Name: Answer Key

Study Guide for Test

-Organelles:
Define each: (use notes to define)

Nucleus-

Ribosome-

Mitochondria-

Endoplasmic reticulum-

Chloroplast-

Vacuole-

Centrioles-

Cell membrane-

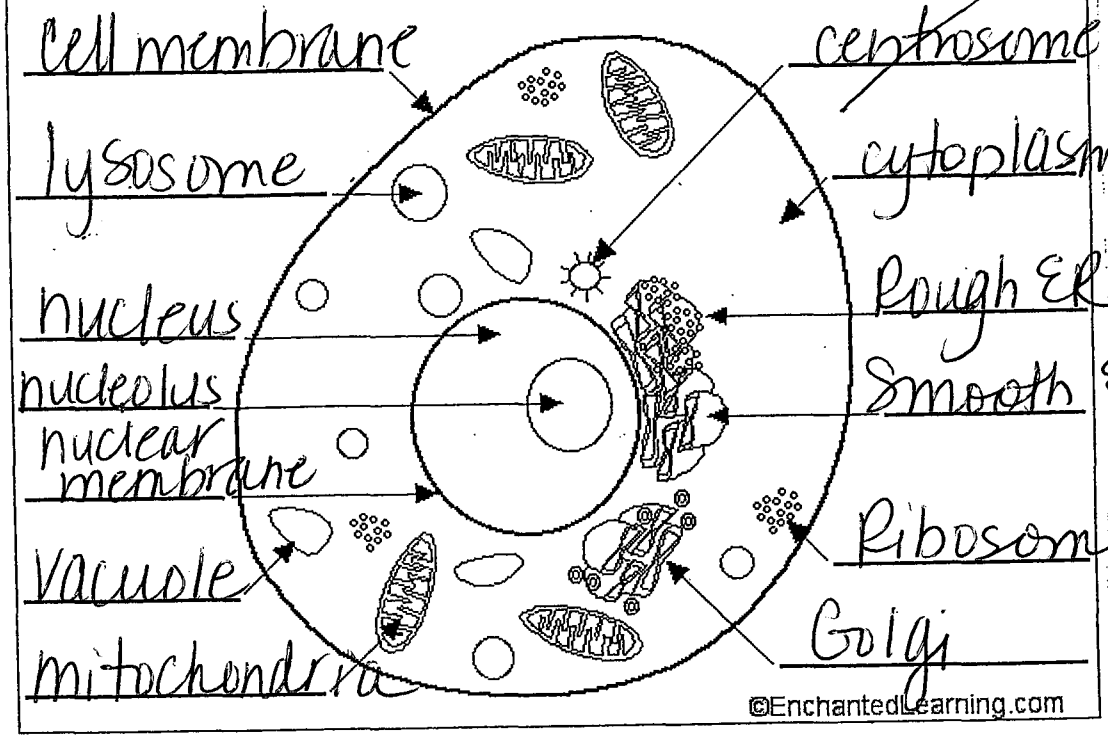
Cell wall-

Golgi body-

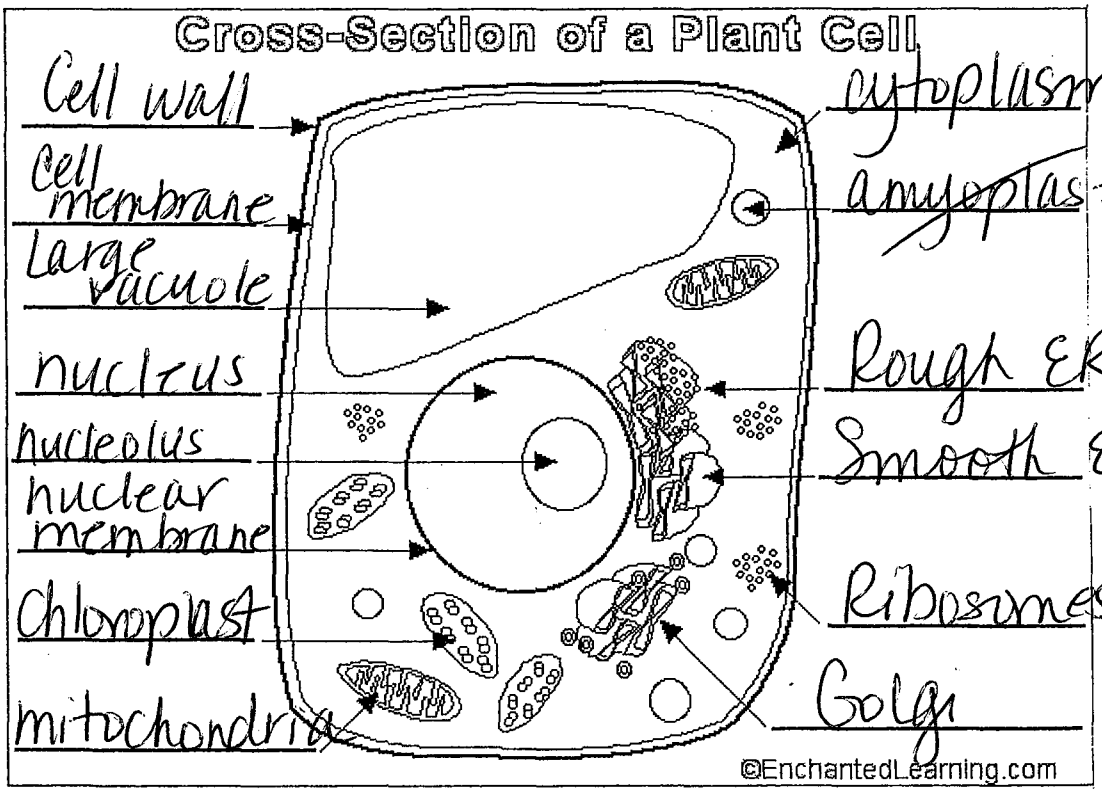
Lysosome-

Contractile vacuole-

Cross-Section of an Animal Cell



Cross-Section of a Plant Cell



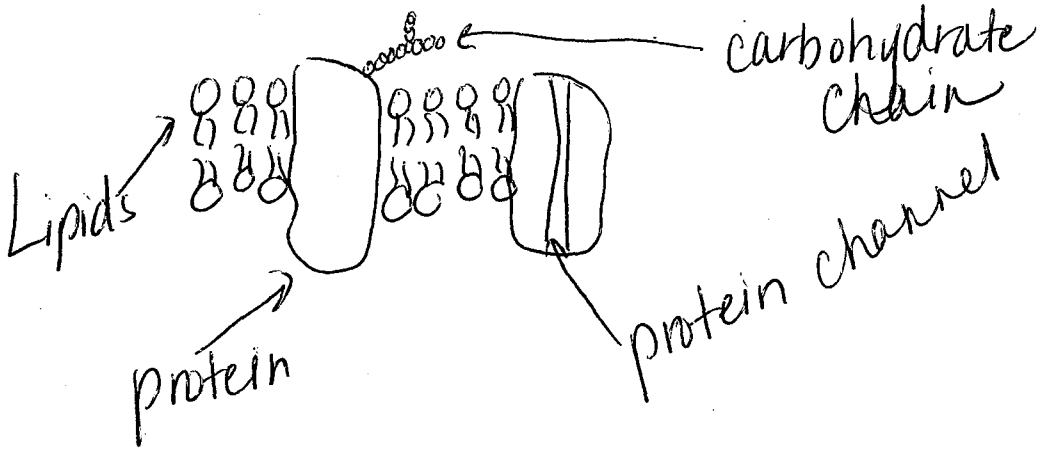
-Plant vs. Animal cells

Describe 2 differences between a plant and animal cell:

- Animal cell has centrioles.
- plant cells have cell wall & chloroplasts.

-Cell Membrane structure and function

Describe and illustrate the structure of the cell membrane:



-Passive Transport

Examples:

Diffusion- Molecules move from a high → low concentration. No energy required.

Osmosis- Special type of diffusion involving water.

-Active Transport: Molecules move from a low → high concentration. (Against the concentration gradient) *Requires ATP!

State 2 ways that diffusion and active transport are different:

1. Diffusion: high → low
   Active: low → high
2. Diffusion: no ATP needed
   Active: ATP required

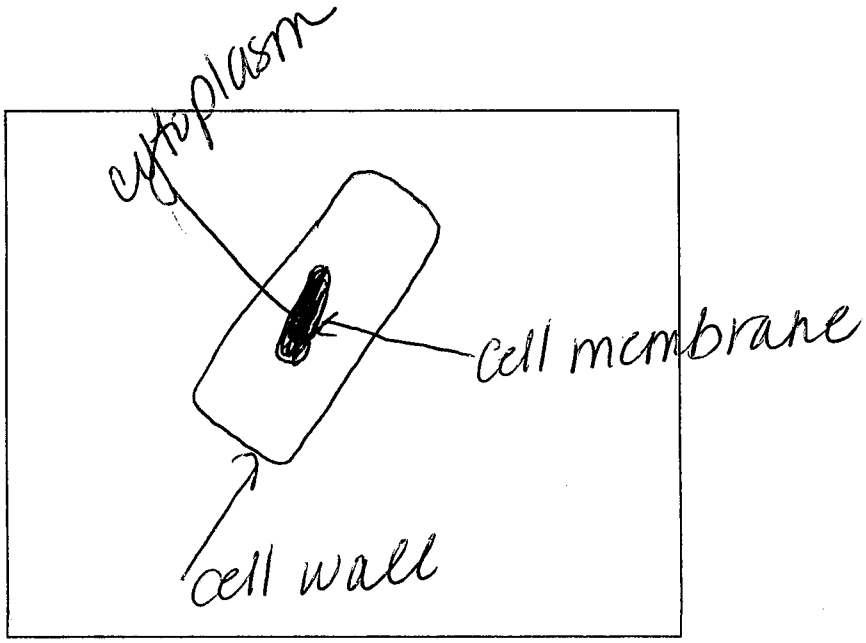
-NYS Lab:

Understand the use of indicators (iodine and benedicts solution)
Iodine→ turns blue/black in the presence of starch.
Benedicts solution→ turns orange/green when heated in the presence of glucose

Why was glucose and iodine able to diffuse through the cell while starch was not? glucose & iodine are small, starch is too big

Understand the effect of salt solution on an onion cell
Salt water added→ what happens to the onion cells?
shrink/shrivel

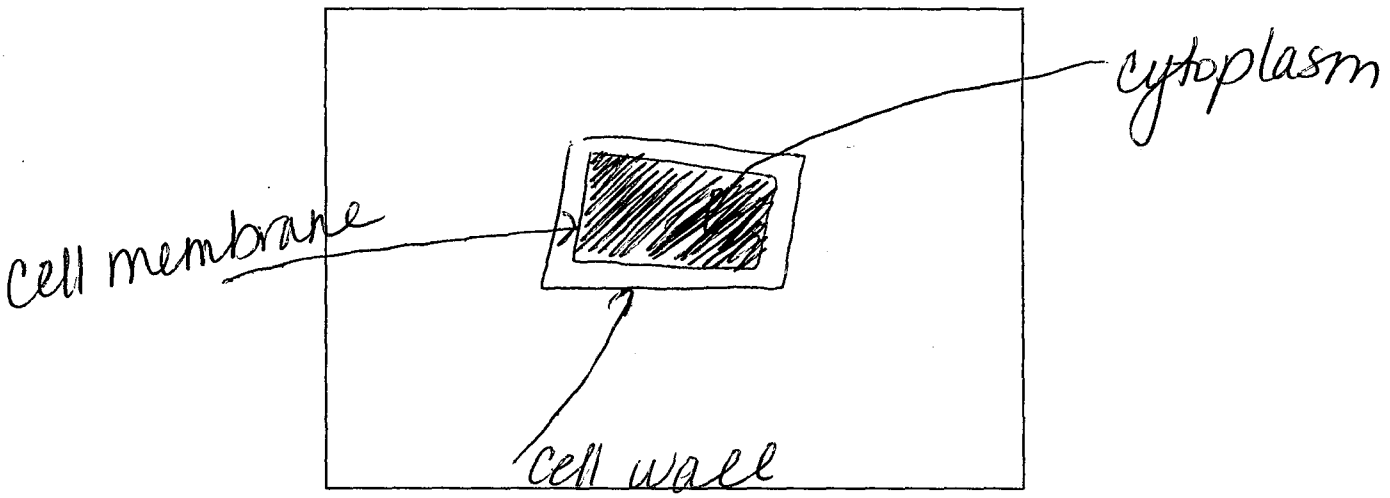
Draw and label red onion cells in the presence of salt:



Distilled water added→ what happens to the onion cells?

water moves into the onion cell, returns to normal

Draw and label red onion cells in the presence of distilled water:



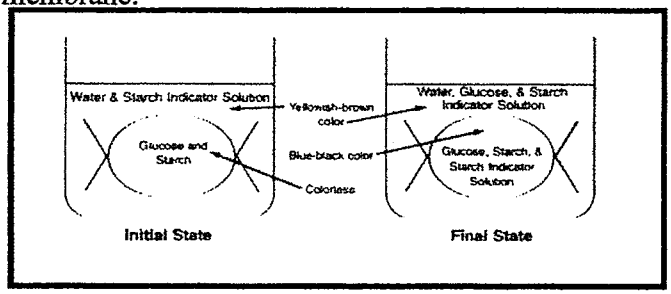
Review Sheet/NYS Regents Lab Activity #5
Diffusion Through a Membrane (Union-Endicott CS review sheet revision)

Key Points I

1. Molecules tend to move from high to low concentration without the use of energy (diffusion).
2. Membranes may allow some molecules to pass through while not allowing others (selectively permeable).
3. Indicators are used to show the presence of certain kinds of molecules.

Procedure I

1. A model cell is made using a plastic membrane (usually *dialysis tubing*) containing starch + ~~iodine~~ glucose. The bag is sealed with often with string.
2. Starch indicator (iodine) is placed in solution outside the 'cell'.
3. Because of the differences in concentration, starch indicator diffuses in and glucose diffuses out. Starch 'wants' to diffuse out, but it cannot because the molecule is too large to pass through the membrane.



4. Starch (milky white) + starch indicator (brown) = blue/black color
5. The inside of the bag turns blue/black while the outside stays brown, proving that indicator went in, but starch did not leave.
6. *Glucose indicator which is* Benedict's (blue) + glucose (clear) + HEAT = eventually turns orange
7. Testing the fluid outside the 'cell' shows glucose has left. This is tested by placing fluid from outside into a test tube, adding indicator solution, and heating the mixture.
8. You may prove that #6 is true by testing (heating) indicator alone and also testing indicator + starch. Both of these *controls* result in a light blue color (no change).

Analysis I

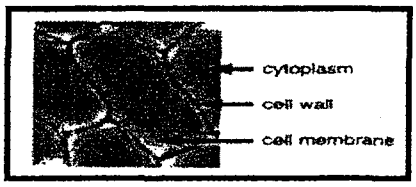
1. Glucose and starch indicator may pass through the membrane. Starch may not. This is because starch is a much bigger molecule than glucose or starch indicator.
2. This shows the importance of breaking down large molecules inside the digestive system in order for nutrients to enter the bloodstream.

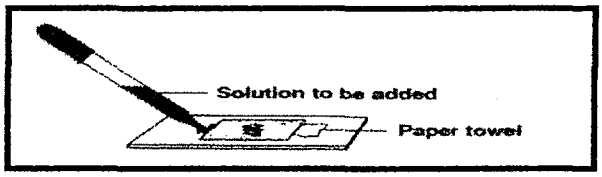
Key Points II

1. Basic parts of the cell that are easily seen under the microscope are the *cytoplasm*, *cell membrane*, and *cell wall* (in plants).
2. Molecules tend to move from high → low concentration without the use of energy (*diffusion*).
3. Diffusion of water molecules is particularly important and has the special name of osmosis.
4. The balance of water molecules inside and outside the cell is extremely important for the survival of all organisms, including humans.

Procedure II

1. Make a *wet mount* slide of a thin section of red onion cells. The cells are taken from the outer 'skin' of the onion bulb and a small piece is placed in a drop of water on a microscope slide. A coverslip is placed on top by touching it to the water at an angle, and then carefully placing it on the specimen, trying not to get air bubbles underneath.
2. The cells are examined under the light (compound) microscope. You should be able to identify the cytoplasm, cell membrane, and cell wall.
3. It is important to see that the cell membrane and cytoplasm completely fill the space within the cell wall.





4. Place a 10% salt solution under the cover slip. This is done by putting a drop of salt solution next to one edge of the coverslip, then absorbing water from the other side of the slip using a paper towel.
5. Observe the cells in the salt solution. It is important to see that the cytoplasm and cell membrane have shrunk inside the cell wall. This is due to water leaving the cell and entering the salty (low water) solution.

Label the structures in the onion cells in salt water solution below.

6. Place distilled water under the cover slip using the technique described in #4 above.
7. Observe the cells in distilled water. It is important to see that the cytoplasm and cell membrane have expanded to fill the entire space available within the cell wall.

Analysis II

1. Cells placed in very salty solutions will shrink, causing them to collapse and possibly lose the ability to complete life functions.
2. Cells placed in very watery solutions will tend to gain water, which causes them to expand/swell and might cause them to burst/break open, destroying the cell. Note that this did not happen in the plant cells because the cell wall prevents the cell membrane from easily expanding.
3. Freshwater creatures, particularly single-celled organisms, must cope with too much water entering the cells. They use their contractile vacuole if single celled to pump out this water. Saltwater organisms tend to have the opposite problem and must try to reclaim lost water.

TRANSPORT

Transport involves the absorption of materials through an organism's cell membranes and into its body fluids, and the circulation of materials throughout its body.

The Cell Membrane

The cell membrane surrounds the cell and regulates the passage of materials into and out of the cell.

Structure of the Cell Membrane. The currently accepted model of the structure of the cell membrane is called the *fluid mosaic model.* According to this model, the cell membrane consists of a double layer of lipid in which large protein molecules float (Figure 2-4).

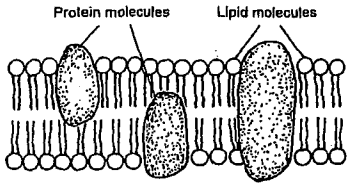


Figure 2-4. The fluid mosaic model of cell membrane structure.

Function of the Cell Membrane. The cell membrane selectively regulates the passage of substances into and out of the cell. Small molecules, including water, carbon dioxide, oxygen, and the soluble end products of digestion, pass easily through the cell membrane. Most larger molecules, such as proteins and starch, cannot pass through the cell membrane. However, molecular size is not the only factor that affects passage through the cell membrane.

Diffusion and Passive Transport

All ions and molecules are in constant, random motion. When such particles collide, they bounce off each other and travel in new directions. As a result of their motion and collisions, the particles tend to spread out from an area of high concentration to an area of low concentration, a process known as **diffusion.** The difference in concentration between two such areas is known as the *concentration gradient.*

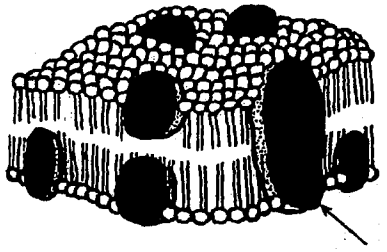
Molecules and ions that can pass through a cell membrane tend to move into or out of the cell by diffusion. The direction of diffusion depends on the relative concentration of the substance inside and outside the cell and usually results in a balance, or **equilibrium,** in the substance's concentration. Diffusion is a type of *passive transport;* it occurs because of the kinetic energy of the molecules and ions and does not require the use of additional energy by the cell.

The diffusion of water through a membrane is called *osmosis.* In osmosis, water molecules move from a region of higher concentration of water to a region of lower concentration of water until they reach an equilibrium.

Active Transport

Processes that require **active transport** involve the movement of particles through a membrane with the use of energy by the cell. In some cases, substances are moved by active transport from a region of lower concentration to a region of higher concentration (against the concentration gradient). In active transport, protein molecules embedded in the cell membrane act as carriers that aid in the transport of materials across the membrane.

1. The diagram below represents the fluid-mosaic model of a cell membrane.



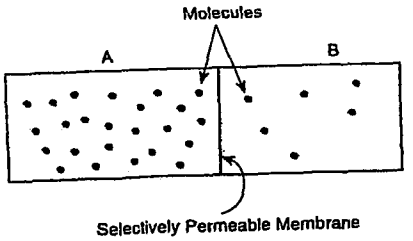
The arrow points to a component of the membrane that is best described as a

(1) sugar floating in lipids
(2) protein floating in lipids
(3) lipid floating in proteins
(4) lipid floating in sugars

2. Which process utilizes cellular energy to move particles through a membrane?

(1) osmosis
(2) passive diffusion
(3) active transport
(4) transpiration

3. The diagram below shows the same type of molecules in area *A* and area *B*. With the passage of time, some molecules move from area *A* to area *B*.



This movement is the result of the process of

(1) phagocytosis
(2) pinocytosis
(3) diffusion
(4) cyclosis

Questions

Multiple Choice

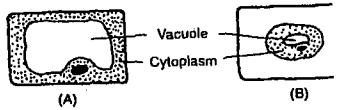
4. Which process would describe the m
ment of sugar molecules through a memb
from a region of higher concentration to a re
of lower concentration? (1) osmosis (2) c
sis (3) passive transport (4) active transpo

5. In the human body, the potassium ion
pass easily through cell membranes, ye
potassium ion concentration is higher i
many cells than it is outside these cells. This
dition is mainly the result of (1) passive t
port (2) active transport (3) osmosis (
nocytosis

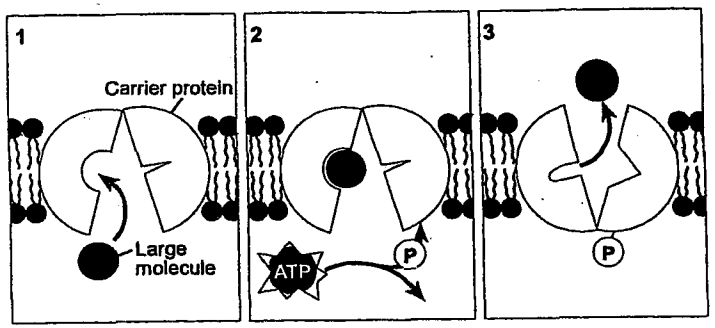
6. Chemical analysis indicates that the
membrane is composed mainly of (1) pro
and starch (2) proteins and cellulose (3)
and starch (4) lipids and proteins

7. The flow of materials through the mem
of a cell against the concentration gradi
known as (1) passive transport (2)
transport (3) osmosis (4) pinocytosis

8. A biologist observed a plant cell in a d
water and illustrated it as in diagram *A*. He
a 10% salt solution to the slide, observed th
and illustrated it as in diagram *B*. The cha
appearance of the cell resulted from
(1) salt flowing out of the cell than into th
(2) salt flowing into the cell than out of th
(3) water flowing into the cell than out of th
(4) water flowing out of the cell than into th



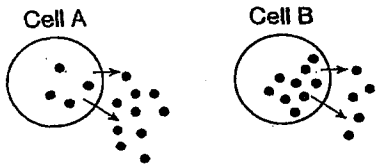
The diagram below represents movement of a large molecule across a membrane.



process is best represented in this diagram?

ctive transport (2) diffusion (3) protein building (4) gene manipulation

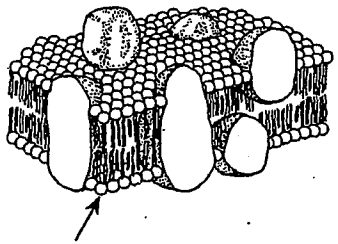
The arrows in the diagrams below represent the direction of movement of a certain type of molecule through the cell membrane of two different cells. The dots represent the relative concentrations of this molecule.



Which processes are illustrated in the diagrams?

(1) phagocytosis and diffusion
(2) pinocytosis and osmosis
(3) active transport and diffusion
(4) dehydration synthesis and circulation

11. A model of a section of a cell membrane is represented below.



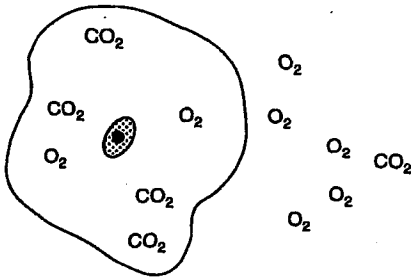
Which type of molecule is indicated by the arrow?

(1) protein (3) carbohydrate
(2) nucleotide (4) lipid

12. Red blood cells contain a higher concentration of potassium than the surrounding blood plasma does. This higher concentration is maintained by the process of

(1) cyclosis (3) simple diffusion
(2) osmosis (4) active transport

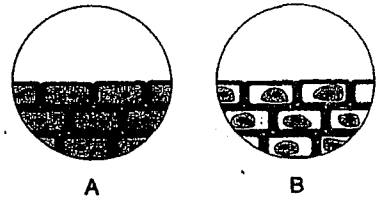
13. The diagram below represents a cell in water. Formulas of molecules that can move freely across the cell membrane are shown. Some molecules are located inside the cell and others are in the water outside the cell.



Based on the distribution of these molecules, what would most likely happen after a period of time?

(1) The concentration of O_2 will increase inside the cell.
(2) The concentration of CO_2 will remain the same inside the cell.
(3) The concentration of O_2 will remain the same outside the cell.
(4) The concentration of CO_2 will decrease outside the cell.

14. A student observed a wet mount of some stained plant cells in the high-power field of a compound light microscope. Diagram *A* represents the general appearance of these cells. The student then added several drops of a liquid to the wet mount and continued the observations. Diagram *B* represents the general appearance of the cells a few minutes after adding the liquid.



The liquid that the student added to the wet mount was most likely

(1) salt water (3) pond water
(2) distilled water (4) tap water