Name: _____

Cell Structure and Function

I. The Discovery of the Cell

A. Robert Hooke - 1665

1. The word "_____" was first used in late 1665 by Robert Hooke. He looked at:

2. Cork seemed to be made of thousands of _____.

3. Hooke called these chambers “cells” because they reminded him of the tiny rooms in which he lived in the monastery.

4. Today we know that cells are not empty chambers, but contain much living matter.

B. Anton van Leeuwenhoek – Late 1600’s

1. Leeuwenhoek made many _____ to observe things in nature that interested him.

2. He discovered the hidden world of microorganisms in a drop of water. He called them “little beasties.”

3. He was the first to:

C. Matthias Schleiden - 1838

1. German botanist
2.

D. Theodore Schwann - 1839

1. Zoologist
2.

E. Virchow

1. In 1858, Rudolph Virchow said that:

F. The Cell Theory

1.

2.

3.

II. Energy Requirements of Living Organisms

A. Living organisms need a constant supply of energy to maintain themselves and to grow and reproduce.

B. Ways Organisms Get Energy

1. Heterotrophs
   a) Heterotrophs are _____.

   b) Heterotrophs cannot _____. They must get it from outside sources.

   c) Examples:

2. Autotrophs
   a) Autotrophs are _____.

   b) Autotrophs _____ and are not dependent on outside sources for their food.
   c) Examples include:

III. All cells must be able to perform the following processes:

1. Ingestion:

2. Digestion:

3. Cyclosis:

4. Respiration:

5. Biosynthesis:

6. Excretion:

7. Egestion:

8. Movement

9. Reproduction:

10. Irritability:

11. Secretions:

IV. Structures of Animal Cells

A. Organelles:
   1. Organelles are the:

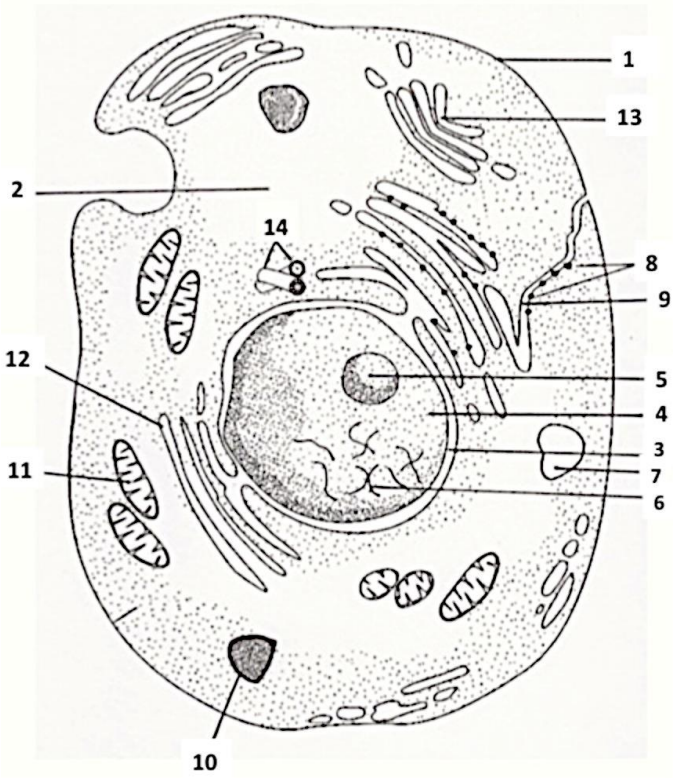
   2. Each organelle has a specific job or function.

B. A cell is divided into 2 parts:
   1. Nucleus –

   2. Cytoplasm –

V. The Animal Cell

A. Let's start by learning the basic structures found in an animal cell. Label each of the numbered organelles.



B. The Nucleus
   1. The nucleus is the _____of the cell.
   2. The nucleus contains nearly all of the cell's _____. The DNA has the instructions for:

   3. The nucleus is surrounded by a _____. The nuclear membrane is a double membrane that is dotted with thousands of _____. These pores allows materials to move:

4. The chromosomes are made of DNA and have two functions:
   a)

   b)
5. The Nucleoplasm is the semi-liquid portion inside the nucleus.

6. Nucleolus
   a)

   b) There are two subunits:

   c) These subunits then pass through the pores of the nucleus to the cytoplasm where they combine to form _____.

7. Functions of the Nucleus
   a) The nucleus is the carrier of the genetic information because this is where the genes are found.

   b)

   c)

   d)

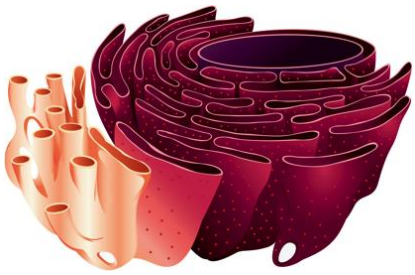
C. Ribosomes

1. Ribosomes may be found _____, or they may be found attached _____.

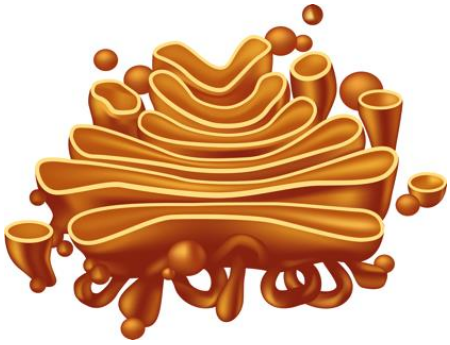
2. Ribosomes are the most numerous of the cell's organelles.

3. Ribosomes are the site of _____. All proteins of the cell are made by the ribosomes.

D. Endoplasmic Reticulum



1. The internal membrane system of a cell is known as the _____.
2. This system of membranes is so extensive throughout the cell that it accounts for more than half the total membrane in a cell.
3. It connects the _____ to the _____.
4. The smooth endoplasmic reticulum has no _____. The function of the smooth endoplasmic reticulum is to make _____.
5. The rough endoplasmic reticulum has _____ attached to it. This type of endoplasmic reticulum is involved in the making of _____. Newly made proteins leave the ribosome and are inserted into _____ where they are _____ into a functioning _____.



E. Golgi Apparatus

1. _____ that were produced in the rough endoplasmic reticulum now move to the Golgi apparatus.

2. The Golgi apparatus appears as a stack of loosely connected membranes.

3. The function of the Golgi is to _____ the proteins that have arrived from the endoplasmic reticulum.

4. These proteins will either be _____ or be _____ of the cell.

5. The _____ are put on proteins here before they are shipped off to their final destinations.

F. Lysosomes

1. Lysosomes are filled with _____.

2. One function is the _____ that can be used by the rest of the cell. They recycle the cell's own organic materials, breaking them down into their building blocks, and returning them to the cytoplasm to be used again.

3. Lysosomes are responsible for:

4. Lysosomes help to "clean up" or destroy any debris that might build up inside the cell.

5. Lysosomes are surrounded by a _____, because the cell would be destroyed if the enzymes were released.

G. Vacuoles

1. A vacuole is a:

2. A vacuole may store water, salts, proteins, and carbohydrates.

H. Mitochondria

1. The mitochondria is the "_____" of the cell.
2. The purpose of the mitochondria is _____. Cellular respiration is the process of converting:

3. Mitochondria have an inner membrane and an outer membrane.
4. The folds on the inner membrane are known as _____.
5. The cristae _____.
6. 100's or 1000's may be found in a cell.

I. The Cytoskeleton

1. The organelles of a cell do not float freely in the cytoplasm.

2. Cells must have an internal framework and _____ to give _____ and organization to a cell.

3. The cytoskeleton is a network of protein tubes and fibers that helps the cell to maintain its _____.

4. The cytoskeleton is also involved in _____.

5. Two of the types of fibers found in the cytoskeleton are:

6. Microfilaments are:

   Microfilaments form extensive frameworks inside the cell to give support to the cell. They help to bear mechanical stress.

7. Microfilaments also help cells to _____. They can assemble and disassemble rapidly causing movement.

8. Microtubules are hollow structures. Their functions include:
   a)

   b)

   c)

J. The Cell Membrane

1. Also called the plasma membrane.

2.

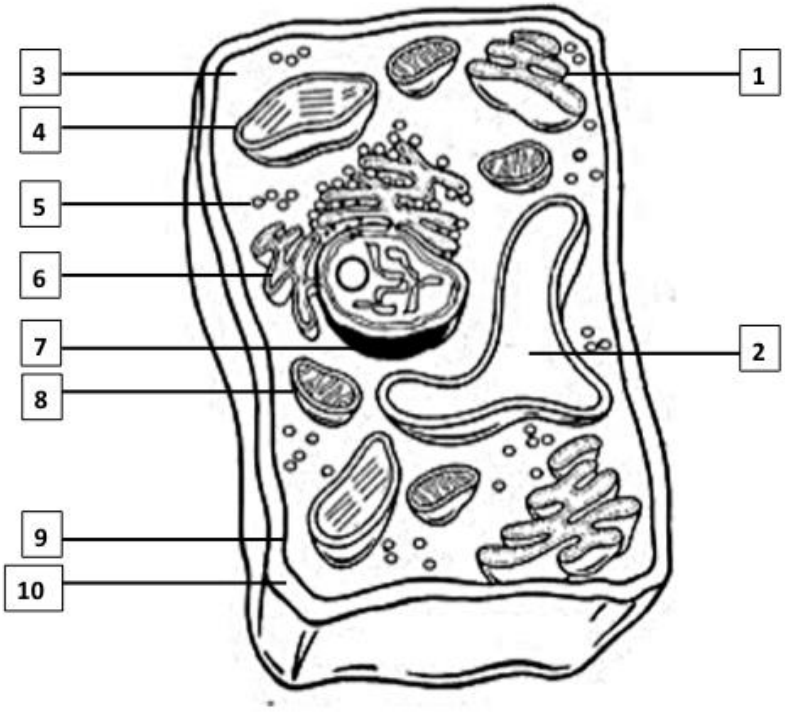
3.

4.

5.

VI. The Plant Cell

A. A plant cell has many of the same parts found inside an animal cell, but there are a few organelles that are only found in plant cells.



B. Differences Between Plant and Animal Cells
   1. Structures never found in plant cells:

   2. Structures never found in animal cells:

C. Large, Central Vacuole
   1.

   2. When filled with water, it creates _____ to give _____ to the cell. This allows the plant to support heavy structures such as flowers and leaves.

   3. It can also serve as a storage area for organic compounds

D. Plastids
   1. There are three types of plastids found in plant cells:

E. Chloroplasts
1. Chloroplasts are only found in plant cells and other unicellular organisms that do _____.

2. A chloroplast is where photosynthesis takes place.
3. Chloroplasts:

4. A chloroplast is similar to a solar power plant.
5. Chloroplasts are surrounded by an outer and an inner membrane.
6. Inside the chloroplast are large stacks of other membranes called _____. These thylakoids contain the green pigment _____ which is required for _____.

F. Chromoplasts
1. "Chromo" means _____.

2. Chromoplasts contain:

3. Chromoplasts give:

G. Leukoplasts
1. Leukoplasts:

2.

H. The Cell Wall
1. The cell wall is a supporting structure found in the cells of _____.
2. The main function of the cell wall is to:

3. The cell wall is composed mostly of:

VII. The Diversity of Cellular Life (Levels of Cellular Organization)

A. Unicellular Organisms
1.

2. Examples:

B. Colonial Organisms
1. Unicellular organisms that live together in groups.
2. The cells have:

3. There is no:

C. Multicellular Organisms

1. A multicellular organism is a group of cells that _____ in one organism.
2. There is differentiation and cell specialization.
3. Advantage of having cell specialization:

4. Disadvantage of cell specialization:

If one group of cells fails to do its job, the other cells will perish.

D. Levels of Organization

1. Cell Specialization:

2. Tissue:

3. Organ:

4. Organs:

5. Various systems work together to form a _____.

VIII. Prokaryotic and Eukaryotic Cells

A. All cells have two characteristics in common:

1. They are:

2. They contain:

3. All cells fall into two broad groups, depending on whether or not they contain a _____.
   a)

   b)

B. Prokaryotic Cells

1. Prokaryotic cells lack _____.

2. Prokaryotic cells have genetic material (DNA) that is not contained inside a nucleus. No membrane separates this from the rest of the cell.
3. Prokaryotic cells are generally _____ than eukaryotic cells.
4. Prokaryotic cells have a _____.
5. Prokaryotic cells have _____.
6. _____are prokaryotic cells.

C. Eukaryotic Cells

1. Eukaryotic cells are generally _____ and much more _____ than prokaryotic cells.

2. Eukaryotic cells have:

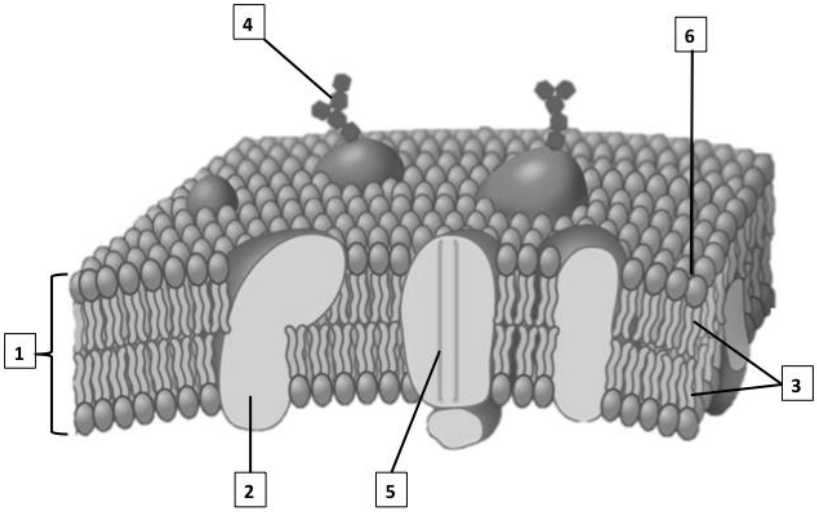
3. Eukaryotic cells contain a _____ which is kept separate from the rest of the cell.

4. _____ all have eukaryotic cells.

IX. How Do Materials Enter and Leave A Cell? (The Cell Membrane)

A. Structure of the Cell Membrane

1. Parts of the membrane



2. The cell membrane _____ what enters and what leaves the cell. It also provides _____ to the cell.

3. The membrane consists of a _____ (double layer) in which proteins are embedded. The lipid bilayer gives the membrane a flexible structure that forms a strong barrier between the inside and the outside of the cell.

4. Many of the proteins form _____ to help move materials across the membrane.

5. The carbohydrates serve as:

B. Homeostasis

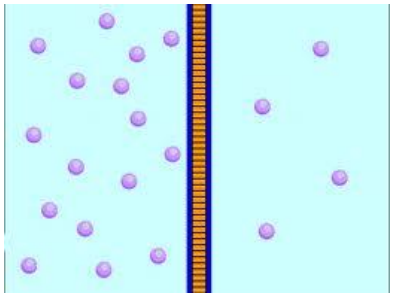
1. Homeostasis is a _____ that organisms maintain through self-regulating adjustments.
2. It requires self-regulation of materials coming into the cell and going out of the cell.
3. The cell is an open system. It requires the constant inflow of matter and energy and the constant out flow of waste.

C. Permeability of the Membrane

1. The cell membrane is called a _____ membrane or a semipermeable membrane.
2. It has the ability to let one substance pass through more readily than others. Some materials are not allowed to enter at all.
3. It can control the speed at which molecules are allowed to enter.

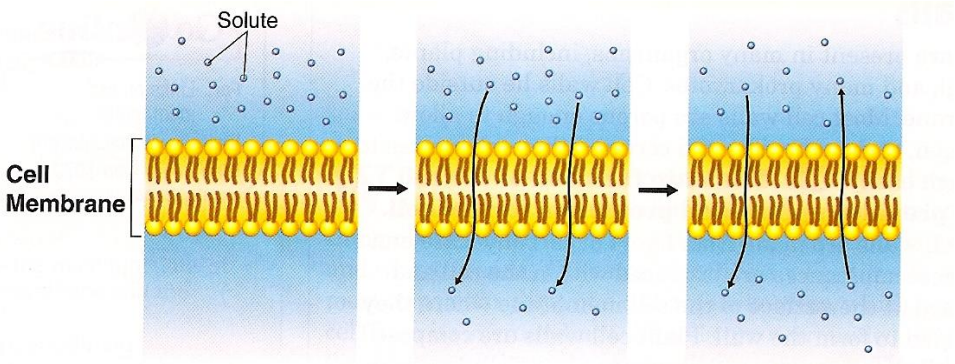
D. The Concentration Gradient

1. In the absence of other forces, materials will tend to:



2. On the drawing to the right, label the area of higher concentration. Label the area of lower concentration.
   Draw an arrow on the drawing showing the direction of movement for this solute.

3. Describe what is happening in the drawing below.



A. B. C.

A)

B) The solute molecules move from the side of _____ to the side of _____. This movement will continue until the concentration is _____on both sides of the membrane.

C) _____ has been reached. The concentration is equal on both sides of the membrane. There will still be movement in _____ directions, but the concentrations will remain _____.

E. Types of Passive Transport

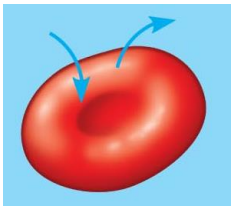
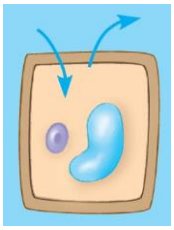
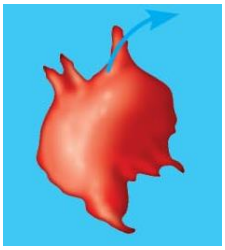
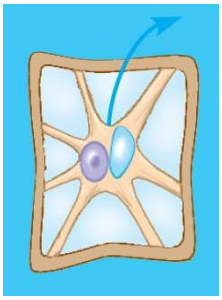
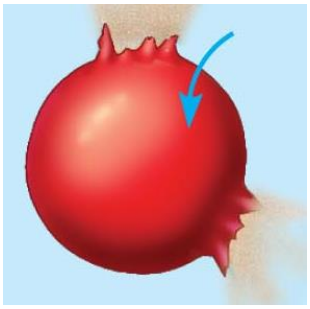
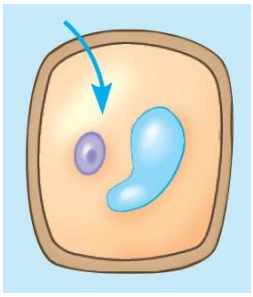
1. Passive transport means that:

2. Diffusion
    a) Diffusion is:

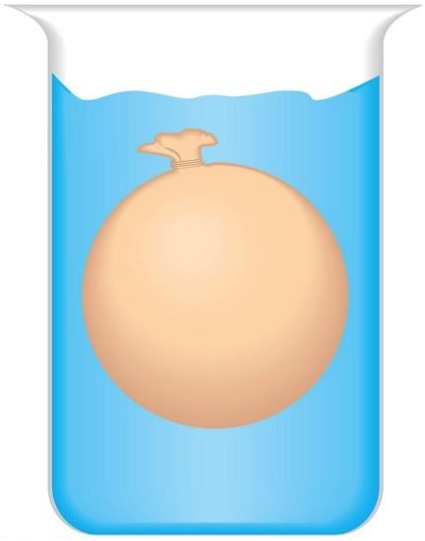
3. Osmosis
    a) Osmosis is the movement of _____ across a membrane from a region of high concentration to a region of low concentration

    b) Refers to the movement of water only.

4. There are three types of water solutions:

Type of Solution	Animal Cell	Plant Cell
Isotonic The amount of water is the _____ on the inside and the outside of the cell. Water will still flow back and forth across the membrane, but at the _____ in both directions.		
Hypertonic If a cell is placed in a hypertonic solution, there is _____ water on the _____ of the cell than on the _____ of the cell. There is a net movement of water _____ of the cell. Plasmolysis:		
Hypotonic If a cell is placed in a hypotonic solution, there is _____ water on the _____ of the cell than on the inside of the cell. There is a net movement of water _____ the cell. Cytolysis:		 In cells with a cell wall: The central vacuole of a plant cell will become extremely full of water. _____ will increase. This helps to give structure and support to a plant cell.

Let's Practice!!

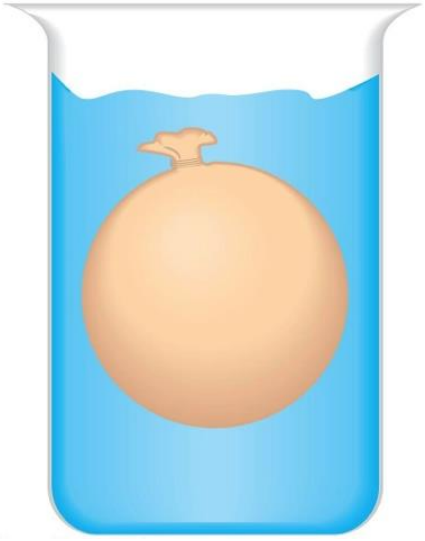


Label the drawing as we work through this.

1. The bag contains a 20% salt solution.
2. The water surrounding the bag is pure (100%) water.
3. What is the concentration of water inside the bag?
4. Is the bag hypotonic or hypertonic to the water on the outside?
5. Is the water on the outside hypertonic or hypotonic to the bag?
6. In which direction will water move?
7. In which direction will salt move?
8. What process might occur if too much water moves into the bag?
9. The movement of the salt and the water will continue until???
10. After equilibrium has been reached, what will happen to the movement of these molecules?

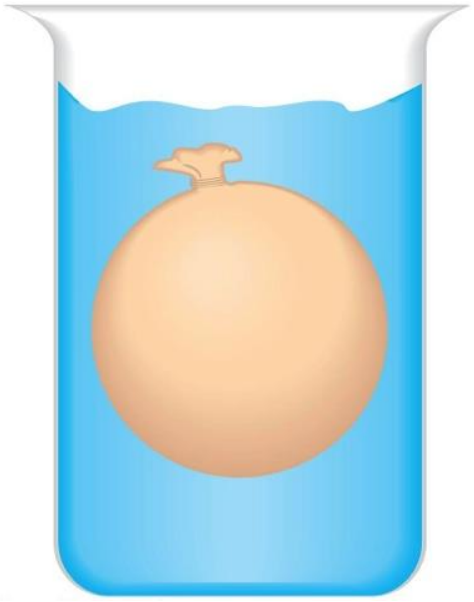
11. Water always moves from an area of _____ concentration to an area of _____ concentration. In other words, water moves from the _____ side to the _____ side.

Label the drawing as we work through this.



1. The bag contains a 40% sugar solution.
2. The water solution surrounding the bag contains a 40% sugar solution.
3. What is the concentration of water inside the bag?
4. What is the concentration of water on the outside of the bag?
5. What type of solutions are these?
6. In which direction will water move?

Label the drawing as we work through this.

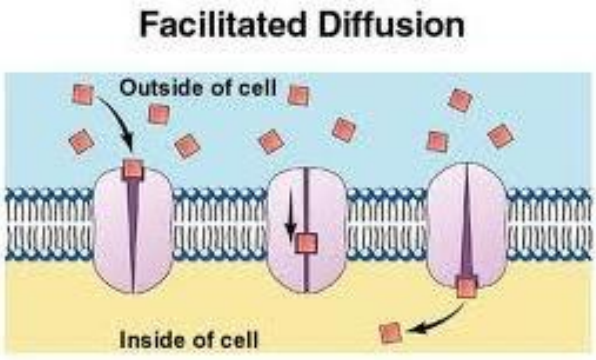


1. The bag contains a 5% salt solution.
2. The water surrounding the bag contains a 25% salt solution.
3. What is the concentration of water inside the bag?
4. What is the concentration of water outside the bag?
5. Is the bag hypotonic or hypertonic to the water on the outside?
6. Is the water on the outside hypertonic or hypotonic to the bag?
7. In which direction will water move?
8. In which direction will salt move?
9. What process might occur if too much water leaves the bag?
10. The movement of the salt and the water will continue until???
11. After equilibrium has been reached, what will happen to the movement of these molecules?

12. Water always moves from an area of _____ concentration to an area of _____ concentration. In other words, water moves from the _____ side to the _____ side.

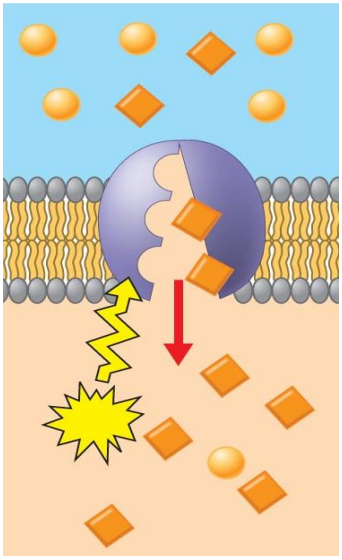
F. Facilitated Diffusion

1. _____ (water, glucose) have difficulty crossing through the _____ of the membrane.
2. _____ help these molecules to pass through the membrane more easily.
3. Polar molecules cross directly through the protein without coming into contact with the lipid bilayer.
4. This is known as _____ because these proteins "facilitate or help" the diffusion of these molecules across the membrane.
5. Facilitated diffusion is considered:



Facilitated diffusion speeds the passage of a solute by providing a passage through the membrane. It does not alter the direction of transport.

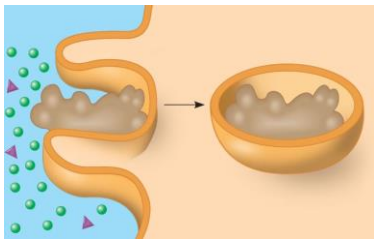
G. Types of Active Transport



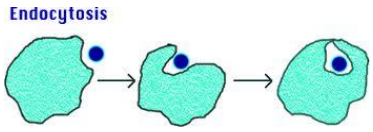
1. Materials must sometimes move _____ the concentration gradient. The cell must move materials from an area of _____ concentration to an area of _____ concentration.
2. This is called:

3. If small molecules and ions need to be moved across the membrane against the concentration gradient, it will require the use of _____ that are embedded in the membrane. This use of protein pumps requires:

4. Large molecules may have to be transported by a movement of the cell membrane.



_____ is the process of taking material into the cell by means of infoldings, or pockets, of the _____. The pocket that results breaks loose from the cell membrane and forms a _____ within the cytoplasm. Large molecules and clumps of food are taken up in this way.



This requires much _____.

Two types of endocytosis are:

Phagocytosis is:

Pinocytosis is "_____". The cell surrounds and engulfs droplets of extracellular fluid. It is not the fluid that is needed, but the molecules dissolved in the droplets.

Exocytosis is:

A vacuole fuses with the cell membrane, forcing the contents out of the cell.