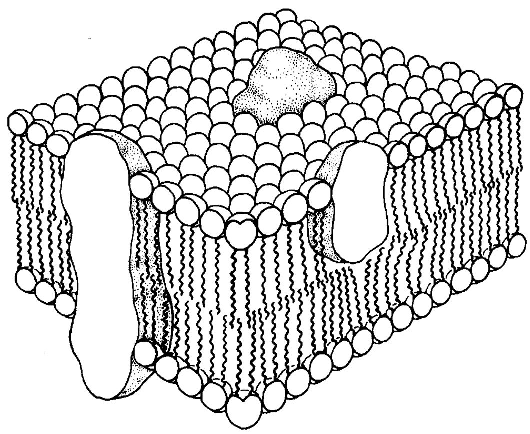
AP BIOLOGY
CELL UNIT
ACTIVITY #5

NAME______________________

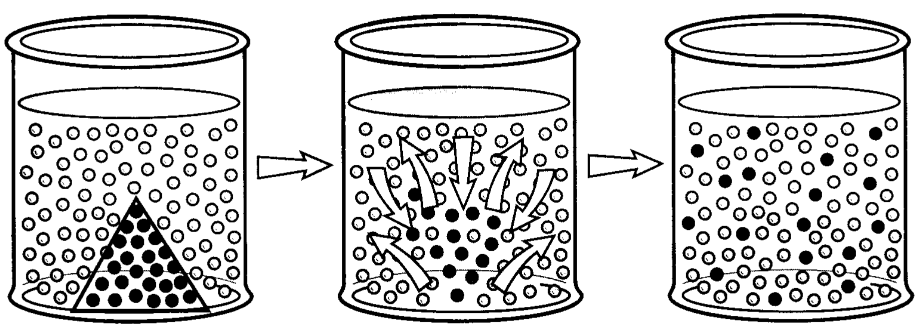
DATE___________HOUR_____

CELL TRANSPORT

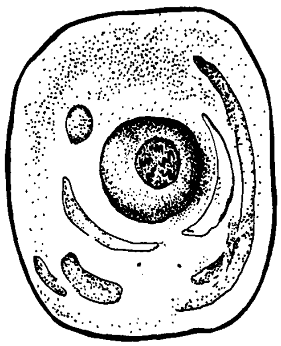
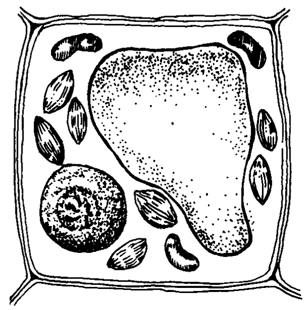
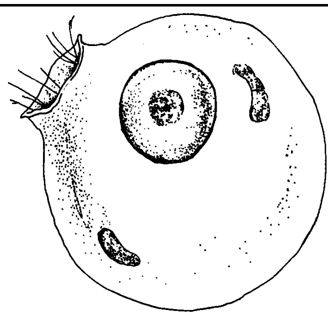
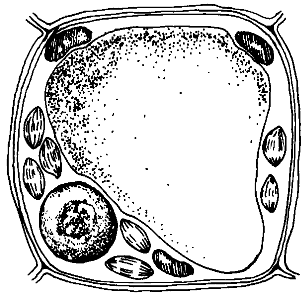
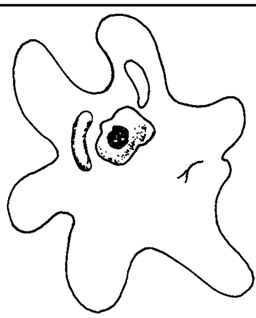
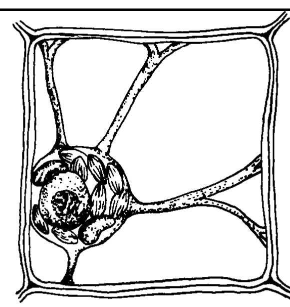
MEMBRANE PROPERTIES

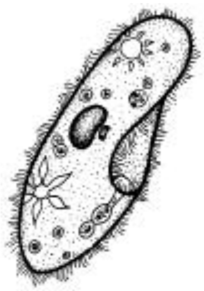
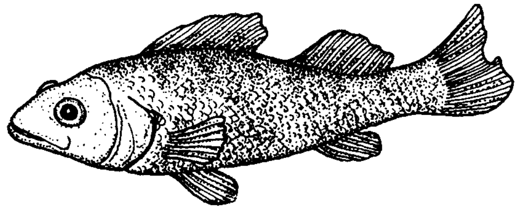


PASSIVE TRANSPORT

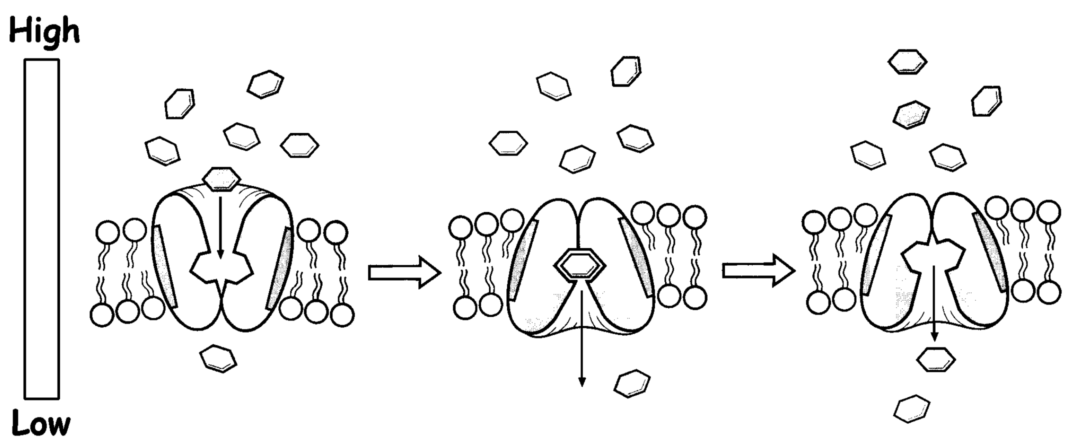
CHARACTERISTICS:
DIFFUSION: 

Osmosis:		
Isotonic	**Hypotonic**	**Hypertonic**

Animal Cells	**Plant Cells**
	
	
	

Osmoregulation – Adaptations		
Paramecium 	**Fresh Water Bony Fish** 	**Marine Bony Fish** 

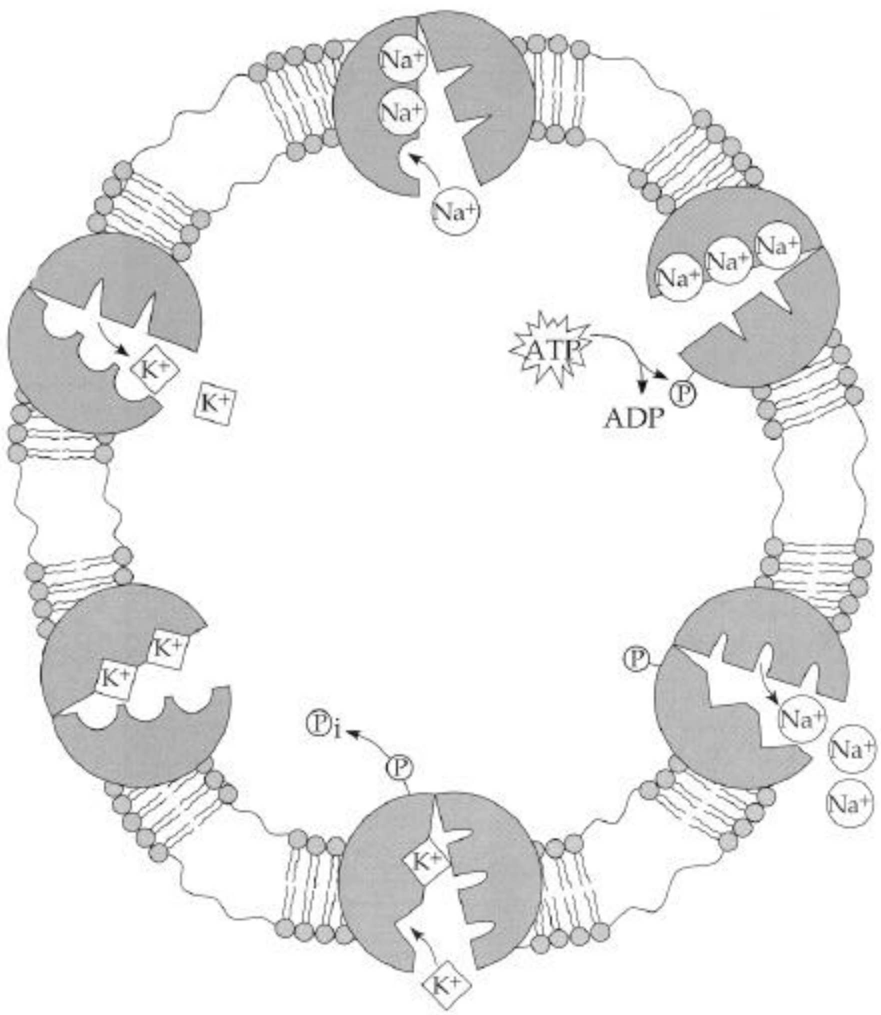
Facilitated Diffusion:



ACTIVE TRANSPORT

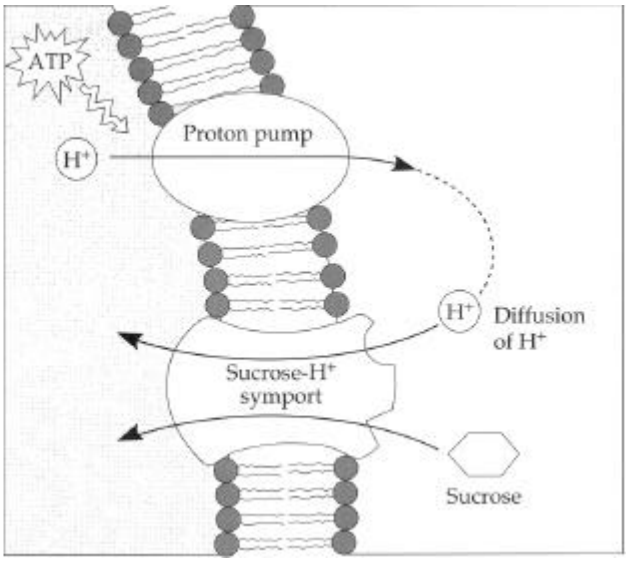
CHARACTERISTICS:

NA+/K+ PUMPS:

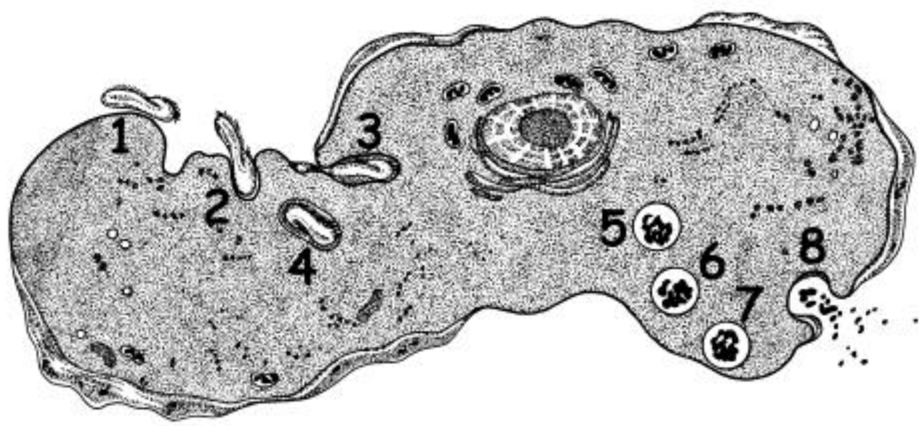


OTHER EXAMPLES:

COTRANSPORT:



TRANSPORT OF LARGE MOLECULES:



Types of Endocytosis	
Phagocytosis	
Pinocytosis	
Receptor-Mediated Endocytosis	

Questions:

1. Use the key below to indicate how each class of materials is transported across the membrane.

   A. Diffuses through the membrane.
   B. Small enough to pass through the spaces between the phospholipid molecules.
   C. Requires the assistance of transport proteins.

   _______ Nonpolar materials

   _______ Water

   _______ Ions

   _______ Large polar uncharged molecules

   _______ Small polar uncharged molecules

2. What is the role of transport proteins in biological membranes?

____

____

3. Describe how each of the following affect the rate of diffusion.

a. Molecular size:____

b. Temperature:____

4. A semipermeable sac, containing 4% NaCl, 9% glucose, and 10% albumin, is suspended in a solution with the following composition: 10% NaCl, 10% glucose, and 40% albumin. Assume the sac is permeable to all substances **except** albumin. Use the key provided to determine how each substance will move.

______ Glucose	A. Moves into the sac
______ Albumin	B. Moves out of the sac
______ Water	C. Does not move
______ NaCl	

5. The diagrams below show three microscopic fields (A-C) containing red blood cells. Arrows indicate the direction of net water movement. Answer the following questions.

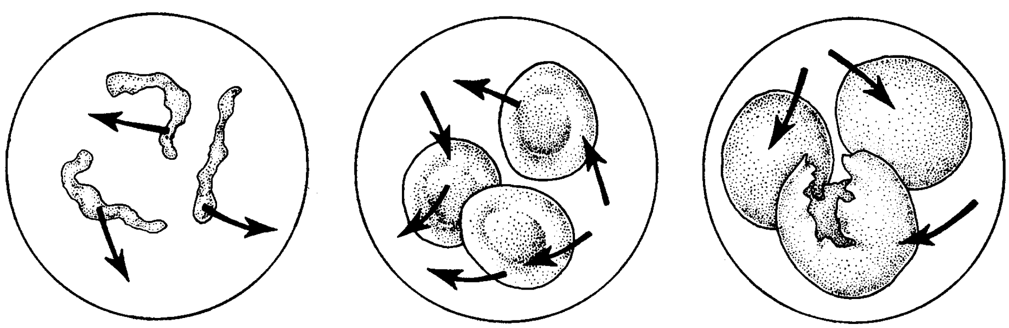


Diagram A Diagram B Diagram C

a. Which microscopic field shows a hypertonic environment?___________

b. Which microscopic field shows a cell hypertonic to its environment?

____

c. Which microscopic field shows an isotonic environment?_____________

d. Describe what is happening to the cells in Field C.

____

Explain why this is happening.___________________________

____

6. The table below describes the experimental procedure designed to investigate the effect of temperature and concentration on the rate of diffusion.

Beaker A	**Beaker B**	**Beaker C**	**Beaker D**	**Beaker E**	**Beaker F**
Fill with 200 mL of tap water	Fill with 200 mL of tap water	Fill will 200 mL of tap water	Fill will 200 mL of tap water	Fill will 200 mL of tap water	Fill will 200 mL of tap water
Room Temp.	Room Temp.	Place 4 ice cubes in beaker	Place 4 ice cubes in beaker	Heat beaker until water boils	Heat beaker until water boils
Place 5 g of potassium permanganate crystals in beaker	Place 10 g of potassium permanganate crystals in beaker	Place 5 g of potassium permanganate crystals in beaker	Place 10 g of potassium permanganate crystals in beaker	Place 5 g of potassium permanganate crystals in boiling water	Place 10 g of potassium permanganate crystals in boiling water
Do not stir.	Do not stir.	Do not stir.	Do not stir.	Do not stir.	Do not stir.
Time how long water takes to become completely colored	Time how long water takes to become completely colored	Time how long water takes to become completely colored	Time how long water takes to become completely colored	Time how long water takes to become completely colored	Time how long water takes to become completely colored
Record time.	Record time.	Record time.	Record time.	Record time.	Record time.

In summarizing the data, the class ordered the beakers according to the rate of time it took for the water to become colored. The list is shown below:

F Beaker in which water became completely colored first
E
B
A
D
C Beaker in which water became completely colored last

a. What effect did the concentration of potassium permanganate have on the rate of diffusion in:

Beakers A and B?_________________________________

Beakers C and D? ____

Beakers E and F? ____

b. What effect did temperature have on the rate of diffusion?

____

c. Which set of beakers -- A and B, C and D, or E and F -- served as the control in this investigation?

____

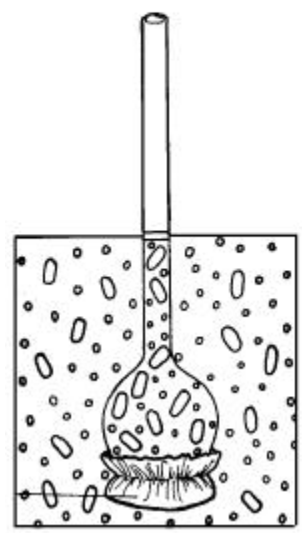
d. Why did the water in beaker F become colored the fastest?

____

e. What would happen if the concentration of potassium permanganate in beaker D were increased?

____

7. Examine the drawing at the right. The tube, filled with 10% sucrose solution, was placed in a 5% sucrose solution. The membrane covering the bottom of the tube is impermeable to sucrose.



a. In what direction does water move?

____

b. Explain why in terms of osmotic pressure.

____

____

c. Is the tube contents hypertonic, hypotonic, or isotonic? ____________

d. Is the solution outside the tube hypertonic, hypotonic, or isotonic?

____

9. Define the following terms:

Membrane potential	
Electrochemical gradient	

10. What two forces drive the passive transport of ions across a membrane?

____

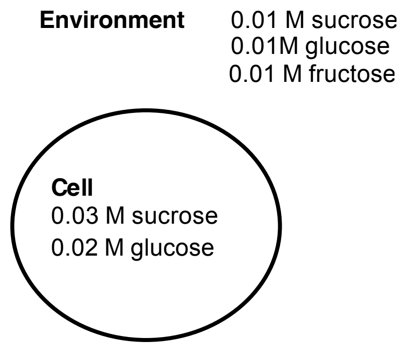
____

11. What factors contribute to the membrane potential of a cell?

____

____

12. An artificial cell with an aqueous solution enclosed in a selectively permeable membrane has just been placed in a environment containing a different solution. The membrane is permeable to water and to the simple sugars glucose and fructose, but is completely impermeable to sucrose. Use this information and the diagram at the right to answer the questions that follow.



a. Which solute(s) will exhibit a net diffusion into the cell?

____

b. Which solute(s) will exhibit a net diffusion out of the cell?

____

c. In which direction will there be a net osmotic movement of water?

____

d. After the cell is placed into the environment, which of the following changes would occur? (Check the correct box.)

☐ The artificial cell would be become flaccid.
☐ The artificial cell would become more turgid.
☐ There would be no net change in the cell.

13. Match the description / definition / example with the correct transport process.

A. Active transport
B. Diffusion
C. Endocytosis
D. Exocytosis
E. Facilitated diffusion
F. Osmosis
G. Phagocytosis
H. Pinocytosis
I. Receptor-mediated endocytosis

_______ movement of water across a semipermeable membrane down its concentration gradient.

_______ The movement of materials across a semipermeable membrane down their concentration gradients with the assistance of transport proteins

_______ The movement of materials down their concentration gradients

_______ Pumping of materials across a membrane against their concentration gradients

_______ Intake of small droplets of liquid by endocytosis

_______ Occurs when a vesicle/vacuole fuses with the cell membrane releasing the contents to the outside

_______ Intake of solids by endocytosis

_______ Occurs when a small region of the plasma membrane invaginates, pinches off, and forms a vesicle/vacuole

_______ The molecule to be transported binds to a receptor protein in the plasma membrane; the complex migrates to a specialized coated pit; the pit pinches off forming a vesicle/vacuole

_______ Low-density lipoproteins outside the cell bind to LDL receptor proteins on the cell membrane; the LDL protein complex migrates through the cell membrane to specialized coated pits; the pit pinches off forming a vesicle/vacuole

_______ Sodium / potassium pump

_______ Transport proteins are used to transport glucose or amino acids down their concentration gradients into the cell

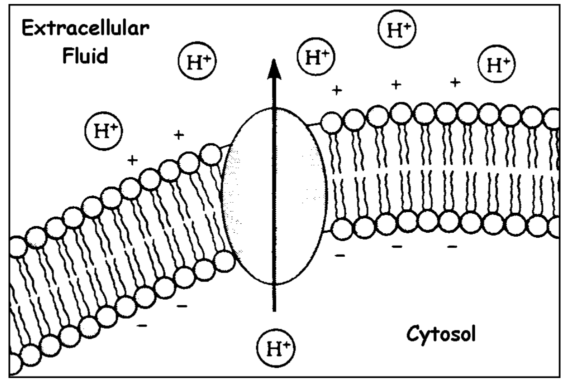
_______ White blood cells engulf a harmful bacterium

_______ Drinking sea water causes the loss of water from cells lining the digestive tract

14. Complete the following chart comparing the different transport processes.

Transport Method	**Requires Cell Energy Yes or No**	**Transport Direction: Down gradient (H to L) or Against gradient (L to H)**
Diffusion		
Facilitated Diffusion		
Osmosis		
Active Transport		
Endocytosis		
Exocytosis		

15. Examine the drawing at the right.



a. Does this drawing represent facilitated diffusion or active transport

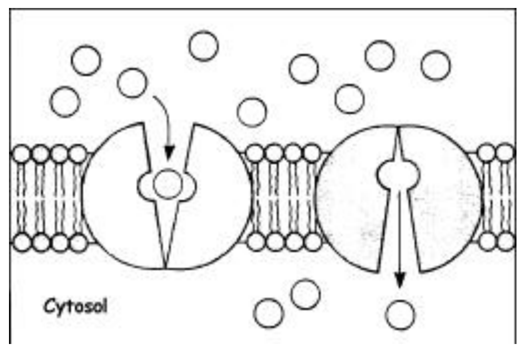
____

b. How can you tell?

____

____

16. Examine the drawing at the right.



a. Does this drawing represent facilitated diffusion or active transport?

____

b. How can you tell?

____

____