

# Unit 4 - Cellular Transport & Homeostasis

- Know that one way cells maintain homeostasis is by controlling the movement of substances across their cell membrane.
- Know that the concentration gradient is a difference in the concentration of a substance across a space
- Explain diffusion as the movement of a substance from an area of high concentration to an area of lower concentration caused by the random motion of the particles of the substance.





# Homeostasis & The Cell Membrane



- I. Homeostasis
  - **B.** Homeostasis is the maintaining the same internal state when the external is

changing.

- C. Example
  - 4. Sweating maintains proper body temperature.

#### V. Homeostasis & the Cell Membrane

- F. The cell membrane maintains cell homeostasis by being semi-permeable.
  - **7. Semi-permeable**: allows only some substances through under specific conditions
  - 8. Permeable: allows all substances to pass through
  - 9. Impermeable: does not allow any substance to pass through
- . Semi-Permeable membranes are membranes that allow some substances to
  - pass through, but not others.





# **Concentration Gradient**



1. Sets up a concentration gradient – whereby

the amount of solute on one side of the membrane will differ from the amount on the other.

- B. Why?
  - Cells need to get rid of wastes while keeping other molecules in.
    - **d.** Endocytosis take in or ingest nutrients
    - e. Exocytosis to release or remove waste
- 2. Likewise, they must let things in (like nutrients) while keeping others out (like toxins).



# Structure of the Cell Membrane

### 01

**Phospholipids** 

#### III. Structure of the Cell Membrane

A. The cell membrane is a

phospholipid bi-layer

- 2. Phospho = phosphate heads
  - c. Hydrophilic "water loving"
- 4. Lipid = fatty acid tail
  - e. Hydrophobic "water

scared"

*6. Bi* = two

#### **Membrane Proteins**

02

B. Membrane Proteins

1.Each layer is made up of a sheet of lipid (fat)

- molecules
- with protein molecules
   embedded (Like raisins in a slice of raisin bread) in the lipid bi-layers.

### 03

#### Types

- <u>a. Carrier Proteins</u> allow substances that are too large to fit through the bi-layer into the cell
   <u>b. Receptor proteins</u> Receptors are protein molecules, embedded in either the plasma membrane (cell surface receptors) or the cytoplasm or nucleus (nuclear receptors) of a cell, to which one or more specific kinds of signaling molecules may attach.
   <u>c. Channel Proteins</u> are pore-forming proteins that help establish and control the voltage gradient (charge) across the plasma
  - membrane of cells by allowing the flow of ions

down their electrochemical gradient



# **Phospholipid Bilayer**



© Mammoth Science



# **Passive Transport - 3 Forms**

**A. Types of Transport – Passive Transport:** the movement of substances

across a cell membrane without the use of energy (ATP)

#### **b.** Diffusion

- 3. Movement of particles/ "Stuff" from more concentrated to an area of lesser concentration.
- 4. Particles tend to distribute themselves evenly within a solution
- 5. Occurs until equilibrium is reached
- 6. An example of diffusion
  - G.Spraying perfume in an area. It is very strong in that area at first, and then it spreads out through the room and is not as strong.
- **b.Facilitated Diffusion** the transport of substances through a cell membrane along a concentration gradient with the aid of carrier proteins.

1.No energy

2. Needs a Protein

#### c. Osmosis

- 1. The diffusion of **water** molecules.
- 2. Water molecules move from an area of high concentration to an area of low concentration.
- 3.Osmosis is when water moves from an area of LOW solute concentration (low osmolarity) to an area of HIGH solute concentration (high *osmolarity*) through a semipermeable membrane.
- 4.Osmosis is one of the most important ways that plants and animals achieve homeostasis. Keeping the body's conditions stable makes it possible for living things to survive.
- 5.Osmosis plays an important role in the human body,especially in the gastro-intestinal system and the kidneys.Osmosis helps you get nutrients out of food. It also gets wasteproducts out of your blood.



### **Passive Transport**



# **Active Transport**

- **b.** Active Transport: the movement of
  - substances across a cell membrane, against a concentration gradient and requires the cell to use energy (ATP)
  - 1) Requires a membrane protein
  - 2) Examples:
    - c) Endocytosis:
      - Receptor Mediated Endocytosis
      - **<u>Pinocytosis</u>** "cell drinking"
      - **Phagocytosis** "cell eating"





MAMMOTH



# **Solution Types**

### 01

#### Hypotonic - hypo" = below/low

- 2. Hypotonic solutions
  - a)A <u>hypotonic solution</u> is a solution whose solute concentration is lower than the solute concentration inside a cell
  - b)Example: Distilled water
    - High concentration of water = outside
    - 4) Low concentration of water = inside
    - 5) So the water will flow from outside to inside a cell
    - 6) Cell will burst

### 02

#### Hypertonic - "hyper" = excessive

- 3. Hypertonic solutions
  - a) A <u>hypertonic solution</u> is a solution whose solute concentration is higher than the solute concentration inside the cell.
  - b)Example: Salt Water...the ocean!
    - 3) High concentration of water = inside
    - Low concentration of water = outside
    - 5) So the water will flow from inside to outside the cell
    - 6) Cells will shrivel. Think Dehydration

### 03

#### Isotonic - "iso" = equal

#### 4. Isotonic solutions

- a) An <u>isotonic solution</u> is a solution
  whose solute concentration outside
  the cell is equal to the solute
  concentration inside the cell.
  b) Cells are in <u>equilibrium</u>:
  concentrations do not change, but
  materials still move in and out of the
  cell
- c) Example: Our blood!



# **Tonic solutions Effect on Cells**



© Mammoth Science



# Thank you!

Do you have any questions? <u>matthewsimmons@hebisd.edu</u> 817-399-3360 x-7565

