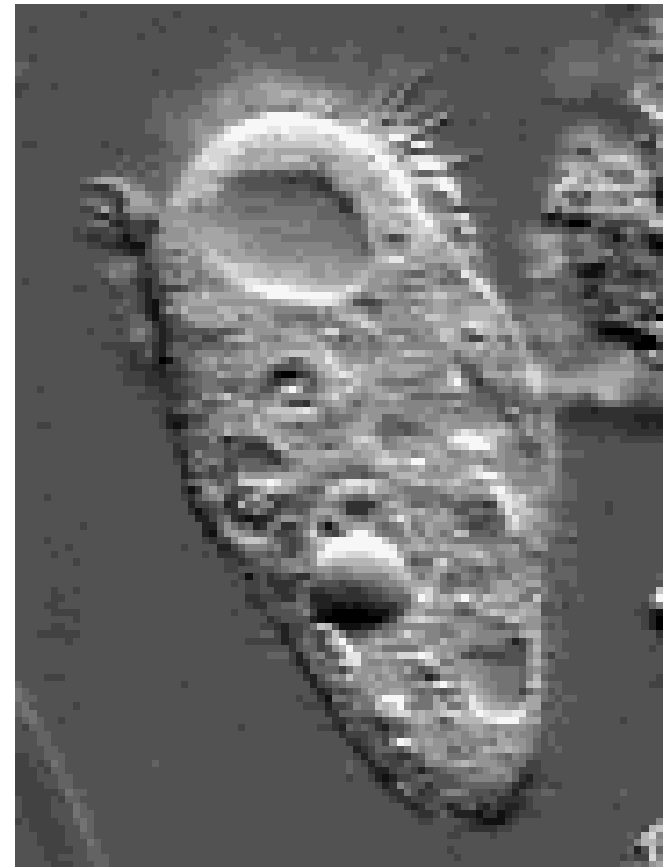


Chapter 7.3

Cell Membrane and Cell Transport

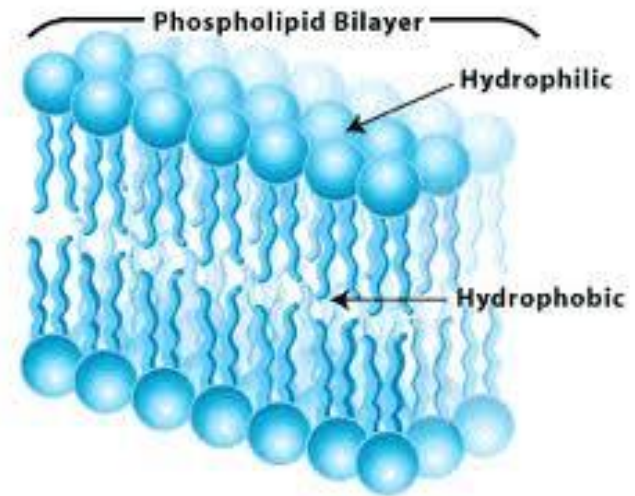
Cell Membrane

1. AKA – **Plasma Membrane**
2. Cell membrane is **flexible** and allows a unicellular organism to move.
3. Controls what **enters** and leaves the cell
4. Selectively permeable
 - **Only certain substances** (molecules) are allowed to **pass through**
5. Made of a **phospholipid bilayer**
6. Called the "**Fluid Mosaic Model**"



Phospholipid Bilayer

- Head
 7. Polar (charge)
 8. Phosphate (PO_4) and Glycerol
 - Hydrophilic (water-loving)
 - Pointed toward inside & outside of cell
- Tails
 9. Nonpolar (no charge)
 10. Fatty acid chains
 11. 2 fatty acid chains (tails)
 - Hydrophobic (water-hating)
 - Pointed toward middle of membrane
- Hydrophobic vs Hydrophilic
 11. Hydrophobic – fears water
 - Hydrophilic – loves water



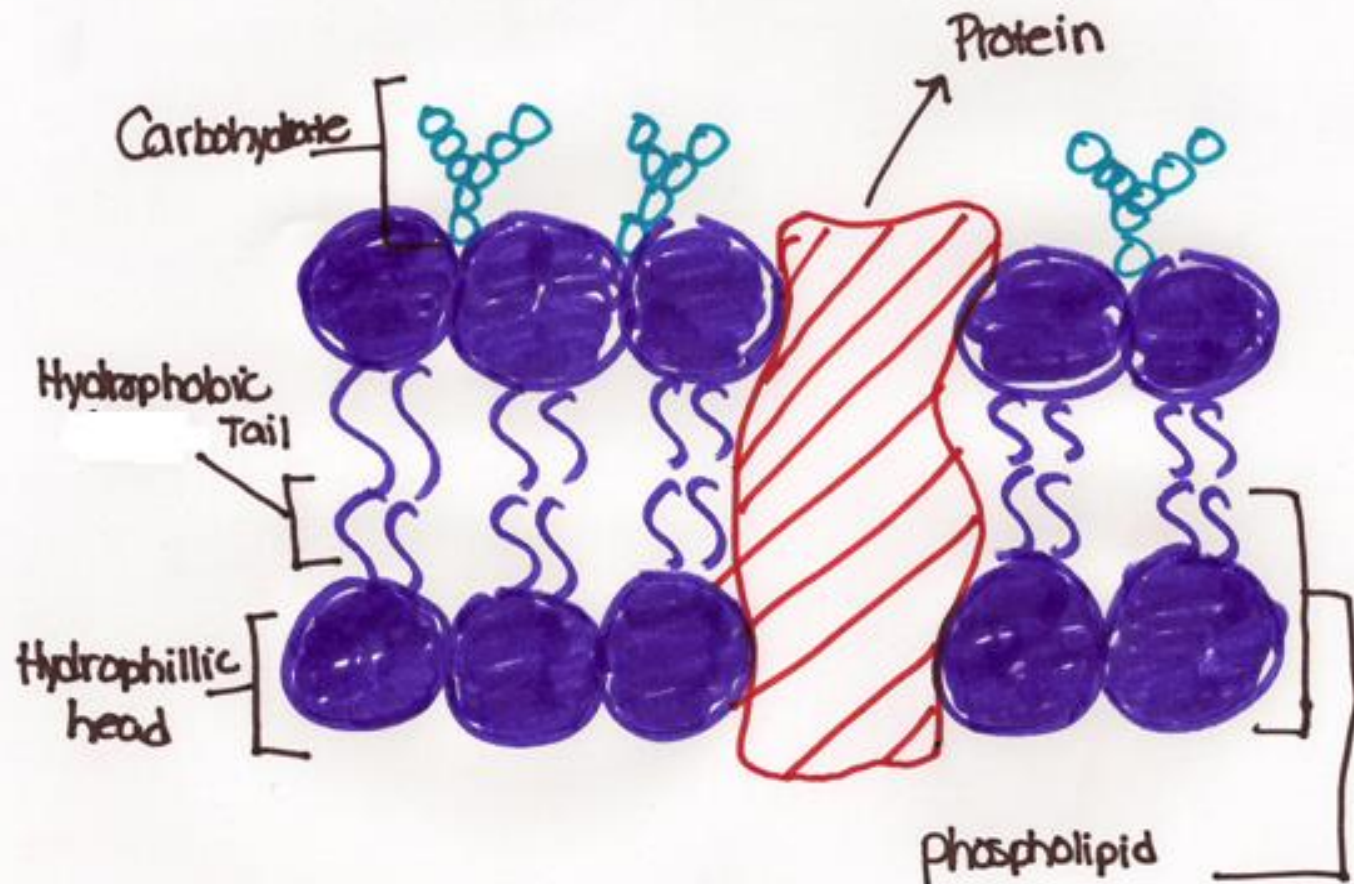
Homeostasis

- 13. **Balanced internal condition** of cells
- 14. Also called **equilibrium**
- 15. Maintained by plasma membrane controlling **what enters and leaves** the cell

Functions of Plasma Membrane

16. 7 Functions of plasma membrane
 - a. Protective **barrier**
 - b. Regulates **transport** in and out of the cell (**selectively permeable**)
 - c. Allows cell **recognition**
 - d. Provides **anchoring sites** for filaments of cytoskeleton
 - e. Provides a **binding site** for enzymes
 - f. **Interlocking surfaces** bind cells together (**junctions**)
 - g. Contains the **cytoplasm** (fluid in cell)

Phospholipid Bilayer (sketch)



What else is in the phospholipid bilayer?

18. Cholesterol and proteins – other 2 components of bilayer

- Cholesterol/carbohydrates

19. Provides support and flexibility

20. Proteins Functions

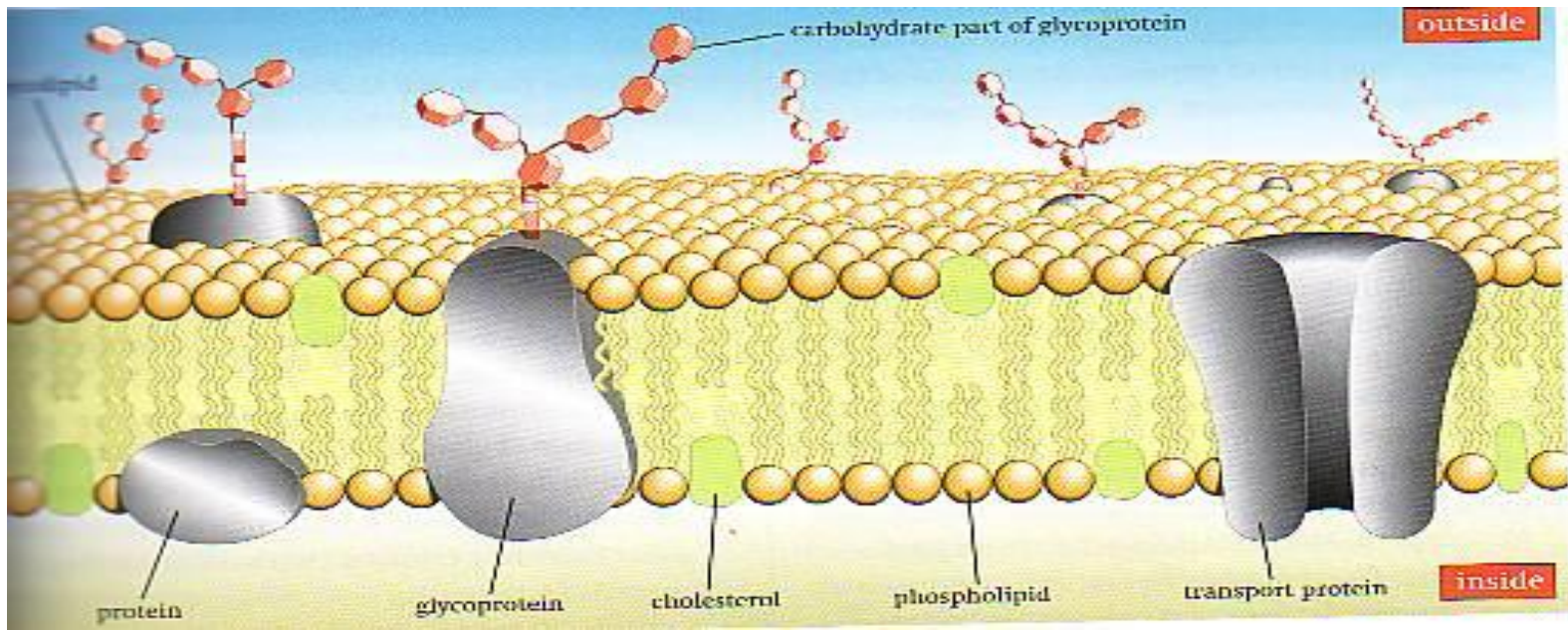
a. **Regulates** which particles can pass across membranes

b. **Act as enzymes** in chemical reactions

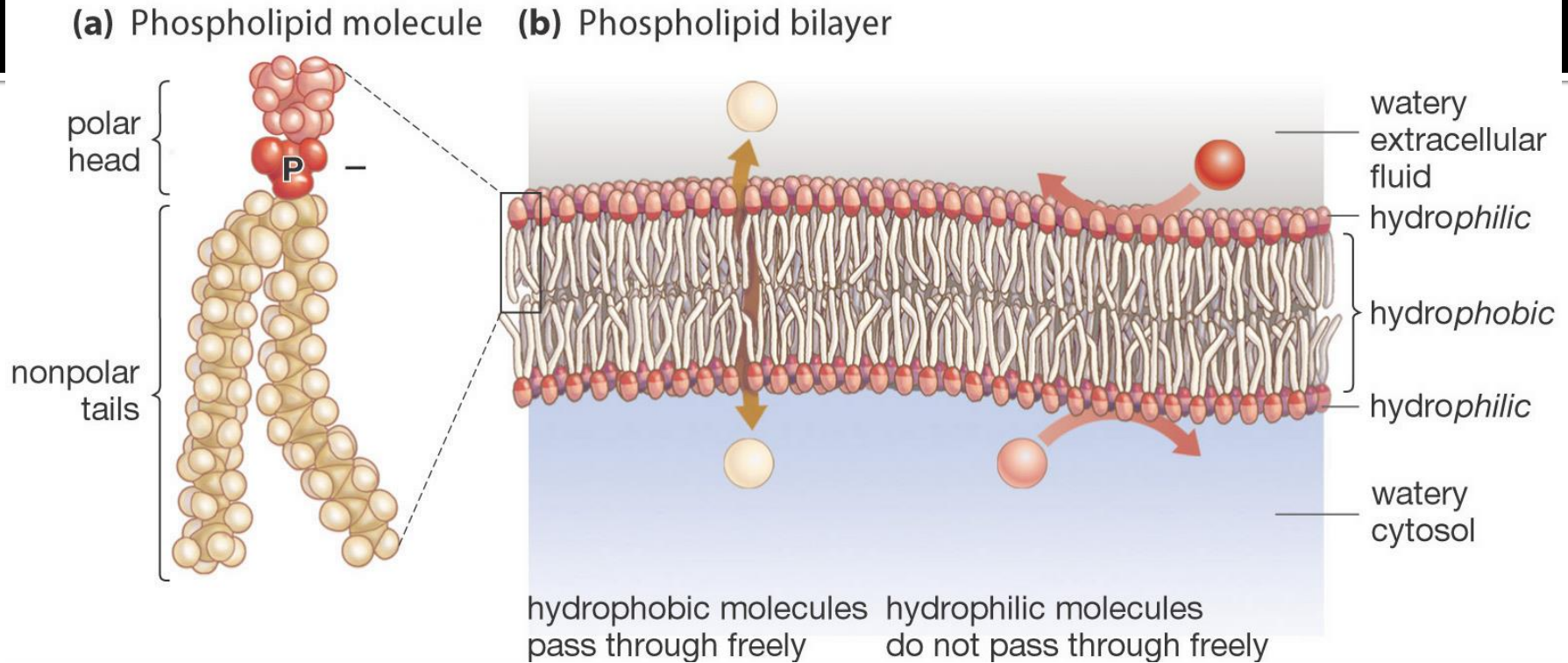
c. **Act as markers** (nametags) for cell recognition and fighting off disease

Fluid Mosaic Model

21. FLUID- because individual phospholipids and proteins can **move side-to-side** within the layer, like it's a liquid.
22. MOSAIC- because of the pattern produced by the **scattered protein molecules** when the membrane is viewed from above.



Cell Membrane

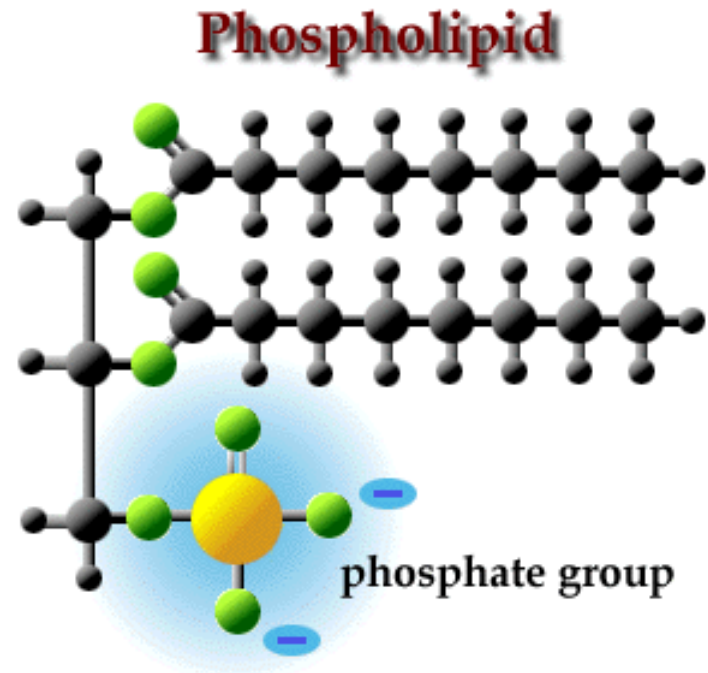


23. The cell membrane is made of **2** layers of phospholipids called the lipid **bilayer**.

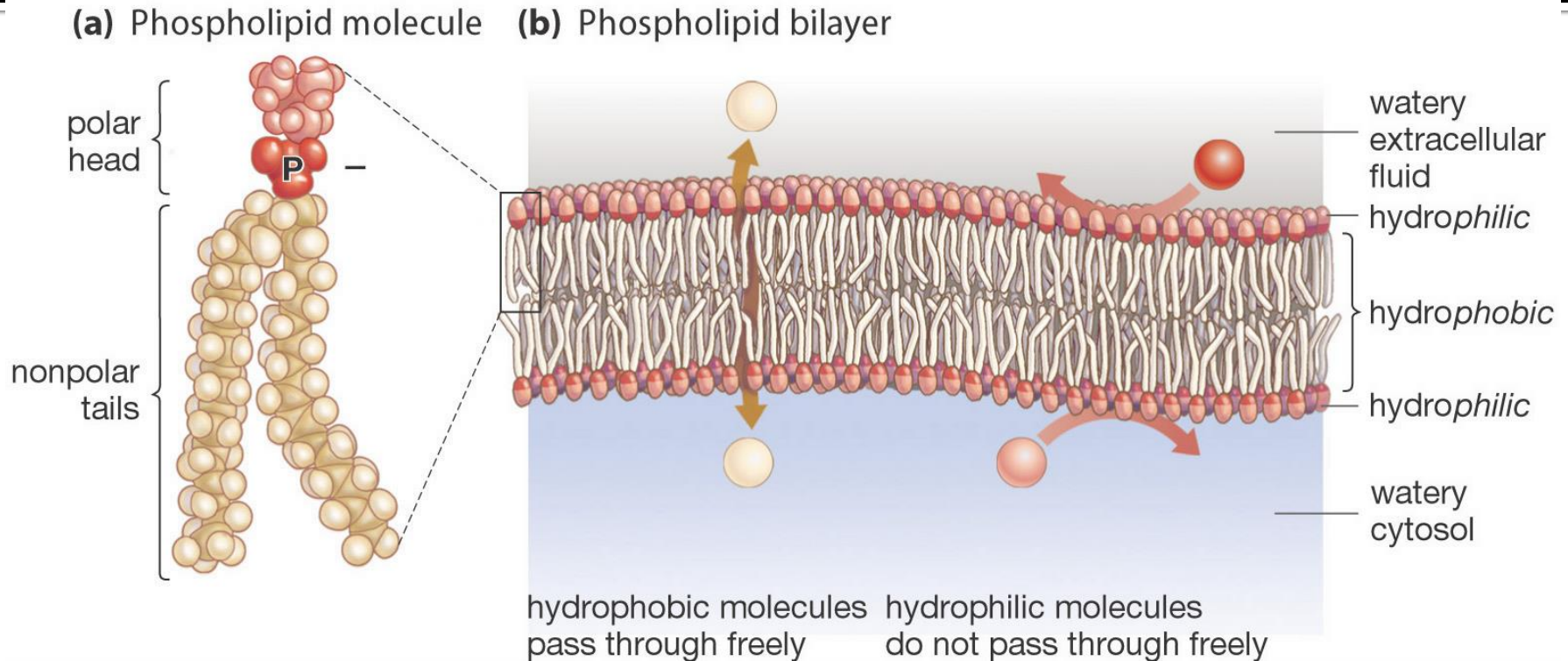
24. Hydrophobic molecules pass easily; **hydrophilic** DO NOT.

Solubility

25. Materials that are soluble in **lipids** can pass through the cell membrane easily.

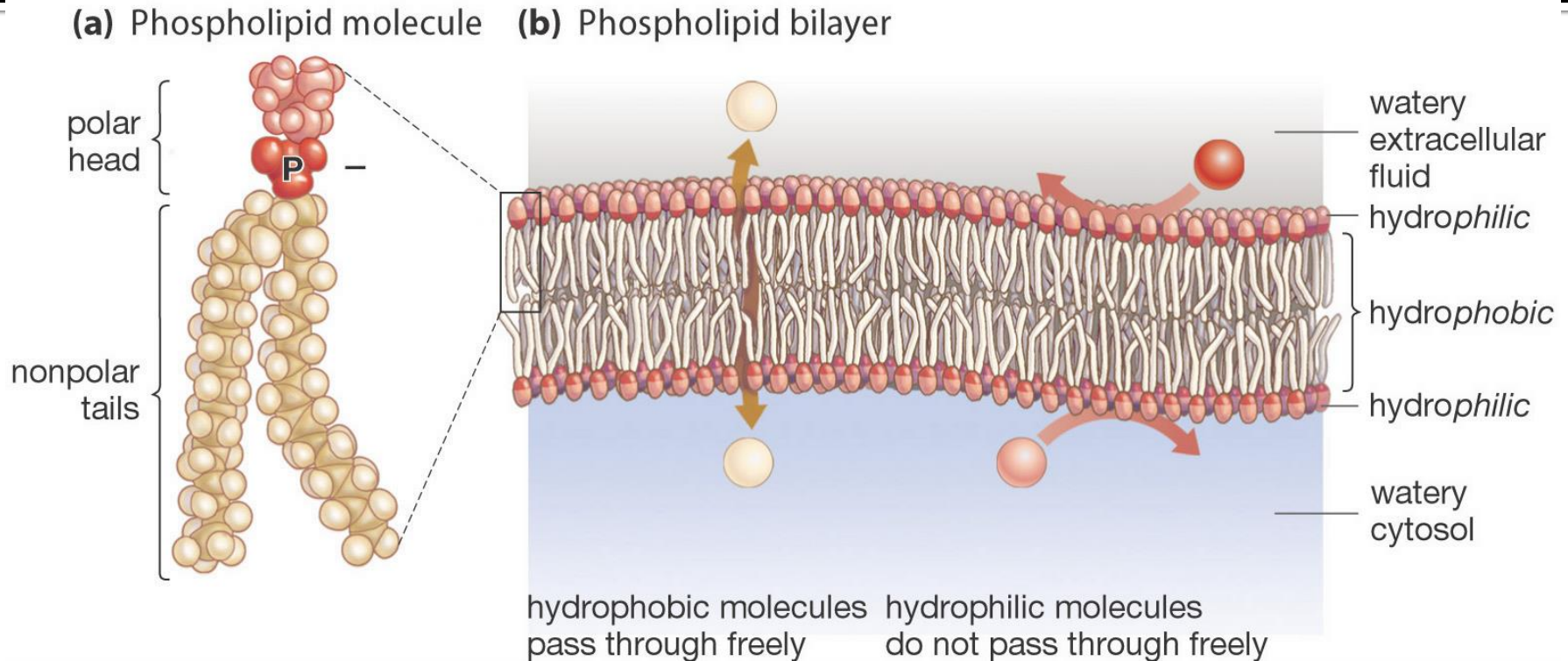


Semipermeable Membrane



26. Small molecules and larger hydrophobic molecules move through easily. Examples: O_2 , CO_2 , H_2O

Semipermeable Membrane



27. **Ions**, **hydrophilic** molecules larger than water, and large **molecules** such as proteins do not move through the membrane on their own.

Movement Through the Membrane

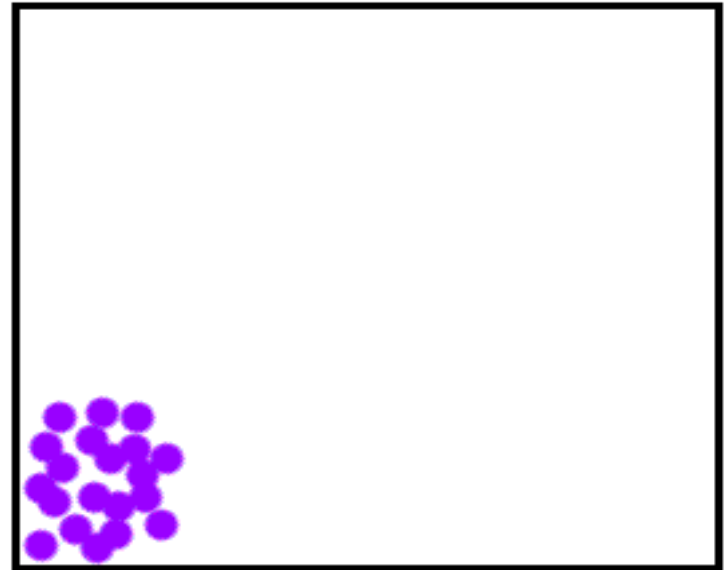
- Cell membrane monitors travel of substances across its surface.
- 28. Substances can pass the membrane wall through
 - a. **Passive Transport** (requiring NO energy; HIGH TO LOW)
 - i. **Simple diffusion**
 - ii. **Osmosis**
 - iii. **Facilitated Diffusion**
 - b. **Active Transport** (requiring energy; LOW TO HIGH).
 - i. **Endocytosis**
 - ii. **Exocytosis**

Passive Transport

29. When molecules/ particles pass through a cell membrane **WITHOUT** energy; **high** to **low** concentration
30. 3 Types:
 - a. **Diffusion**—movement of O_2 , CO_2 , alcohol
 - b. **Osmosis**—movement of H_2O only
 - c. **Facilitated Diffusion**—movement of larger particles (glucose); need a facilitator protein

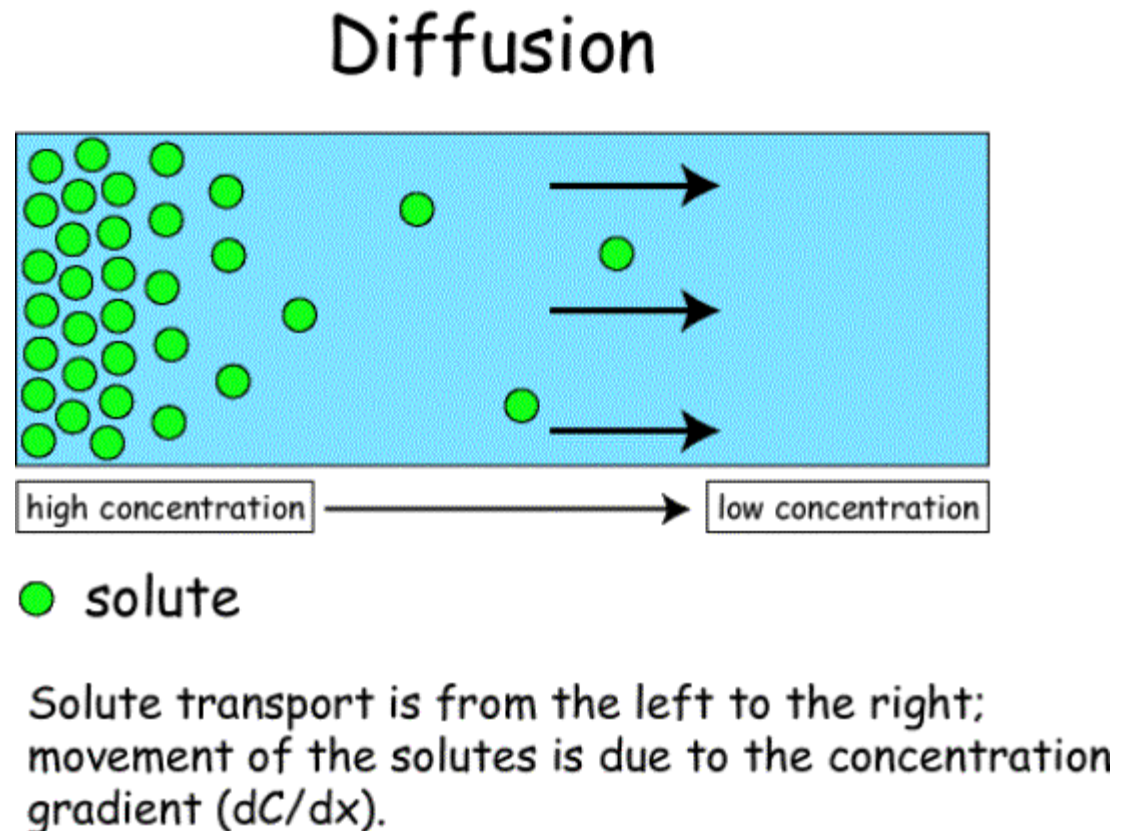
Simple Diffusion

- 31. Simple **diffusion** requires no energy
- 32. Molecules move from areas of **HIGH to LOW** concentration



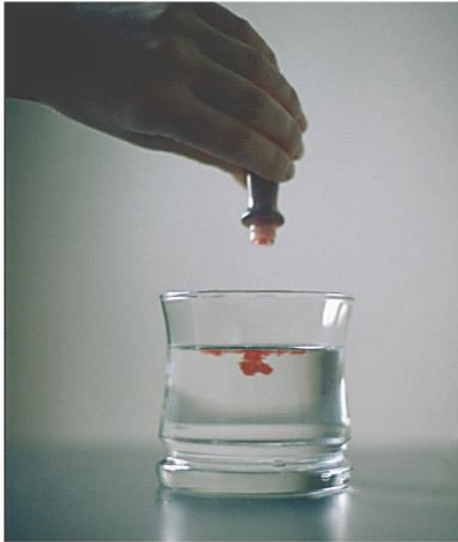
Diffusion

33. Diffusion is a **PASSIVE** process which means **no energy** is used to make the molecules move
34. They have a natural **KINETIC ENERGY**.



36. Diffusion of Liquids

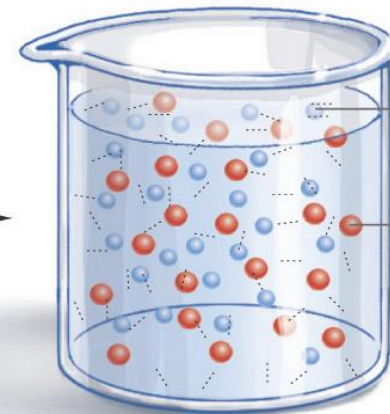
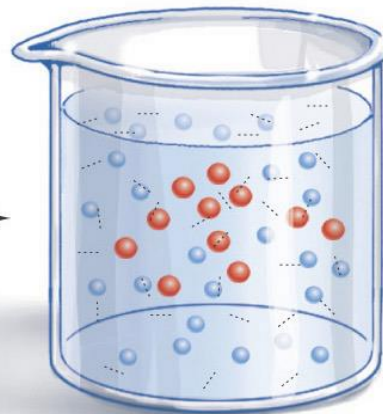
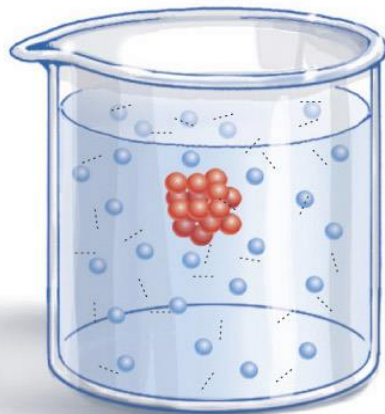
(a) Dye is dropped in



(b) Diffusion begins



(c) Dye is evenly distributed

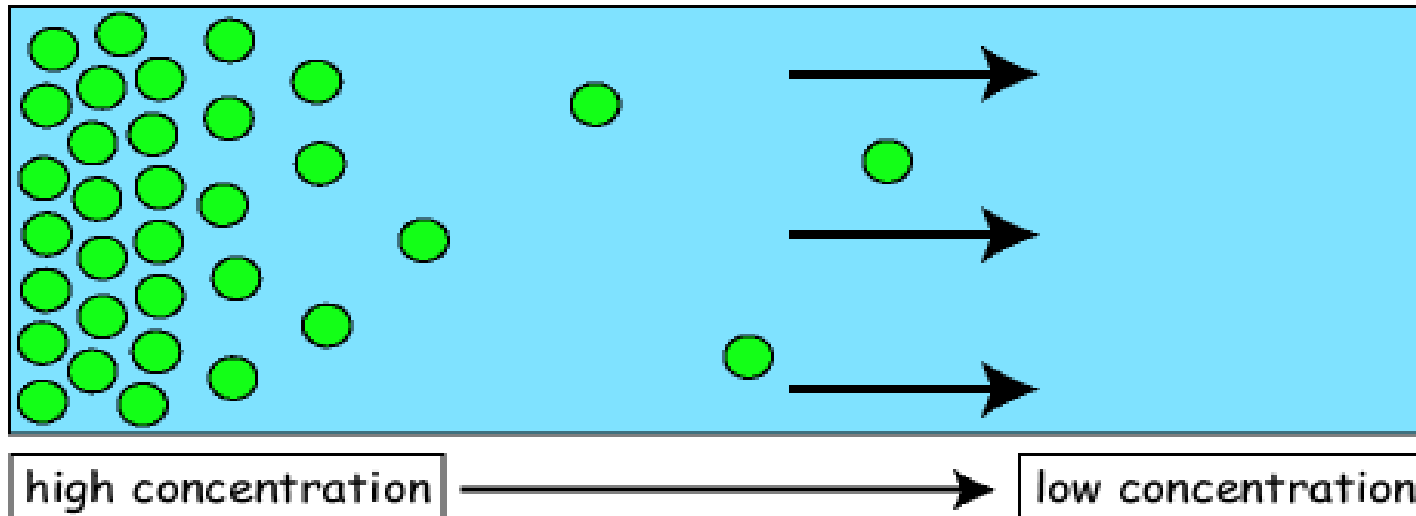


water molecules

dye molecules

Diffusion through a membrane

Diffusion

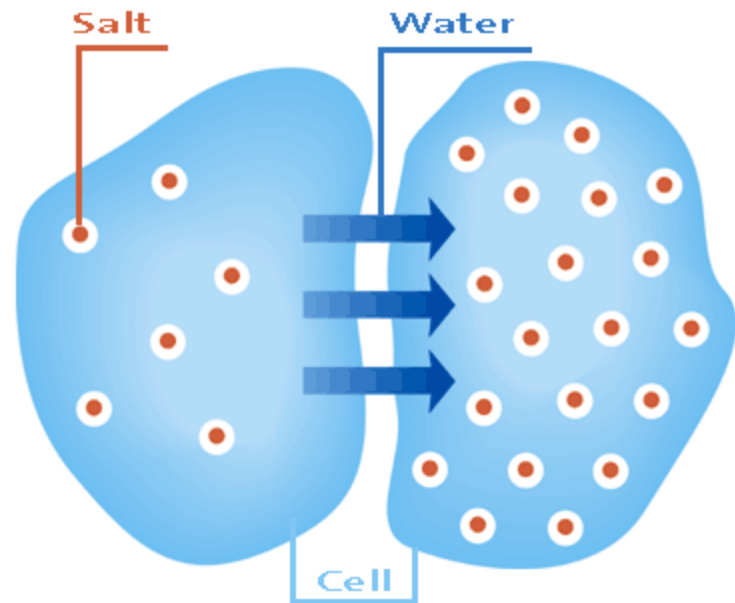


● solute

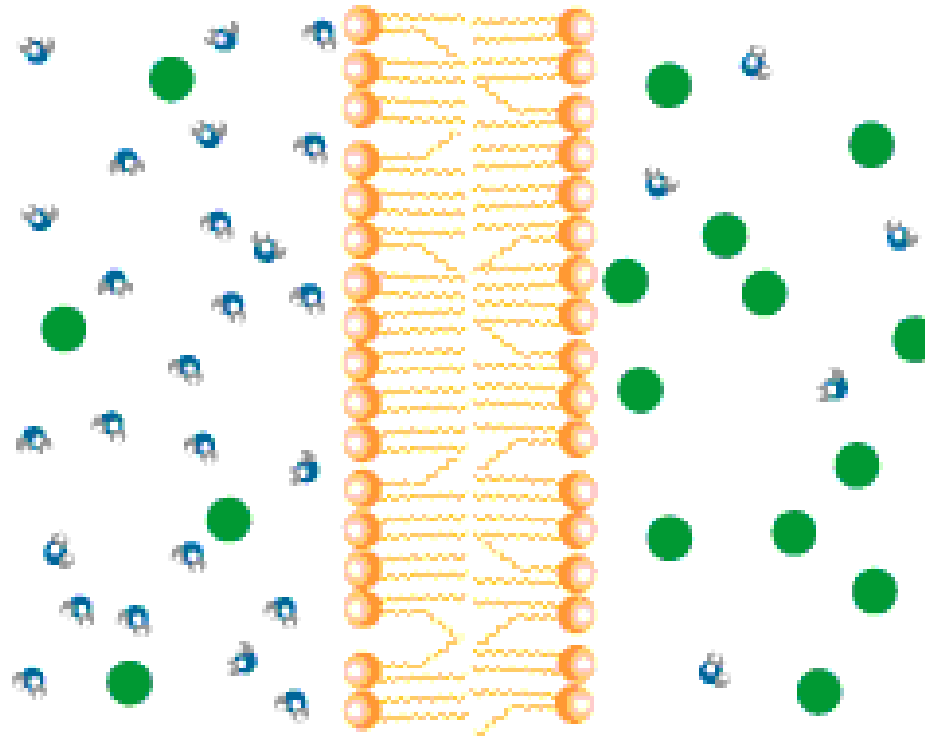
- Just a reminder.....
- 36. Solute moves DOWN a concentration gradient (HIGH to LOW)

Osmosis

- 37. Diffusion of **water** across a membrane
- 38. If water potential is HIGH, solute concentration is **low**.
- 39. If water potential is LOW, solute concentration is **high**.



Diffusion of Water Across a Membrane



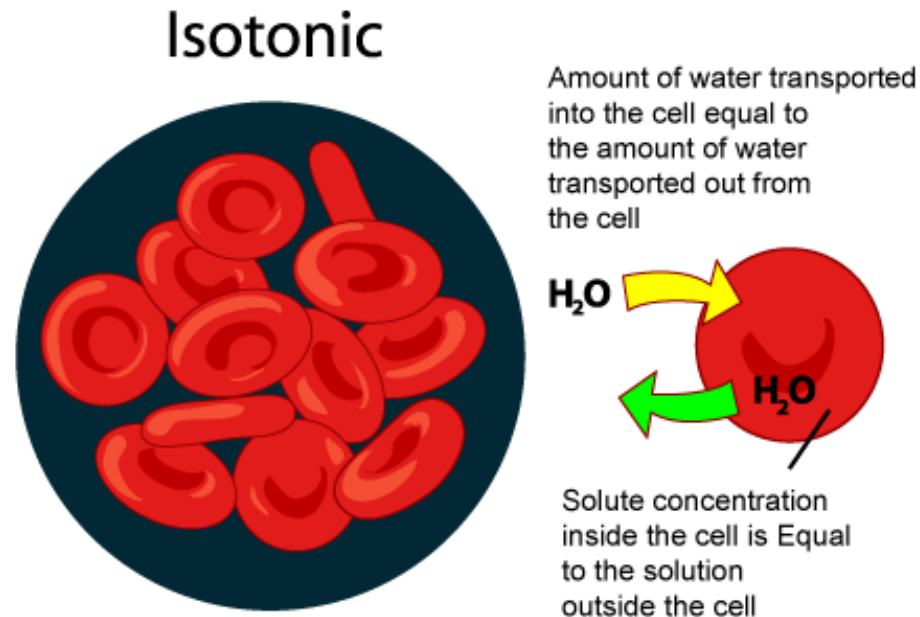
High H_2O potential
Low solute concentration

Low H_2O potential
High solute concentration

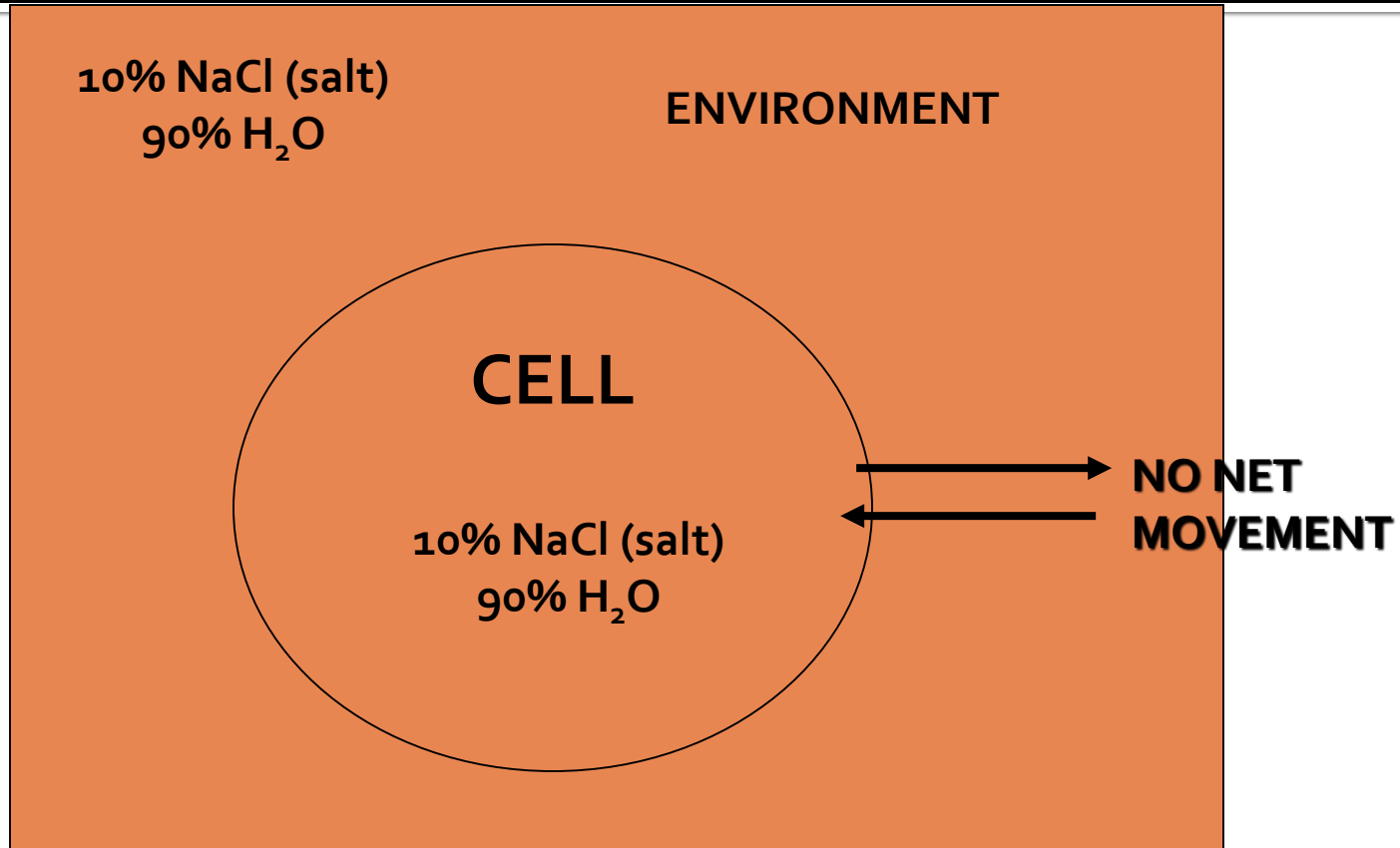
Types of Solutions

Isotonic Solution – Red Blood Cells

40. When the concentration is the **same** inside and **same** outside the cell.



41. Cell in Isotonic Solution



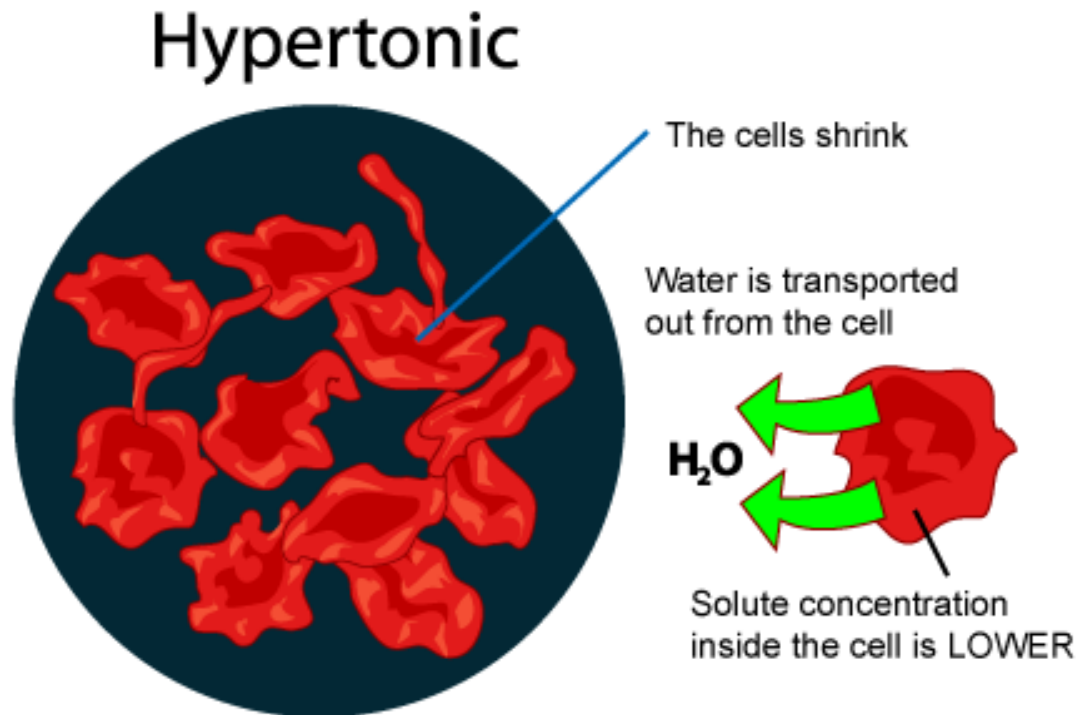
What is the direction of water movement?

The cell is at equilibrium.

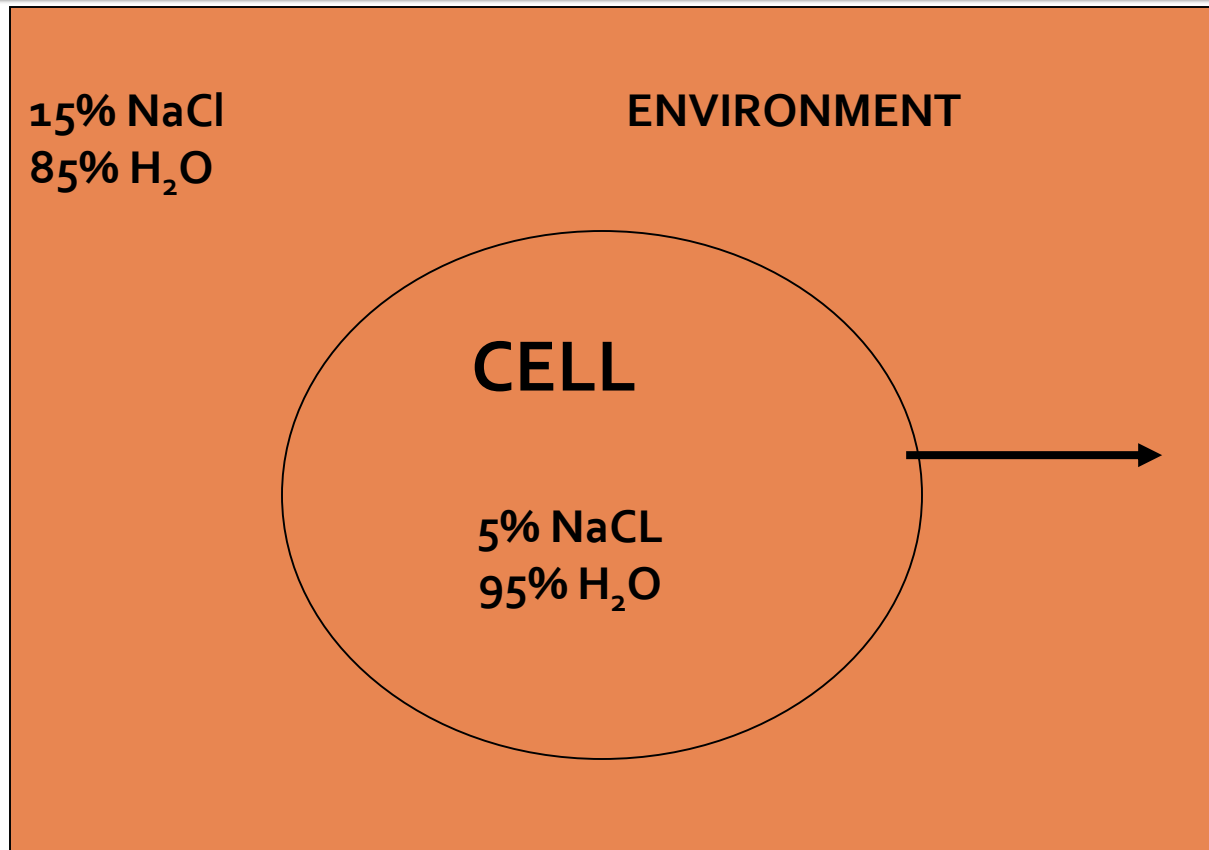
Types of Solutions

Hypertonic Solutions – Red Blood Cells

42. A hypertonic solution has a **higher** solute concentration than the cell



43. Cell in Hypertonic Solution

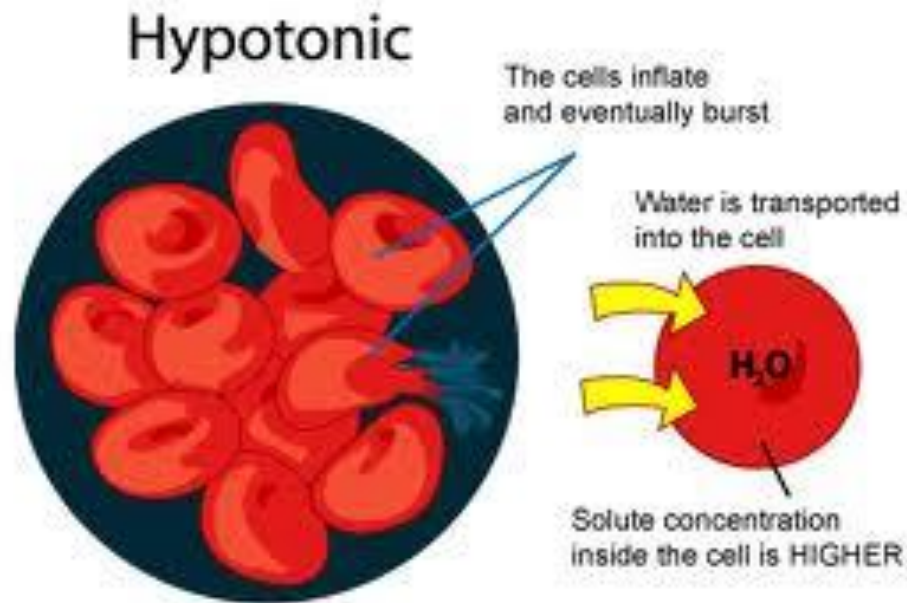


What is the direction of water movement?

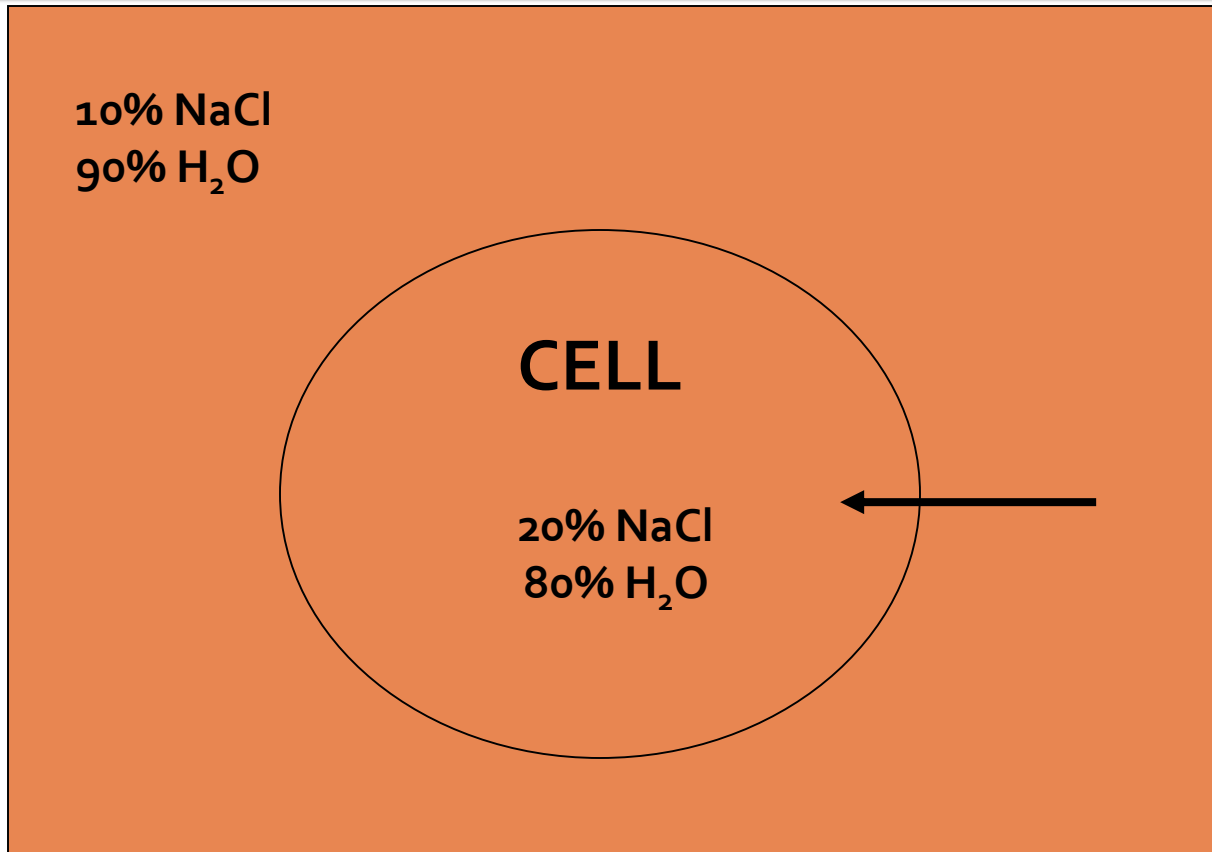
Types of Solutions

Hypotonic Solution – Red Blood Cells

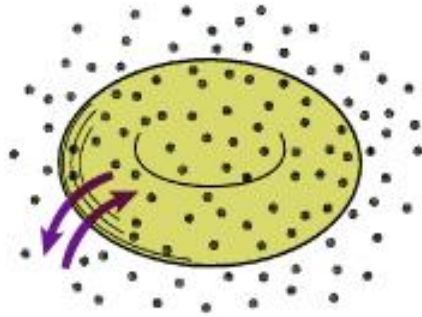
44. A hypotonic solution has a **lower** solute concentration than the cell



45. Cell in Hypotonic Solution



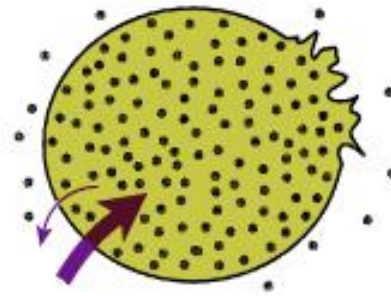
What is the direction of water movement?



Isotonic Solution



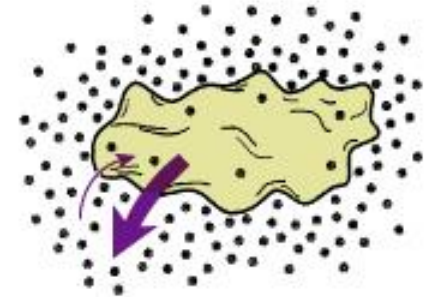
NO NET MOVEMENT OF
H₂O (equal amounts
entering & leaving)



Hypotonic Solution



NET MOVEMENT OF
WATER: GOES IN
CYTOLYSIS

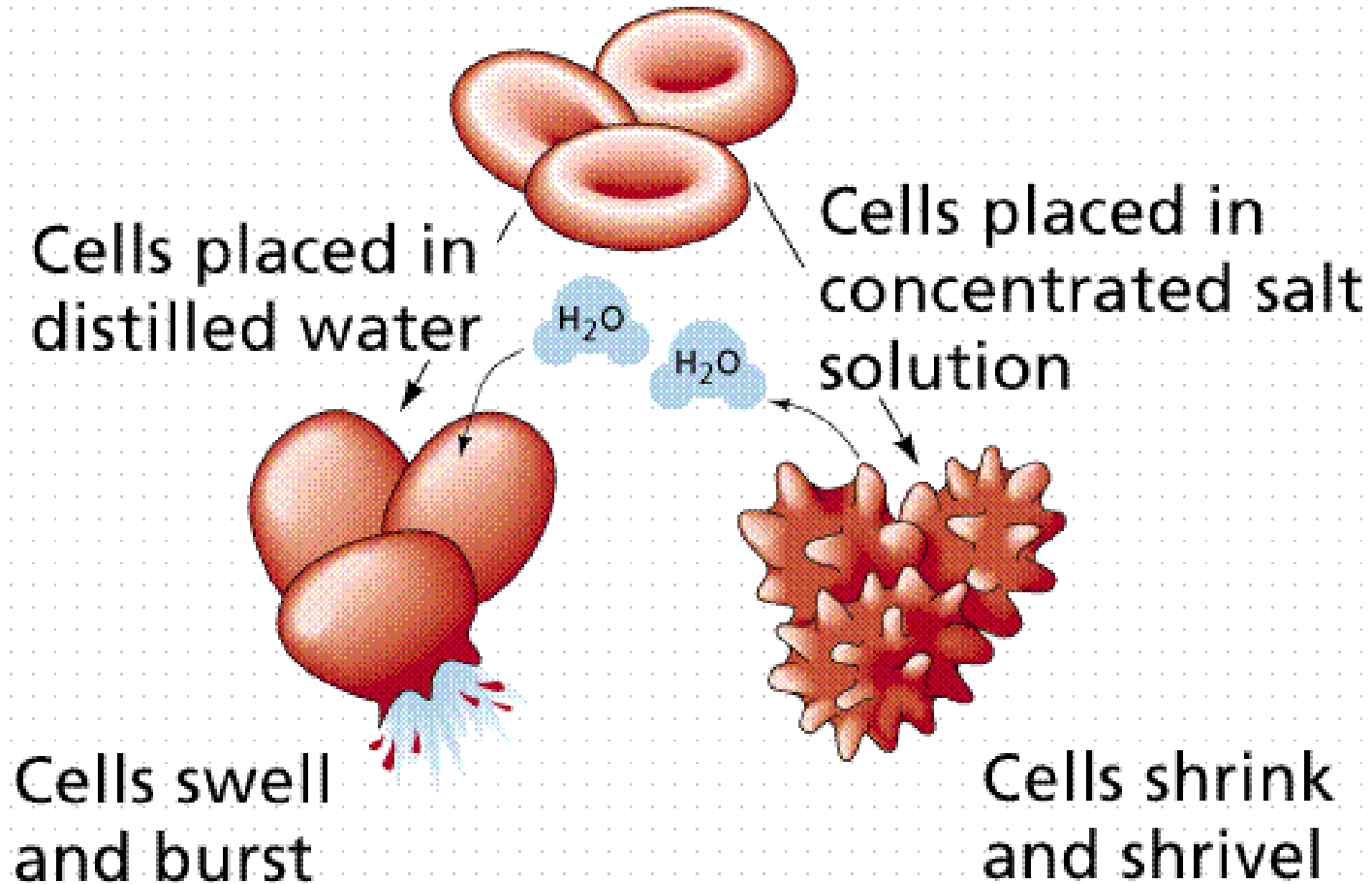


Hypertonic
Solution



NET MOVEMENT OF
WATER: GOES OUT
PLASMOLYSIS

Cytolysis & Plasmolysis

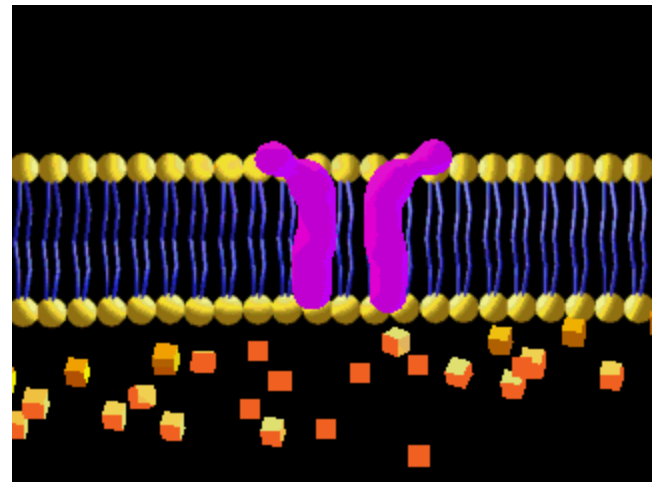


48. Cytolysis

49. Plasmolysis

Facilitated Diffusion

- 50. Movement of specific molecules across cell membranes through **protein channels**
- 50. Examples: glucose
- 51. Needs a **"carrier" protein**

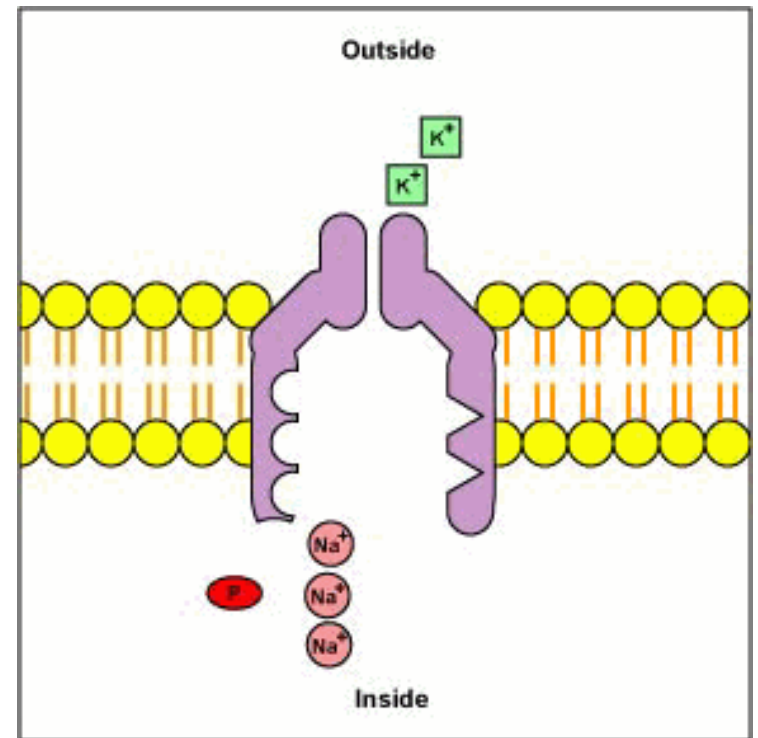


Active Transport

- 52. **Active Transport** - when particles (solute) pass through a cell membrane WITH energy, but go from **low** to **high** concentration
- 53. This requires energy in the form of **ATP**
 - a. Requires a transport protein or “pump”
 - b. Usually found in the cell membrane
- 54. Moves **AGAINST** the concentration gradient

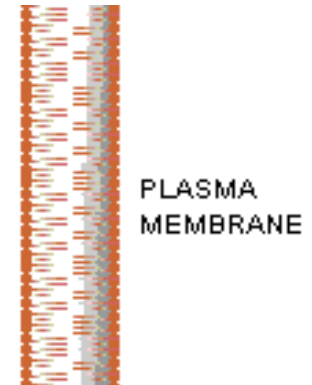
Active Transport

- Examples: Pumping Na^+ (sodium ions) out and K^+ (potassium ions) in against strong concentration gradients.
55. Called the **Sodium-Potassium Pump**



Moving the Big Stuff

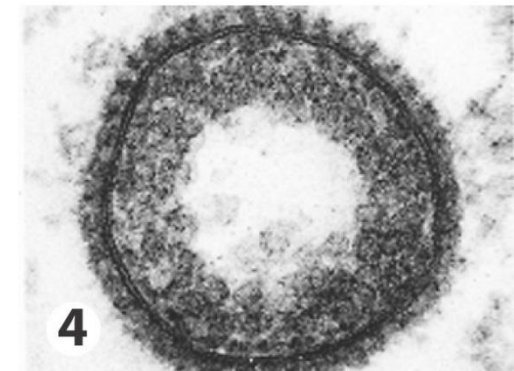
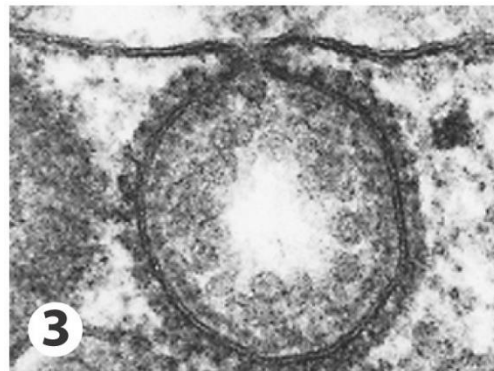
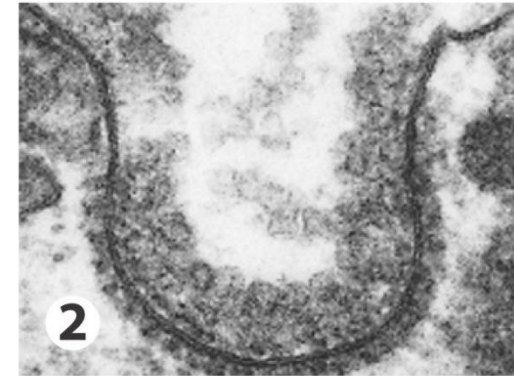
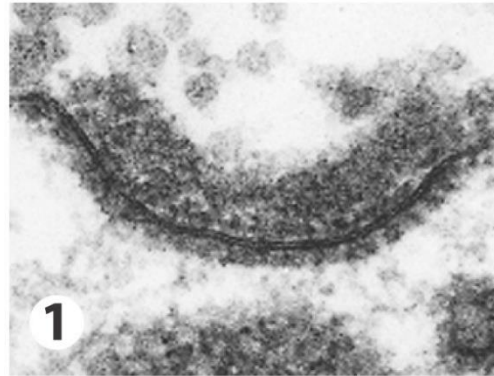
56. **Exocytosis** – moving things out of the cell or forcing contents out of the cell.
57. Molecules are moved out of the cell by **vesicles** that fuse with the plasma membrane.
- This is how many hormones are secreted and how nerve cells communicate with one another.



Moving the Big Stuff

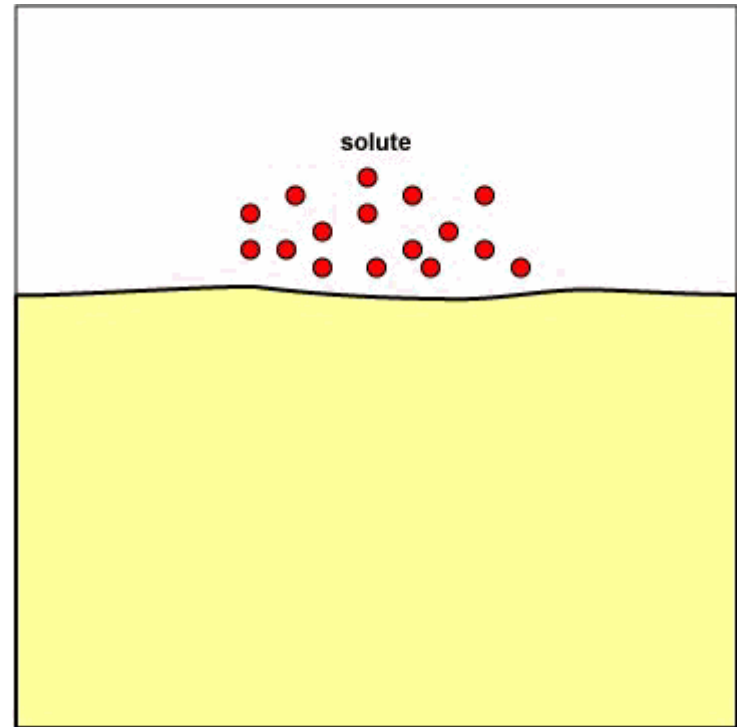
58. Large molecules move materials into the cell by one of three forms of **endocytosis**.

58. Process of taking material into the cell by means of infoldings, or pockets, of the cell membrane.



Pinocytosis

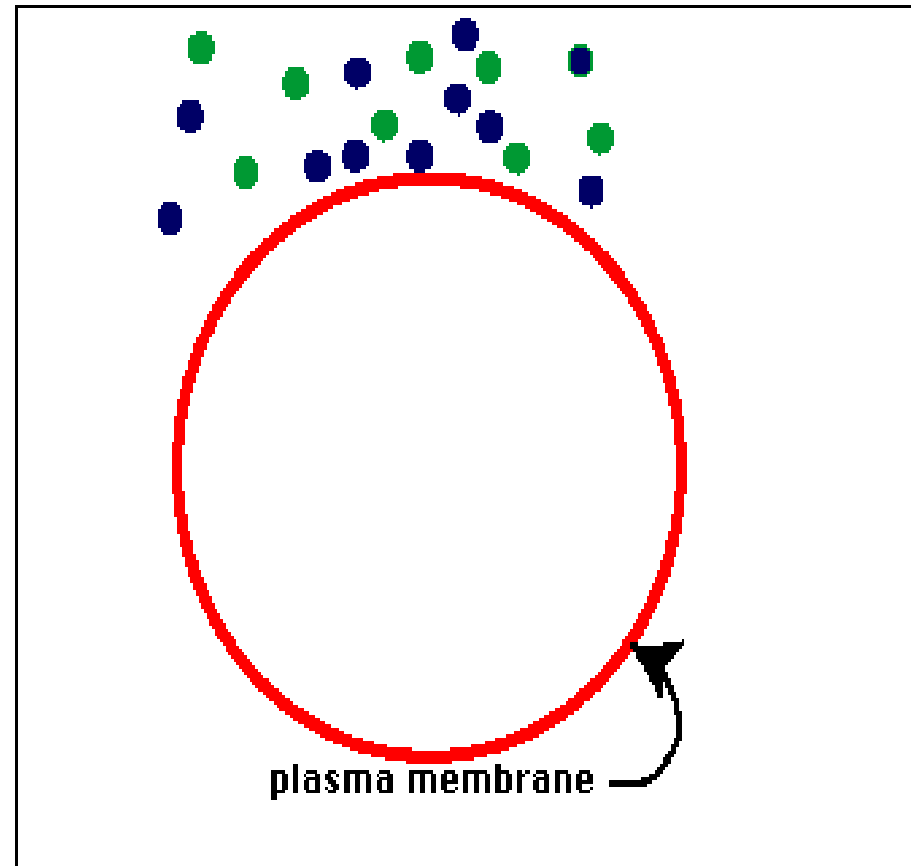
- Most common form of endocytosis
- Takes in dissolved molecules as a vesicle
- Takes in liquid from the surrounding environment



Pinocytosis

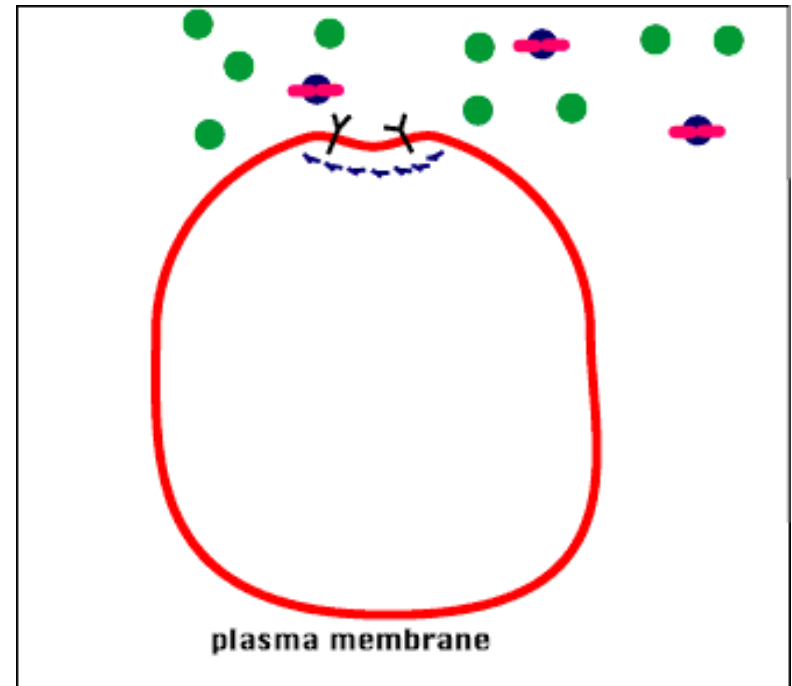
- Cell forms an invagination
- Materials dissolve in water to be brought into the cell

59. **Pinocytosis** -
called "cell
drinking"



62. Receptor-Mediated Endocytosis

60. Some integral proteins have **receptors** on their surface to recognize and take in hormones, cholesterol, and other materials.



61. Phagocytosis

- Used to engulf large particles such as food, bacteria, and other materials into vesicles.
- Called “cell eating”

