\_\_ energy.

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

|  |
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| **Products** |
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| --- |
| **Raw Materials** |
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**Assignment #5**

**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)** C12H22O11 **(d)** NH3

**\_\_\_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?

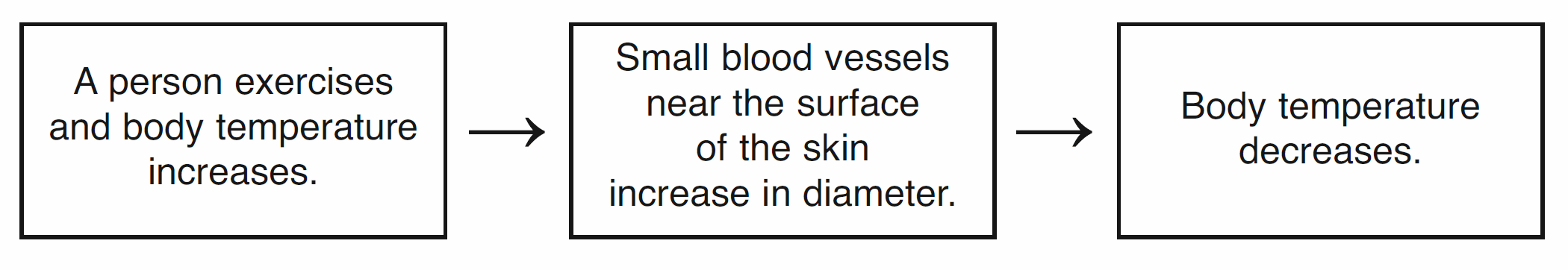
**(a)** An organic compound is broken down and energy is released.

**(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 #6**

**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 **(c)** centrosomes

**(b)** chloroplasts **(d)** nuclei

**\_\_\_5.** Intracellular transport of materials is most closely associated with which cell

organelle?

**(a)** cell membrane **(c)** cell wall

**(b)** ribosome **(d)** endoplasmic reticulum

**\_\_\_6.** The ribosome is an organelle that functions in the process of -

**(a)** excretion. **(c)** photosynthesis.

**(b)** protein synthesis. **(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)** mitochondria **(c)** chloroplast

**(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?

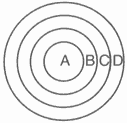
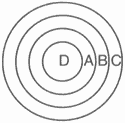
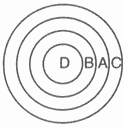
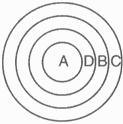
**A** - cell

**B** - tissue

**C** - organ

**D** - organelle

**(a) (b) (c) (d)**



**\_\_\_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

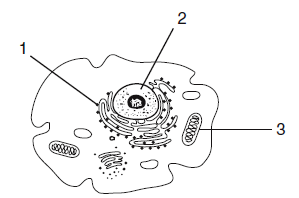
**\_\_\_20.** A brick is to house as a cell is to -

**(a)** an organ system. **(c)** an organ.

**(b)** a tissue. **(d)** an organism.

**Assignment #7**

In a cell, a variety of structures perform specific functions and interact to maintain a stable internal environment or homeostasis. The diagram below represents a typical cell with three cell structures labeled 1, 2, and 3.



**1.** Select one cell structure labeled in the

diagram and write its number and name

in the space below.

\_\_\_\_\_ = \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**2.** Explain how the cell structure you selected helps maintain homeostasis in a cell.

In your answer, be sure to:

* state one function of this cell structure
* identify one substance that is often associated with the cell structure you selected and state how that substance is associated with the cell structure
* identify one other cell structure and explain how it interacts with the cell structure you selected to maintain homeostasis in the cell

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**Assignment #8**

**Crossword Puzzle**