Unit 4 – The Cell

Name: _____

Objectives

At the end of this unit, you should be able to…

1) Convert measurements from one unit of the metric system to another

2) State the 3 parts of the cell theory

3) Contrast the following word pairs:

   Prokaryote and Eukaryote
   Animal cell and Plant cell
   Passive Transport and Active Transport

4) Identify and label all organelles of a bacteria cell, a plant cell and an animal cell

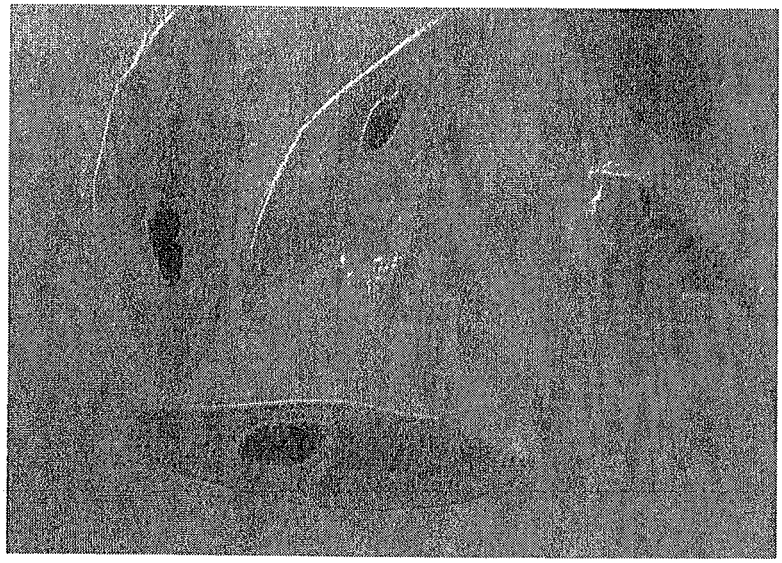
5) Explain the function of each cell organelle

6) Explain the structure of the cell membrane and its role in the transport of materials in and out of the cell

7) Describe how the concentration of salts, starches and sugars in the environment affects the movement of water in and out of a cell

8) Performance objectives

   Learn correct use of a microscope to observe living things
   Prepare a wet mount slide
   Use biological stains to observe cells
   Construct a model of a generalized plant and animal cell
   Determine the total magnification of a sample viewed through a microscope



Vocab

Active Transport

Cell Theory

Cell Theory

Cell Wall

Centrioles

Chloroplasts

Cilia

Concentration Gradient

Cytoplasm

Cytoskeleton

Diffusion

Endocytosis

Equilibrium

Eukaryote

Exocytosis

Flagella

Fluid-Mosaic Model

Golgi Body

Hypertonic

Hypotonic

Isotonic

Lysosome

Mitochondria

Nucleolus

Nucleus

Osmosis

Passive Transport

Phagocytosis

Phospholipid Bilayer

Pintocytosis

Plasma Membrane

Prokaryote

Ribosome

Rough Endoplasmic Reticulum

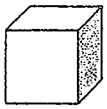
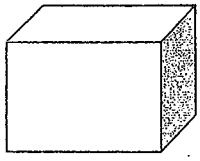
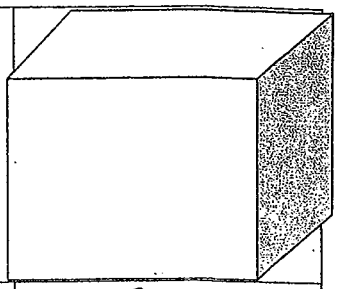
Smooth Endoplasmic Reticulum

Sodium/Potassium Pump

Vacuole

AP Biology
"Cell Size Exercise"

Complete the calculations to fill in the chart below.

			
Length of sides	1 cm	2cm	3cm
Surface area			
Volume			
Surface area: volume ratio			

The boxes represent the units of life = _____

As cells get bigger, both the surface area of membrane and the volume of cytoplasm _____.

However, describe the relationship between cell size and the *ratio* of surface area to volume. Explain.

Should cells be BIG or small? Explain.

Before we begin this unit, let's review SI (metric) units of measure…

HEY LOOK!! This is one's new

K_____	H_____	D_____	B_____	d_____	c_____	m_____	μ_____
1 x 10	1 x 10	1 x 10	1 x 10	1 x 10	1 x 10	1 x 10	1 x 10

To go from one unit of measure to another one, you simply _____

To go from a smaller unit to a larger unit, move the _____ to the _____

To go from a larger unit to a smaller unit, move the _____ to the _____

Now let's practice: convert the following into the *equivalent* measurements

Tall Man: 2 m = _____ cm = _____ mm = _____ μm

Hand: _____ m = 20 cm = _____ mm = _____ μm

Penny: _____ m = 2 cm = _____ mm = _____ μm

Blood Cell: _____ m = _____ cm = _____ mm = 10 μm

Bacterium: _____ m = _____ cm = _____ mm = 2 μm

Why use the micrometer (μm)?

Cells

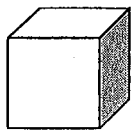
Cell Theory

1) _____

2) _____

3) _____

So, why are cells so darn small?

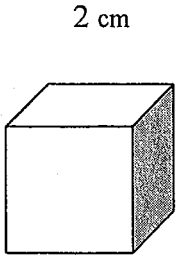


Surface Area =

Volume =

Surface Area to Volume Ratio

:



Surface Area =

Volume =

Surface Area to Volume Ratio

:

As cell size _____, the ratio of surface area to volume _____.

This makes it _____ for a cell to obtain nutrients and get rid of wastes.

Features of <u>ALL</u> cells (Review: prokaryote _____ & eukaryote_____)

1.

2.

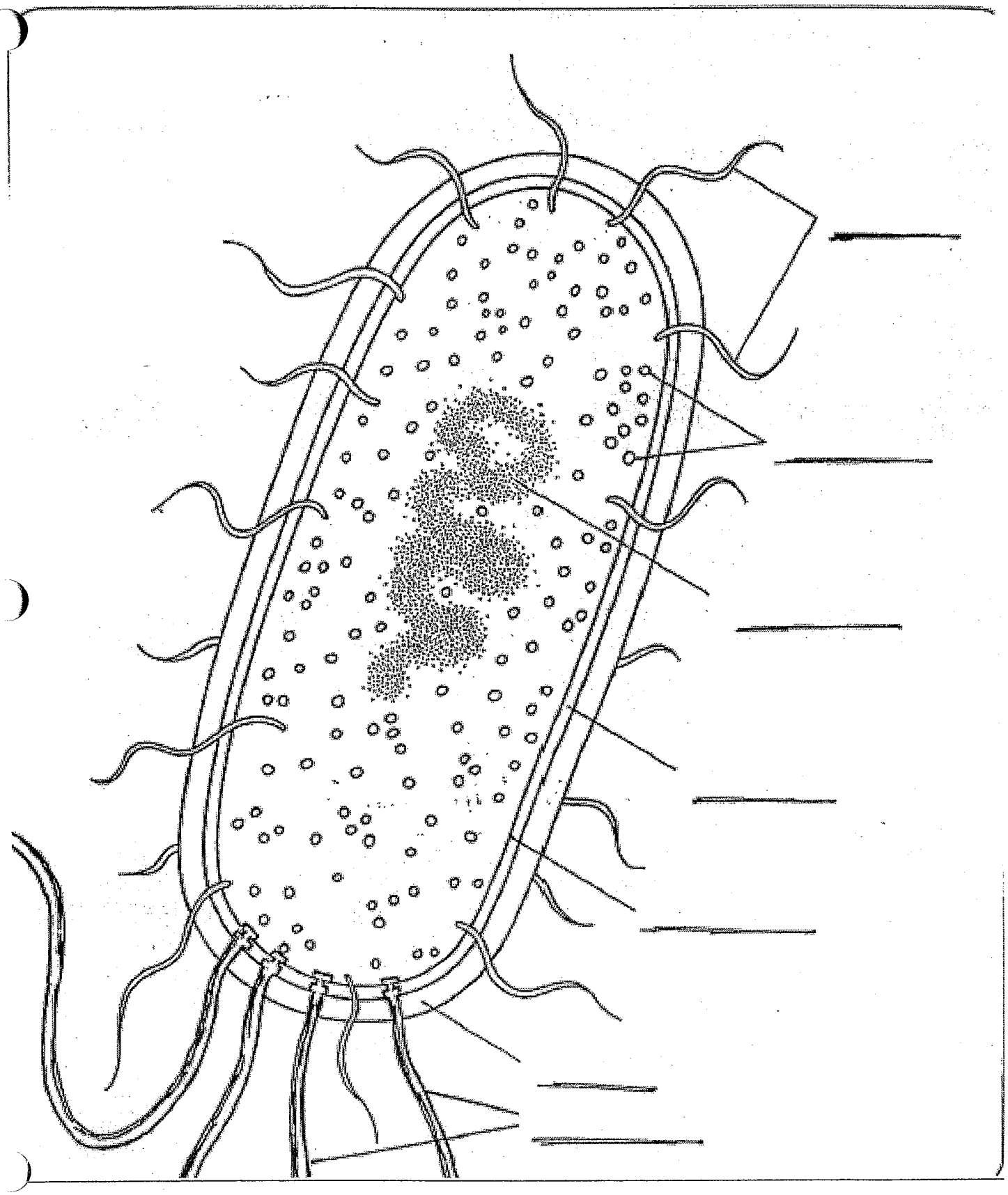
3.

4.

Cell Types:

	Prokaryote	**Eukaryote**
DNA		
Organelles		
Nucleus		
Examples		

A Bacterium (a prokaryote)



Bacteria Cell Functions

a. Pili: _____

b. Ribosomes: _____

c. Nucleoid: _____

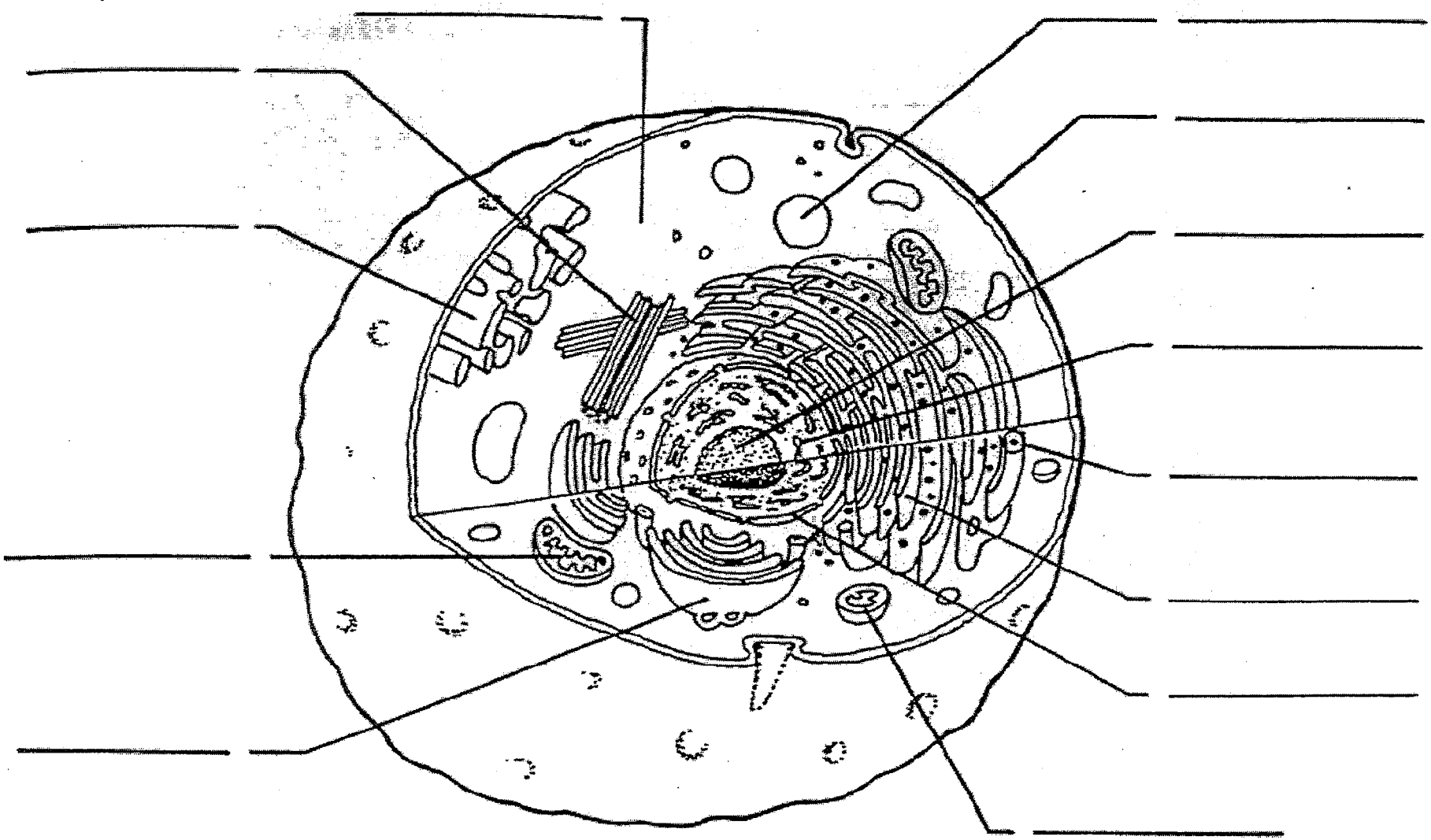
d. Cell wall: _____

e. Cell membrane: _____

f. Capsule: _____

g. Flagella: _____

Animal Cell (Eukaryote)



Animal Cell Functions

a. Nucleus: _____

b. Nuclear Membrane: _____

c. Mitochondria: _____

d. Ribosomes: _____

e. Nucleolus: _____

f. Golgi Body: _____

g. Lysosome: _____

h. Cytoplasm: _____

i. Cell (plasma) membrane: _____

j. Smooth endoplasmic reticulum: _____

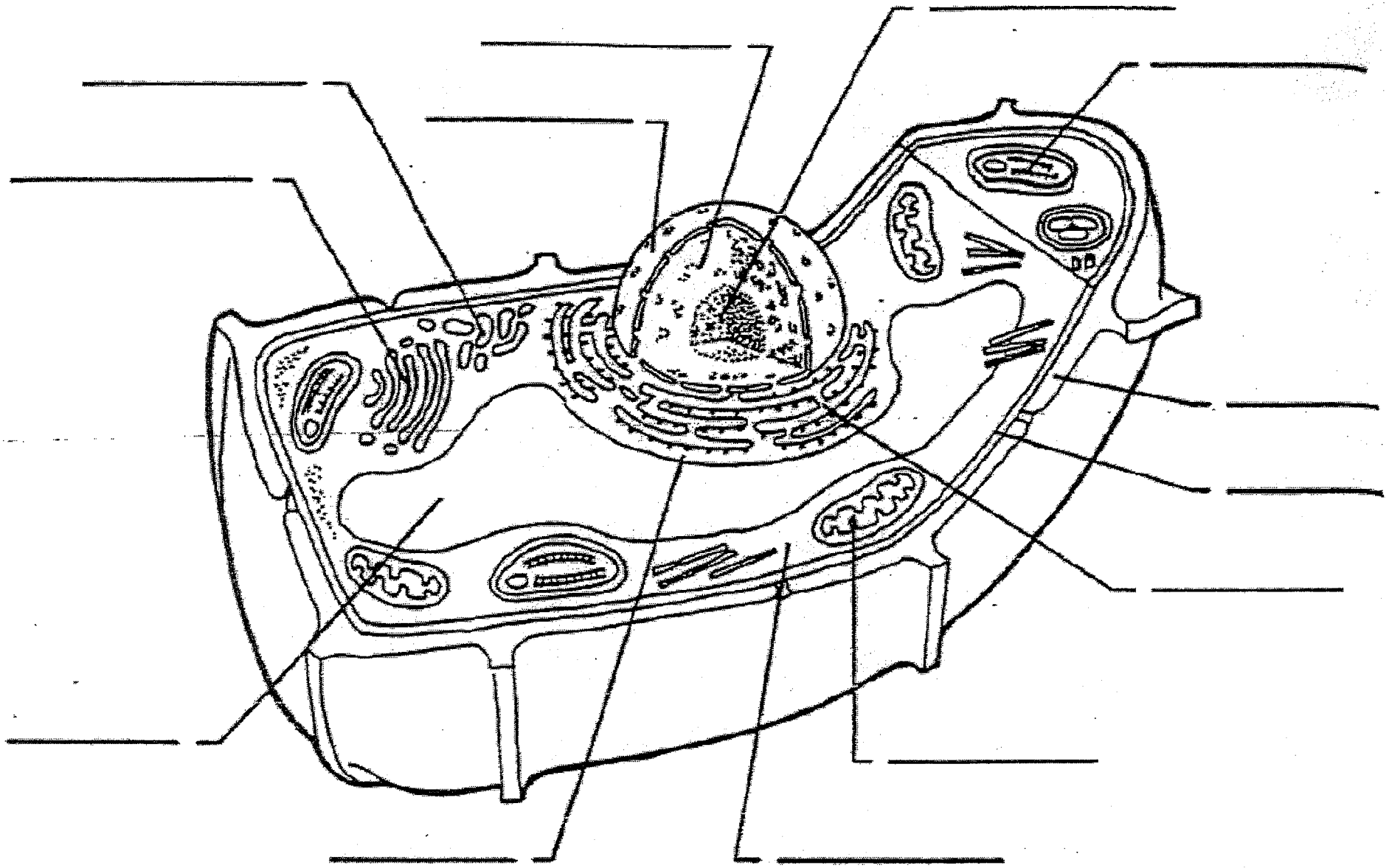
k. Rough endoplasmic reticulum: _____

l. Cytoskeleton (not shown): _____

m. Vacuole: _____

n. Centriole: _____

Plant Cell (Eukaryote)



Plant Cell Functions

a. Nucleus: _____

b. Nuclear Membrane: _____

c. Mitochondria: _____

d. Ribosomes: _____

e. Nucleolus: _____

f. Golgi Body: _____

g. Cytoplasm _____

h. Cell (plasma) membrane: _____

i. Smooth endoplasmic reticulum: _____

j. Rough endoplasmic reticulum: _____

k. Cytoskeleton (not shown): _____

l. Vacuole: _____

m. Chloroplast: _____

n. Cell wall: _____

Organelle	**Structure** Yes, DRAW it	**Function(s)**	**Plant, Animal or Both**
Plasma Membrane			
Nucleus			
Nucleolus			
Ribosome			
Rough Endoplasmic Reticulum			
Smooth Endoplasmic Reticulum			
Mitochondria			
Golgi Body			

Organelle	**Structure** Yes, DRAW it	**Function(s)**	**Plant, Animal or Both**
Cytoskeleton			
Cytoplasm (not an organelle)			
Vacuole			
Cell Wall			
Chloroplasts			
Lysosome			
Centrioles			
Cilia & Flagella			

The Plasma Membrane

A _____ barrier between a cell and its surroundings

Regulates the _____ of substances in and out of the cell

A) Structure

1) Phospholipids

2) Lipid Bilayer

Cells are bathed in a _____ environment

The bi-layer's _____ heads = face _____

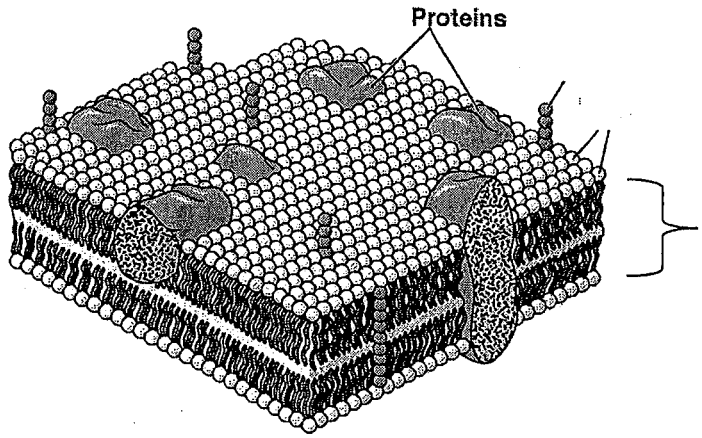
The bi-layer's _____ tails = face _____

3) The Fluid-Mosaic Model

_____ in the cell membrane have essential functions

1. **Receptor Protein**:
2. **Marker Protein**:
3. **Enzyme Protein**:
4. **Transport Protein**:
5. **Channel Protein**:

Fluid-Mosaic Model



B) Function

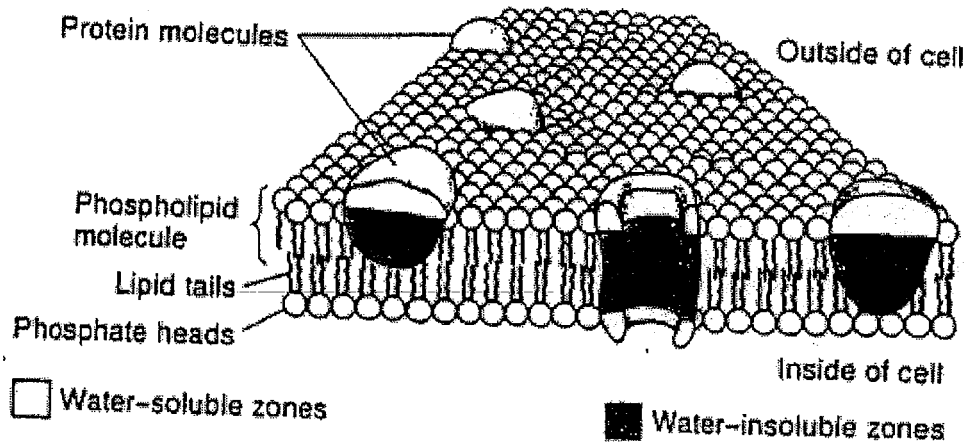
1) Transport

2) Regulation

i.e.

These functions help maintain _____!

The Cell Membrane:



1. a. What type of molecule makes up the double layer of a cell membrane?

   b. What smaller pieces make up this molecule? (Hint: think biochemistry)

2. What is the function of the cell membrane?

3. The cell membrane is semi-permeable. What does this mean?

4. The environment outside of a cell and the fluid inside of the cell is made mostly of _____.

5. Why do the "heads" of the phospholipids face outward and the "tails" face inward?

6. a. What type of molecule is also found in the cell membrane? (They are the "blobs" in the diagram)

   b. What is the job of these molecules?

7. The molecules that make of the cell membrane are _____. In other words, they are always moving and *flowing*.

8. This model of the cell membrane, having lots of different pieces in constant motion, is known as the _____ _____ model.

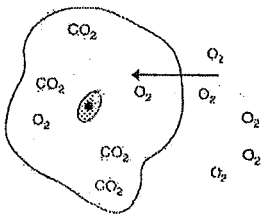
Transport Notes

Name: _____

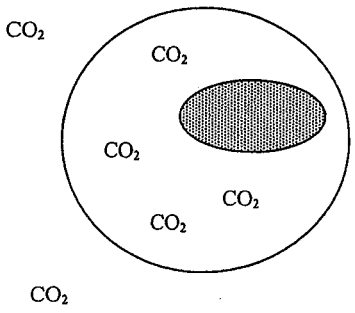
Review: Transport:

PASSIVE Transport

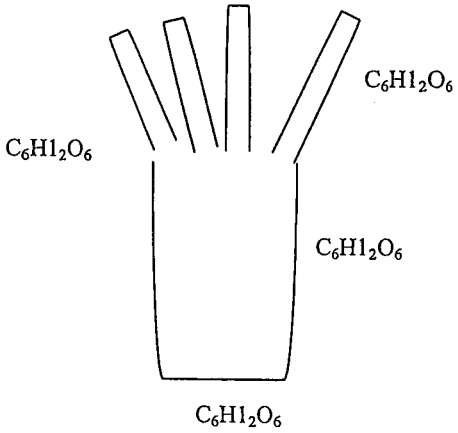
1) Diffusion



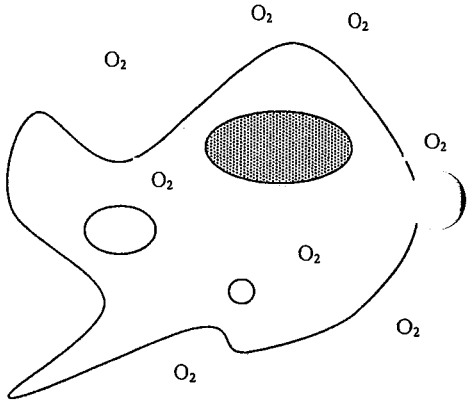
Draw an ⟶ to indicate the direction that the dissolved substances will diffuse.



Cheek Cell

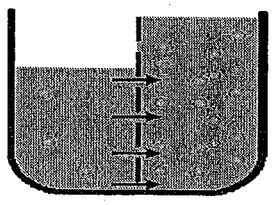


Hydra



Ameba

2) Osmosis



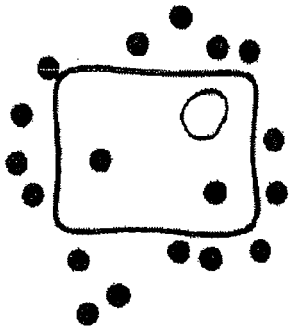
Osmosis
(Water moves by concentration gradient)

3) Facilitated Diffusion

Diffusion and Osmosis

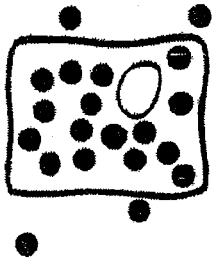
1. Look at these pictures of a cell surrounded by sugar molecules. The small dots are sugar molecules. Circle the picture that correctly shows where sugar molecules should appear after diffusion has taken place.

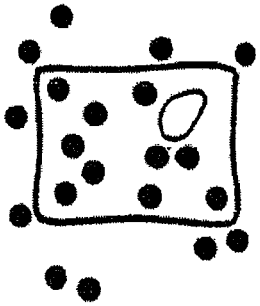
Before

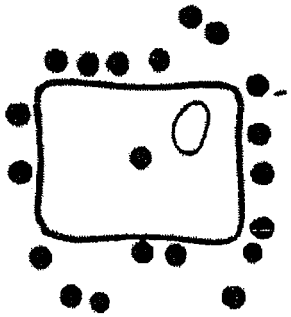


ALSO, CORRECTLY LABEL EACH OF THESE FOUR SOLUTIONS AS:
a) ISOTONIC
b) HYPERTONIC
OR c) HYPOTONIC
COMPARED TO THE CELL.

After







2. What is diffusion? _____

_____

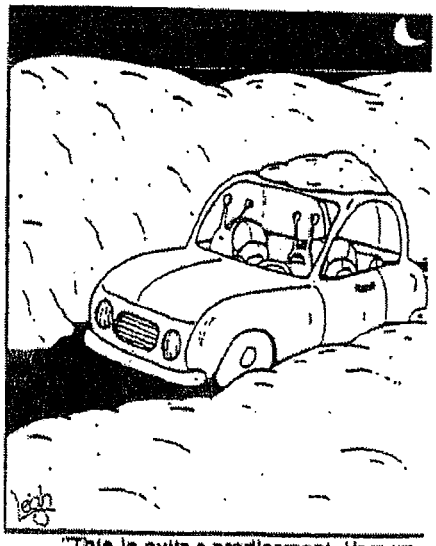
3. How do molecules get through the cell membrane? _____

_____

4. What is osmosis? _____

_____

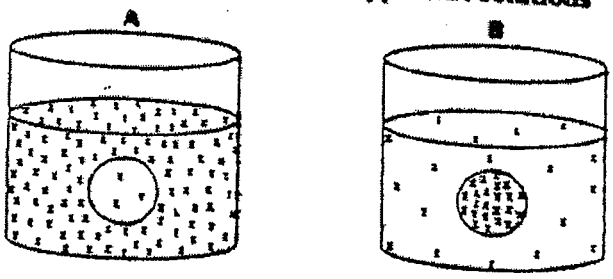
5. Which way would the water molecules move in the following:
   a. cucumber slice in salt water _____
   b. salt is poured on a snail _____
   c. vegetables are sprinkled with water _____



"This is quite a predicament. Here we are, stranded in the middle of nowhere, and I can't go for help because the road is salted!"

-15-

Figure 1. Hypertonic and Hypotonic Solutions



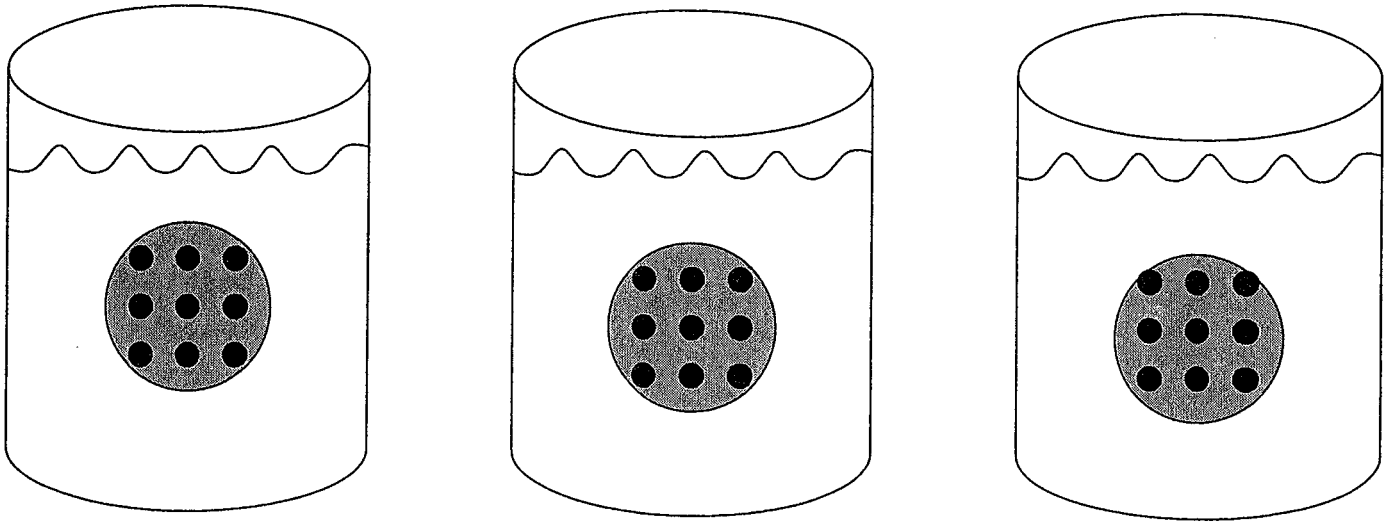
1. Is the solution in container A hypertonic or hypotonic?

2. What do you predict will happen to the cell in container A?

3. Is the solution in container B hypertonic or hypotonic?

4. What do you predict will happen to the cell in container B?

5. **DRAW** particles (●) to represent the correct environment around each of the following cells.



Hypotonic **Isotonic** **Hypertonic**

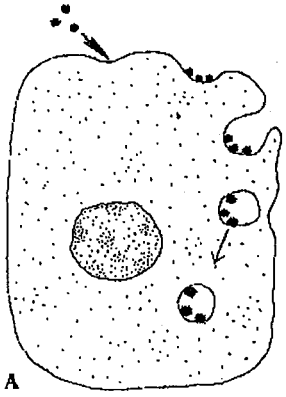
6. **DRAW** an arrow to show which way the **WATER** will move in each environment.

Your choices are…

* out of the cell * into the cell * no net movement.

ACTIVE Transport

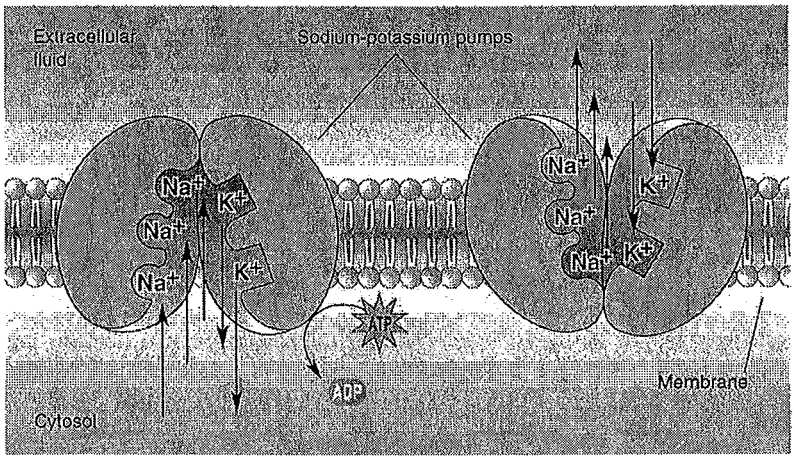
1) Endocytosis



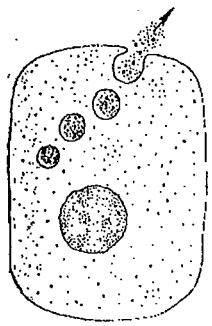
a) Phagocytosis
("phago" =)

b) Pinocytosis
("pino" =)

2) Sodium/Potassium Pump



2) Exocytosis



CHAPTER 4 DIRECTED READING

Cells and Their Environment

► Section 4-1: Passive Transport

Diffusion Is Caused by the Random Movement of Particles

Read each question, and write your answer in the space provided.

1. What is passive transport? Why is diffusion an example of passive transport?

2. How does the cell membrane help cells maintain homeostasis?

3. What determines the direction in which a substance diffuses across a membrane?

4. Describe the state of equilibrium.

Water Diffuses into and out of Cells by Osmosis

In the space provided, explain how the terms in each pair differ in meaning.

5. osmosis, diffusion

6. hypertonic solution, hypotonic solution

7. isotonic solution, equilibrium

Proteins Help Some Substances Cross the Cell Membrane

Mark each statement below T *if it is true or* F *if it is false.*

_____ 8. Most polar molecules cannot cross cell membranes without the help of certain proteins.

_____ 9. An ion channel is a selectively permeable protein with a pore.

_____ 10. The pores of ion channels are always open.

_____ 11. Carrier proteins require cells to expend energy when they transport substances across a cell membrane.

_____ 12. Carrier proteins are used in a process called facilitated diffusion.

_____ 13. Ion channels do not depend on concentration gradients to move ions and polar molecules across a cell membrane.

_____ 14. Random motion causes the movement of ions through ion channels.

▶ Section 4-2: Active Transport

Some Substances Are Transported Against a Concentration Gradient

Complete each statement by writing the correct term or phrase in the space provided.

1. The transport of a substance across the cell membrane against its concentration gradient is called _____ _____ .

2. Active transport requires the cell to use _____ .

3. The energy needed for active transport is usually supplied by _____ .

4. The sodium-potassium pump is a(n) _____ _____ .

5. The concentration of sodium ions inside the cell is usually _____ than the concentration of sodium ions outside the cell.

6. The concentration of potassium ions inside the cell is usually _____ than the concentration of potassium ions outside the cell.

7. The sodium-potassium pump picks up _____ ions outside the cell.

8. The sodium-potassium pump releases _____ ions inside the cell.

Vesicles Move Substances Across Membranes

Read each question, and write your answer in the space provided.

9. Explain why proteins and polysaccharides cannot enter and leave cells through membrane proteins.

10. What is the difference between endocytosis and exocytosis?

11. How is a vesicle formed in endocytosis?

12. What happens to a vesicle in exocytosis?

13. How do sodium-potassium pumps support the efficient functioning of cells?

SKIP THIS QUESTION!!!!!!!!

Membrane Receptor Proteins Receive Information

In the space provided, write the letter of the description that best matches the term or phrase.

_____ 14. signal molecule

_____ 15. receptor protein

_____ 16. ion channel

_____ 17. second messenger

_____ 18. enzyme action

_____ 19. beta blocker

_____ 20. changes in permeability

a. a large protein in the cell membrane that transports a specific ion

b. acts as a signal molecule in the cytoplasm

c. a protein that binds to a specific signal molecule

d. speeds up chemical reactions in the cell

e. a drug that interferes with the binding of signal molecules to receptor proteins in heart muscles

f. carries information throughout the body and to other cells

g. occur when a receptor protein is coupled with an ion channel