



Unit 3: Cells!

Warm Up (Discussion...)

1. What is a cell?
2. Where do we find cells?
3. What are cells made up of?
4. What happens in a cell?
5. How are plant and animal cells different?

Cell Theory

1. Cells are the basic unit of structure and function
2. Cells come from pre-existing cells
3. All living things are composed of cells

People to Know...

Robert Hooke- first to observe a cell- gave cells their name

Anton van Leewenhoek- first to observe a living cell

Others:

Virchow- cells come from preexisting cells

Schleiden- all plants are composed of plant cells

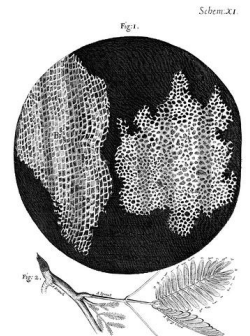
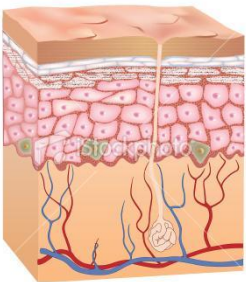
Schwann- all animals are composed of animal cells

2.1 Cell Structure and Function

- Macromolecules such as PCLN are organized to form the structures that create cells. Cells are the smallest unit of living organisms.

- Important scientists who discovered cells:

- 1) Robert Hooke – First to observe cells – looked at cork (dead cells) and gave individual units the name “cells”

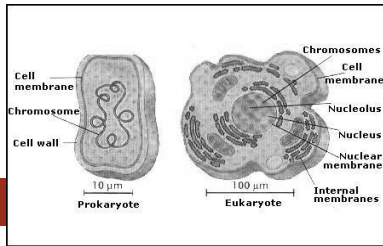


Important Scientists

- Anton von Leeuwenhoek – **First to observe living cells** – looked at scrapings from his cheek and saw live cells



4 Structures (organelles) found in all cells:



1. Cell membrane – a phospholipid bilayer that separates the inside of the cell from the outside
2. Cytoplasm – the inside filling of the cell; mostly water
3. DNA – the genetic material to control the cell; organized into chromosomes that are circular in prokaryotes and linear in eukaryotes.
4. Ribosomes – an organelle where the DNA code is used to build (synthesize) proteins

Types of cells:

- Prokaryotic: “pro” means before and “kary” means nucleus. They do NOT have a central place to store DNA. The DNA is free-floating in the cytoplasm. These cells have all four main organelles to build a cell but are able to perform all STERNGRR life functions.
- Eukaryotic: “eu” means true and “kary” means nucleus. These cells have a membrane that surrounds all the DNA in the cell. The cells have all four main organelles as well as up to 7 additional organelles to perform specific functions.

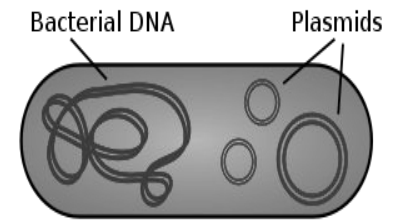
Venn Diagram: Eukaryotic vs. Prokaryotic

Place each of the following in a section of the Venn Diagram

- No nucleus
- Nucleus
- Organelles
- No organelles
- Simple & small
- Complex & size varies
- Unicellular
- Unicellular or Multicellular
- Bacteria
- Cell membrane
- DNA
- Ribosomes
- Cytoplasm
- Cytoskeleton
- First cells
- Cell walls
- Cytoskeleton
- Everything but bacteria

Warm Up Discussion

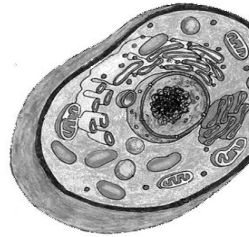
1. What is an organelle?
2. What are some similarities between prokaryotic and eukaryotic cells?
3. What kind of cells would I find in plants?
4. Who was Robert Hooke?
5. ARE YOU EXCITED THAT IT'S FRIDAY?!
 - a. I am.



- **Cell Organelles**- cellular parts that have unique structures and unique functions. There are four that all cells share (see prior page) and up to 9 that are found in plant and animal cells.
- **Prokaryotic cell organelles**- in addition to the four common organelles, prokaryotes also have:
 - Plasmids - smaller circular pieces of DNA that can be traded between bacteria
 - Cell wall - structures outside the cell membrane to help protect the cell

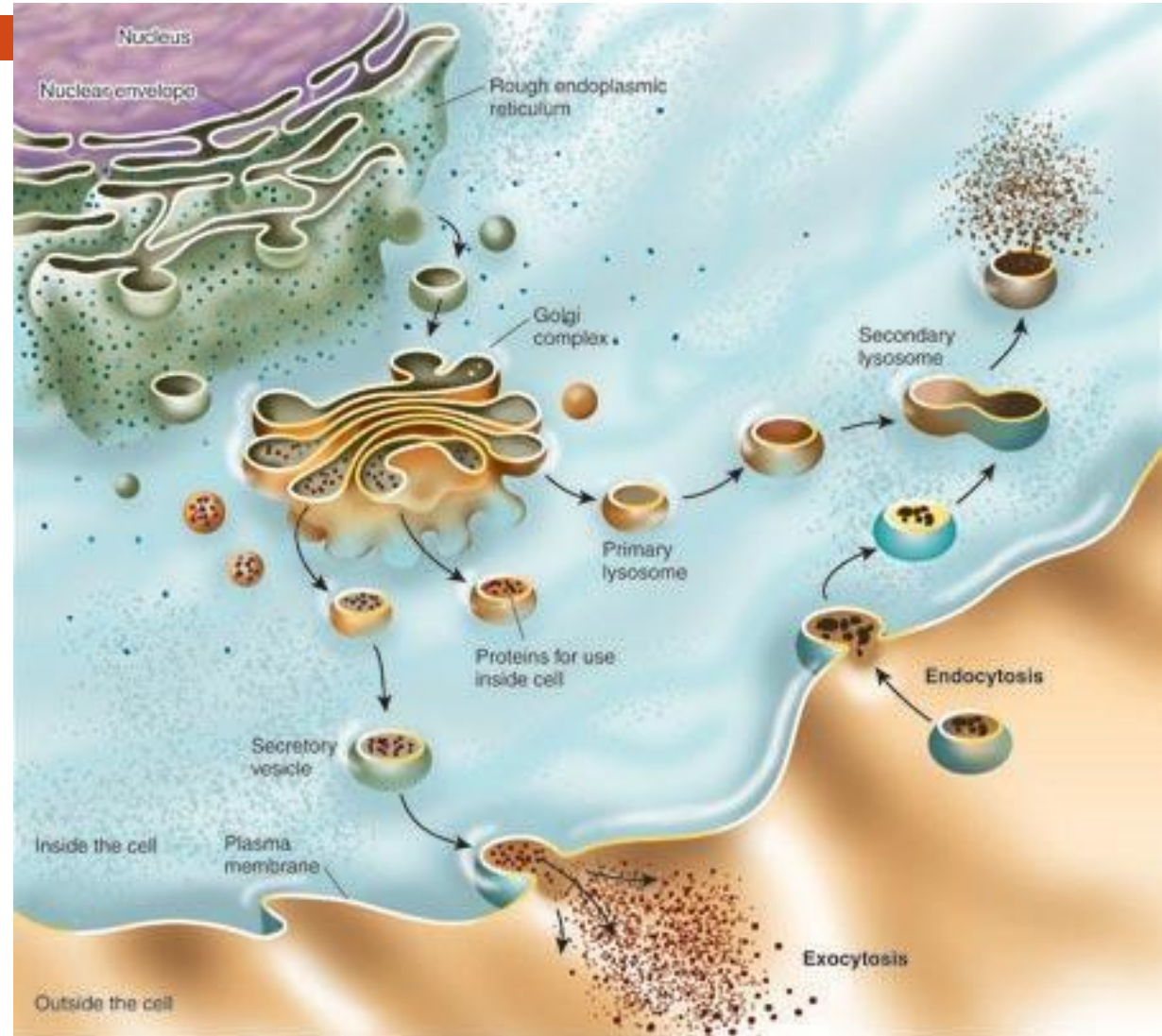
Eukaryotic cell organelles- in addition to the four common organelles, eukaryotic cells also have the following six organelles:

- Nucleus— the region of eukaryotic cells where DNA is contained by a membrane
- Lysosome- membrane containing digestive enzymes to digest waste and cell structures
- ER (endoplasmic reticulum) - membrane to change proteins, detoxify alcohol and communication
- Golgi Body/Complex - membrane to package proteins for release from a cell
- Vacuole- a membrane that creates a storage space for food, water or waste
- Mitochondria – a series of folded membranes where carbs are broken down for energy



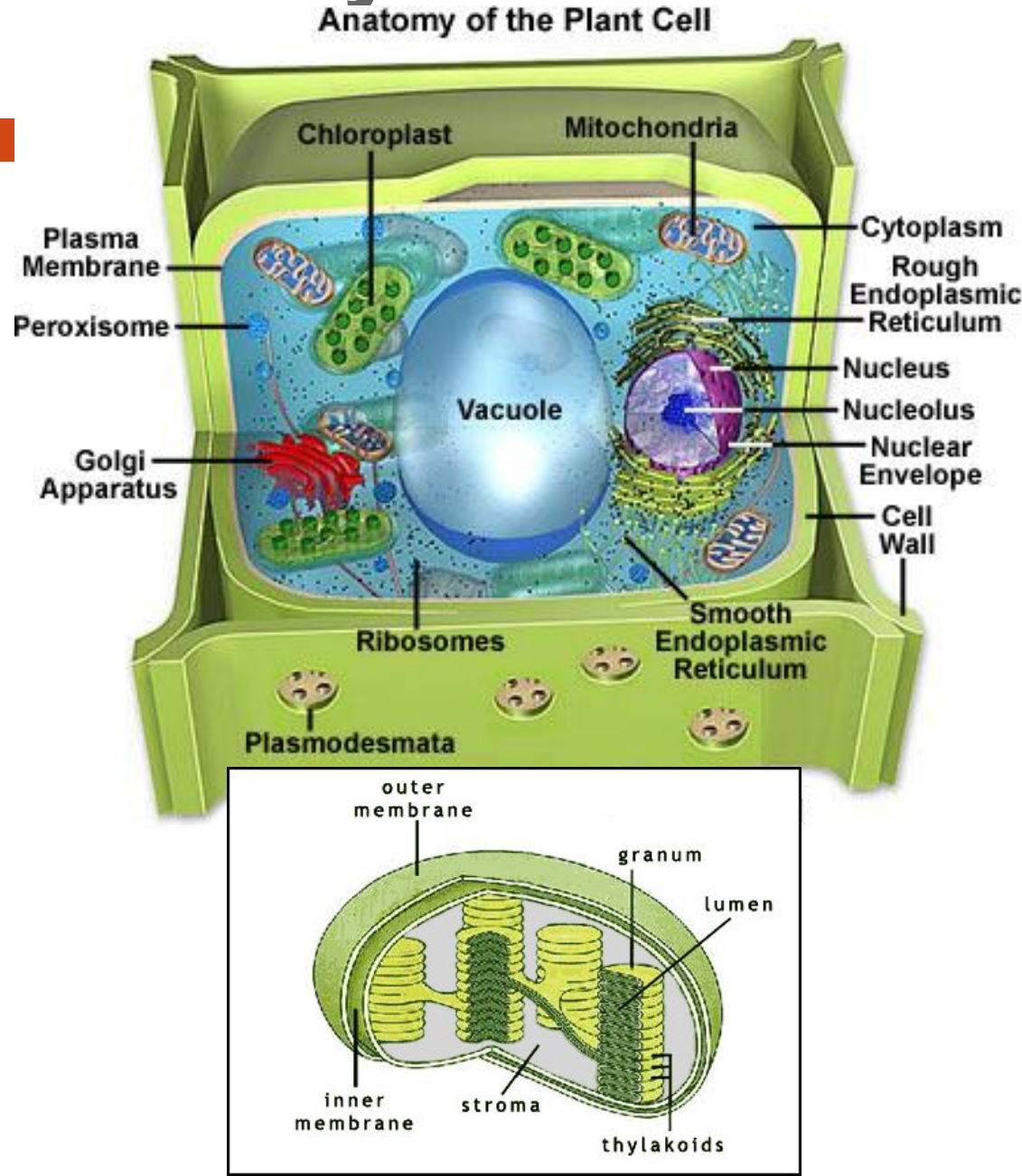
Organelles interact with each other to carry out cell functions:

□ Example: DNA in the nucleus codes for the ribosomes to build proteins. These proteins can then be used as hormones to be released by the cell.



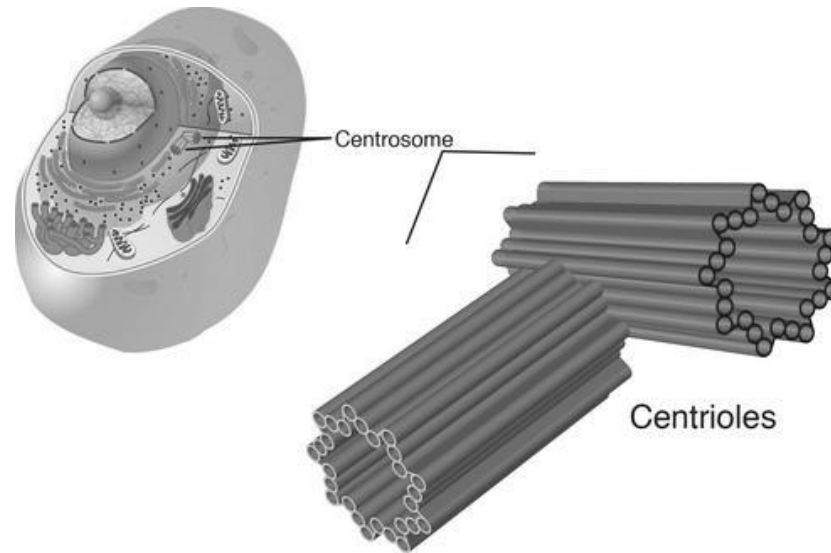
Organelles found only in PLANT cells

- Cellulose cell wall - large carbohydrates create extra support for plants
- Chloroplast (plants) – the organelle that has stacks of membranes to create food during photosynthesis



Organelles found ONLY in animal cells

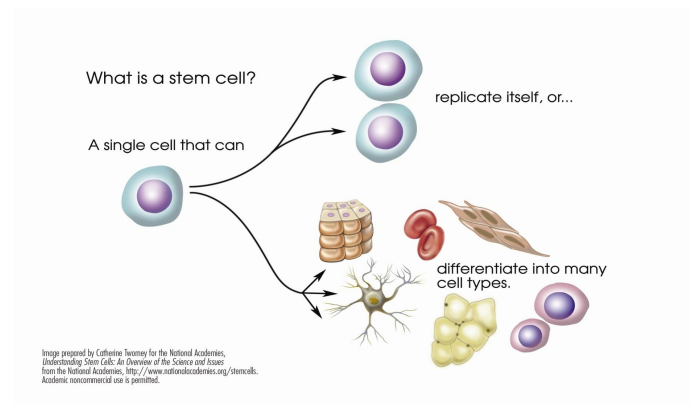
- Centrioles – proteins that help animal cells divide



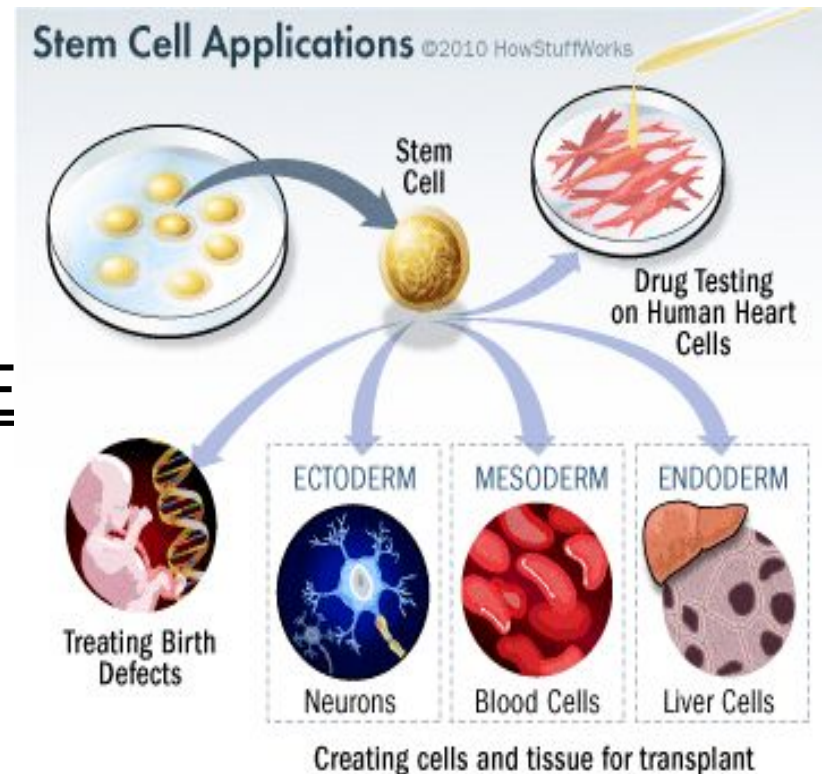
Summary:

Cell specialization creates different cells within an organism.

- A multicellular organism begins its life as an embryo with many cells that have the same DNA and no job other than to grow. As the cells develop, they differentiate or become specialized.



- Cells are SPECIALIZED, this means their structure fits their function. Cells throughout the organism perform different jobs .
- The cells of multicellular organisms have the SAME DNA, but some of their genes are turned on, and some turned off. This allows cells to be specialized.



Warm Up

1. What are lysosomes?
 - a. Carbohydrates that float in the cell
 - b. Enzymes that break down waste and food
 - c. Part of the cell membrane
2. Golgi Bodies could best be described as:
 - a. The powerhouse
 - b. Genetic material
 - c. The mailroom
3. Where are phospholipids found?
4. Name the 4 structures found in all cells
5. What do chloroplasts do?

Word Bank

- glycerol
- fatty acids
- non-polar
- energy
- with/down
- diffusion
- bilayer
- plasma
- around
- cholesterol
- proteins
- integral

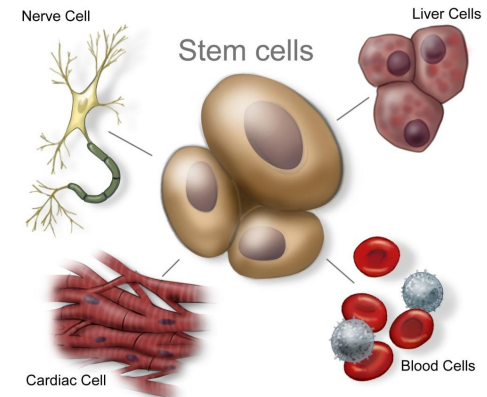
- parts
- proteins
- transmembrane
- peripheral
- Head
- tail

4 Functions:

1. cell signaling
2. selective transport
3. excretion of waste
4. structural support

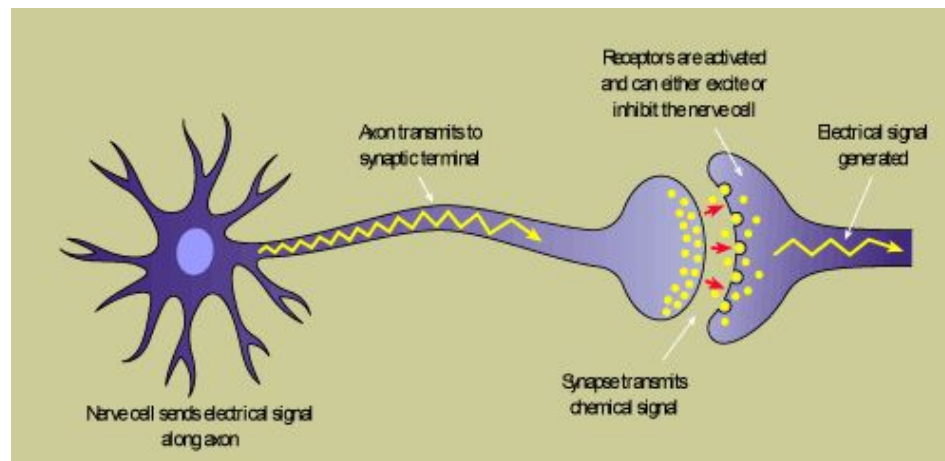
Adult organisms still have small reserves of stem cells in some areas of the body.

- Red blood cells are specialized with the protein hemoglobin to transport oxygen.
- Muscle cells have LOTS of mitochondria because they need a TON of energy.
- Sperm cells have a flagella to swim toward the egg
- Some plants have XYLEM cells, they are long thin tubes to carry water.
- Nerve cells are long and thin and have extensions to send messages

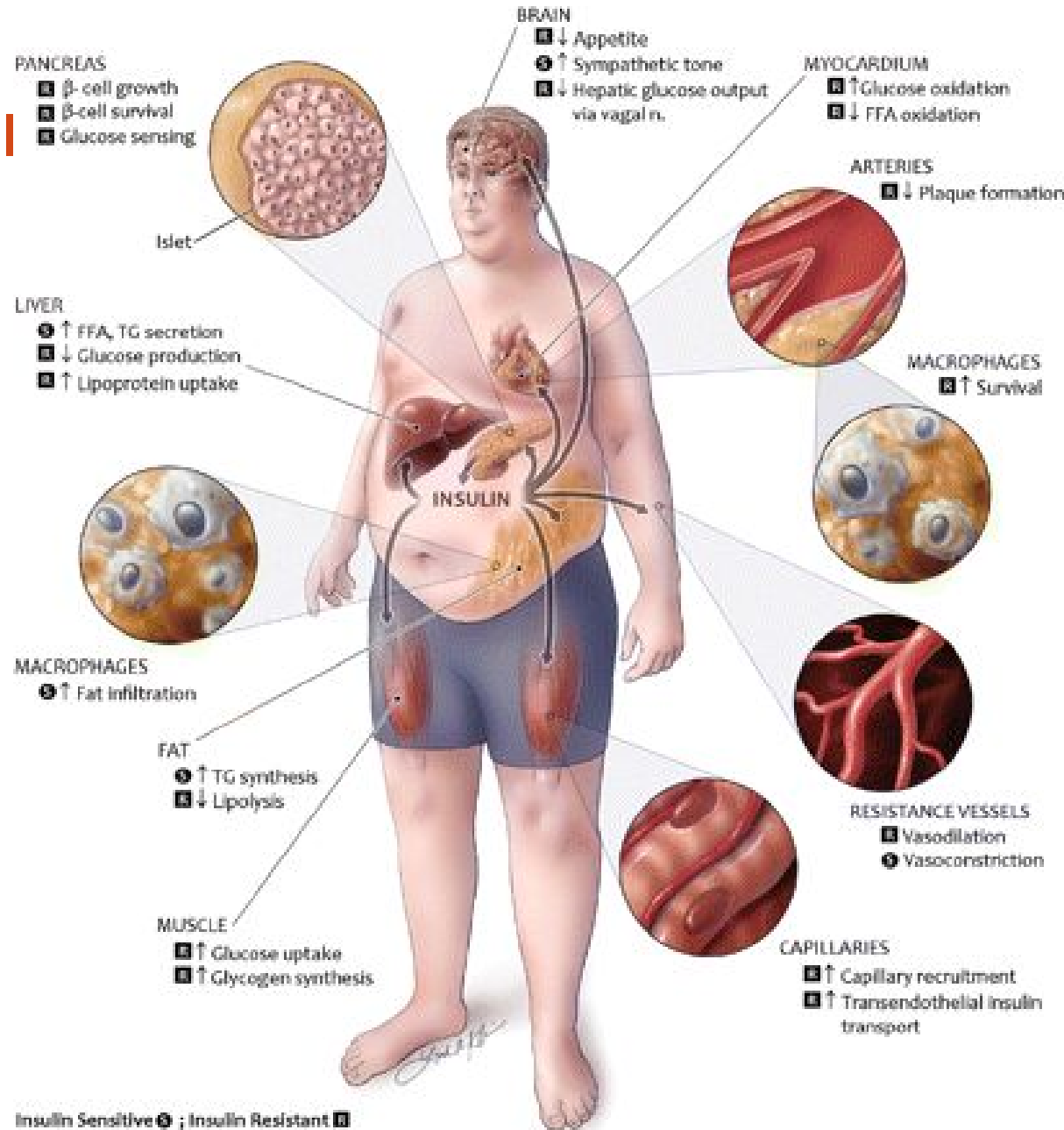


Differentiated cells require cells to collaborate and communicate.

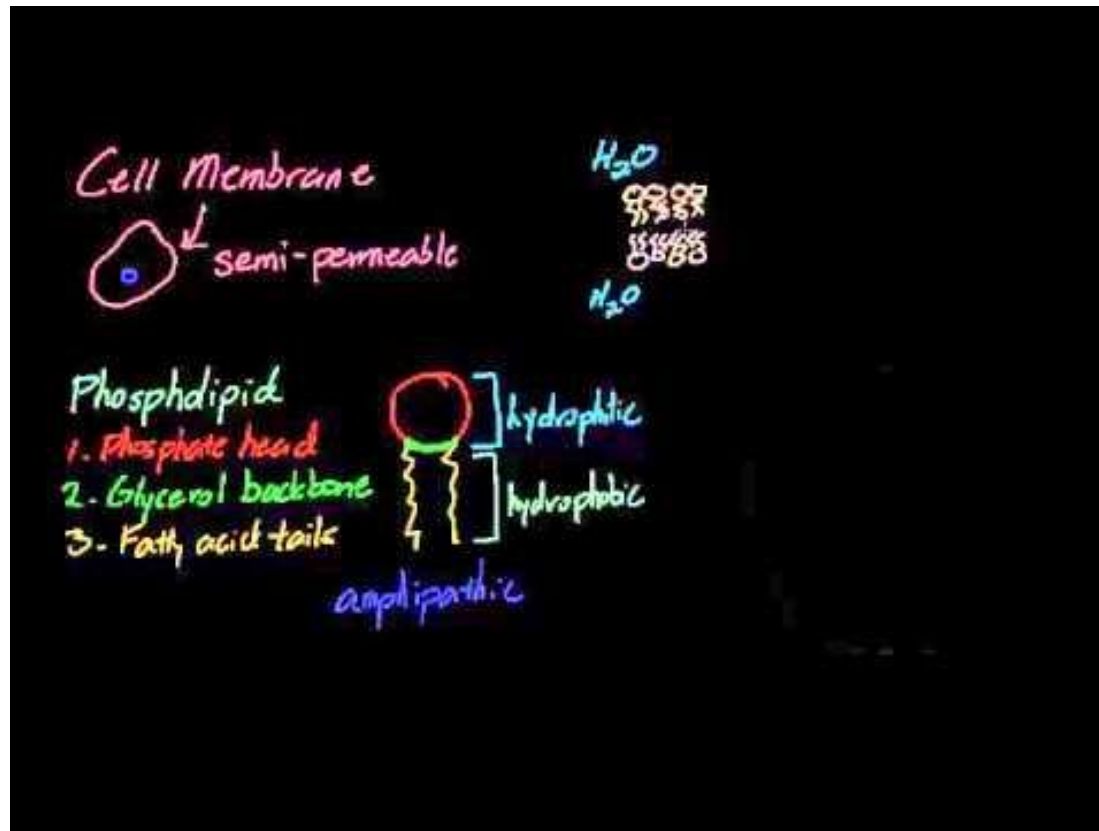
- Short distance: Cells that touch or have a very small distance can use chemical or electrical signals. Animal nerve cells use both electricity and chemical signals to control body responses.

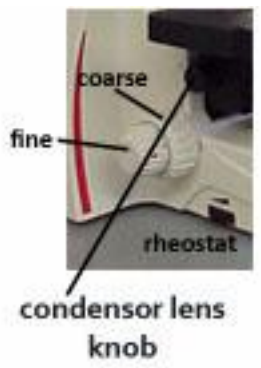


Long distance: communication across long distances require long-lasting chemicals like hormones like insulin. This hormone is released by the pancreas and has effects throughout the mammalian body.



Plasma Membrane





ocular lenses
interpupillary distance adjuster
bodytube/ nosepiece
objective lenses
stage
condenser lens/ diaphragm
coarse focus (large)
fine focus (small)
light source
base
stage control



The condenser lens knob is on the left side out of view.

Light ON/OFF
rheostat
stage control

Exit Ticket

1. What types of objects would you look at under a light microscope?
2. What microscope would you use to view a cell?
3. Draw a phospholipid bilayer
4. What does hydrophilic mean? What part of the phospholipid is hydrophilic?
5. What is selective permeability?

It's Tuesday...

You don't have to be here tomorrow
(I do...)



Warm Up

1. What organelle is considered the “powerhouse” of the cell? What is its function?
2. If water is moving into and out of the cell, it is:
 - a. Hypotonic
 - b. Hypertonic
 - c. Isotonic
3. True or False: Cells specialize because they have different DNA.
4. What is a plasmid?
5. The fatty acid tails of a phospholipid are
 - a. Hydrophobic
 - b. Hydrophilic

Organelle Matching!

- Groups of 3-4 (see next slide)
- Match the picture of the organelle to the name and description
- Raise your hands when you are finished
 - Winner gets Dum Dums... #incentive
- When you are finished and have been checked off, go and help another group!

Microscopes

Light

- Small, light
- Less expensive
- Use light to view object
- Less magnification
- View small objects
- Can be blurry

Electron

- Large, heavy
- Expensive
- Use beam of electrons to view objects
- Greater magnification
- View very small objects
- Clearer picture

Microscope Lab

Follow instructions on lab. Complete Part A (Intro to Microscope) and Part B (Onion Cell Lab).

Materials can be found in the front of classroom

If you need anything else, raise your hand silently and Ms. S will come to you!

Finish questions for homework!

If you finish early, work on the phospholipid cutout (front of class)

Exit Ticket

1. Name one difference between an electron and light microscope
2. Where is DNA found in a eukaryotic cell?
3. True or false: Animals have cell walls
4. Which material makes the cell membrane more fluid?
 - a. Cholesterol
 - b. Glycoproteins
 - c. Glycolipids
 - d. Proteins
5. True or false: Peripheral proteins are within the cell membrane

Warm Up

1. What is one difference between a light and an electron microscope?
2. What is cell differentiation?
3. Cellulose is found in what plant structure?
4. Ribosomes
 - a. Build lipids
 - b. Hold nutrients and waste
 - c. Build proteins
 - d. Give support
5. The DNA in a prokaryote is found as a **(plasmid/nucleus)**, the DNA in a eukaryote is found as a **(plasmid/nucleus)**

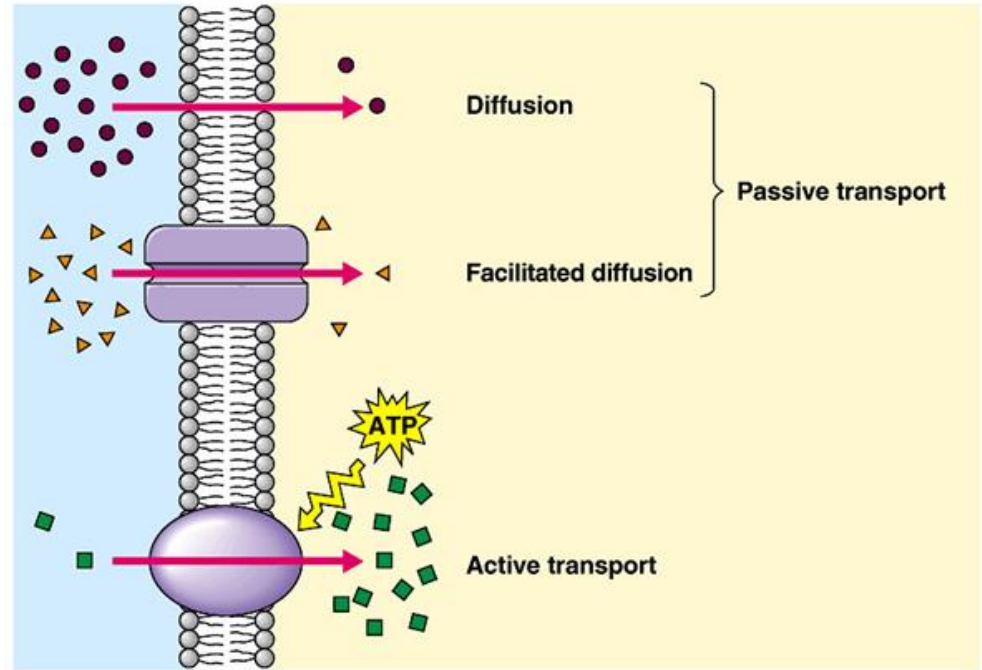
Cell Transport

<http://www.wiley.com/legacy/college/boyer/0470003790/animations/animations.htm>

Cell Transport

Define the following

- Osmosis
- Diffusion
- Facilitated diffusion
- Passive diffusion
- Active Transport



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Retest

- We will ALL retest on Friday
 - IT CAN ONLY HELP YOU!
- You must turn in your *test corrections* AND *the Biochemistry Worksheet* to Ms. S in order to retest!

Test Corrections

On a sheet of looseleaf paper:

Name

Test: Biochemistry

1. Write the # of the question you got wrong
2. Write your answer
3. Write the correct answer
4. Mark the following
 - a. C=confusing
 - b. DS= didn't study it
 - c. F= forgot
 - d. O=other (describe! Did I not cover it in class?)

Warm Up

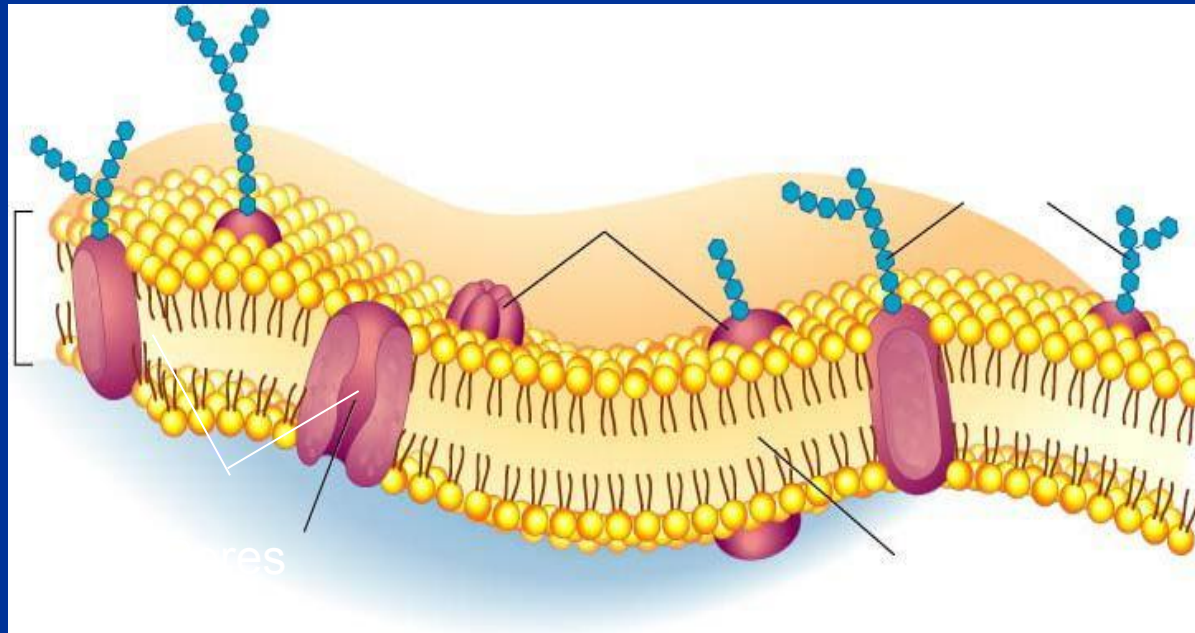
1. If there is more salt outside of a cell, where will water move?
2. What materials might plant cells transport? Provide two.
3. True or false: The vacuole digests nutrients.
4. Cytoplasm is made of mostly:
 - a. Plasma
 - b. Phospholipids
 - c. Water
 - d. Salt
5. What is the function of the cell wall?

Warm Up

1. Which structure is found in a prokaryotic cell?
 - a. Vacuole
 - b. Chloroplast
 - c. Ribosome
 - d. Mitochondria
2. Plasmids are found in _____ cells
 - a. Prokaryotic
 - b. Eukaryotic
 - c. Plant
 - d. Animal
3. Bacteria are (prokaryotic/eukaryotic)
4. True or false: Cell membrane maintains homeostasis
5. What is the plant organelle responsible for capturing sunlight to make food?

About Cell Membranes

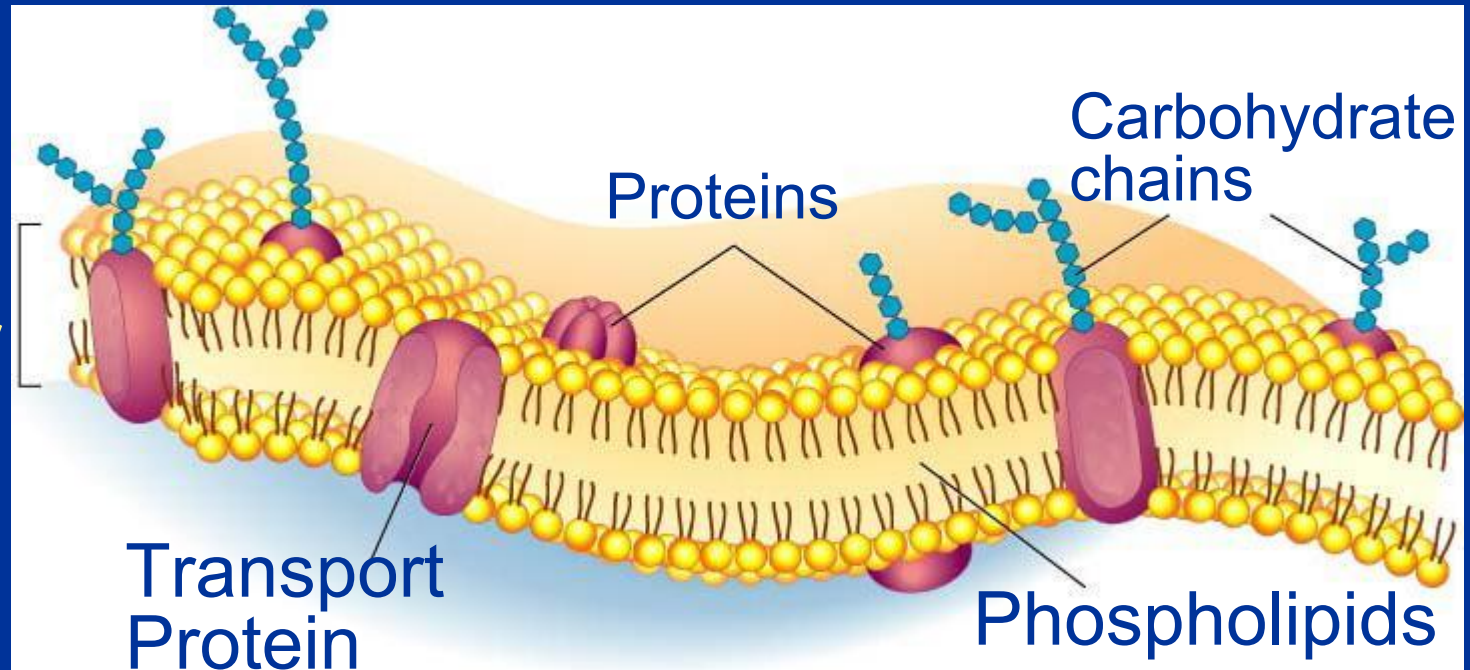
- Cell membranes have pores (holes) in it
 - Selectively permeable:** Allows some molecules in and keeps other molecules out
 - The structure helps it be selective!



Structure of the Cell Membrane

Outside of cell

Lipid
Bilayer



Inside of cell
(cytoplasm)

[Animations](#)
of membrane
structure

Go to
Section:

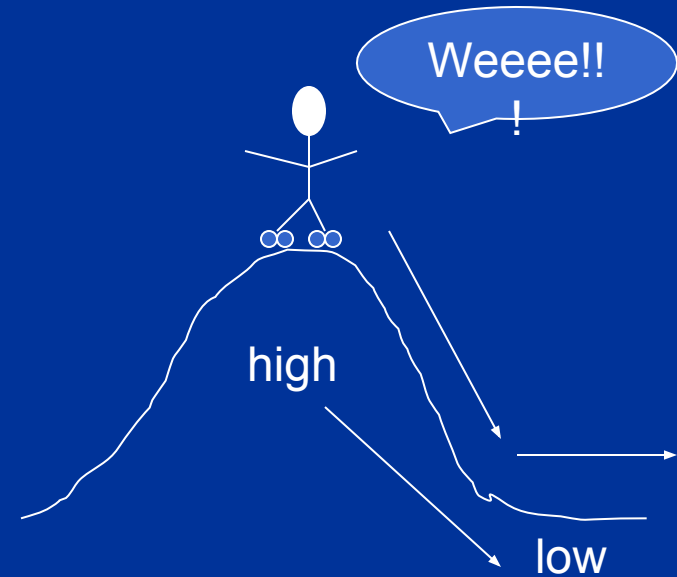
Types of Cellular Transport

• [Animations](#) of Active Transport & Passive Transport

- **Passive Transport**

cell doesn't use energy

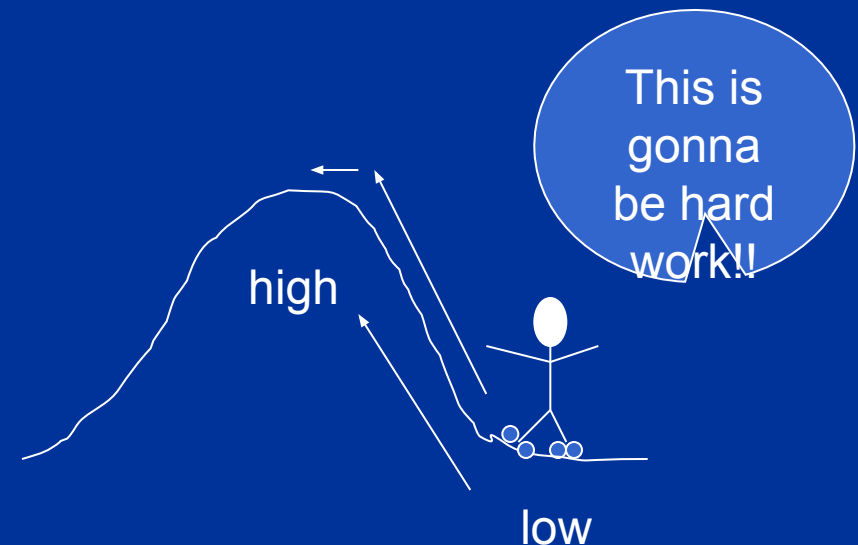
1. Diffusion
2. Facilitated Diffusion
3. Osmosis



- **Active Transport**

cell does use energy

1. Protein Pumps
2. Endocytosis
3. Exocytosis



Passive Transport

- cell **uses no energy**
- molecules move randomly
- Molecules spread out **from an area of high concentration to an area of low concentration.**
- (High→Low)
- **Three types:**

3 Types of Passive Transport

1. **Diffusion**
2. **Facilitative Diffusion** – diffusion with the help of transport proteins
3. **Osmosis** – diffusion of water

Passive Transport:

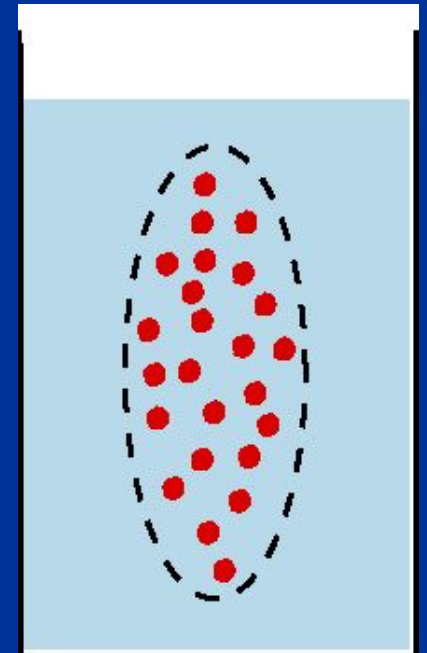
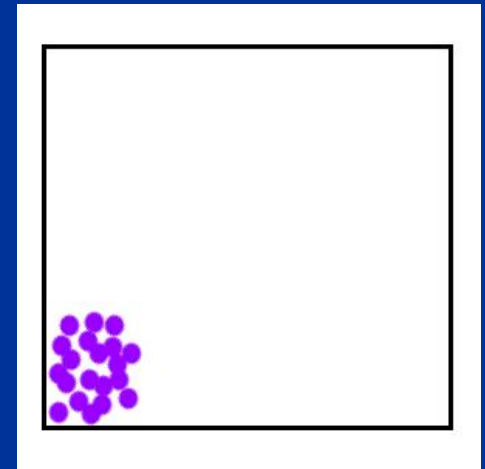
1. Diffusion

1. **Diffusion:** random movement of particles **from an area of high concentration to an area of low concentration.**

(High to Low)

2. Diffusion continues until all molecules are evenly spaced (**equilibrium** is reached)-Note: molecules will still move around but stay spread out.

Simple Diffusion Animation

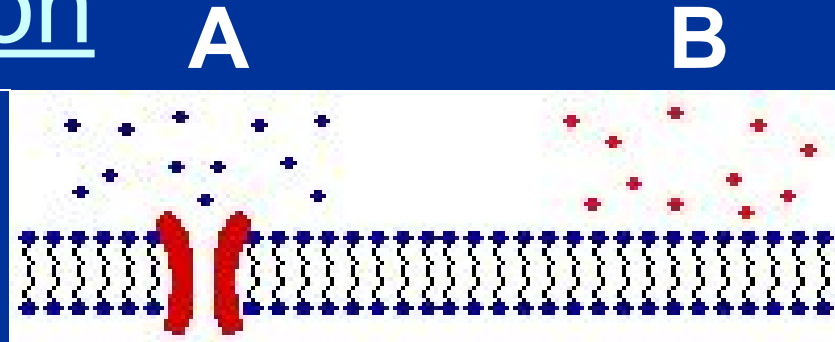


Passive Transport:

2. Facilitated Diffusion

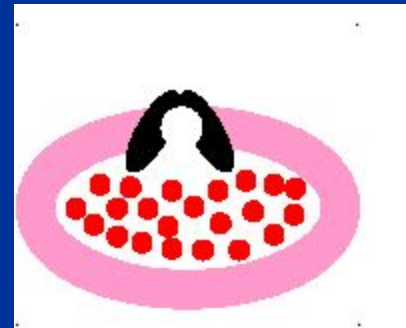
2. Facilitated diffusion:
diffusion of specific particles **through transport proteins** found in the membrane

- Transport Proteins are specific – they “select” only certain molecules to cross the membrane
- Transports larger or charged molecules



**Facilitated
diffusion
(Channel
Protein)**

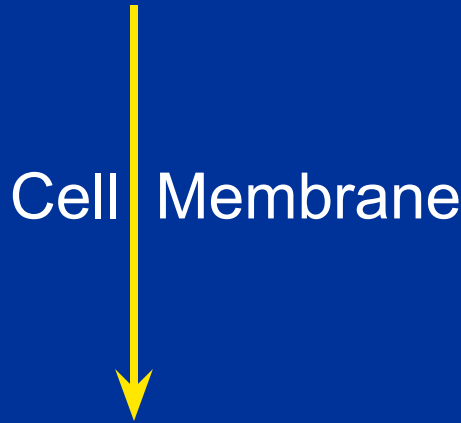
**Diffusion
(Lipid
Bilayer)**



Carrier Protein

Passive Transport: 2. Facilitated Diffusion

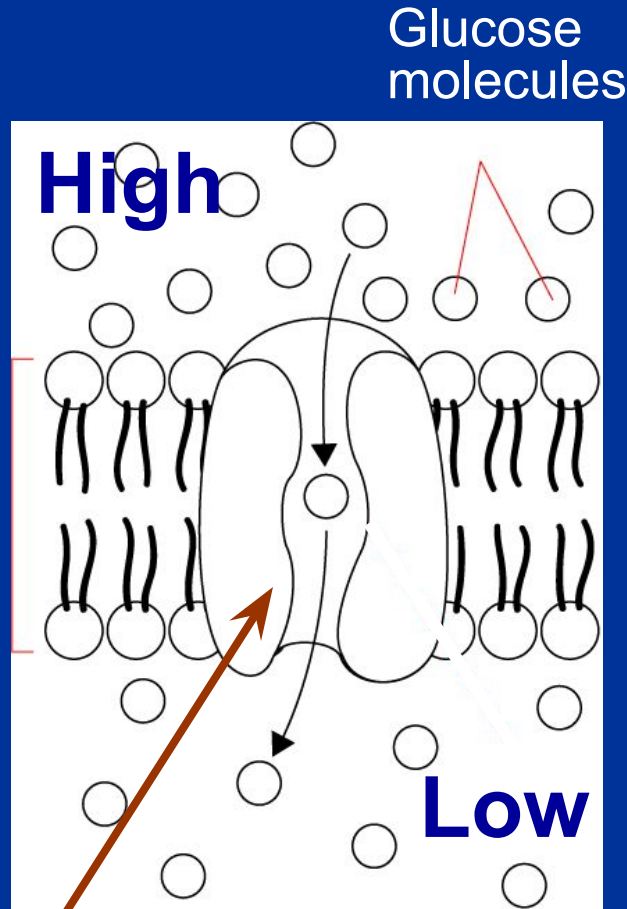
Cellular Transport From a-
High Concentration



Low Concentration

Through a →

Transport
Protein



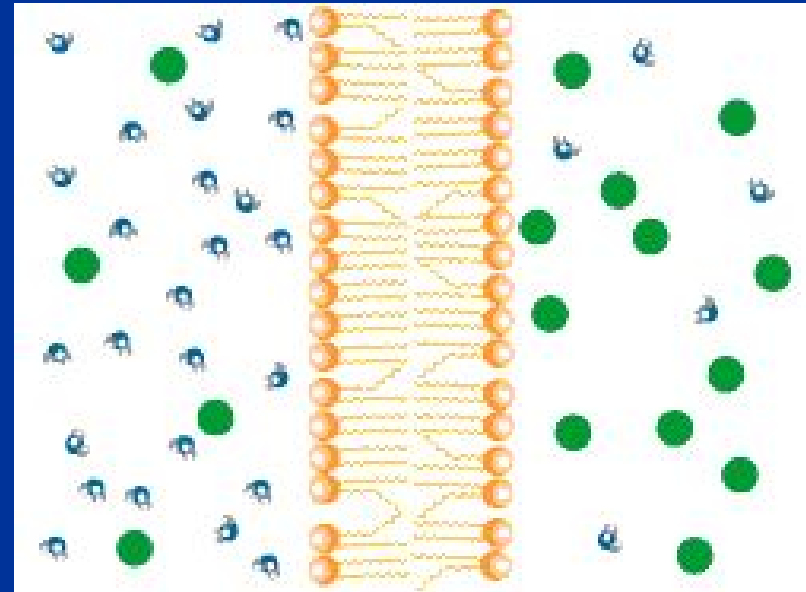
- [Channel Proteins](#) animations

Passive Transport:

3. Osmosis

Osmosis
animation

- **3.Osmosis:** diffusion of *water* through a selectively permeable membrane
- Water moves from high to low concentrations



- Water moves freely through pores.
- Solute (green) too large to move across.

Active Transport

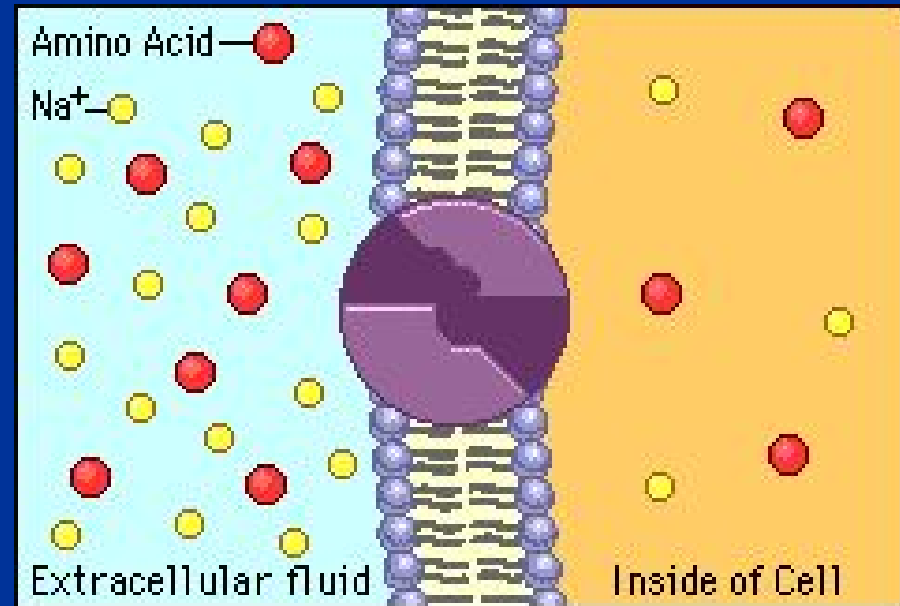
- cell **uses energy**
- actively moves molecules to where they are needed
- Movement **from an area of low concentration to an area of high concentration**
- **(Low → High)**
- Three Types:

Types of Active Transport

Sodium
Potassium Pumps
(Active Transport
using proteins)

1. Protein Pumps -
transport proteins that
require energy to do
work

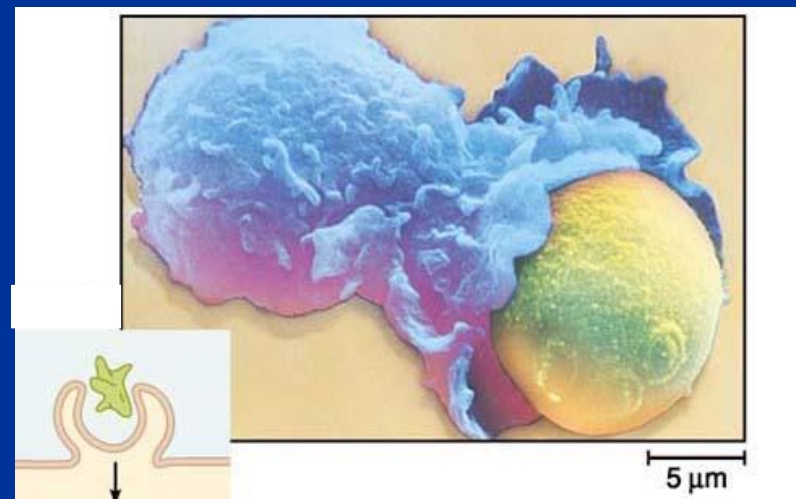
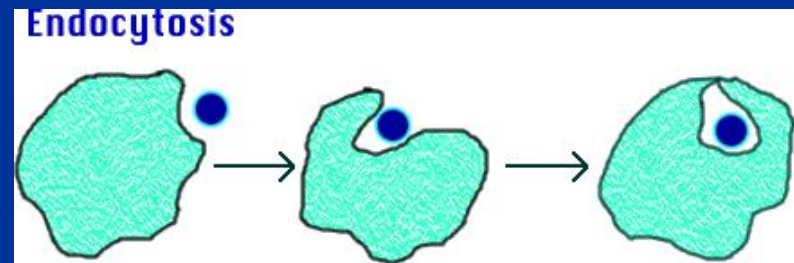
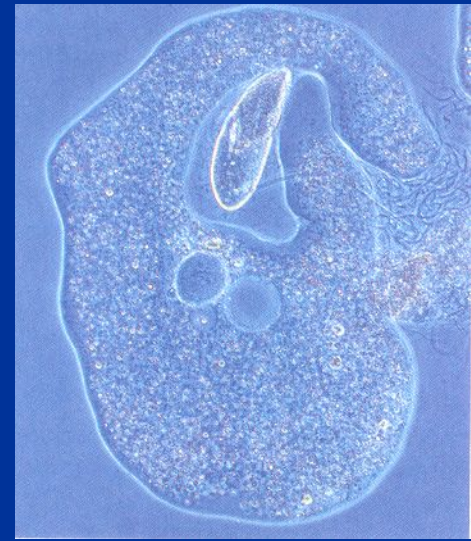
- **Example:** Sodium /
Potassium Pumps are
important in nerve
responses.



Protein changes
shape to move
molecules: this
requires energy!

Types of Active Transport

- **2. Endocytosis:** taking bulky material into a cell
 - Uses energy
 - Cell membrane in-folds around food particle
 - “*cell eating*”
 - forms food vacuole & digests food
 - This is how white blood cells eat bacteria!

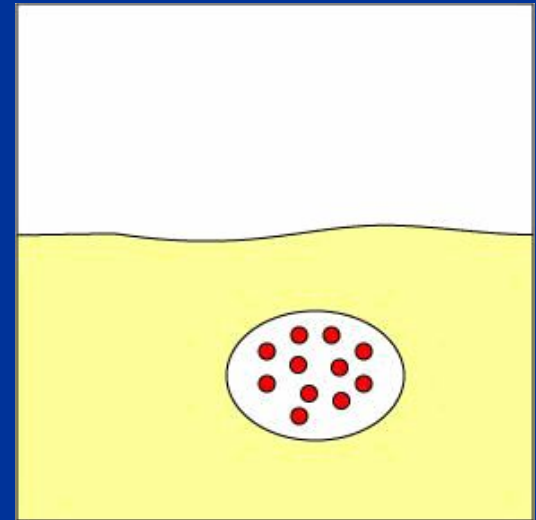


Types of Active Transport

3. **Exocytosis:** Forces material out of cell in bulk

- membrane surrounding the material fuses with cell membrane
- Cell changes shape – requires energy
- EX: Hormones or wastes released from cell

[Endocytosis & Exocytosis animations](#)



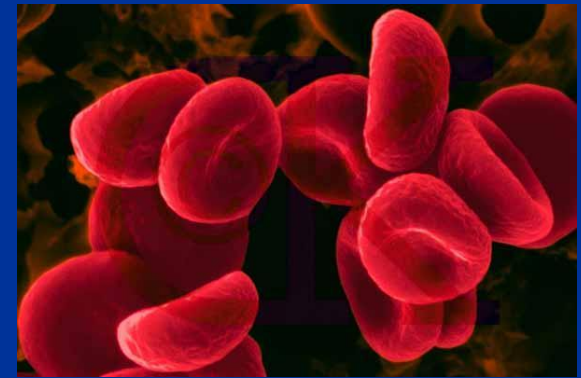
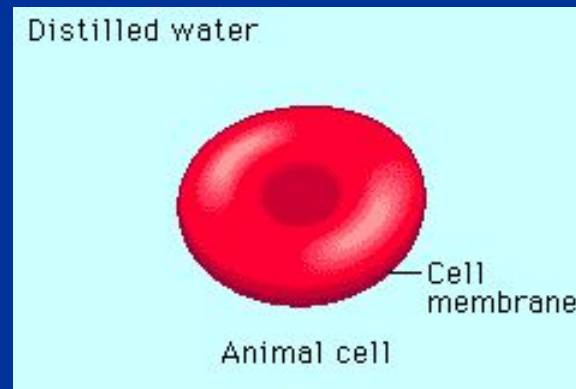
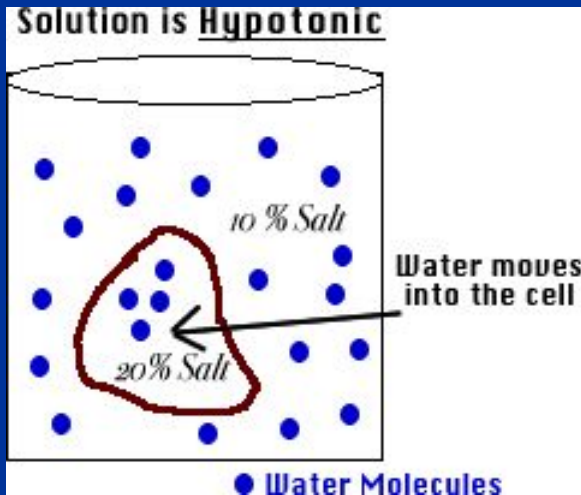
Effects of Osmosis on Life

- **Osmosis**- diffusion of water through a selectively permeable membrane
- **Water is so small and there is so much of it the cell can't control it's movement through the cell membrane.**

Hypotonic Solution

- [Osmosis](#)
Animations for isotonic, hypertonic, and hypotonic solutions

Hypotonic: The solution has a lower concentration of solutes and a higher concentration of water than inside the cell. (**Low solute; High water**)



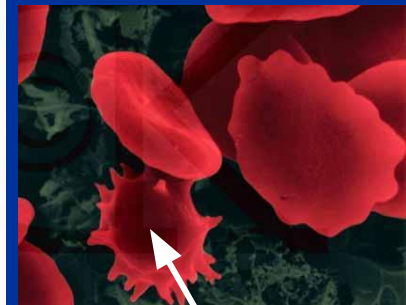
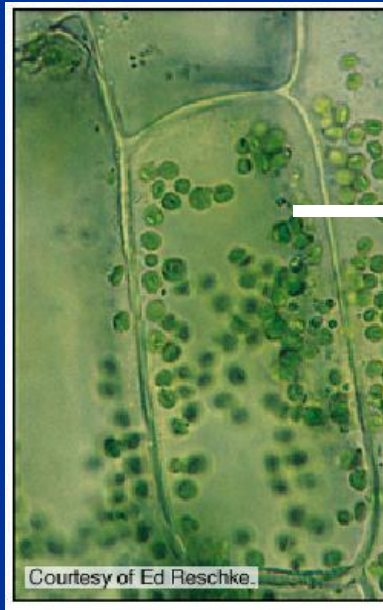
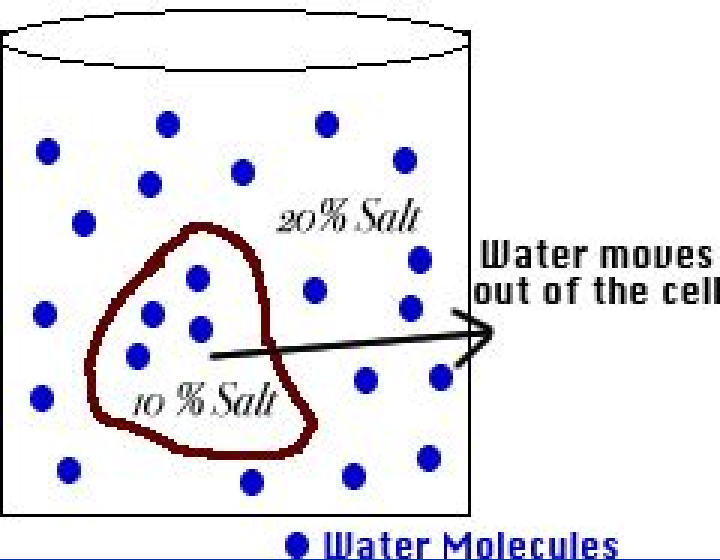
Result: Water moves from the solution to inside the cell): Cell Swells and bursts open (**cytolysis**)!

Hypertonic Solution

- [Osmosis](#)
Animations for isotonic, hypertonic, and hypotonic solutions

Hypertonic: The solution has a higher concentration of solutes and a lower concentration of water than inside the cell. (**High solute; Low water**)

Solution is Hypertonic



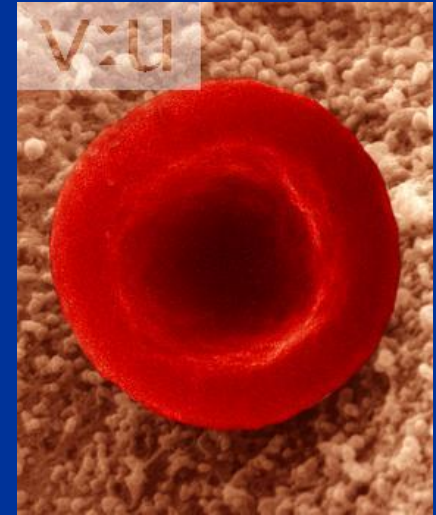
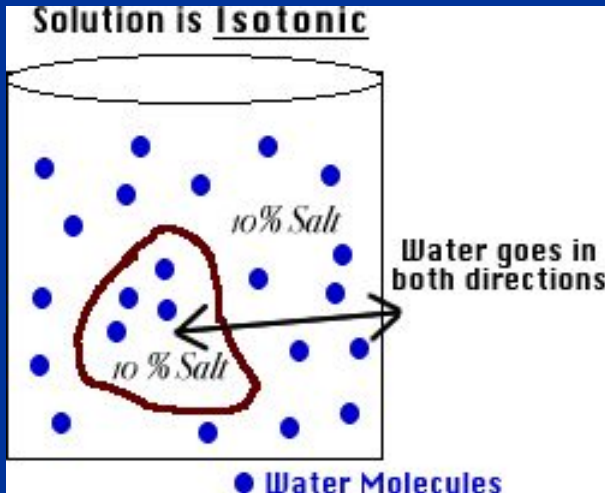
shrinks

Result: Water moves from inside the cell into the solution: Cell shrinks (*Plasmolysis*)!

Isotonic Solution

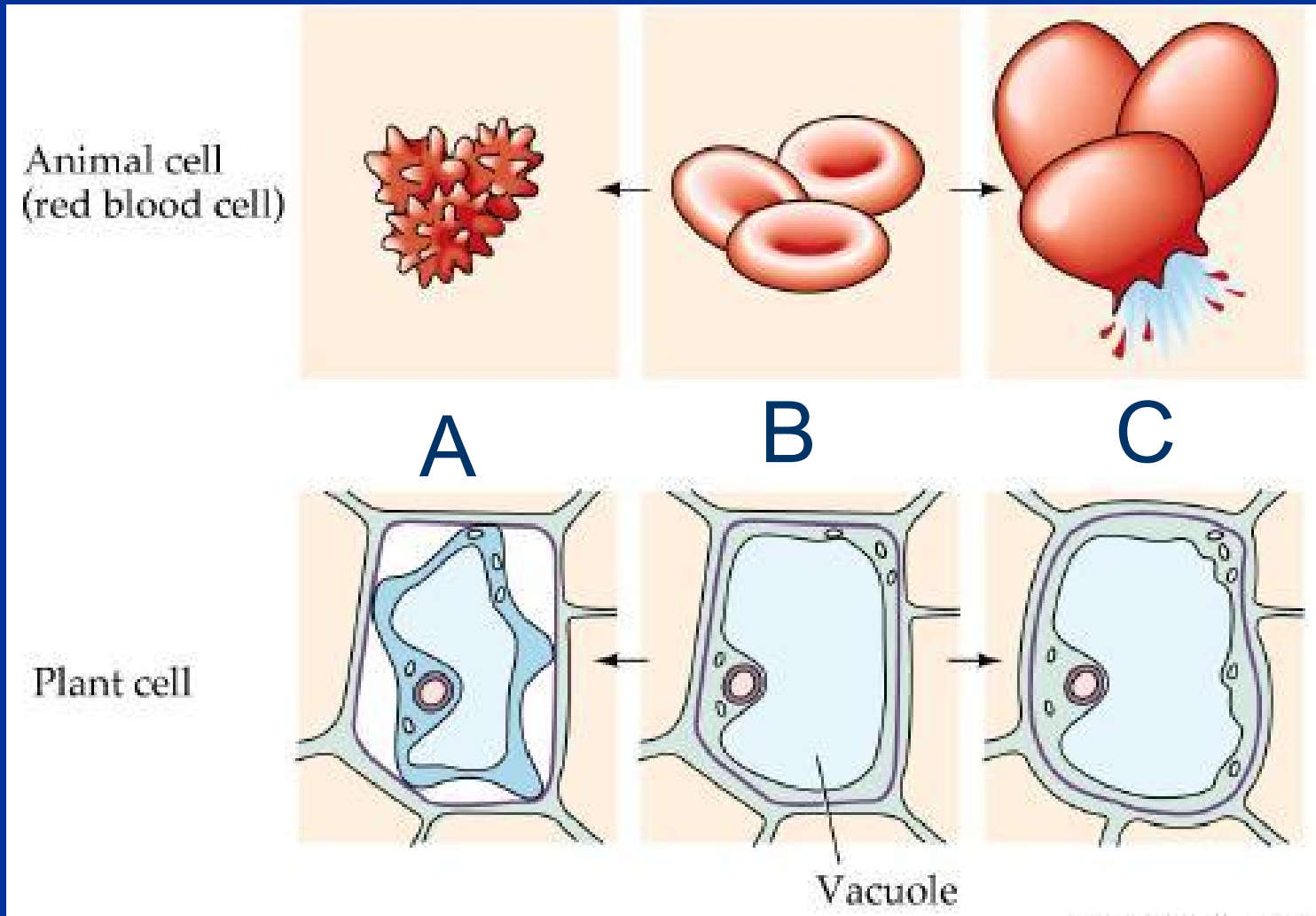
- [Osmosis](#)
Animations for isotonic, hypertonic, and hypotonic solutions

Isotonic: The concentration of solutes in the solution is equal to the concentration of solutes inside the cell.



Result: Water moves equally in both directions and the cell remains same size! (Dynamic Equilibrium)

What type of solution are these cells in?



Hypertonic

Isotonic

Hypotonic

Cell Defense!

<http://biomanbio.com/GamesandLabs/Cellgames/celldefense.html>

Exit Ticket

1. What is the difference between active and passive transport?
2. Diffusion is the transport of _____ and osmosis is the transport _____
3. What do lysosomes do?
4. Integral proteins are found where?
5. What are the two parts of a phospholipid?
Draw the bilayer.

Warm Up

1. Water always moves with _____
2. Define solute.
3. How is facilitated diffusion similar to active transport?
4. Where would you find a peripheral protein?
5. What is selective permeability?

Demonstration

Selective Membrane!



Station Review

Station 1: Matching

Station 2: Identify the organelle and write it's function

Station 3: Compare prokaryotes vs. eukaryote

Station 4: Create a cell membrane

Station 5: Cell Transport Game

Station 6: Overview

Kahoot =)

Exit Ticket

1. STUDY FOR YOUR TEST.
2. STUDY FOR YOUR TEST.
3. STUDY FOR YOUR TEST.
4. STUDY FOR YOUR TEST.
5. STUDY FOR YOUR TEST.