Read the following information to answer questions 1-5:

Despite their differences in size and shape, all cells are enclosed by a cell membrane that consists of a double layer of phospholipids interspersed with proteins. Its unique structure is described as selectively permeable because it permits some substances to cross it rapidly, while others are unable to cross it, or cross it slowly. Thus, the cell membrane regulates the substances entering and leaving the cell. There are three methods for the passive transport of molecules through the cell membrane. Passive transport processes are ones that do not require cellular energy to proceed. A cell membrane that allows the passage of certain substances is said to be semi-permeable. For example, a semi-permeable cell membrane might not be permeable to certain large molecules, but might be permeable to oxygen and carbon dioxide, which means these molecules can pass freely across the membrane. The force that propels oxygen, carbon dioxide, and other molecules across the membrane of the cell is called diffusion. Diffusion is defined as the movement of molecules from an area that is more concentrated (crowded) to an area that is less concentrated. The movement of water molecules across a membrane is a special kind of diffusion called osmosis. Osmosis typically occurs to balance the amount of salt found in the cell or the outside environment. When a red blood cell is placed in a very salty solution, water molecules will begin to flow out of the cell, causing the cell to shrink. Facilitated diffusion is the movement of molecules across the membrane with the aid of a transport protein from the cell membrane. Passive transport typically occurs until the number of molecules on either side of the membrane is equal.

1. What does it mean to be selectively or semi-permeable?

2. What is passive transport?

3. What are the tree types of passive transport that occur in the body?

4. What is facilitated diffusion? What structure assists with this process?

5. What is the overall goal of diffusion, osmosis, and facilitated diffusion?

Given the diagrams below (A-D) answer questions 6-10

6. Which diagram(s) show that the cell will shrink?

7. Which diagram(s) show that the cell will swell?
8. Which diagram(s) show equilibrium in the cell?

9. All of the diagrams above are examples of a type of passive transport called?

10. A type of membrane that only allows certain materials to pass through is called?

Answer questions 11-14 using the diagram below:

11. Is the highest concentration of molecules inside or outside of the cell? ______
12. Draw the above cell in equilibrium with oxygen molecules.

13. What type of passive transport is displayed in the above diagrams?

14. Oxygen is needed to produce energy within eukaryotic cells. Which organelle would you think needs oxygen the most?

Using the information below answer questions 15-17

Salt water has 95% water and 5% salt. Fresh water has 98% water and 2% dissolved substances.

15. If you were lost at sea and you drank salty seawater, what would you expect to happen to the cells in your body? (shrink, swell, or stay same size) Why do you think that?

16. A large-mouth bass is taken from a fresh water lake and is transplanted into a river. If the conditions for survival are optimal, would you expect the cells in the fish to shrink, swell, or stay the same? Why do you think that?

17. If a sea star egg is taken from the ocean and put into Elk Lake would you expect the egg to shrink, swell, or stay the same? Why do you think that?
Active Transport and Endocytosis

The cell membrane encloses the cell, forming a barrier that separates the interior and exterior environments. The membrane may be relatively permeable or impermeable, prohibiting the passage of most molecules. It can also be selectively permeable, allowing certain substances to pass, but not others. In the previous plate, we discussed passive methods of transport, and in this plate, we discuss two methods of active transport. Both of these active transport methods require the input of energy by the cell.

We will discuss two types of active transport. The upper portion shows a process of active transport that involves a transmembrane protein, while the lower portion shows the process of endocytosis.

The process of active transport requires energy because the molecules being moved are traveling from a region of low concentration to a region of high concentration. That is, they are being transported against their concentration gradient.

The first process we will discuss is referred to merely as active transport. In the diagram, we see some amino acids (A) at the cell's exterior. Within the cell, the number of amino acid molecules is higher than on the outside, as you can see in the diagram. Notice that the bar representing the concentration gradient (B) shows an increase in amino acid concentration from exterior to interior. The amino acids must be moved against the concentration gradient if they are to enter the cell. Active transport involves special proteins called transport proteins (C), in the cell membrane (D). Light colors should be used for the cell membrane.

In the second view, you can see that active transport has begun, and an amino acid is enclosed within the transport protein (C). An ATP molecule (E) supplies energy and is consumed during this transportation, and its breakdown results in an ADP molecule (F) and phosphate ion (G). Moving to the third view, we see that active transport is complete, and the amino acid is in the cell's interior; this is how amino acids are absorbed after the digestion of protein by cells that line the digestive tract.

We will now look at a second form of active transport, endocytosis. Endocytosis refers to the movement of particles into cells, as the diagrams show in the lower half.

Certain molecules such as polypeptides, polysaccharides, and DNA are too large to be transported into the cell by carrier proteins, so they must be endocytosed.

In endocytosis, the particles (H) that are to be taken into the cell are represented by dots that should color in a bright color. They are suspended in the extracellular fluid (I), which should be left white or shaded in a pale color. Inside the membrane (J), in the cell's interior, you can see the cell cytoplasm (K).

In the first view, you can see that the membrane is beginning to fold inward, and in the second view, it continues to invaginate, forming a bubble that eventually pinches off. In the third view, the membrane has pinched off from the surface membrane and is now a vesicle (L). The structure of the vesicle is identical to that of the plasma membrane, and as you can see, it contains the particles.

The materials in this vesicle will soon be broken down by enzymes that are derived from a cellular body known as the lysosome. Once digested, the cell will use the products in cellular processes.

Biologists recognize two types of endocytosis. The first, called phagocytosis, is when a cell takes in particulate matter for digestion. For example, white blood cells are responsible for engulfing bacteria and destroying them. The second form of endocytosis is pinocytosis, in which nutrients are taken into the cell. The root cells of plants use this method for obtaining dissolved nutrients from the soil.

**ANSWER THE QUESTIONS BELOW IN COMPLETE SENTENCES ON A SEPARATE PAPER!**

1) What is the purpose of the cell membrane in prokaryotic and eukaryotic cells?
2) In what direction do molecules move during the process of active transport?
3) Why does active transport require energy?
4) What does it mean to move against the concentration gradient?
5) What is the role of transport proteins in active transport? What do they do?
6) What form of energy is used by the cell during active transport? What happens to the molecule once it's been used?
7) When a molecule is too large to be transported into the cell through a transport protein, what happens?
8) Describe the process of endocytosis starting from when molecules are suspended in extracellular fluid outside of the cell until the point in which they become part of the cell.
9) What is a vesicle? How are vesicles broken down?
10) What is phagocytosis? Give an example of when this process is used in living organisms.
11) What is pinocytosis? Give an example of when the process is used in living organisms.
12) What are the two major differences between passive and active transport?
Instead of just coloring this sheet, I want you to show me that you truly understand this figure by drawing your own rendition of this. You can be as creative or as basic as you want, but I want you to draw your own understanding of each figure (Active Transport & Endocytosis). You will not get credit for just copying this figure. To conquer this task you will need to study this figure for a bit and perhaps even discuss it with a buddy.