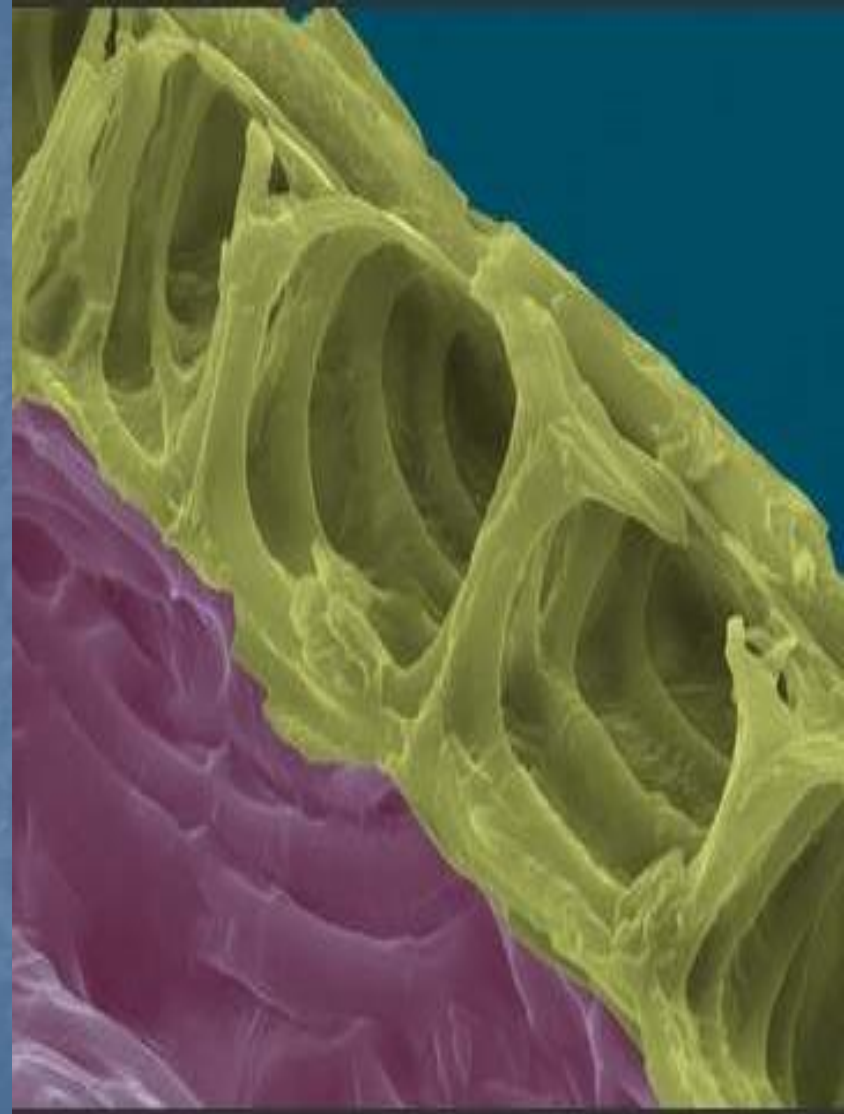


Cellular Boundaries

Cell Walls

- Cell walls lie outside the cell membrane and are found in many **plant, fungi, & prokaryotic cells.**
- Their main function is to **provide support and protection** for the cell.



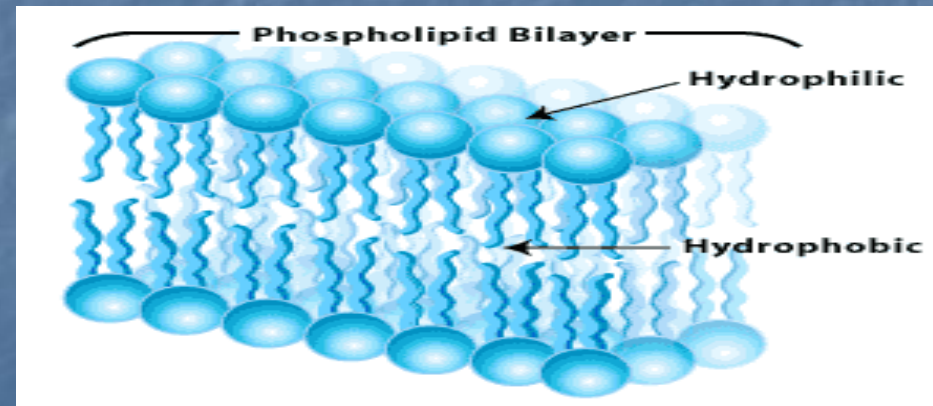
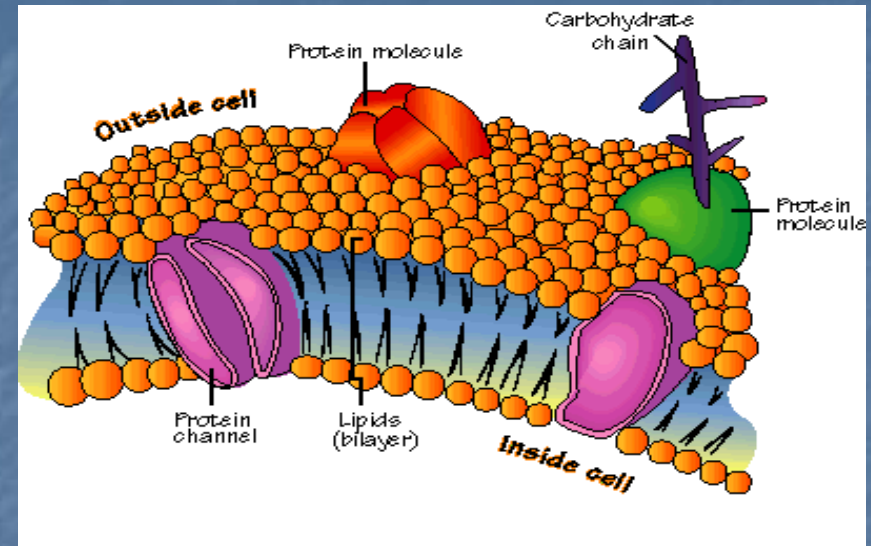
Cell Walls

- Most cell walls are made from carbohydrates and proteins.
- Plant cell walls are composed mainly of **cellulose**.



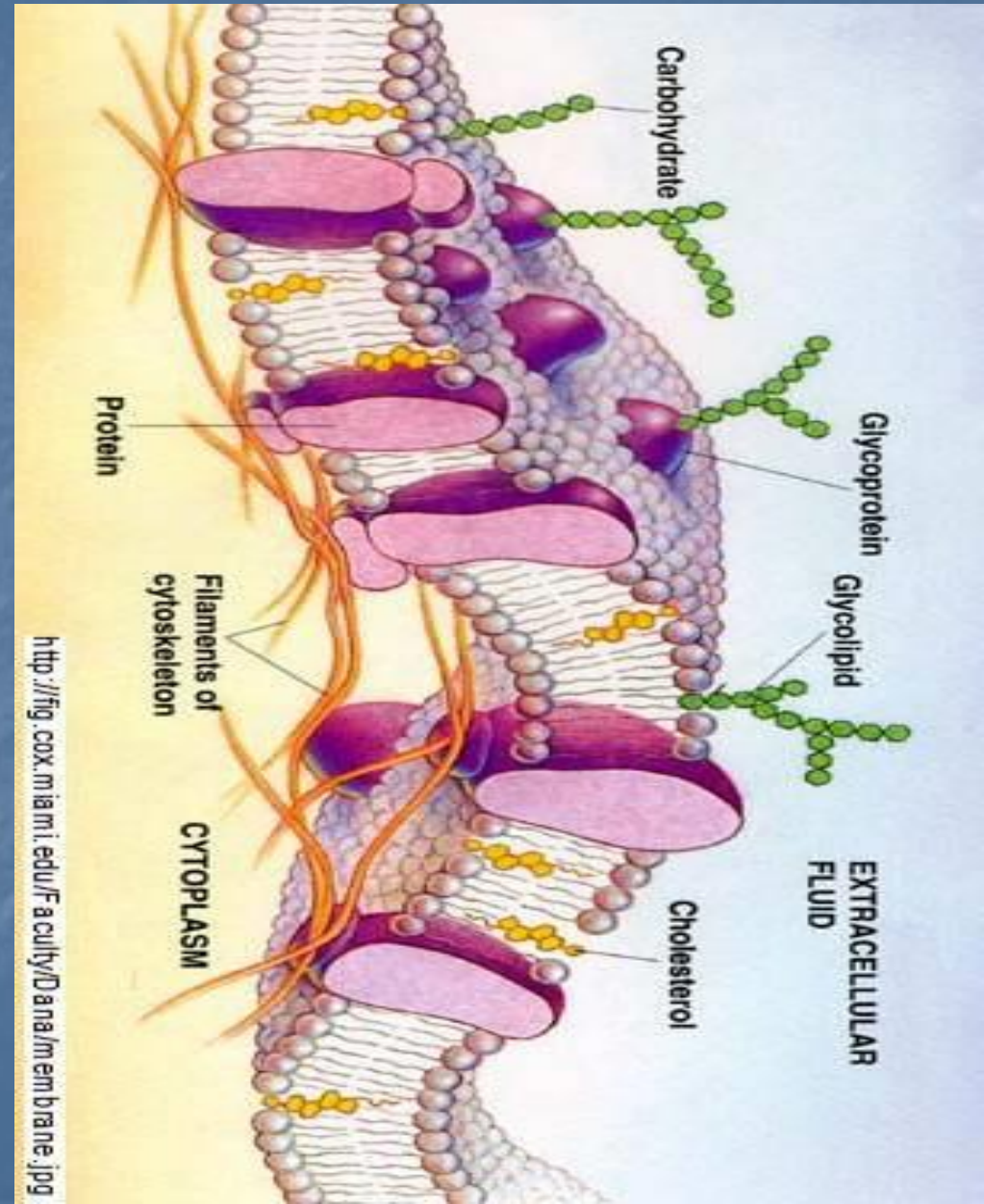
Cell Membrane

- All cells are surrounded by a thin **flexible** barrier.
- It is the responsibility of the cell membrane to **control what enters and leaves the cell.**



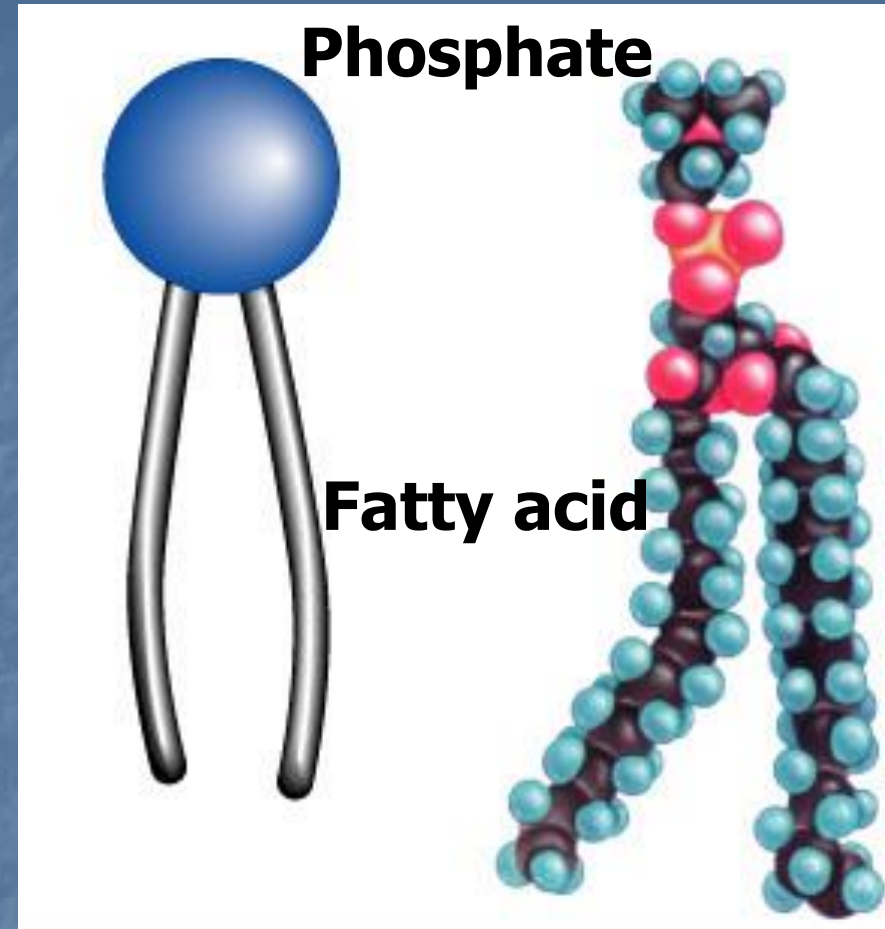
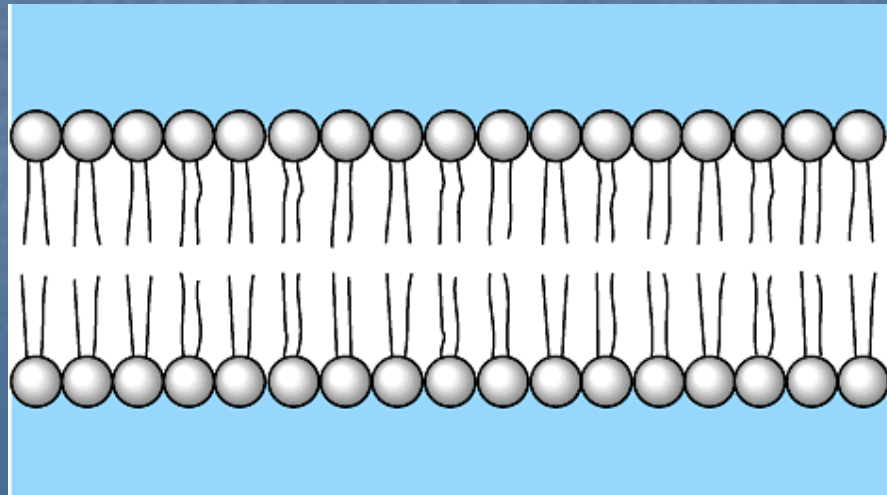
Cell Membrane

- It also provides **support and protection.**
- The membrane is **composed of a double layer of lipids called the lipid bilayer.**
- Also embedded within the bilayer are proteins and carbohydrate chains.

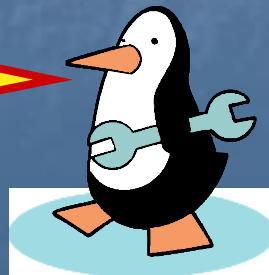


Phospholipids

- Fatty acid tails
 - hydrophobic
- Phosphate group head
 - hydrophilic
- Arranged as a bilayer



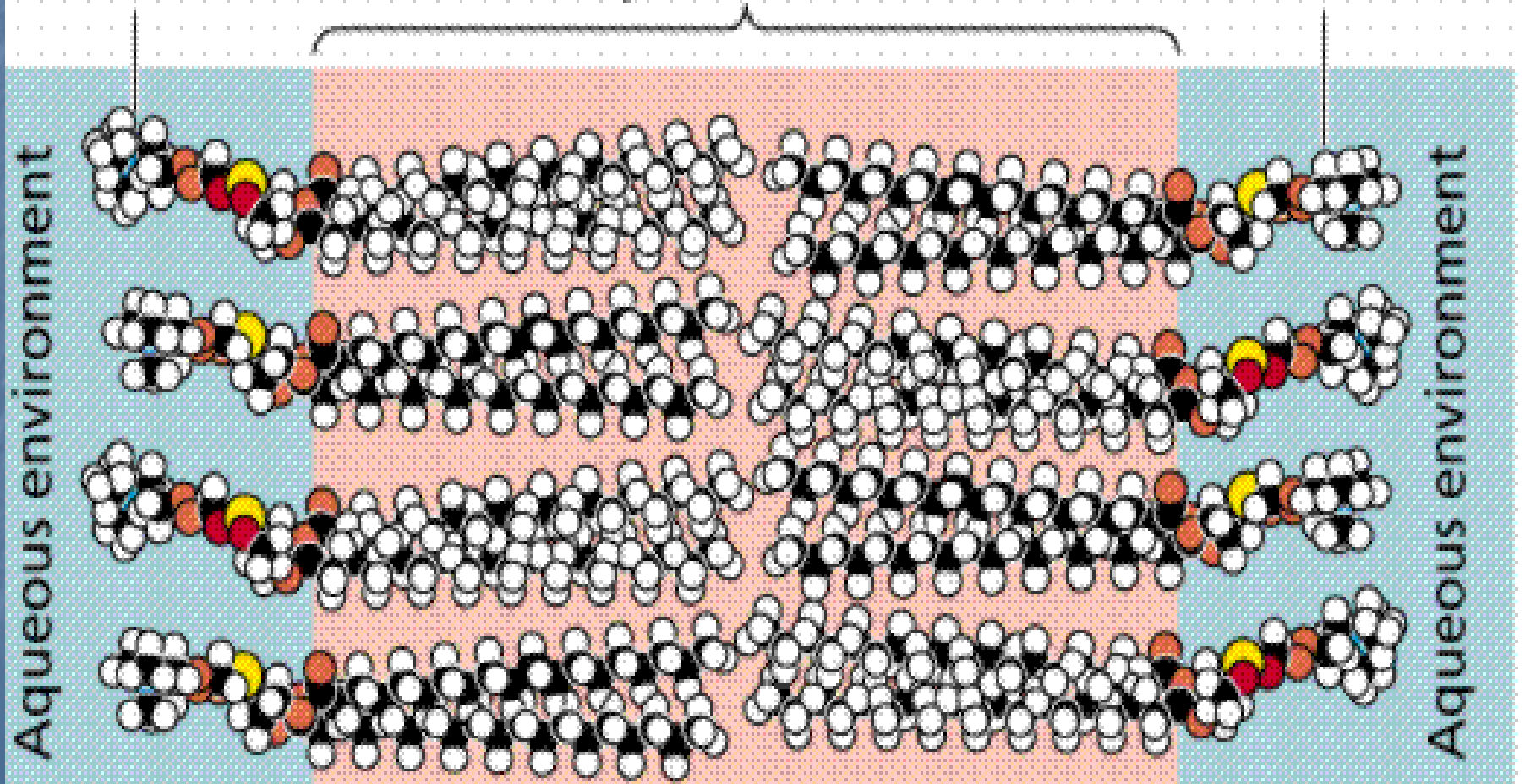
Aaaah,
one of those
structure-function
examples



Polar,
hydrophilic
"head"

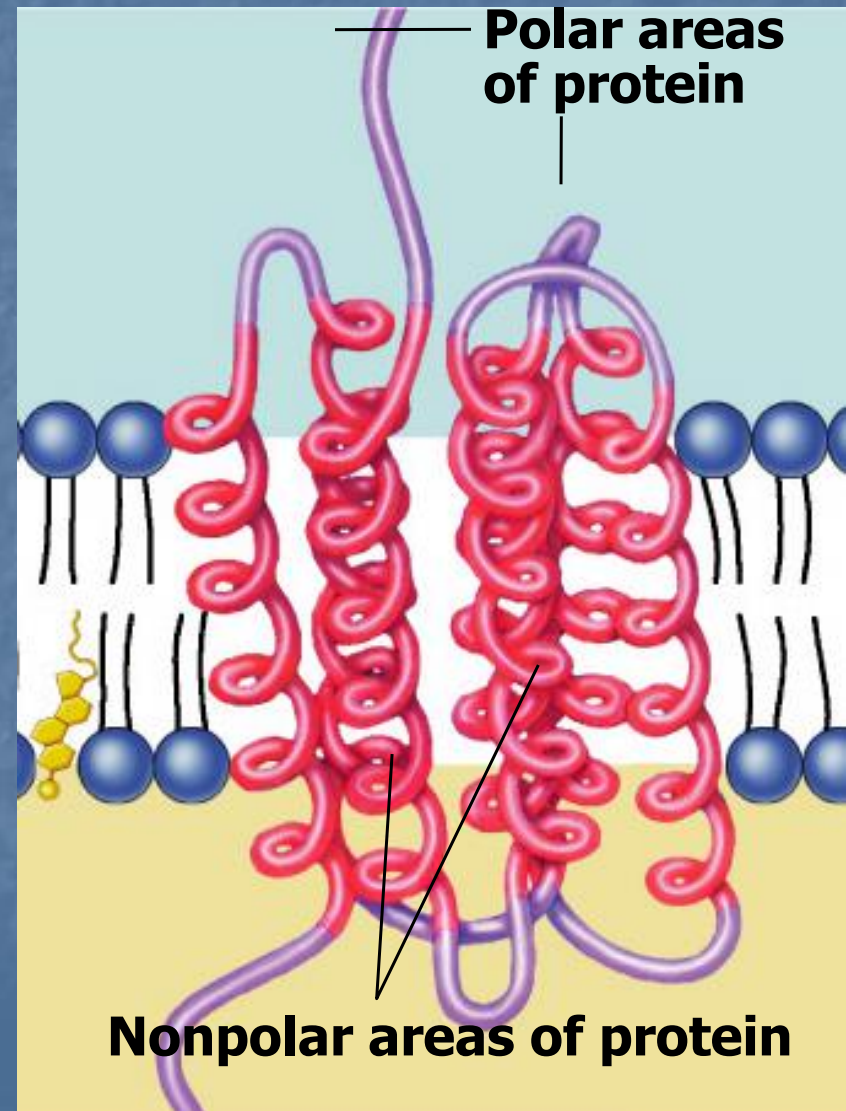
Nonpolar,
hydrophobic,
fatty acid "tails"

Polar,
hydrophilic
"head"

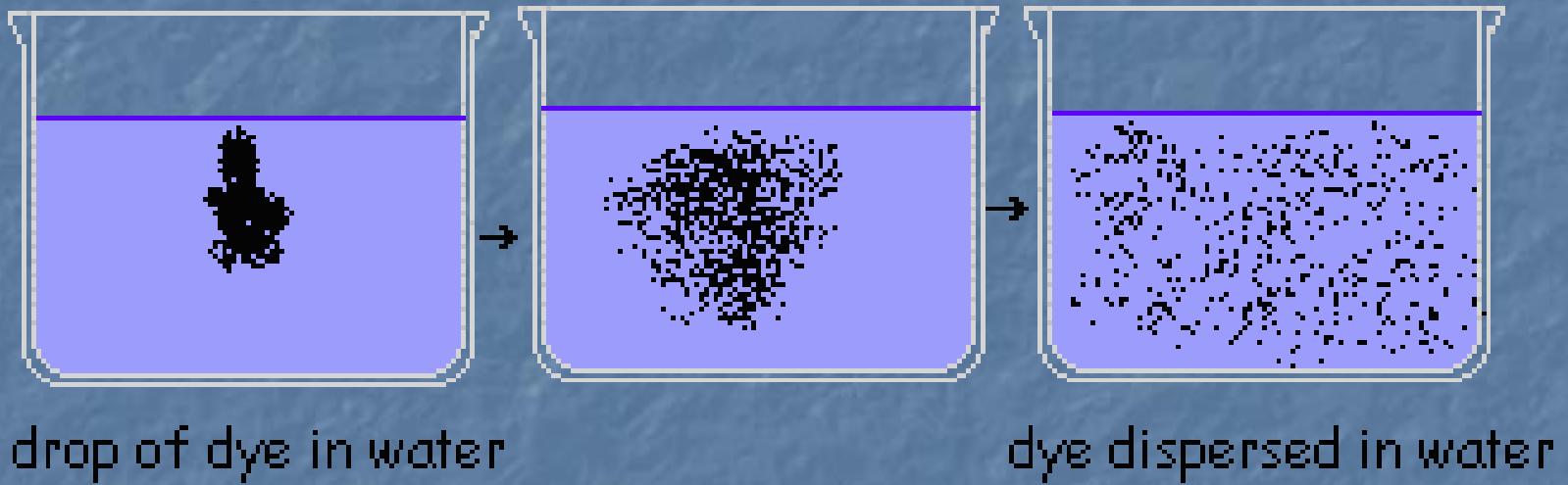


Proteins domains anchor molecule

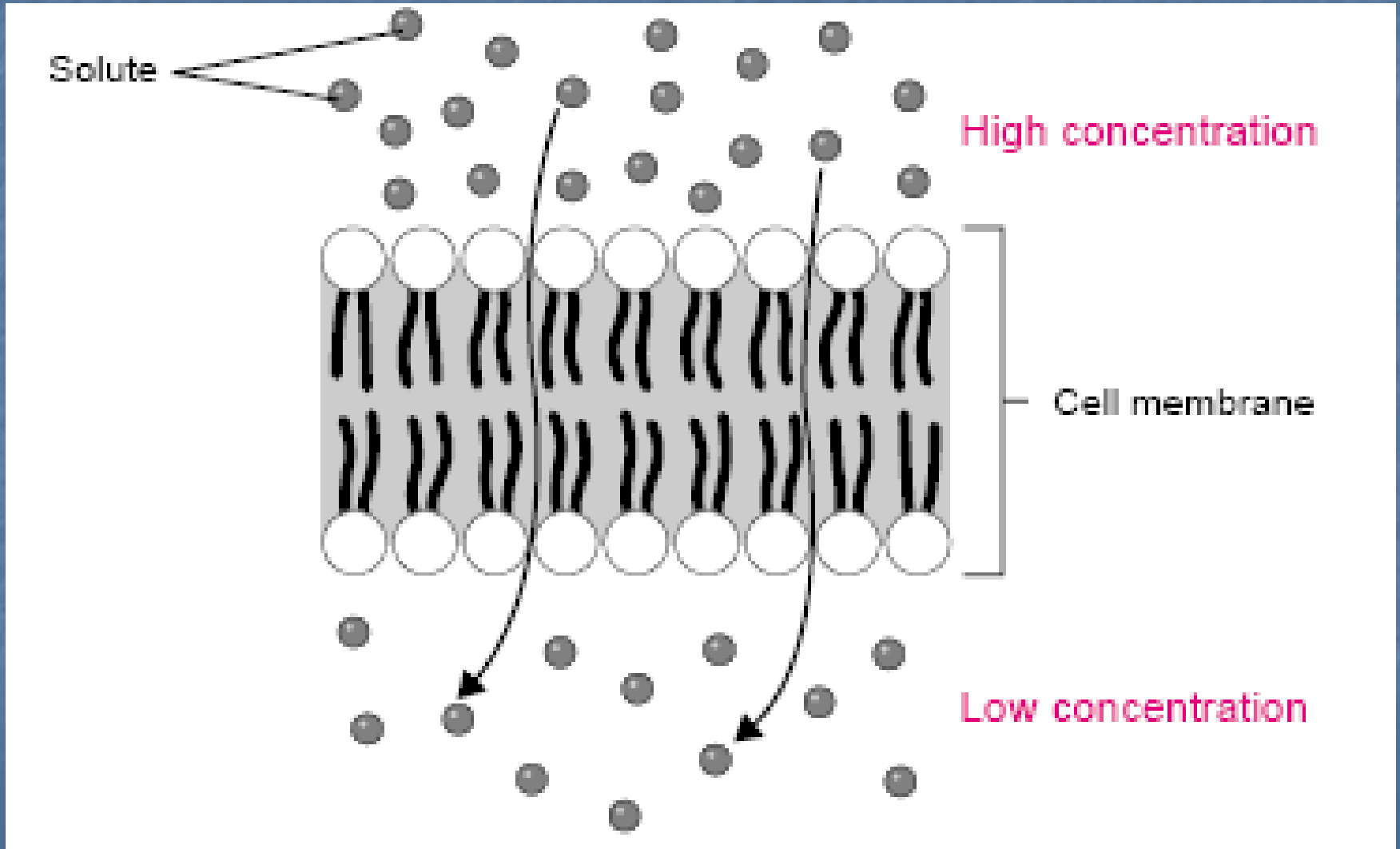
- Within membrane
 - nonpolar amino acids
 - hydrophobic
 - anchors protein into membrane
- On outer surfaces of membrane
 - polar amino acids
 - hydrophilic
 - extend into extracellular fluid & into cytosol



Diffusion of liquids

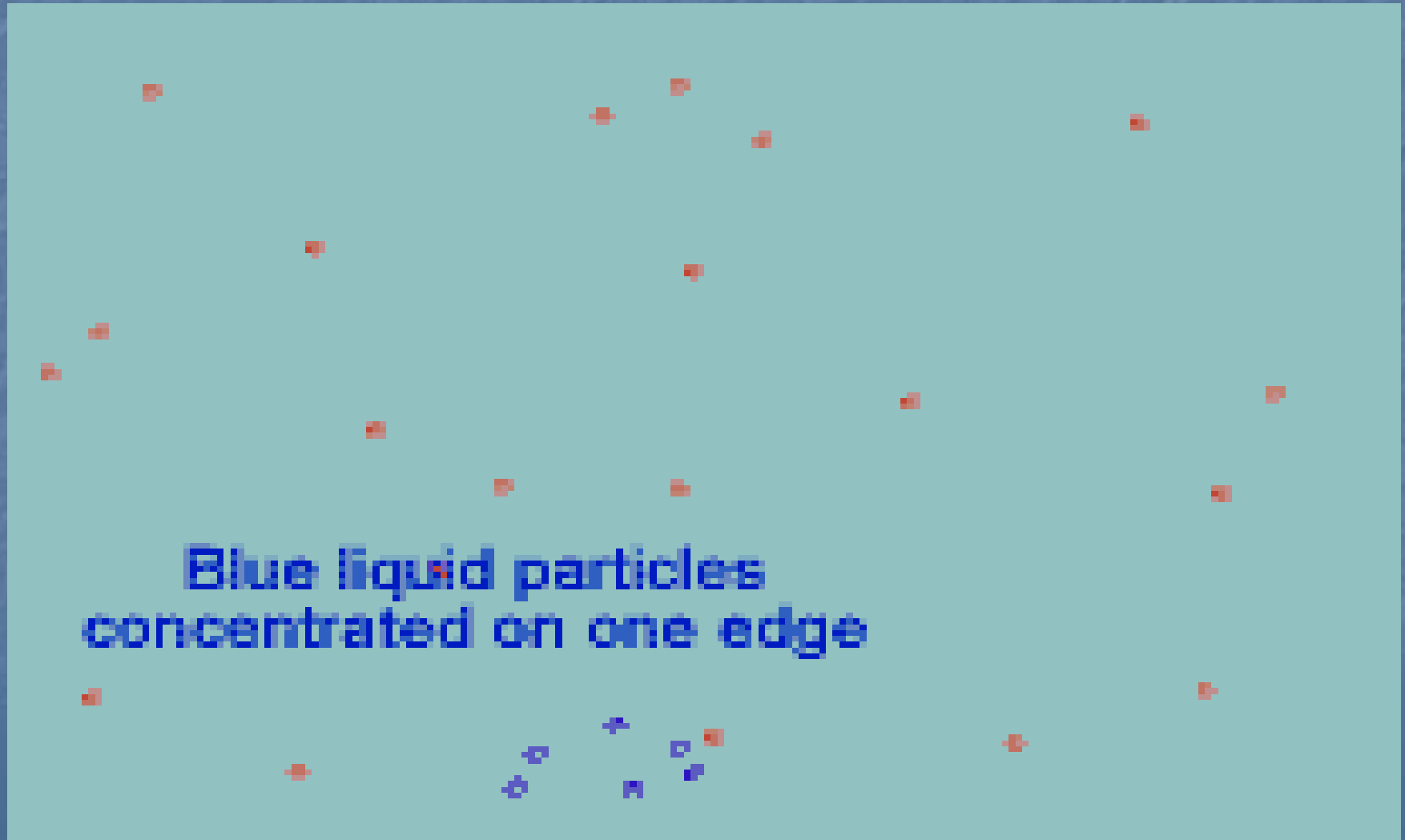


Diffusion Through Cell Boundaries



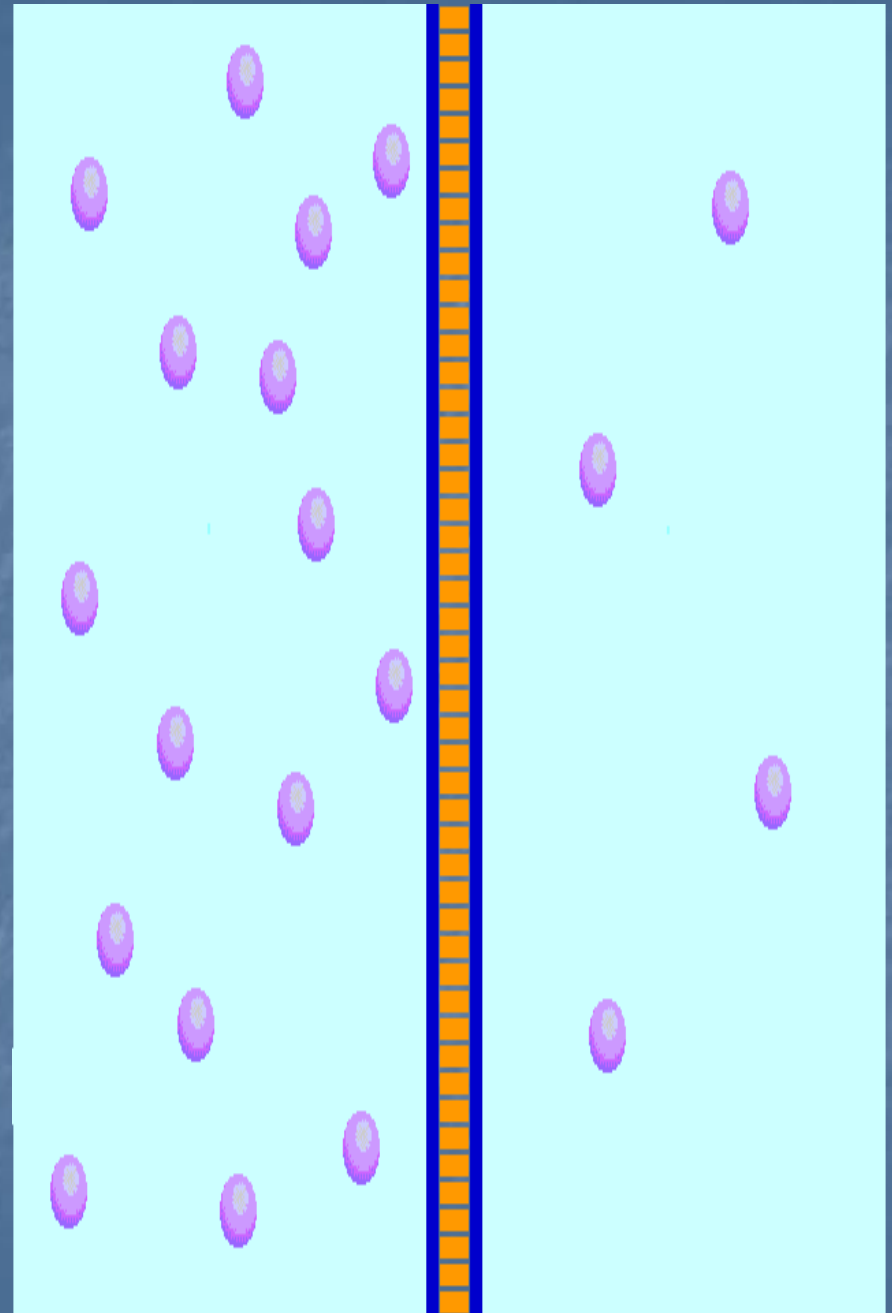
DIFFUSION

Diffusion is **PASSIVE TRANSPORT**. No energy is needed, molecules have a natural kinetic energy.



Diffusion

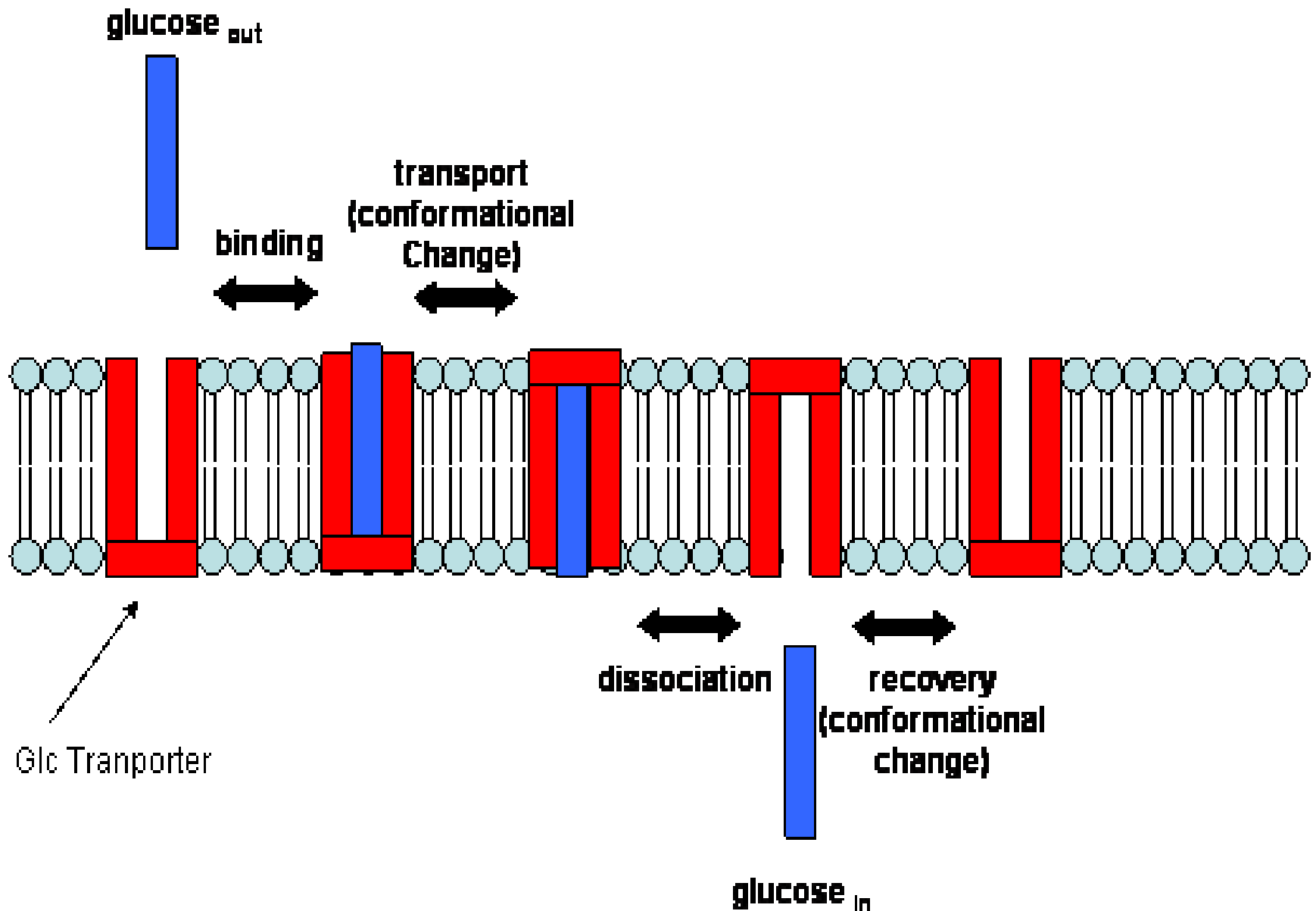
- Diffusion is the tendency of particles to *move from an area where they are more concentrated to an area where they are less concentrated.*
- When the two areas have equal concentrations, this is known as equilibrium.



Facilitated Diffusion

- How do large molecules like glucose diffuse across a cell membrane?
 - The membrane has protein channels that provide "a doorway" for larger particles.
 - The channel is specific for the molecule it allows through.
 - Facilitated diffusion requires no cellular energy.

Facilitated Diffusion of Glucose

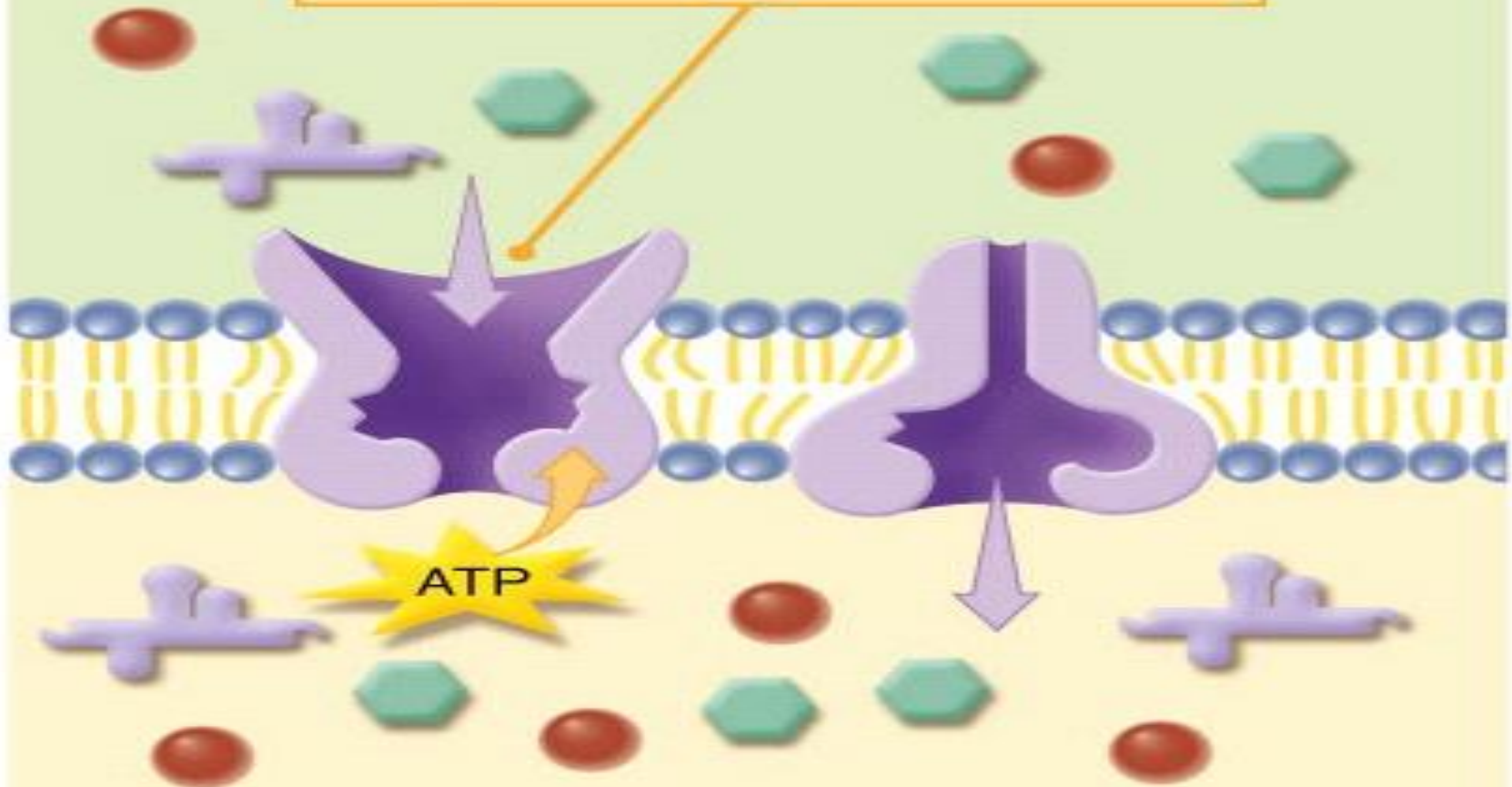


Active Transport

- Cells must sometimes move materials against a concentration gradient. This is *active transport*.
- This requires the cell *to use energy*.
- The active transport of small molecules is generally done by protein “pumps” which are imbedded in the membrane.
- Larger molecules are actively transported by either *endocytosis* or *exocytosis*.

ACTIVE TRANSPORT

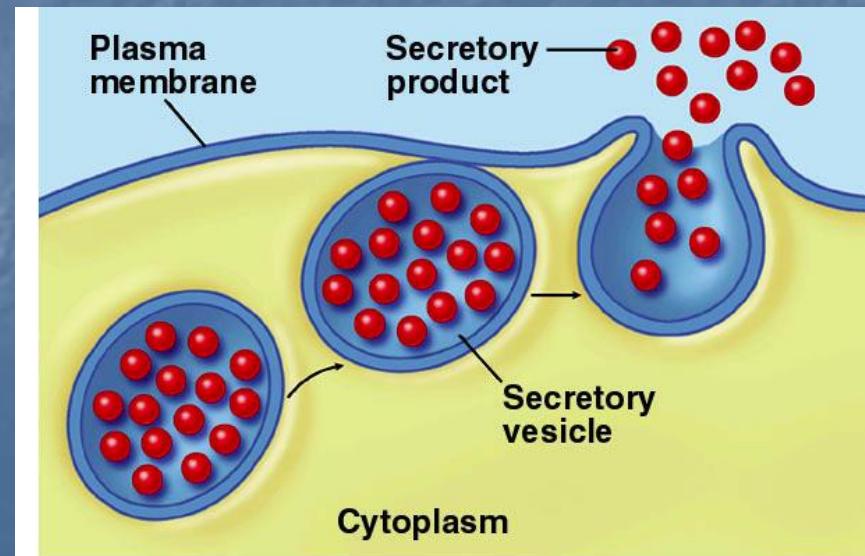
Minerals, some sugars, and most amino acids move against a concentration gradient with an input of energy



How about large molecules?

- Moving large molecules into & out of cell
 - through vesicles & vacuoles
 - endocytosis
 - phagocytosis = “cellular eating”
 - pinocytosis = “cellular drinking”
 - exocytosis

exocytosis

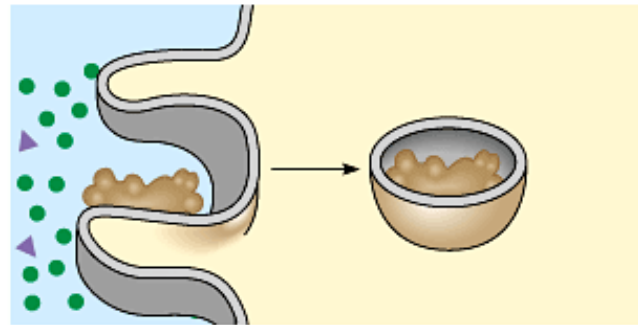


Endocytosis and Exocytosis

- Large molecules are actively transported ***IN*** to the cell.
- The membrane folds around the molecule and forms a vacuole within the cell.
- Large molecules are actively transported ***OUT*** of the cell.
- During exocytosis, the membrane of a vacuole surrounding the material fuses with the cell membrane.
- Then it forces the material out of the cell.

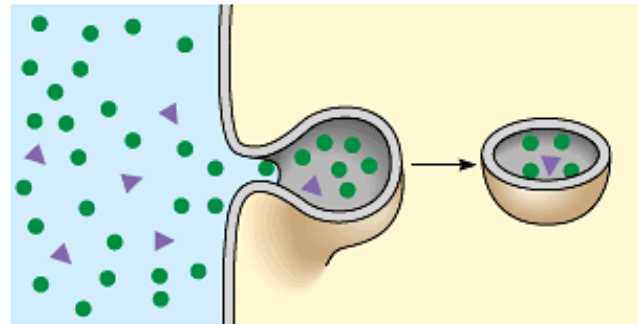
Endocytosis

phagocytosis



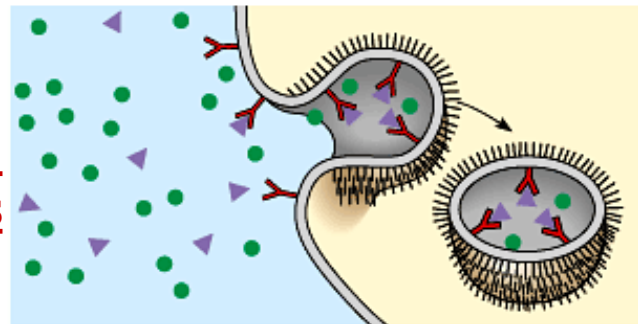
fuse with
lysosome for
digestion

pinocytosis



non-specific
process

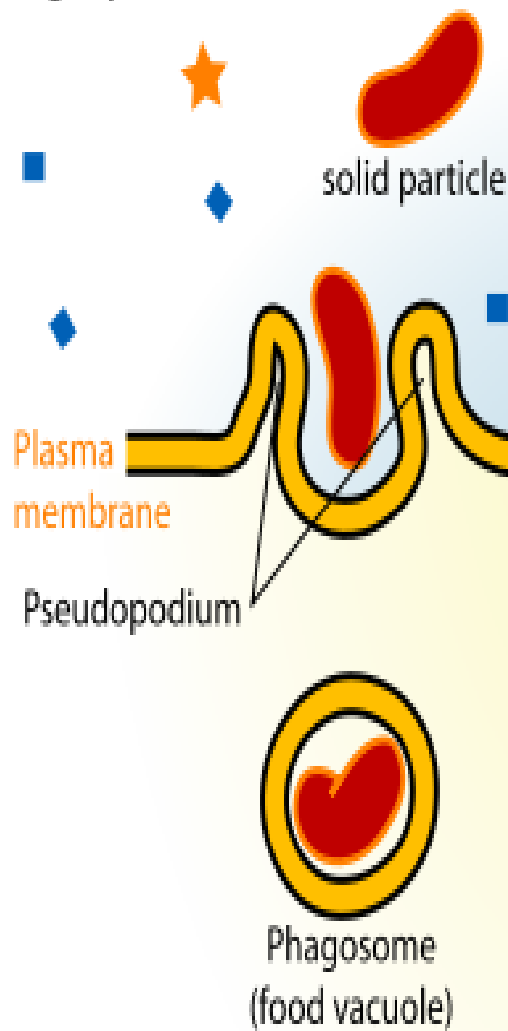
receptor-mediated
endocytosis



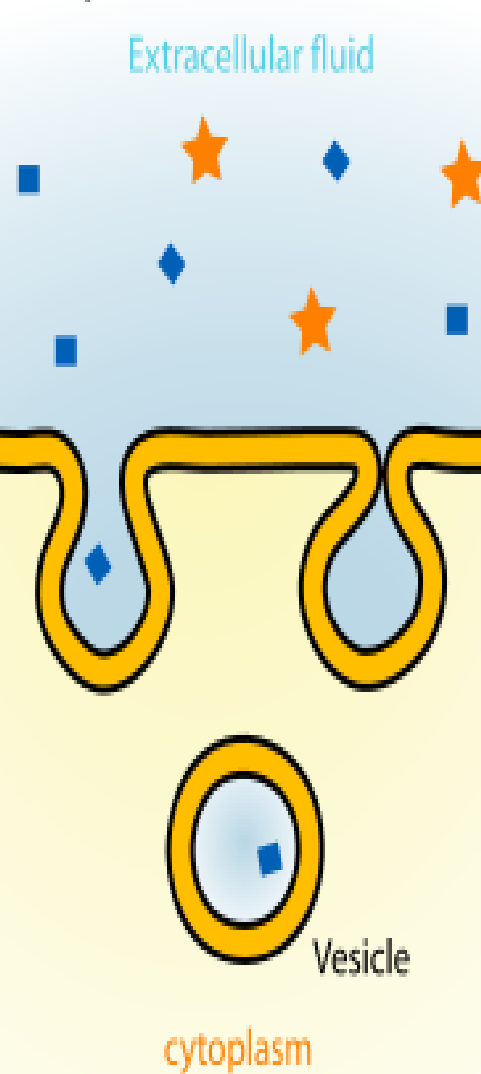
triggered by
molecular signal

Endocytosis

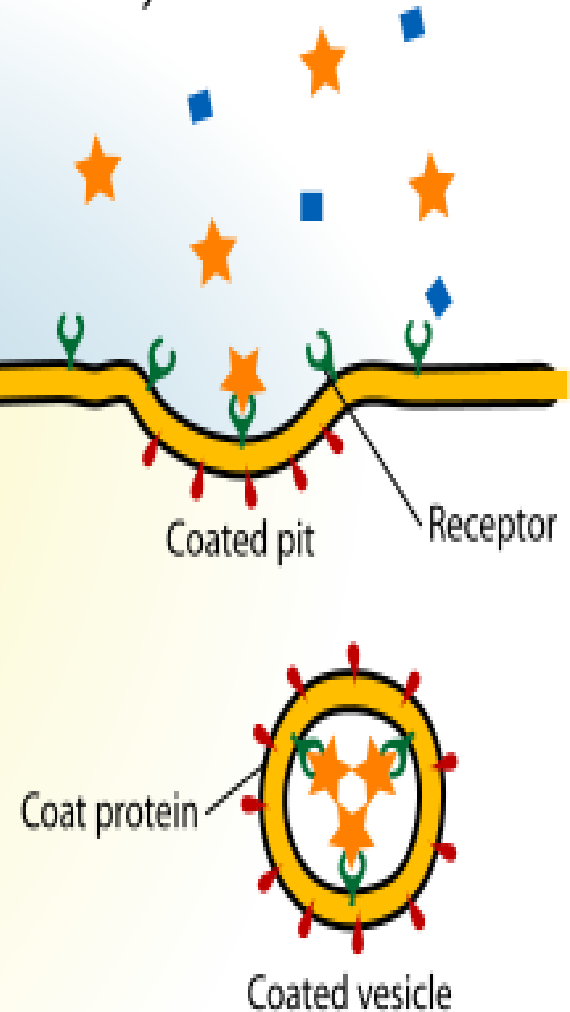
Phagocytosis



Pinocytosis



Receptor-mediated endocytosis



Cell Membrane - Function - Endocytosis

The cell membrane can also engulf structures that are much too large to fit through the pores in the membrane proteins this process is known as endocytosis. In this process the membrane itself wraps around the particle and pinches off a vesicle inside the cell. In this

animation an ameba engulfs a food particle.

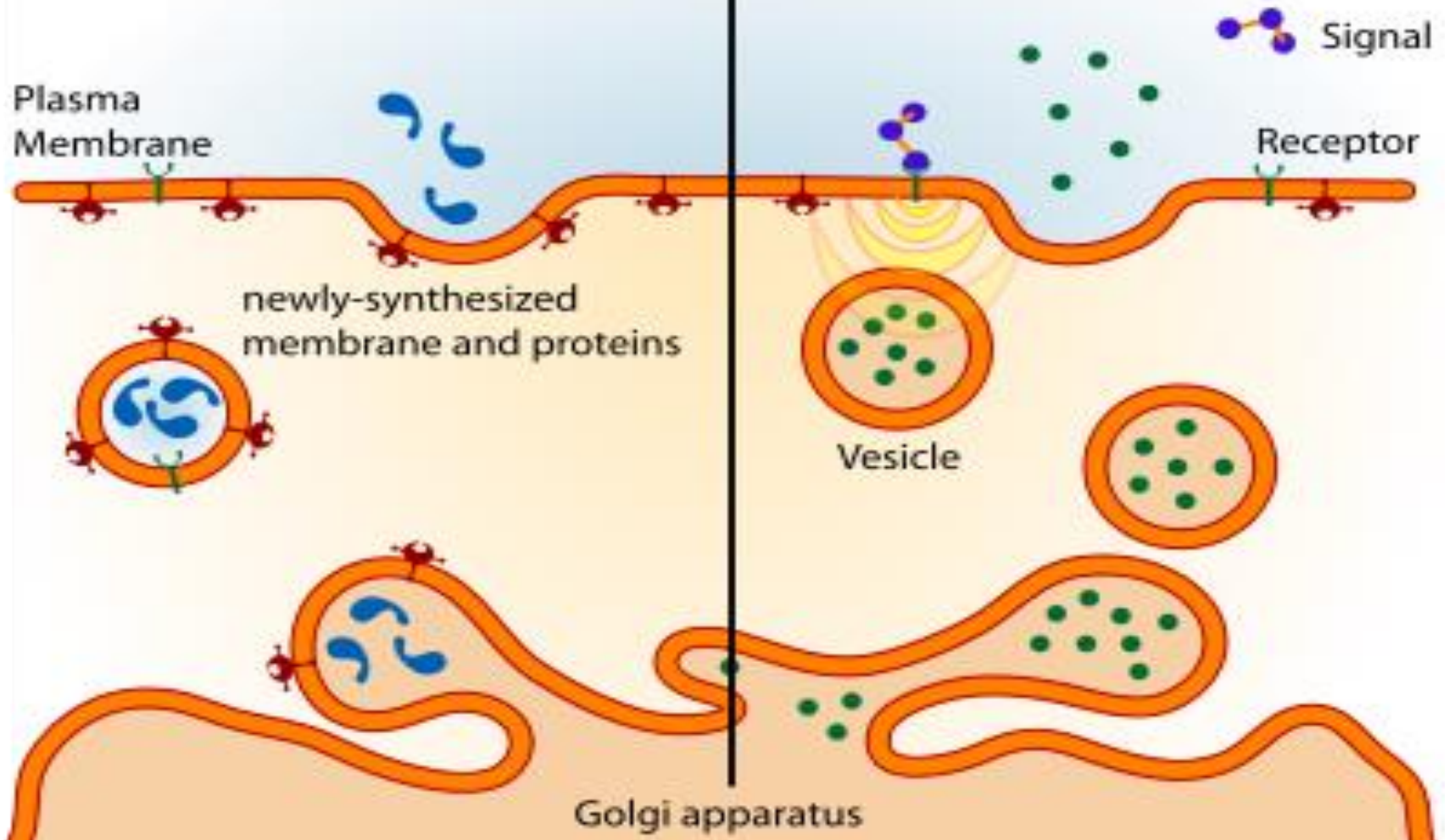


Exocytosis

Constitutive Secretion

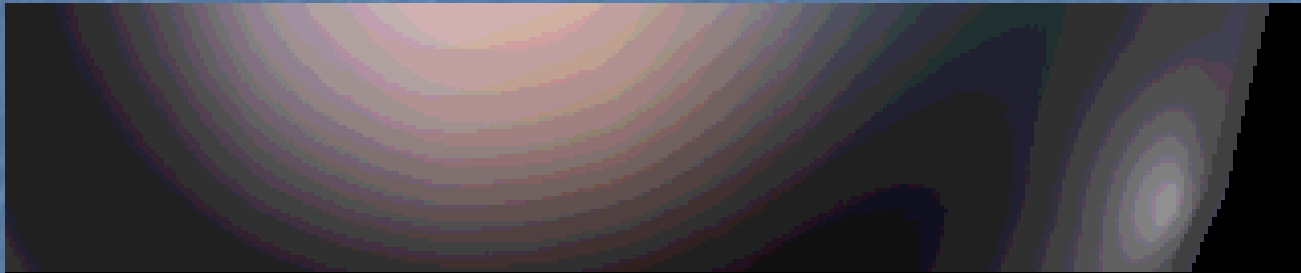
Regulated Secretion

Ca²⁺ triggered



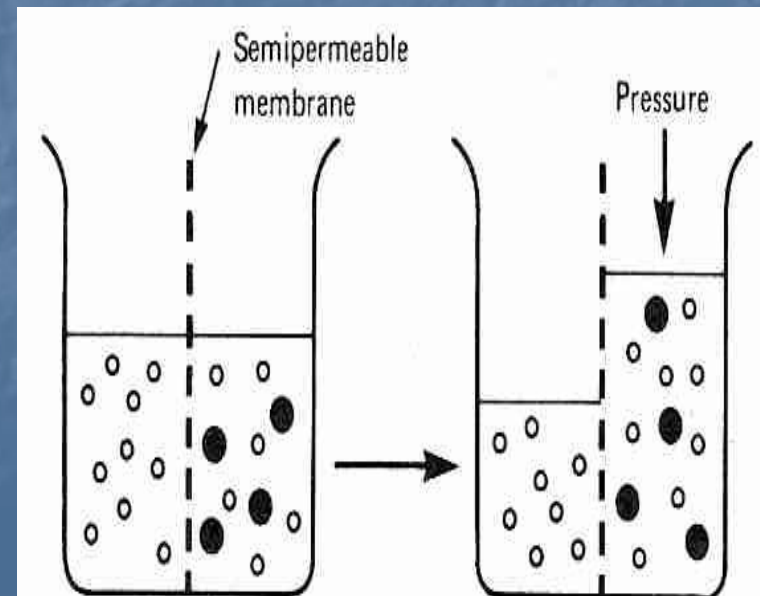
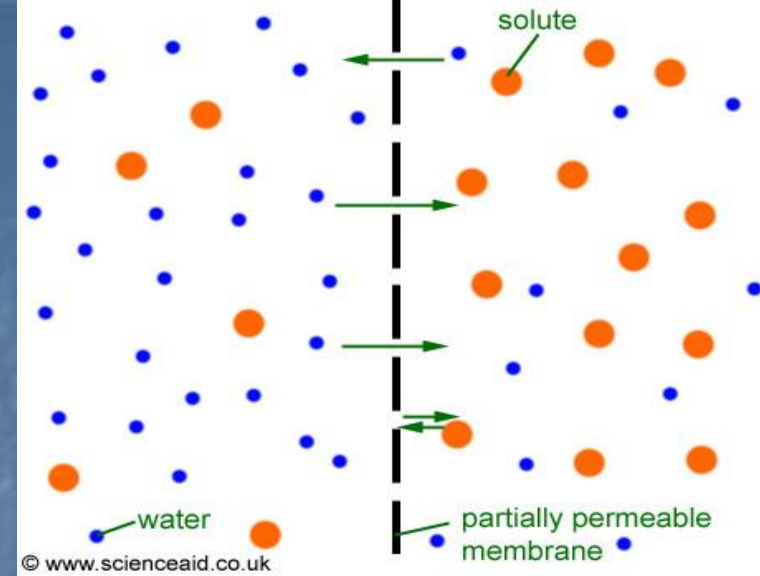
Exocytosis

The opposite of endocytosis is exocytosis. Large molecules that are manufactured in the cell are released through the cell membrane.



Osmosis

- Movement of water through a selectively permeable membrane (only allows certain sized molecules to pass).
- The solute is too large to diffuse so the water molecule diffuses instead until equilibrium is reached.



Managing water balance

- Cell survival depends on balancing water uptake & loss

