Cell Structure & Function

Lesson 3.1 Cell Theory, 3.2 Cell Organelles, 3.3 Cell Membrane, 3.4 Diffusion & Osmosis

Chapter 1 Review

What is a cell?

Basic unit of life

What were examples of structure and function?

All shapes and sizes…..

How does the size of a cell in a tadpole compare to the size of a cell in a whale?

What makes a whale so much larger than a tadple?

Cells are similar in size

The whale has **MORE** cells.

Cell History and Cell Theory

Cell Theory: theory that states ….

1. All organisms are made of cells
2. All existing cells are produced by other living cells
3. The cell is the most basic unit of life

Contributors to cell theory

Hooke- (1665) First to identify cells and name them

Leeuwenhoek (1674) Observed cells in greater detail using lenses he made

Schleiden (1838) 1st to note plants were made of cells

Schwann (1839) Concluded all living things made of cells

Virchow (1855) Said all cells come from other cells

Prokaryote/Eukaryote

They stem from Greek words

Karuon= nut or kernal (center of seed) karyote=nucleus

Eu=true pro= before

Prokaryote= before the nucleus

Prokaryote vs. Eukaryote

Prokaryote

No nucleus

No organelles

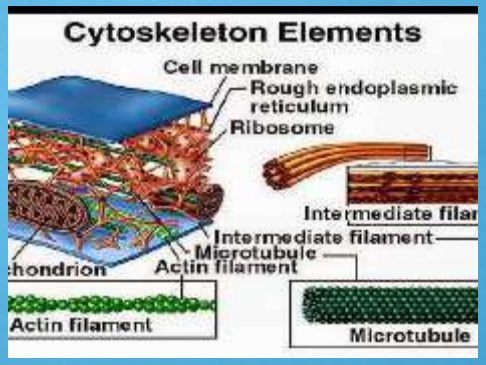
DNA is located in cytoplasm -(jellylike substance that contains building blocks like proteins, nuceleic acids, ions)

Eukaryote

Has a nucleus

Has membrane bound organelles

Cytoskeleton



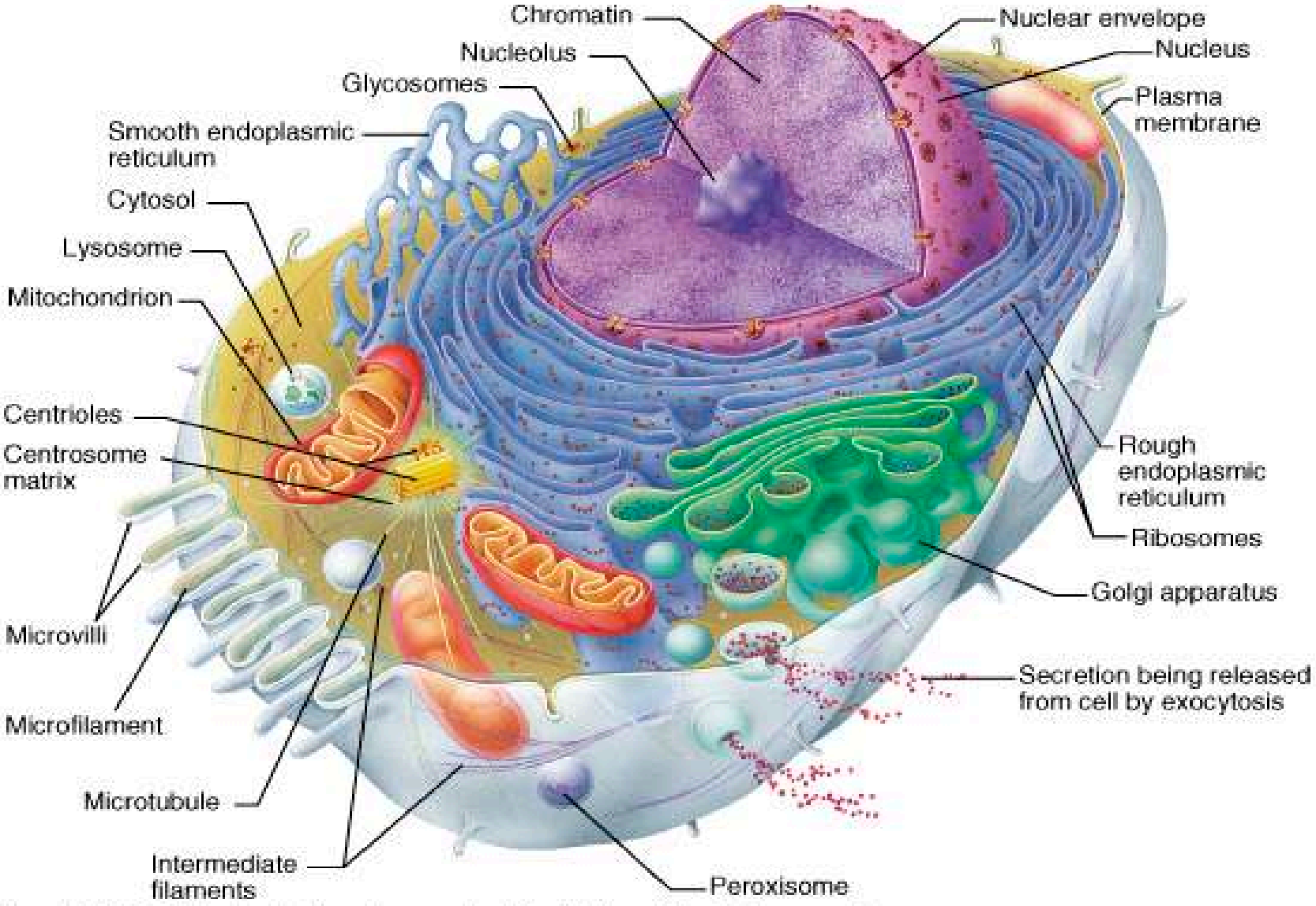
Like a skeleton, the cytoskeleton gives cells their shape, strength, and help the muscles contract and relax.

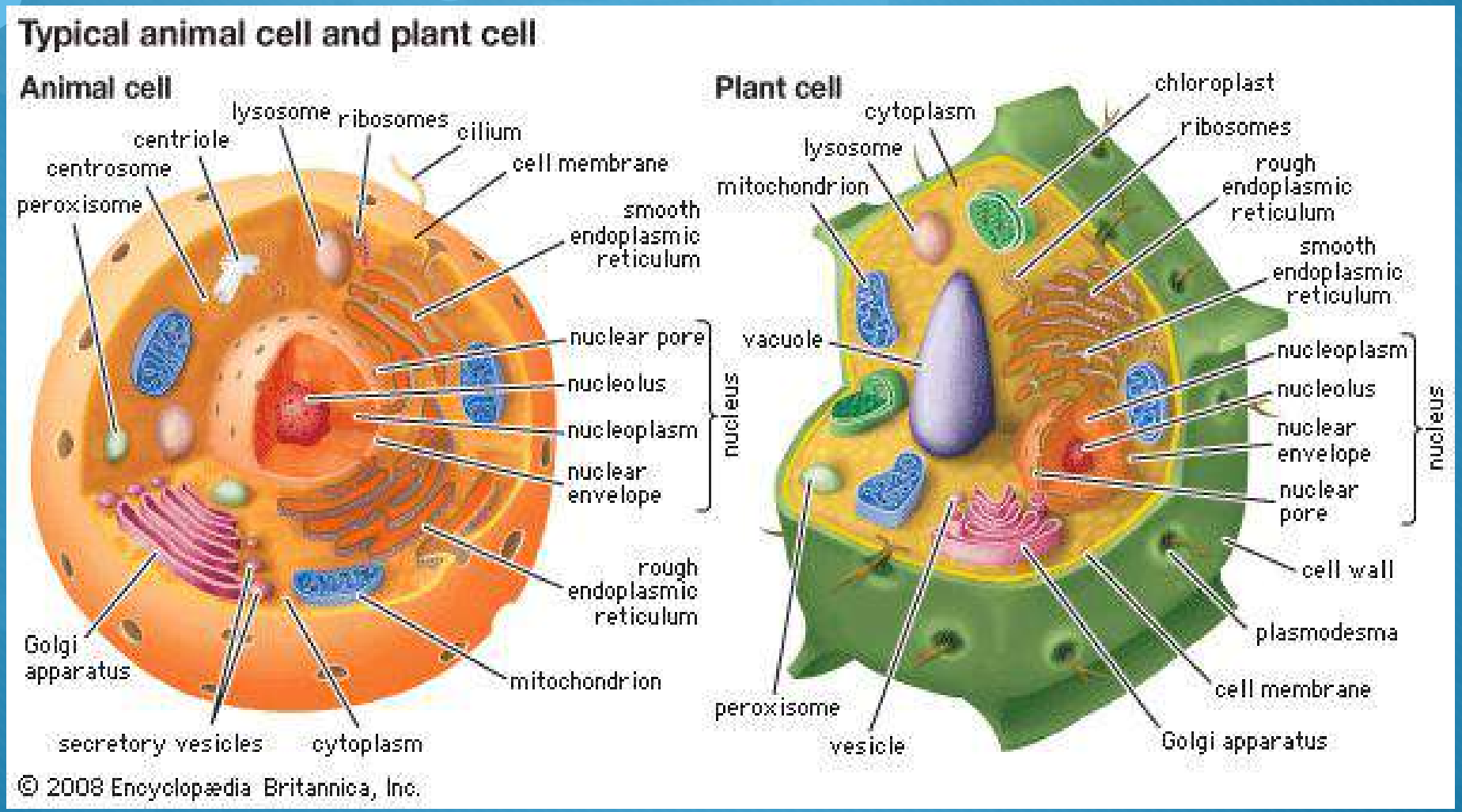
Eukaryotic Structures in Plant and Animal Cells

Name	Description	Function
Cell Wall*	Contains cellulose or chitin	Protection, support
Plasma Membrane	Lipid bilayer with embedded proteins	Outer layer, regulates what passes in and out of cell
Nucleus	Surrounded by double membrane, contains chromosomes	Control center of cell, directs protein synthesis
Nucleolus	Site of genes for rRNA synthesis	Assembles ribosomes
Endoplasmic reticulum (ER)	Network of internal membranes	Forms compartments and vesicles, synthesis and modification of proteins and lipids
Rough ER	Contains ribosomes	Protein synthesis
Smooth ER	Lacks ribosomes	Synthesis of lipids
Golgi Apparatus	Stacks of flattened vesicles	Packages proteins for export, forms secretory vesicles
Vesicle	Membrane-bound sac	Stores and transports substances
Lysosome	Contains hydrolytic digestive enzymes	Digests macromolecules and cell debris
Peroxisome	Contains oxidative and other enzymes	Breaks down fatty acids
Central Vacuole*	Large membrane-bound sac in plants	Storage compartment for water, sugars, ions, pigment
Mitochondrion	Bacteria-like element with double membrane	Carries out cellular respiration, produces ATP
Chloroplast*	Bacteria-like element found in plants	Site of photosynthesis
Cytoskeleton	Network of protein filaments	Structural support, cell movement
Cilia and flagella	9 + 2 pattern of microtubules	Motility
Centrioles**	Occur in pairs, composed of microtubules	Anchor and assemble microtubules

*Plant cells only

**Animal cells only




Typical animal cell and plant cell
Animal cell
lysosome
ribosomes
cilium
centriole
centrosome
cell membrane
peroxisome
smooth endoplasmic reticulum
nuclear pore
nucleolus
nucleoplasm
nuclear envelope
nucleus
rough endoplasmic reticulum
Golgi apparatus
mitochondrion
secretory vesicles
cytoplasm
Plant cell
chloroplast
cytoplasm
ribosomes
lysosome
mitochondrion
rough endoplasmic reticulum
smooth endoplasmic reticulum
vacuole
nucleoplasm
nucleolus
nuclear envelope
nuclear pore
nucleus
cell wall
plasmodesma
cell membrane
peroxisome
vesicle
Golgi apparatus
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Group Questions

What differences do you observe between animal and plant cells?

What might occur if the cell had no cytoskeleton?

How are lysosomes, vesicles, and the central vacuole similar?

Does the chloroplast make energy for the plant? Explain.

What is the difference b/w a prokaryotic cell and eukaryotic cell?

Answers

Plant cell=chloroplasts, central vacuole, and cell wall and animal cells do not.

The cell would be disorganized with no structure. It would be weak and could fall apart.

All are membrane-bound organelles that store or separate substances

No-energy can't be made or destroyed. They convert energy to a form the cell can use.

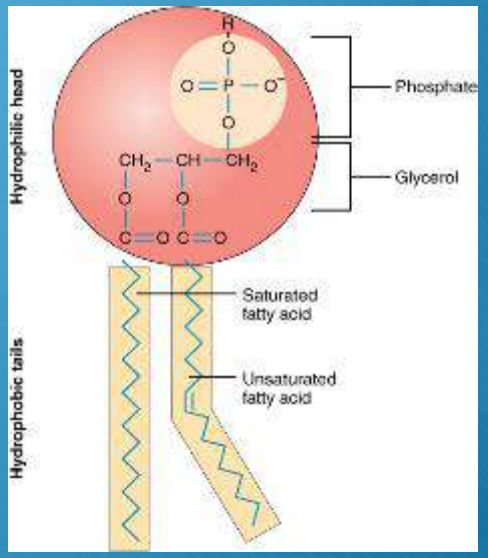
Prokaryotic cells do not have a nucleus or organelles.

Cell Membrane-packaging

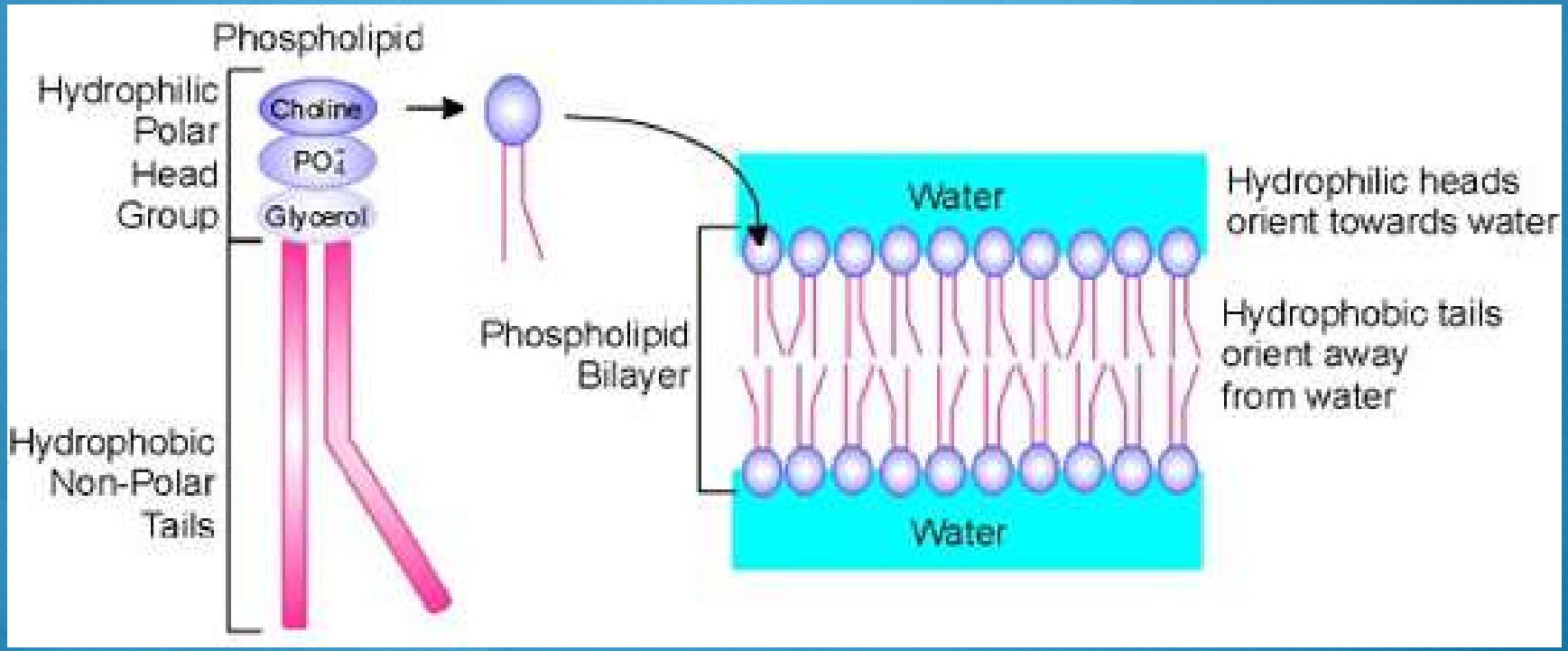
Cell Membrane: (plasma membrane) forms a boundary between a cell and the outside environment and controls the passage of materials into and out of the cell. It consists of a double layer of phospholipids and is embedded with proteins, carbs, & cholesterol

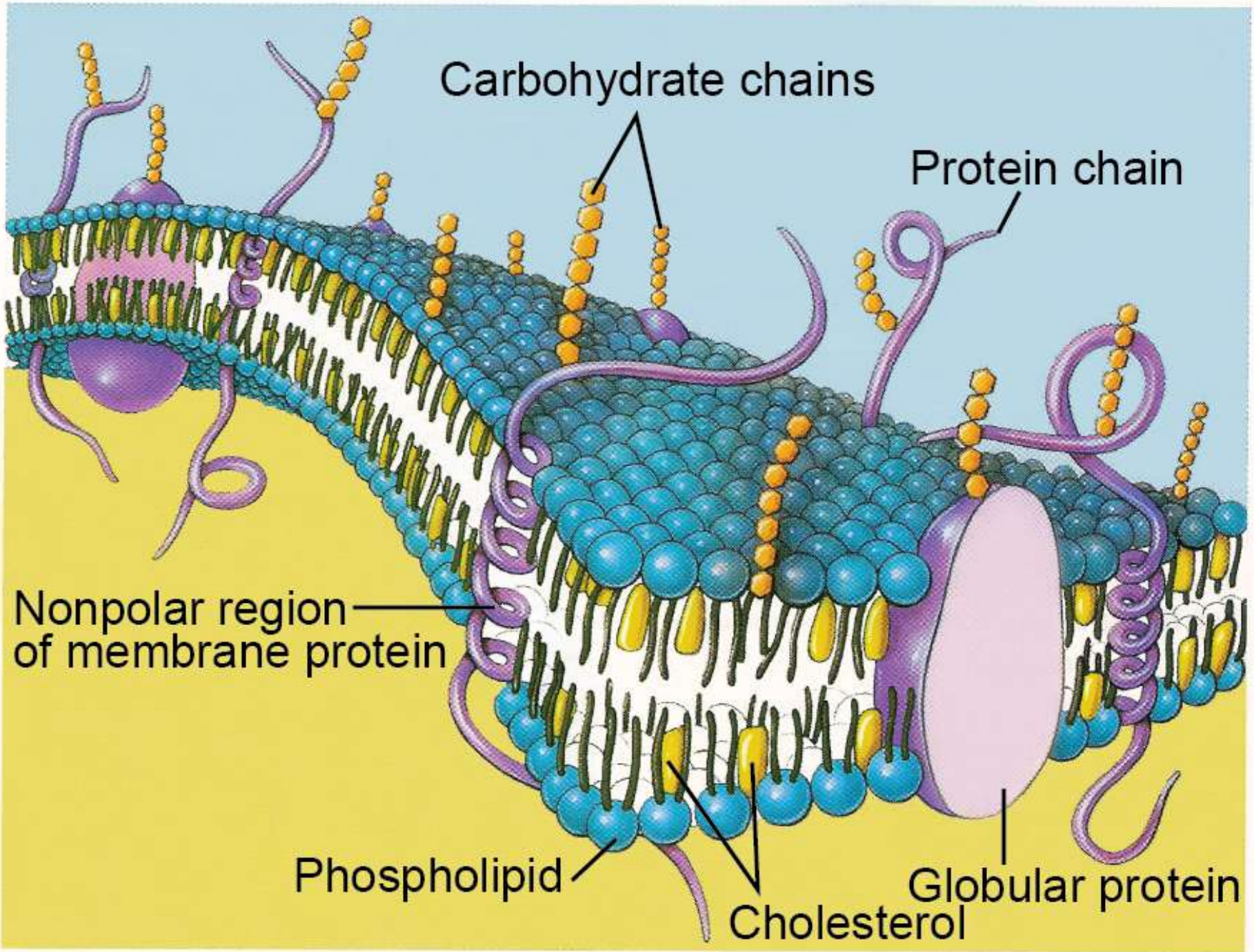
Phospholipid: includes 3 basic parts

- Charged phosphate group
- Gylcerol
- Two fatty acid chains



Phospholipids contd.




Carbohydrate chains
Protein chain
Nonpolar region
of membrane protein
Phospholipid
Cholesterol
Globular protein

Inside the cell membrane

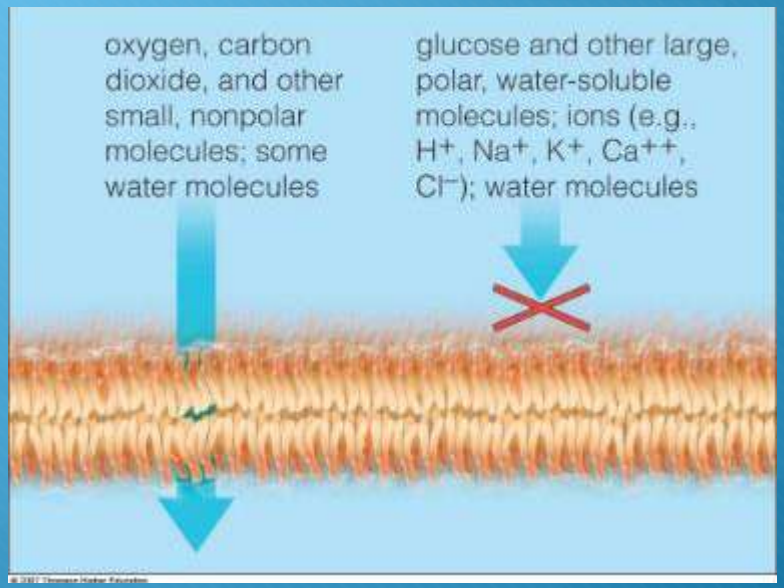
Cholesterol-strengthen the cell

Proteins help materials cross the membrane

Carbohydrates attach to membrane proteins and serve as ID tags to differentiate one cell from another.

Selective Permeability

The cell membrane is <u>selectively permeable</u>=it allows some, but not ALL materials to cross



Demonstration

Cell Membrane

How are chemical signals transmitted across the cell membrane?

Receptor- a protein that detects a signal molecule and performs an action in response.

Two types of receptors

Receptors…..

Intracellular

"Intra"-means within

Receptors that are located inside the cell and bind to molecules that cross directly through the membrane.

Membrane

Receptors located in the membrane that bind to molecules that can't cross it and trasmit signals to the cell interior by changing shape

Diffusion & Osmosis

Diffusion

Total movement of molecules from HIGH concentration to LOW

Osmosis

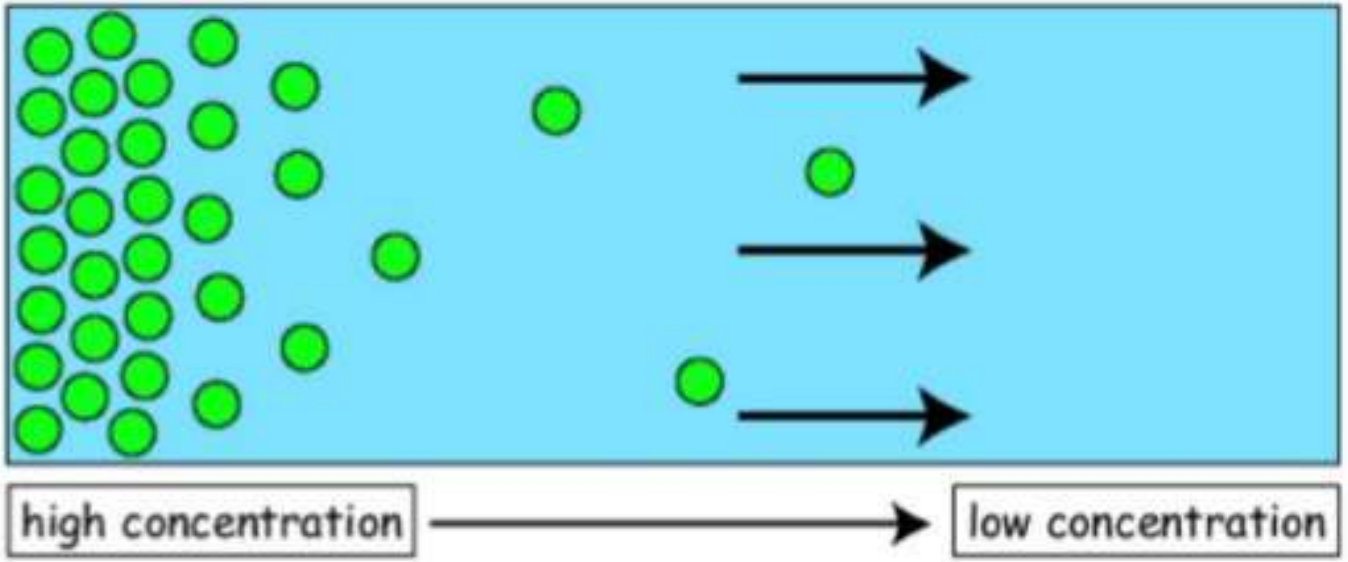
Movement of water molecules from HIGH water conc. to LOW

Remember…

Concentration=# of molecules of a substance in a given volume.

Concentration gradient=the difference in the concentration from one location to another.

DIFFUSION

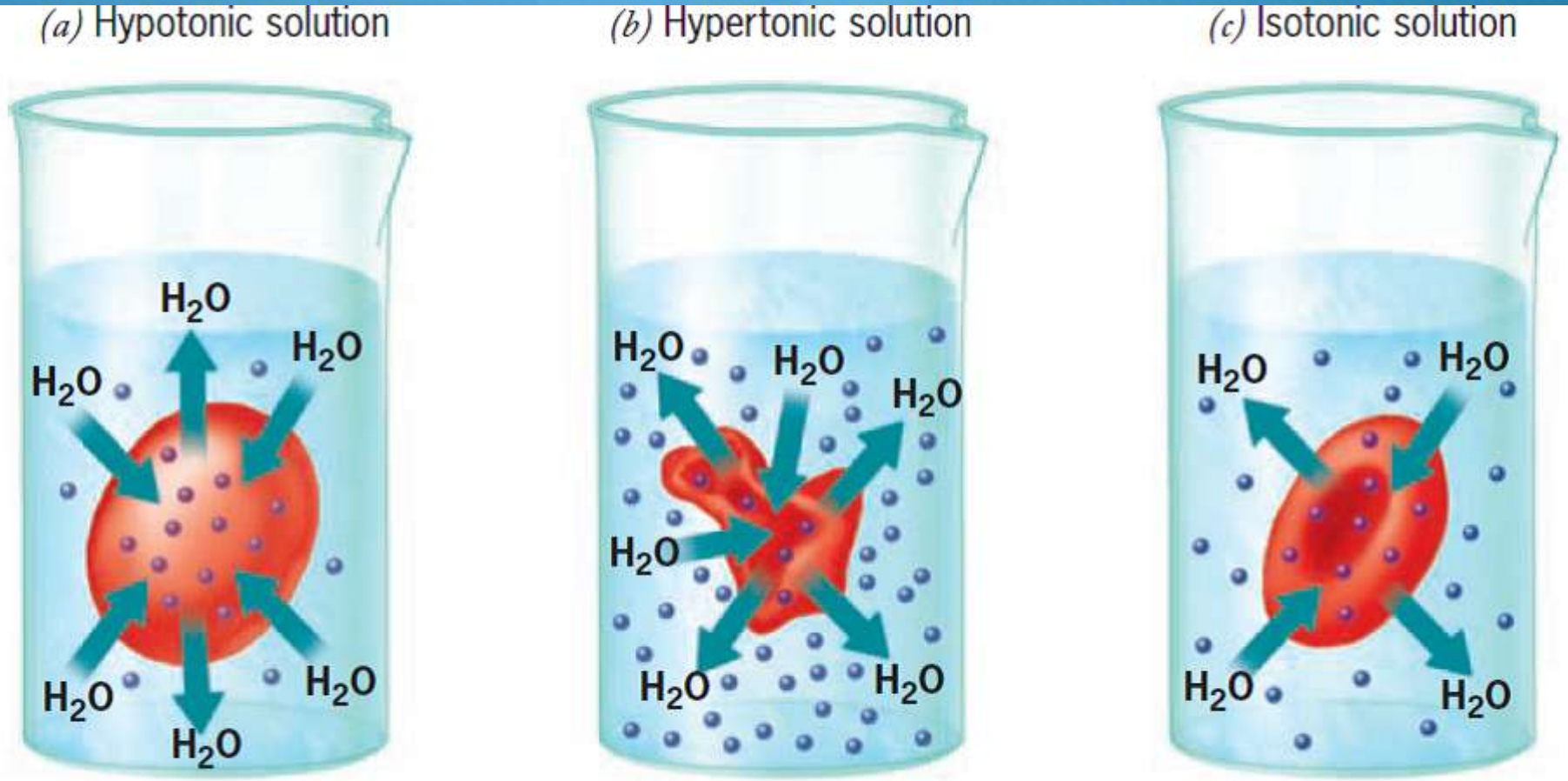


- The net movement of particles from an area of **high concentration** to an area of **low concentration**
- Due to the **random** movement of particles
- A **passive** process which means that **no energy** is needed

Facilitated Diffusion

Diffusion of molecules across a membrane through transport proteins. These proteins make it easier for molecules to enter or exit a cell without having to Interact with phosolipids

Osmosis

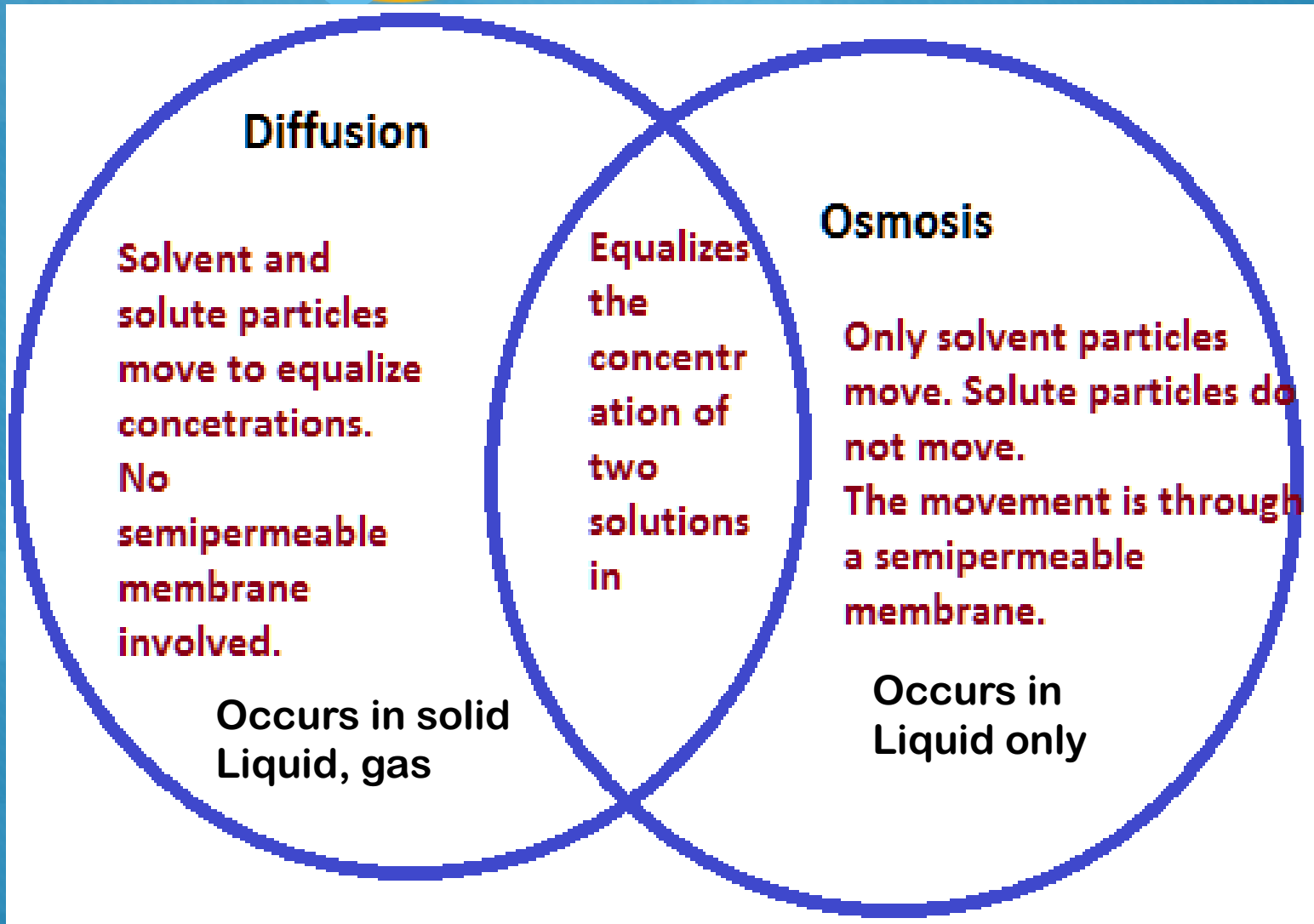

(a) Hypotonic solution
(b) Hypertonic solution
(c) Isotonic solution
H2O
Net water gain
Cell swells
Net water loss
Cell shrinks
No net loss or gain

Isotonic, Hypertonic, Hypotonic

Hypotonic Solution = cell will swell (hypO=blOw)

Hypertonic Solution = cell will shrink or die

Isotonic Solution=concentrations are equal


Diffusion
Solvent and solute particles move to equalize concetrations.
No semipermeable membrane involved.
Occurs in solid
Liquid, gas
Equalizes the concentration of two solutions in
Osmosis
Only solvent particles move. Solute particles do not move.
The movement is through a semipermeable membrane.
Occurs in
Liquid only