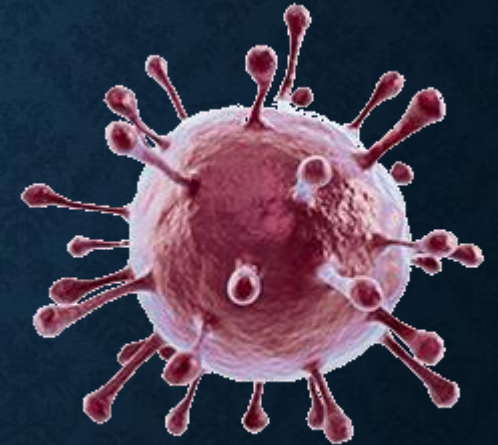


# **UNIT 4- CELL PROCESSES**

4.1 intro to cell processes

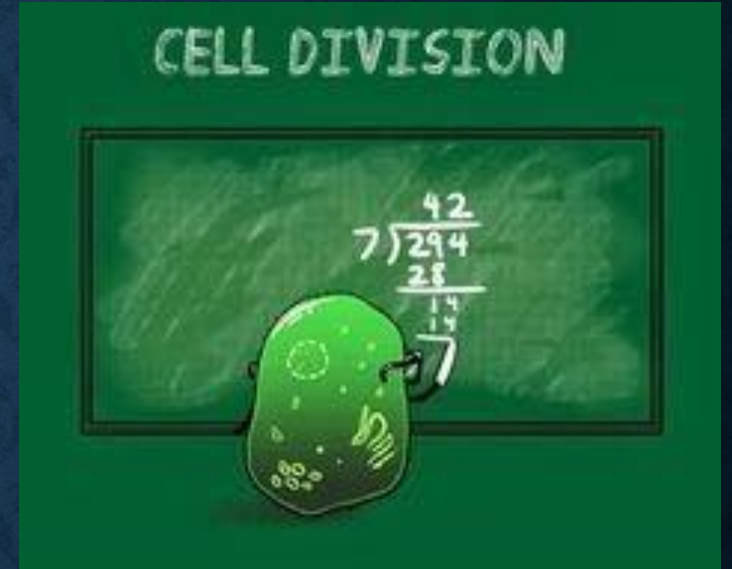
# WRITTEN RESPONSE #1: TRUE/FALSE

1. **Osmosis means to absorb something.**
2. **Cells are able to excrete waste.**
3. **Cells obtain energy by gaining nutrition from food.**
4. **Plants use sunlight for food.**
5. **Plants use heat from the Sun as a source of energy for photosynthesis.**
6. **The main goal of photosynthesis is to produce oxygen.**
7. **Some living things can exist without oxygen.**
8. **Food is synonymous with energy.**
9. **Respiration is synonymous with breathing.**
10. **Only plants photosynthesize and only animals respire.**



# WRITTEN RESPONSE #1: TRUE/FALSE – ANSWERS

1. **Osmosis means to absorb something.**
  - False
2. **Cells are able to excrete waste.**
  - True
3. **Cells obtain energy by gaining nutrition from food.**
  - True
4. **Plants use sunlight for food.**
  - False
5. **Plants use heat from the Sun as a source of energy for photosynthesis.**
  - True



# **WRITTEN RESPONSE #1: TRUE/FALSE - ANSWERS**



- 6. The main goal of photosynthesis is to produce oxygen.**
  - **False**
- 7. Some living things can exist without oxygen.**
  - **True**
- 8. Food is synonymous with energy.**
  - **True**
- 9. Respiration is synonymous with breathing.**
  - **True**
- 10. Only plants photosynthesize and only animals respire.**
  - **True**

# ARE MY CELLS ALIVE?

- Cells are the basic unit of structure and function in living organisms.
  1. All living things are made of cells.
    - a. Unicellular organisms are made of one cell. Ex. Bacteria
    - b. Multicellular organisms are made of many, many, many, many, many, many cells. Ex. You!
  2. All life processes occur at a cellular level.
    - a. Multicellular organisms – bodily functions (breathing and eating) are necessary to supply individual cells with things the cells need.
    - b. The interactions of all the individual cells in a multicellular organism create a need for other bodily functions (Excreting wastes.)

# CELLS INTERACTIONS WITH THE ENVIRONMENT.

1. Nutrients - nutrients must be delivered to the cell or taken from the environment.

Ex. By blood

2. Energy - To generate energy cells require oxygen.

This oxygen must be delivered to the cell (By blood) or taken directly from the environment.

3. Environment - Cells affect their environment by releasing wastes into their surroundings.

Ex. Algae release oxygen into the lake.

# HOMEOSTASIS IN A CELL

- Cells are only able to function because of their selective ability to let materials into and out of a cell.
  - Semi-permeability, selective permeability
- In what way do substances move across membranes?
  - There are 2 classifications of transport:
    - Active
    - Passive

# CONCENTRATION GRADIENT

- Term used to describe the difference between higher and lower concentrations.

refers to solutes inside & outside  
of the cell



# EQUILIBRIUM

- The point at which the molecules are evenly dispersed.
- What factors affect the speed at which equilibrium is reached?
- Temperature
  - High temperature faster reaction rates.
- Concentration Gradient
  - Steeper gradients speed up diffusion.

# **WRITTEN RESPONSE #2: EQUILIBRIUM**

**Once equilibrium is reached, what happens to the movement of molecules? (think about why the molecules move)**

- **Molecules continue to move but there is no net change in the concentration of molecules.**

**ACTIVE**  
**TRANSPOR**

**T**

**PASSIVE**  
**TRANSPOR**

**T**

Energy Required?

Energy Required?

Concentration Gradient

Concentration Gradient

Materials Move....

Materials Move....

Endocytosis

Diffusion

Exocytosis

Osmosis

Protein Pumps

Facilitated Diffusion

# STUDY 5 MINUTES

- Root Words 61-80

# OSMOSIS VS. DIFFUSION

- Before we answer this question let's take a look at two videos to help us reach our conclusions.
  - [Osmosis](#)
  - [Diffusion](#)
- Written Response #3 What is the difference between osmosis and diffusion?
- Discuss and answer:
  - Water moving freely vs. other particles moving freely.

# ACTIVE AND PASSIVE TRANSPORT

- As we discuss the notes in the upcoming section you should not take notes but simply add to your chart/notes.
- DO NOT WRITE WORD FOR WORD!

# PASSIVE

NO energy required



# ACTIVE

Energy required!



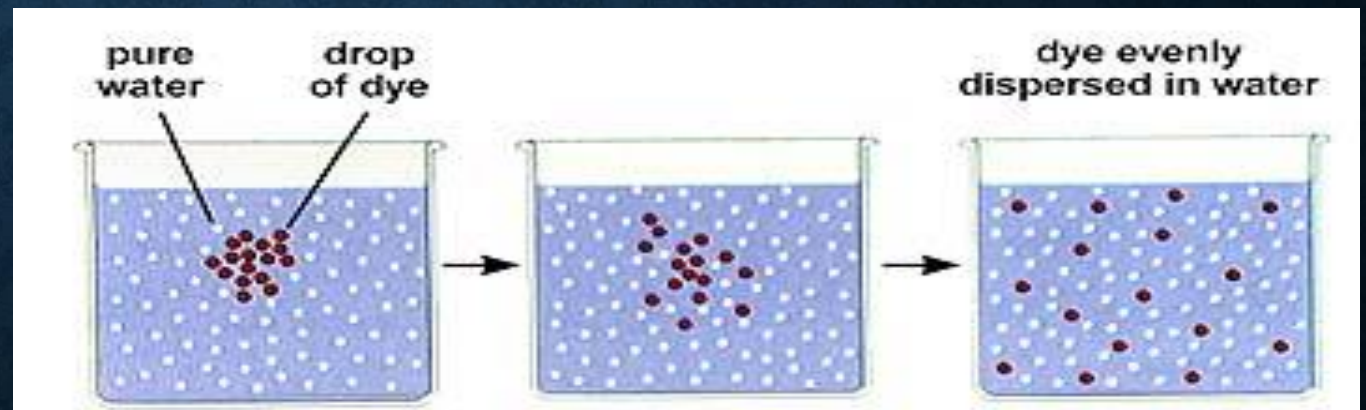


# PASSIVE TRANSPORT

- Does NOT require energy
  - Molecules travel from areas of higher concentration to areas of lower concentration
  - Materials Move With (or down) the concentration gradient
    - Think About It: Does it take much energy to go down a slide?

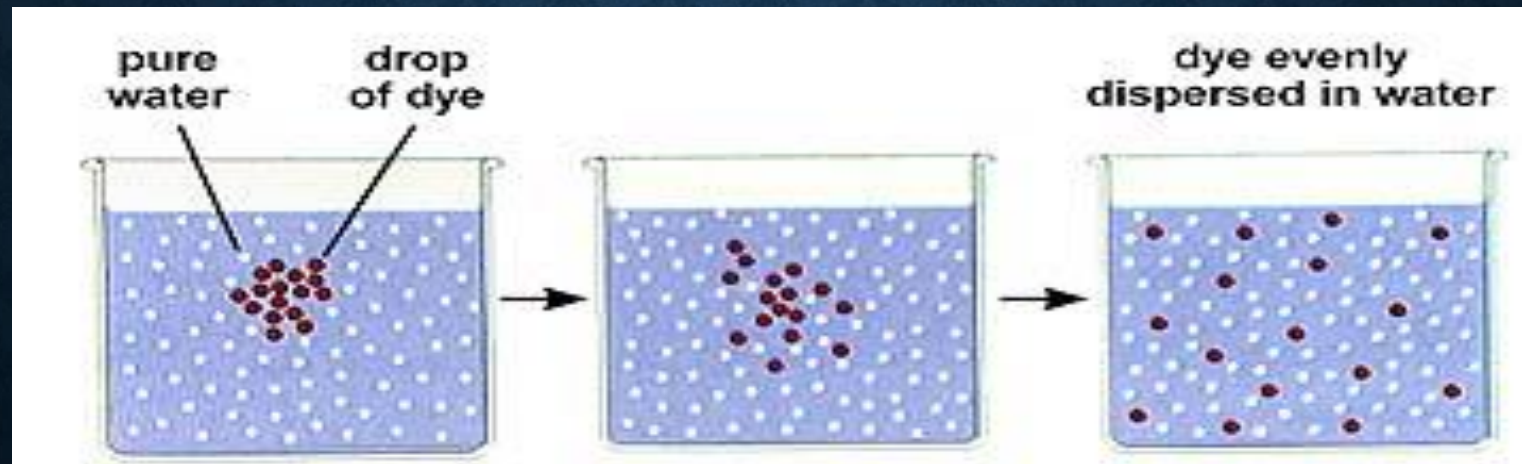
# PASSIVE TRANSPORT-DIFFUSION

- Passive Transport:
- **Diffusion**: small molecules pass easily through the phospholipid bilayer
  - Movement of molecules from an area of high concentration to low concentration
  - No energy needed (driven by kinetic energy of molecules)
  - Examples: Food coloring in water, perfume in air



# PASSIVE TRANSPORT

- Rate of diffusion
- Depends on:
- Temperature- LOWER = SLOWER
- Pressure- LOWER = SLOWER



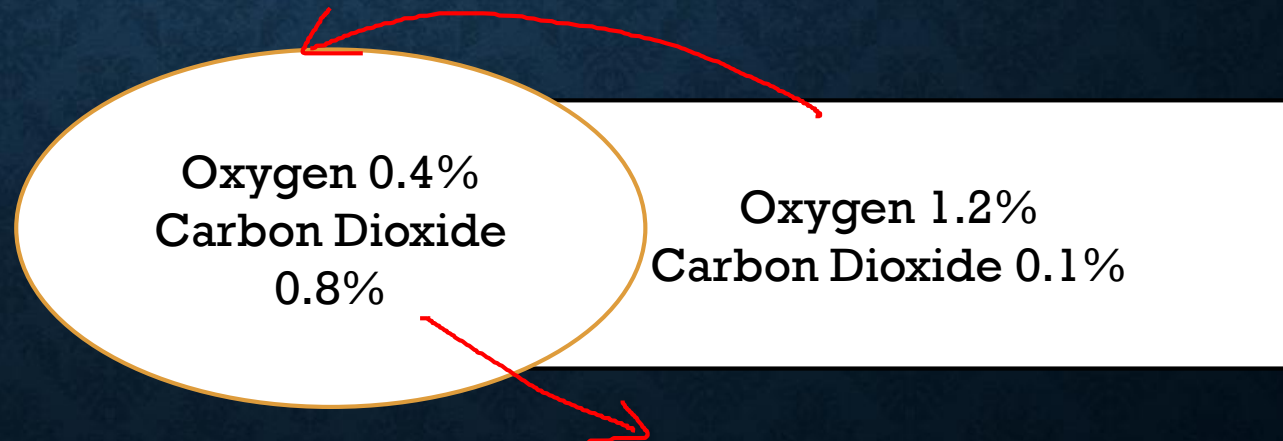
# PRINCIPLES OF DIFFUSION/OSMOSIS

## WRITTEN RESPONSE #5

- Diffusion Example:
- A cell has a concentration of 0.8% carbon dioxide gas and 0.4% oxygen gas. The blood surrounding the cell has an oxygen concentration of 1.2% and a carbon dioxide concentration of 0.1%.

### Written Response #5

- What will the cell lose?
- What will the cell gain?

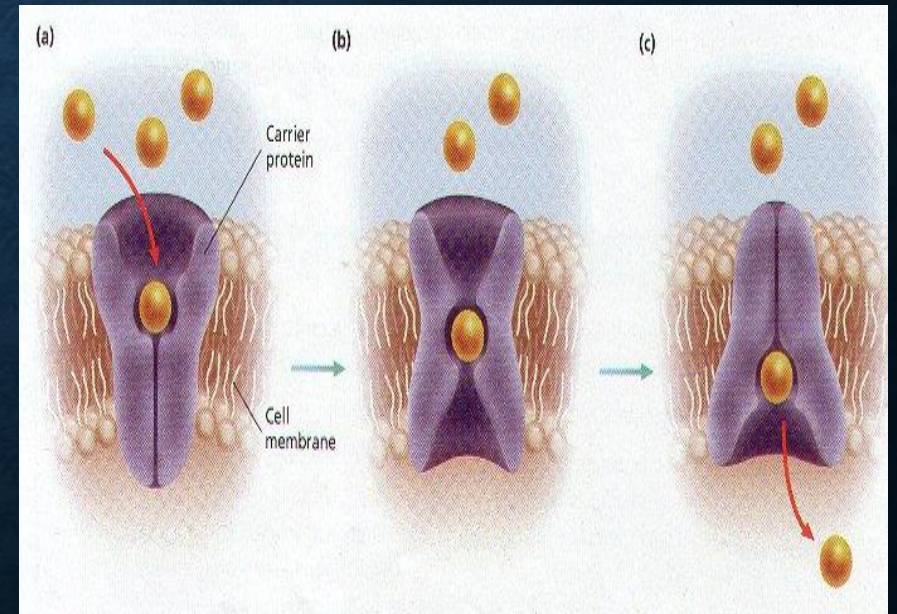


# PRINCIPLES OF DIFFUSION/OSMOSIS

- Answer: Oxygen will diffuse into the cell and carbon dioxide will diffuse out of the cell. This is called gas exchange.

# PASSIVE TRANSPORT-FACILITATED DIFFUSION

- **Facilitated Diffusion:** molecules pass through a carrier protein embedded in the phospholipid bilayer
  - Carrier molecules change shape when a solute (glucose) attaches to them. The change in shape helps move solutes across membrane
- No energy needed, still High  $\rightarrow$  Low Conc.
- Examples: Ions passing through a cell through the membrane



# PASSIVE TRANSPORT- OSMOSIS

- Osmosis: refers to water movement ONLY!
  - Pass easily through the phospholipid bilayer
  - Basically a special form of simple diffusion referring only to water molecules
  - **Occurs from an area of HIGH WATER concentration (less solute) to LOW WATER concentration (high solute)**
  - No energy needed, still High → Low Conc.
  - Examples: water flowing out of a cell (hypertonic), water flowing in a cell (hypotonic)

# PRINCIPLES OF OSMOSIS

Osmosis Example:

A blood cell has the same concentration of water and salt as saline solution. A doctor who failed high school biology and did not listen to the attending nurse used an injection full of distilled water (100% water).

Written Response #6

What will happen to the blood cells surrounded by the distilled water? (Hint: You will feel excruciating pain). Explain



# PRINCIPLES OF DIFFUSION/OSMOSIS

Answer: Water will move into the cell through the process of osmosis, causing the cell to swell and possibly burst.

# PRINCIPLES OF DIFFUSION/OSMOSIS

## Written Response #5

- Goldfish, like other freshwater fish, have saltwater concentrations in their cells that are close to the salt concentration of the freshwater around them, enabling them to maintain homeostasis easily in their freshwater environment. Why is it critical that you NEVER put a fresh water fish in a saltwater aquarium tank? Use appropriate vocabulary!

# PRINCIPLES OF DIFFUSION/OSMOSIS

- Answer:

# ACTIVE TRANSPORT

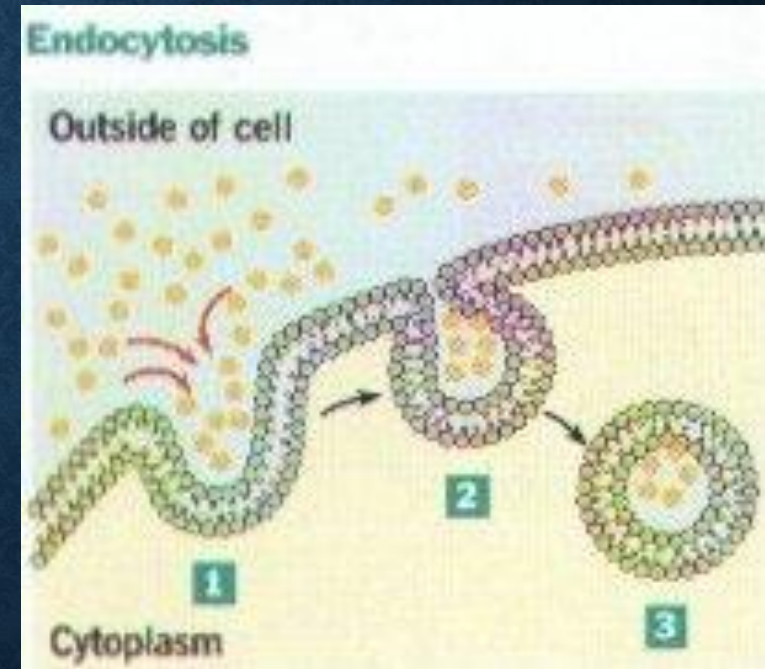
- Active – Requires energy (ATP)
  - Molecules travel from areas of **lower concentration to areas of higher concentration**
  - Against the concentration gradient
    - Think About This: Does it take energy to climb back up a slide?
  - Used to move ions such as  $\text{Na}^+$ ,  $\text{Ca}^+$  and  $\text{K}^+$  across cell membrane
  - Plants use this to help roots absorb nutrients from the soil (plant nutrients are more concentrated inside root than outside)

## ACTIVE- PROTEIN PUMPS

- Sodium Potassium Pump(Protein Pumps): animal cells pump 3 Na<sup>+</sup> ions out of a cell and replace them with 2 K<sup>+</sup> ions (come in to cell)
  - Against the concentration gradient; requires energy
  - Causes a difference in charge inside and outside the cell
    - This is called membrane potential
- Ion pumps help muscle and nerve cells work

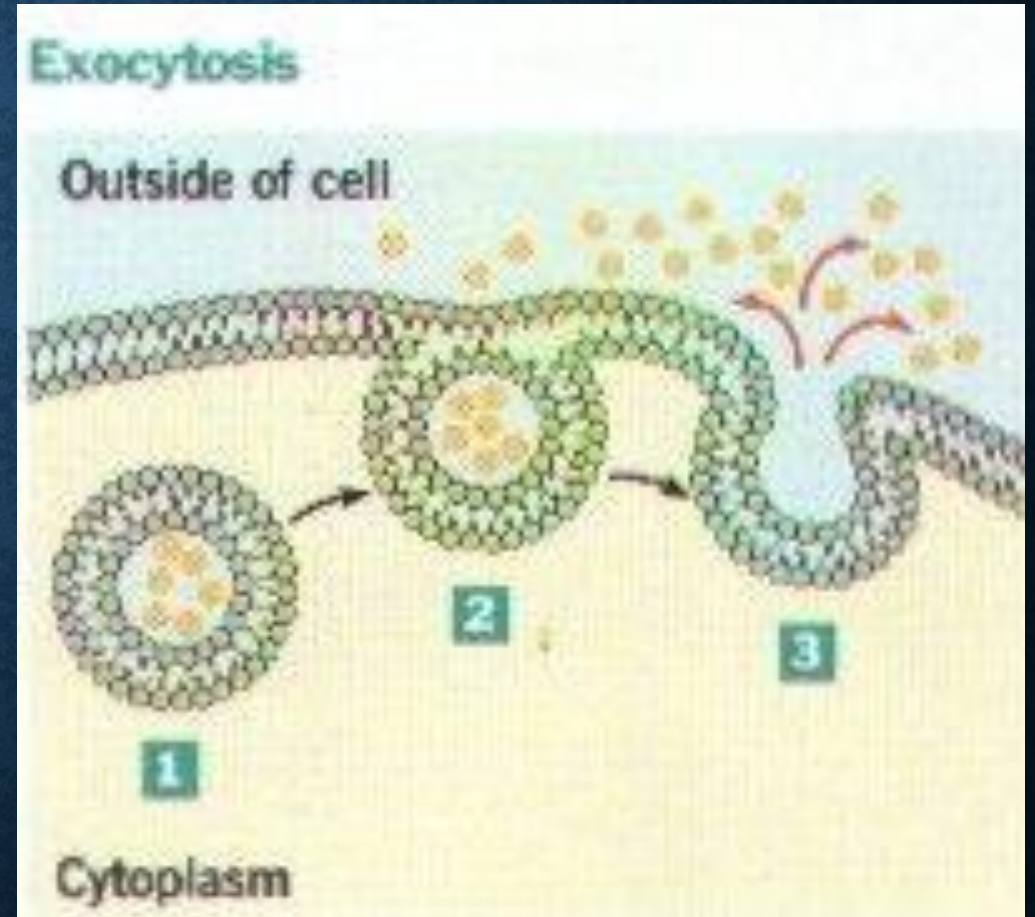
# ACTIVE-ENDOCYTOSIS

- Endocytosis: taking materials into the cell using vesicles
  - Examples: phagocytosis (solid particles); pinocytosis (liquid particles)
    - Phagocytosis: “cell eating”
      - WBC used to kill bacteria
    - Pinocytosis: cell membrane allows fluid droplets in through vesicle; “cell drinking”

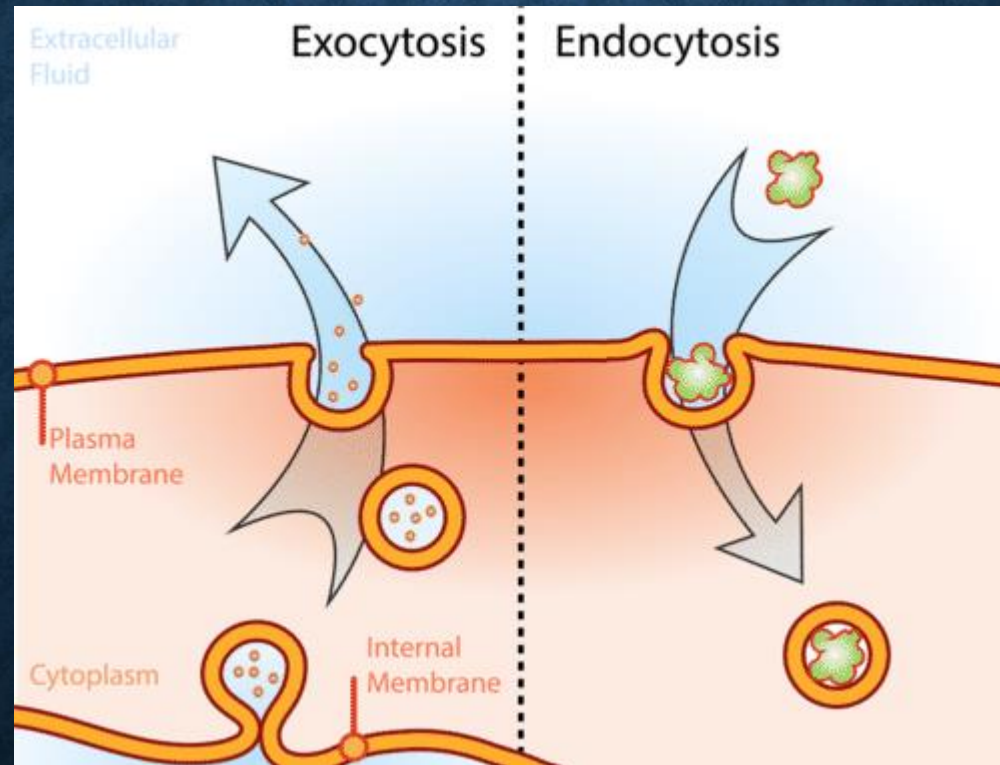


# ACTIVE- EXOCYTOSIS

- Exocytosis: using vesicles to expel materials
- Proteins made by ribosomes are packaged into vesicles by Golgi apparatus
  - Transport vesicles fuse with cell membrane and proteins are secreted out
    - Ex: Insulin



# ENDOCYTOSIS/EXOCYTOSIS





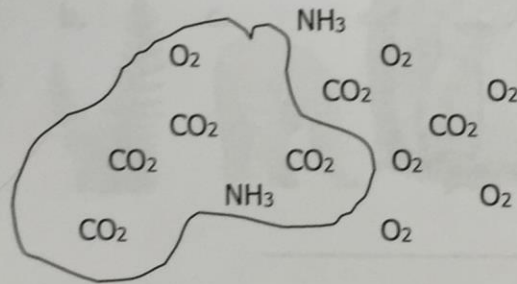
Problem-Solving Set

1. Oxygen and carbon dioxide molecules are able to diffuse through the cell membrane. Inside a cell, the concentration of oxygen molecules is 0.5% and the concentration of carbon dioxide molecules is 0.8%. In the blood surrounding the cell, the concentration of oxygen is 1.2%, and the concentration of carbon dioxide is 0.2%. Which way will the oxygen and carbon dioxide molecules move?

Draw a picture of the situation:

The oxygen will move \_\_\_\_\_ of blood and \_\_\_\_\_ cells.  
 The carbon dioxide will move \_\_\_\_\_ of cells and \_\_\_\_\_ blood.

2. Observe the following cell. What will happen to the molecules after a period of time?



The \_\_\_\_\_ molecules will move into the cell and the \_\_\_\_\_ molecules will move out of the cell.

3. The following picture shows blood cells in a saline (salt) solution.

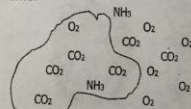
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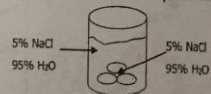
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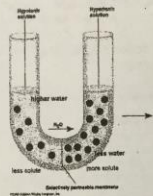


The \_\_\_\_\_ molecules will move into the cell and the \_\_\_\_\_ molecules will move out of the cell.

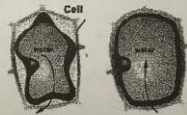
3. The following picture shows blood cells in a saline (salt) solution. Draw arrows on the picture to show which way the water will move.



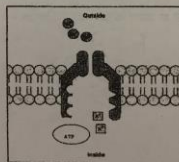
4. Observe the following picture. Draw another picture in the space provided to show how water levels would change after osmosis.



5. Below are pictures of plant cells surrounded by watery solutions. Below each picture, write if the plant cell is in a solution of "more water" or "less water".



6. In the picture below sodium (Na) will move **out** of the cell and potassium (K) will move **into** the cell. Will this be active or passive transport? Why?



The diagram shows \_\_\_\_\_ transport.

Explanation:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

# WHITE BOARD REVIEW

- Pick up a white board.

# REVIEW

Why must some multicellular organisms breathe and eat?

To supply individual cells with the things they need.

# REVIEW

Why do cells interact with their environment?

To maintain homeostasis

# REVIEW

- What structure do molecules pass through when entering or leaving the cell?
- Cell Membrane

# REVIEW

- What type of transport requires no energy and includes diffusion and osmosis?
- Passive Transport



# REVIEW

- What is a concentration gradient?
- The difference between higher and lower concentration.

# REVIEW

- What term is used to describe the diffusion of water across a membrane?
  
- Osmosis

# REVIEW

- What type of transport moves molecules against the concentration gradient?
- Active

# REVIEW

- What term is used to describe an equal distribution of molecules between a cell and its environment?
  
  
  
  
  
  
  
  
  
  
- Equilibrium

# **DIFFUSION LAB**

- Complete and submit assignment once you have completed.