Cell Boundaries

Cell Boundaries

- Cells create boundaries through:
  - Cell Membranes
  - Cell Walls

Diffusion through cell boundaries

- Every cell = a liquid environment

So why have a cell membrane ?

- Function of the cell membrane = regulate the movement of dissolved molecules from one side of membrane to the other

DEMO

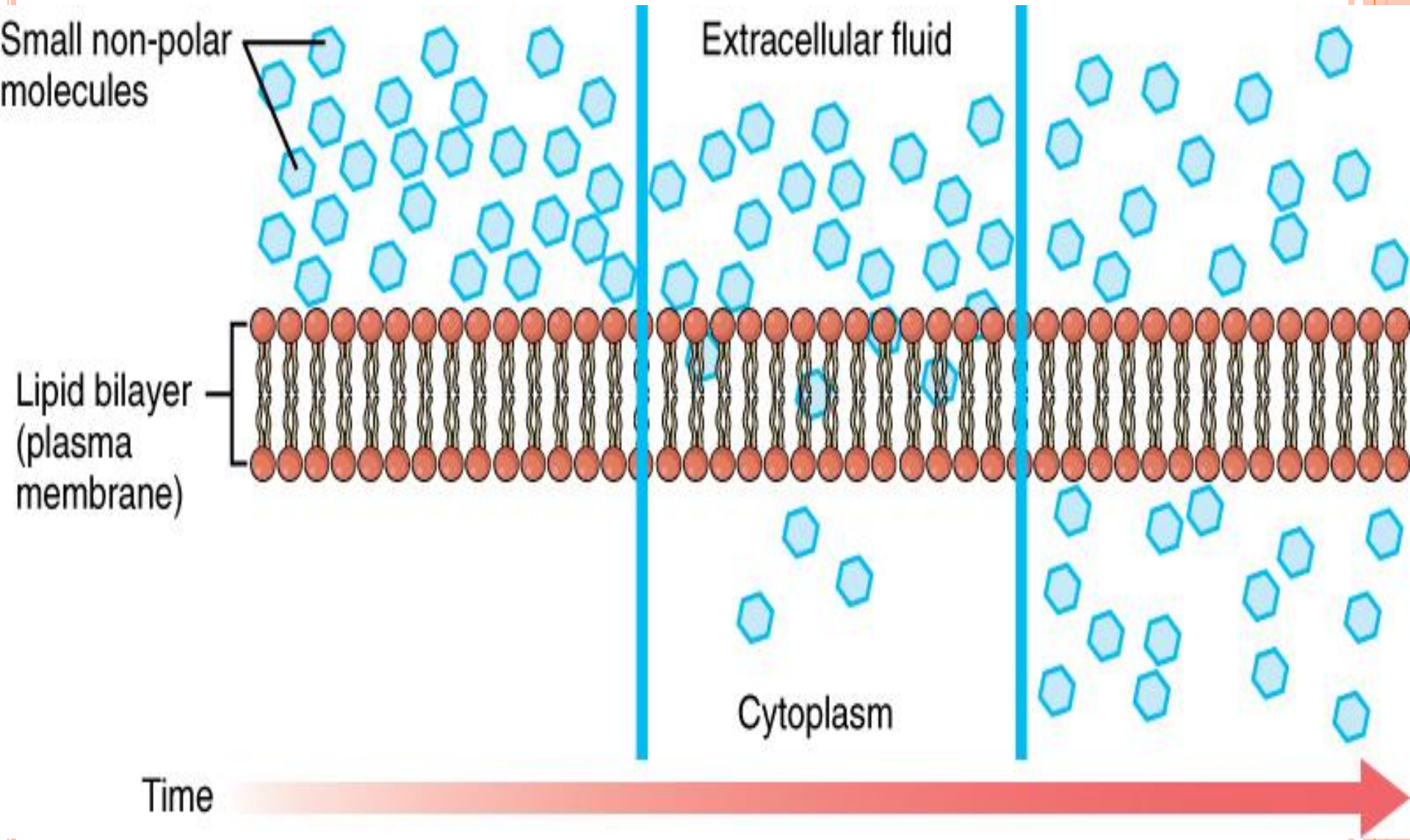
- Beaker = Liquid outside of a cell
- Baggie= Cell membrane
- Inside Baggie = Inside a cell

- Hypothesis ? How will our cell membrane react to the iodine?

Diffusion

- In a solution, particles = move constantly
- R⇨ particles move from an area of more concentrated to less concentrated
- A process = **DIFFUSION.**
- When the concentration of the solution = same throughout a system, R ⇨ **EQUILIBRIUM.**

DIFFUSION


Small non-polar molecules
Extracellular fluid
Lipid bilayer (plasma membrane)
Cytoplasm
Time

Types of Membranes

- Some substances = too large or too strongly charged to cross the lipid bilayer.
- Substance can diffuse across a membrane, the membrane = ***permeable*** to it.
- Substance cannot diffuse= ***impermeable*** to it.

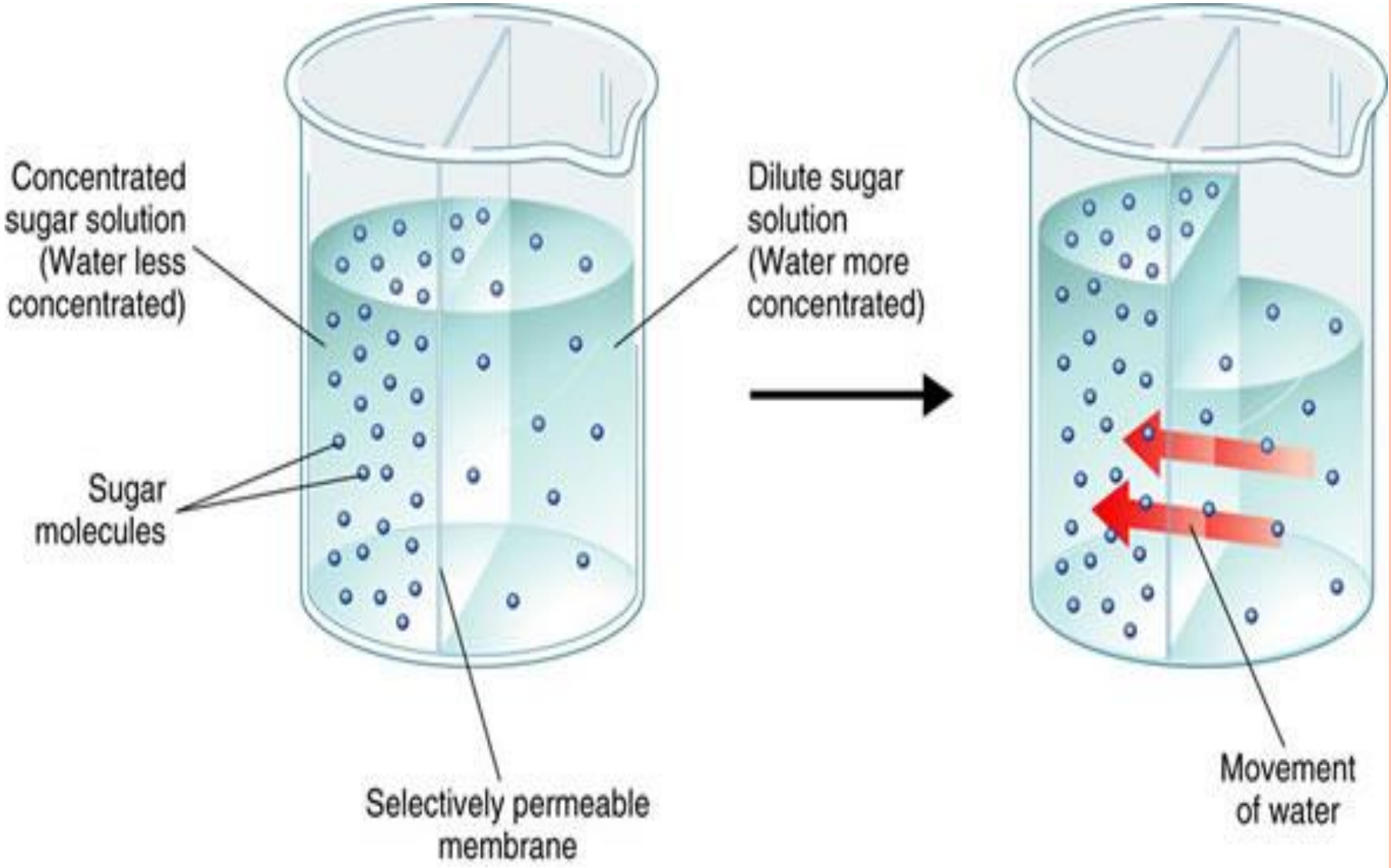
OSMOSIS

- Most membranes = selectively permeable

What do you think that means?

Some substances can pass across and others cannot

- Water passes easily, even though many solute molecules cannot.
- R ⇨ **OSMOSIS**
- **OSMOSIS:** The diffusion of water through a selectively permeable membrane.


Concentrated sugar solution (Water less concentrated)
Sugar molecules
Selectively permeable membrane
Dilute sugar solution (Water more concentrated)
Movement of water

OSMOSIS – DIFFUSION

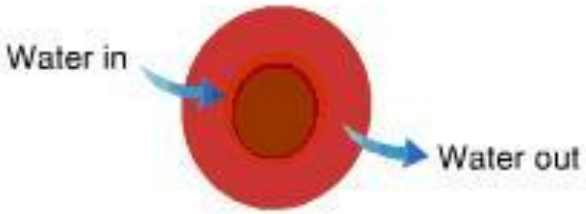
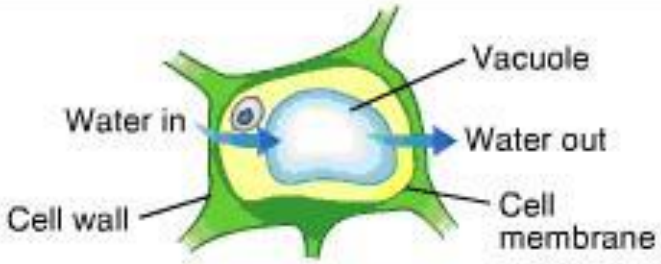
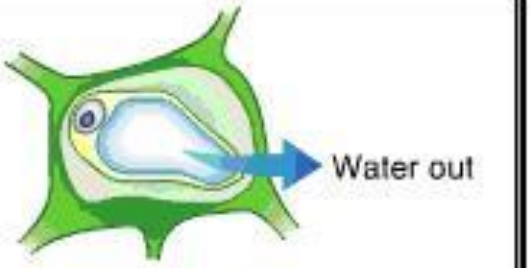
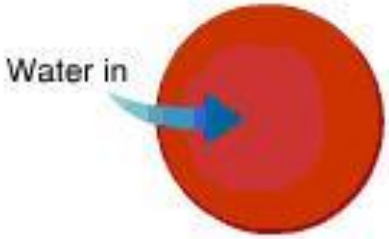
- They sound similar but they ARE NOT!
- Watch this video
- Make a VENN DIAGRAM that compares the two processes
- Put this in your notes *** Good Quiz Question ***

What was the point of the demonstration yesterday?

Types of "Fluid Environments"

- Isotonic: same concentration inside and outside of cell
- Hypertonic: solution has higher concentration than cell
- Hypotonic: solution has lower concentration than cell

The Effects of Osmosis on Cells

Solution	Animal Cell	Plant Cell
Isotonic: The concentration of solutes is the same inside and outside the cell.		
Hypertonic: Solution has a higher solute concentration than the cell.		
Hypotonic: Solution has a lower solute concentration than the cell.		

Effects of Osmosis Cells placed in an isotonic solution neither gain nor lose water. In a hypertonic solution, animal cells shrink, and plant cell vacuoles collapse. In a hypotonic solution, animal cells swell and burst. The vacuoles of plant cells swell, pushing the cell contents out against the cell wall. Predicting ***What would happen to the animal cell in the isotonic solution if it were placed in pure water?***

- Isotonic: Cells neither gain nor lose water.
- Hypertonic: Animal cells shrinks while vacuole of plant cells collapse.
- Hypotonic: Animal cells swell and burst while the vacuole of plant cells swell, pushing cell contents out against cell wall.

Osmotic pressure

- Osmosis R-> pressure known as osmotic pressure on the hypertonic side of a selectively permeable membrane.

- Ex. Cell and fresh water:

I. cell will be hypertonic due to sugars, proteins, etc.
II. Osmotic pressure will push water into the cell (trying to equal out the concentration).
III. Cell will expand and eventually burst.

- Cells in large organisms are not in danger of bursting.
- Most cells in large organisms don't come in contact with fresh water.
- Cells are bathed in fluids, (blood), that are isotonic ie: same strength as cell

- Other cells, (plant cells & bacteria), which come into contact w/ fresh water, are surrounded by a tough cell wall.

- Cell walls prevent the cells from expanding and bursting even under osmotic pressure.

Cell Membrane and Transport

- Crash Course

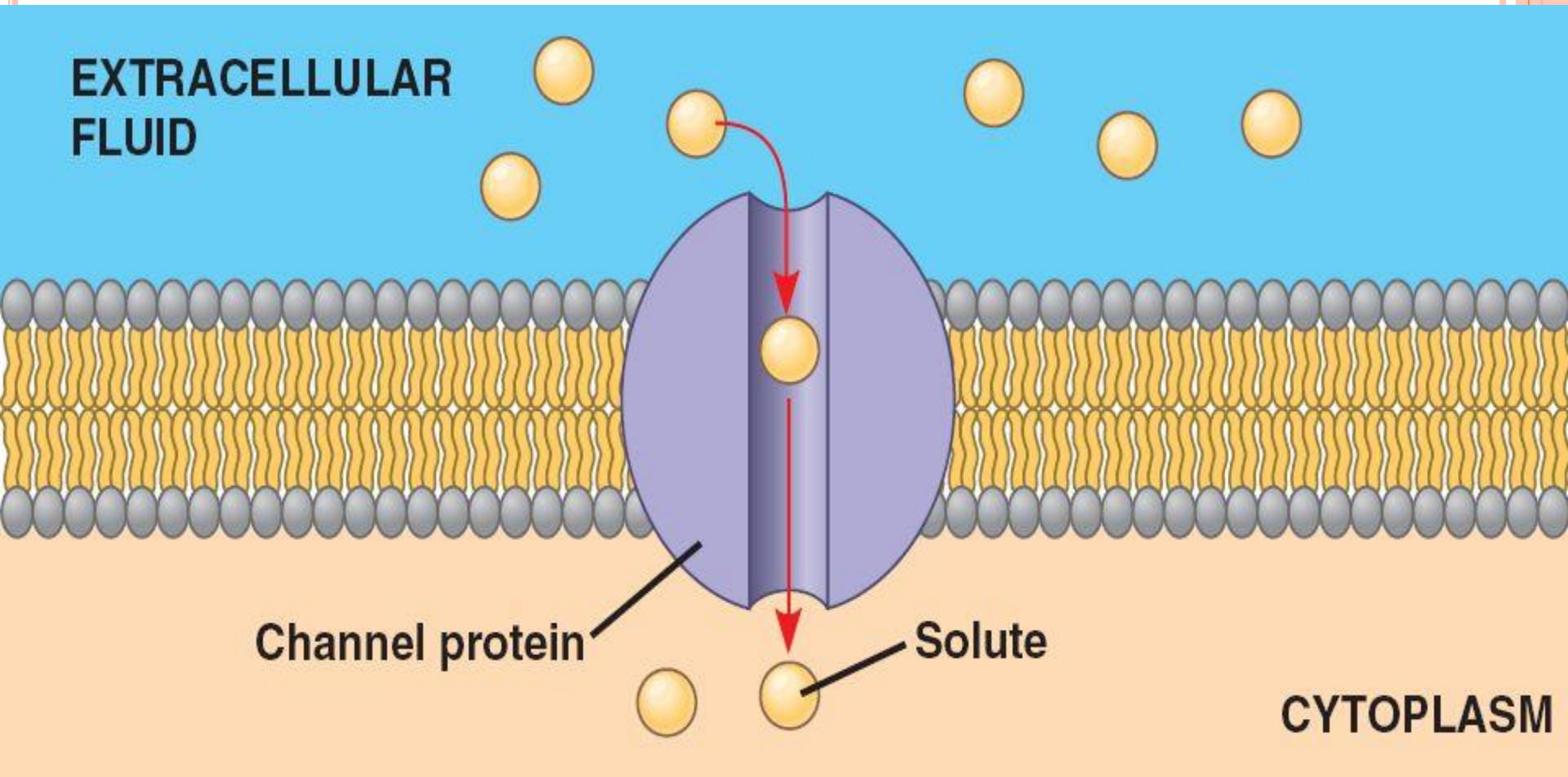
Facilitated diffusion

- Water molecules can cross a membrane through the lipid bilayer, but how do other molecules cross?

- Cell membranes have protein channels that act as carriers, making it easy for certain molecules to cross!

Facilitated diffusion= glucose (cannot diffuse across the lipid bilayer on their own)

R-> move through protein channels instead.



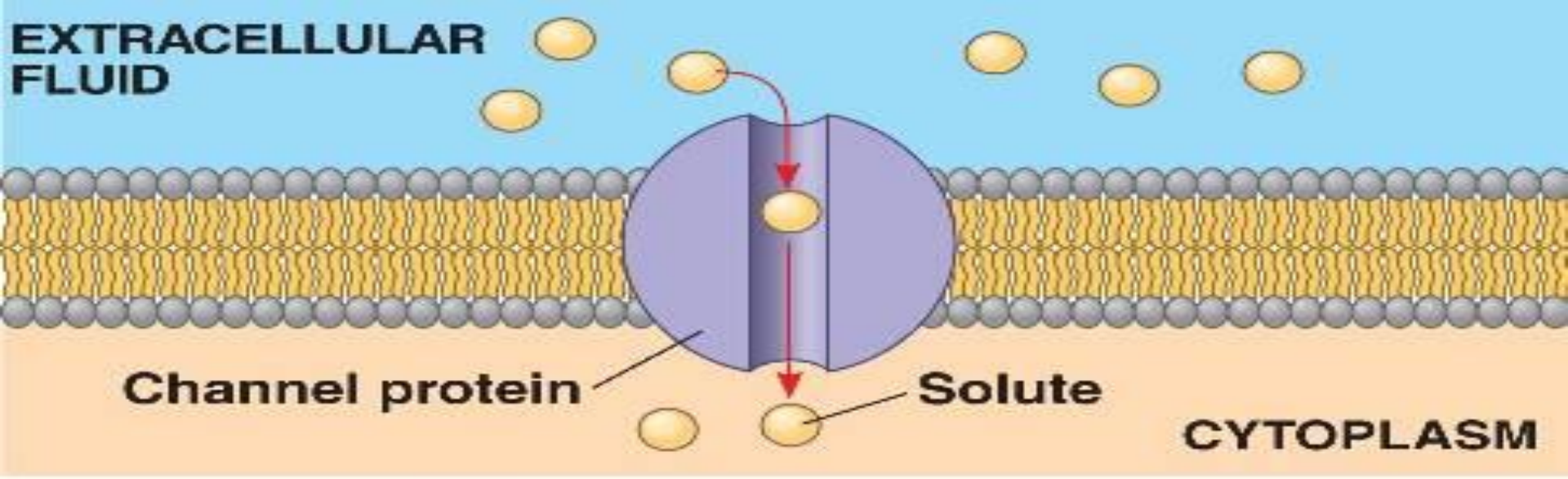
Facilitated Diffusion

- Hundreds of protein channels allow particular substances to cross different membranes.

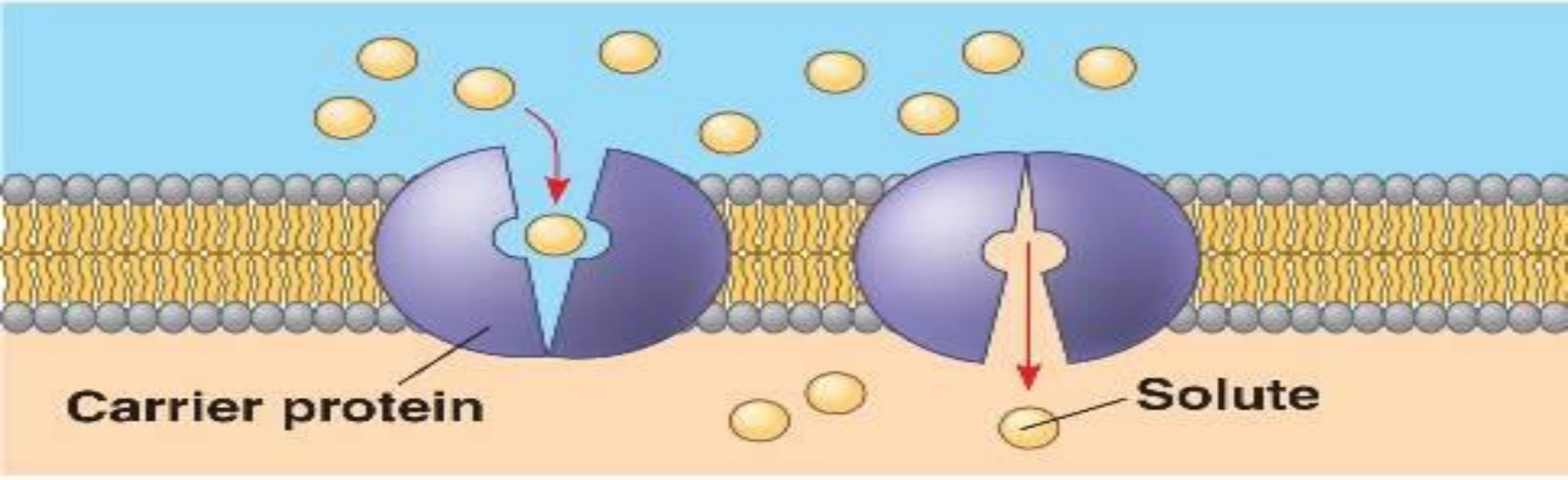
- This movement DOES NOT require the use of the cell's energy.

Active Transport

- Cells sometimes must move materials in the opposite direction – against a concentration difference.
- This is done by a process known as **active transport.**
- This requires energy!

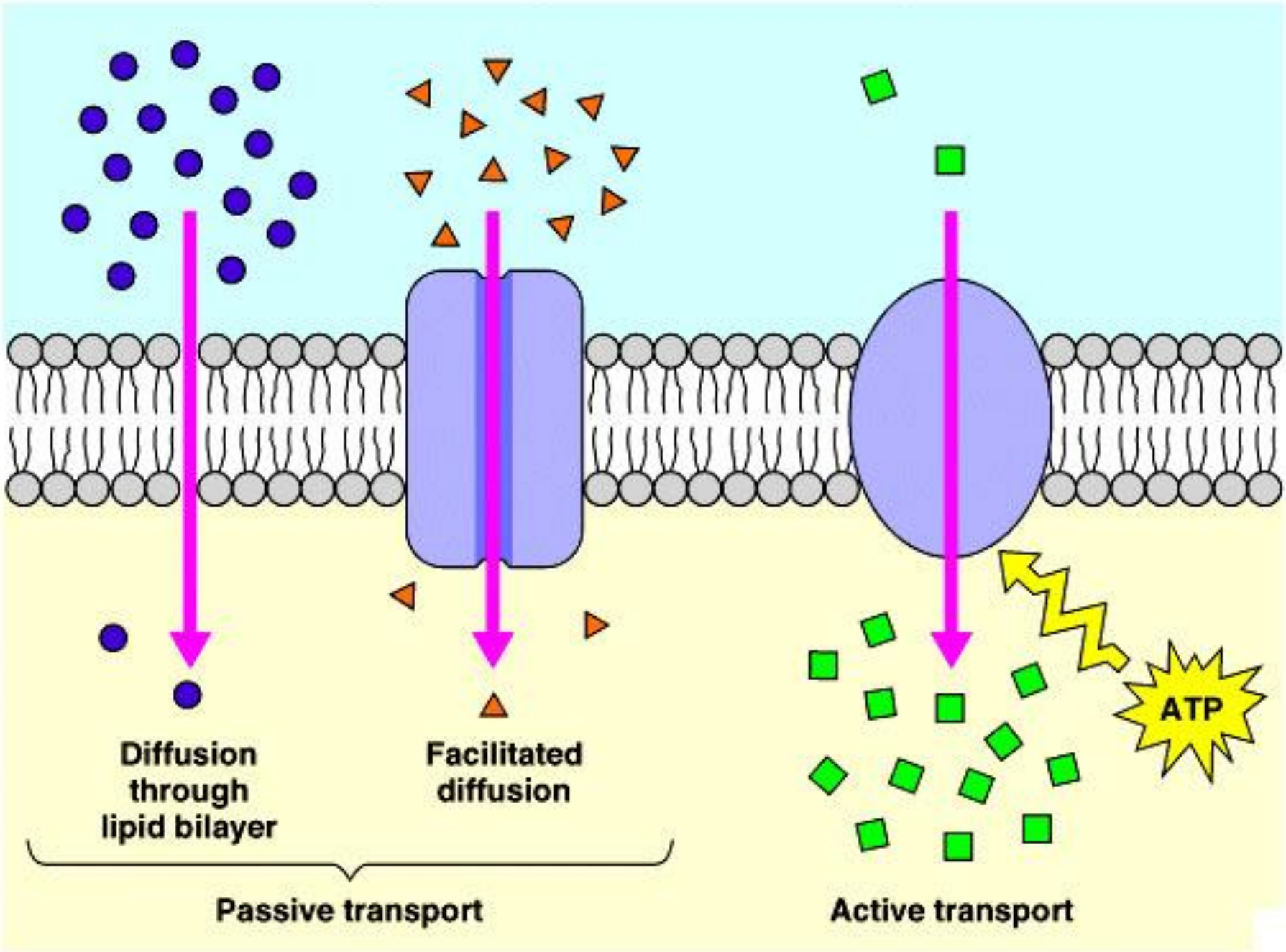


(a) A channel protein



(b) A carrier protein

Figure 8.14 Review: A comparison of passive and active transport



Endocytosis & Exocytosis

- The active transport of small molecules / ions across a cell membrane = transport proteins or "pumps" found in the membrane itself.
- Larger molecules and clumps of materials can be actively transported
- **endocytosis** and **exocytosis**.

- The transport involves changes in the shape of the cell membrane.

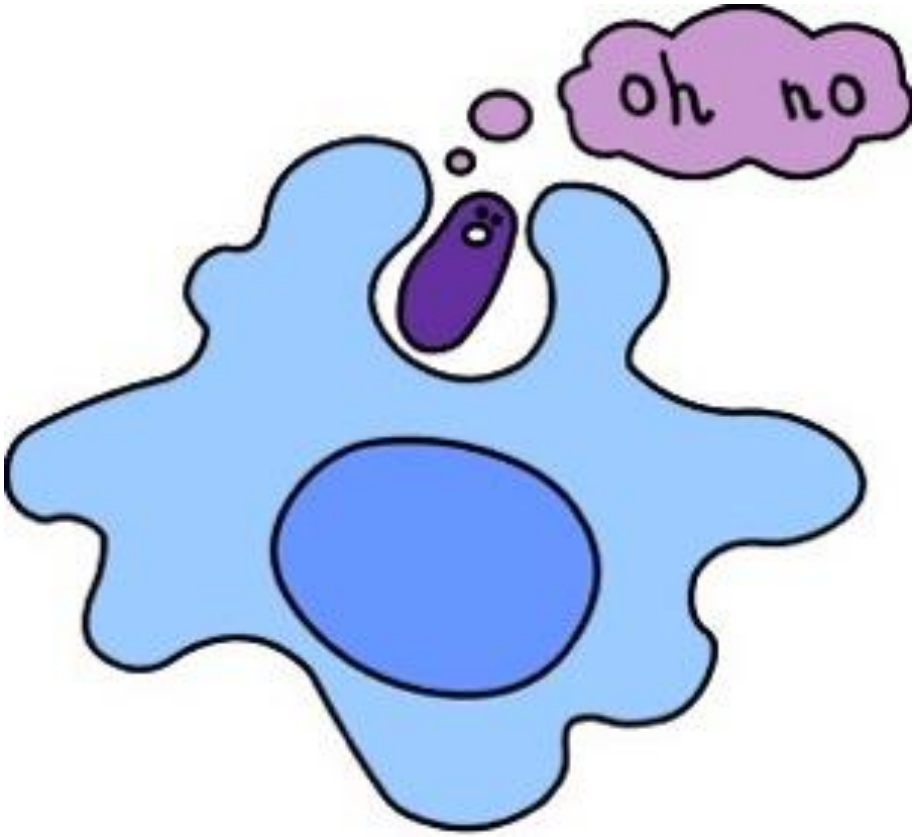
Endocytosis

- Taking materials into the cell by means of pockets of cell membrane.

- The pocket breaks loose from the outer portion of the cell membrane and forms a vacuole in the cytoplasm.

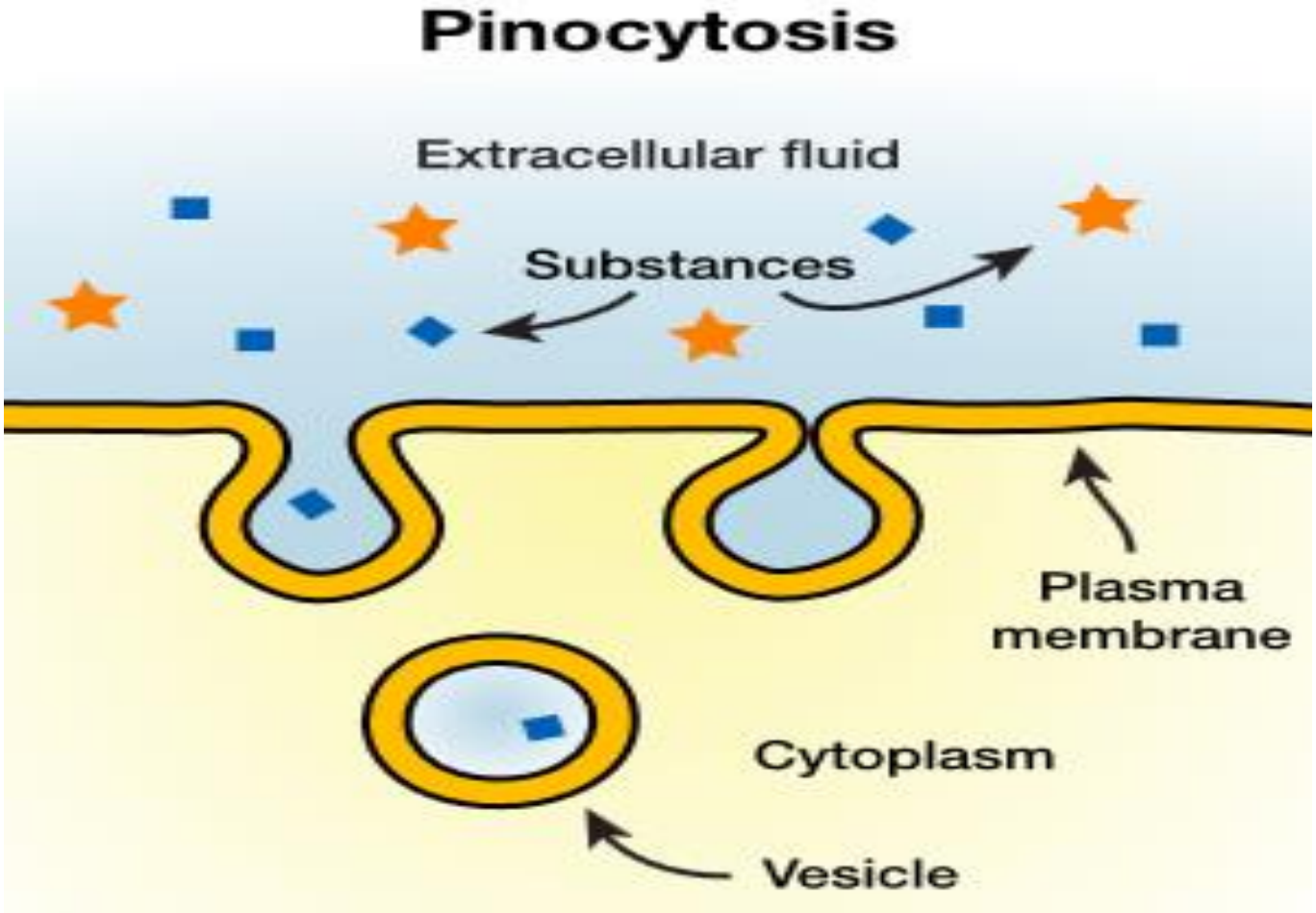
- One example of Endocytosis is:

1. **Phagocytosis**: cytoplasm surrounds a particle and packages it within a food vacuole. The cell then engulfs it!



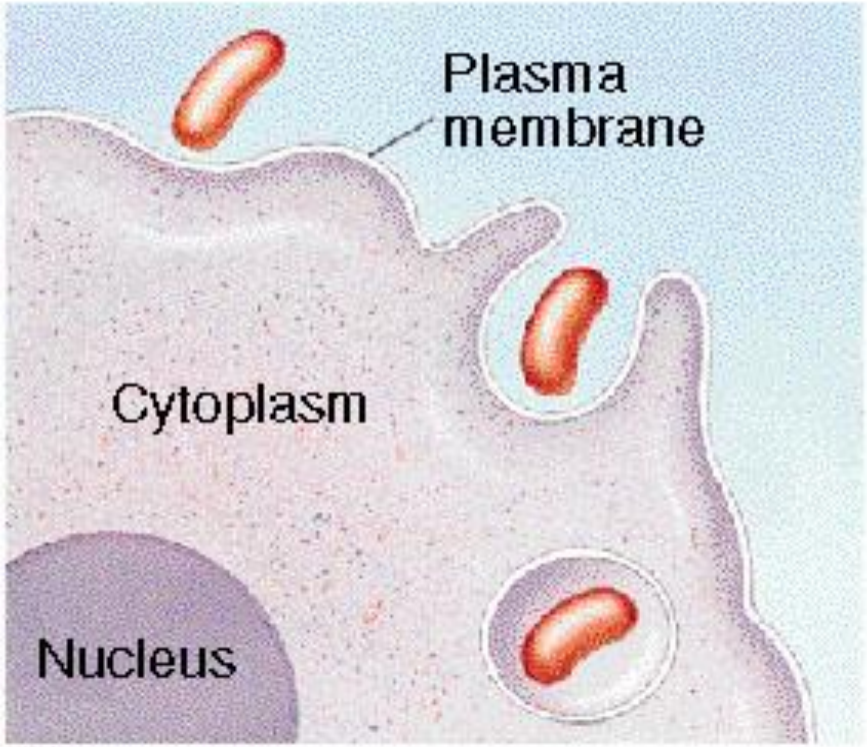
- Another example of Endocytosis is:

2. Pinocytosis: Tiny pockets form along cell membrane, fill with fluid and pinch off to form a vacuole within the cell.

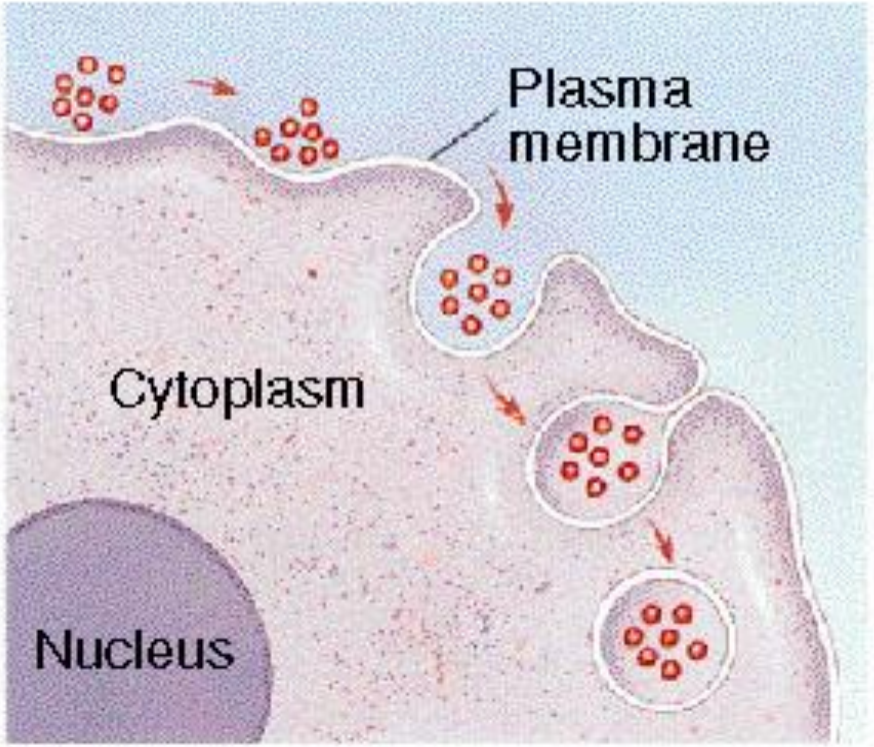


WHAT'S THE DIFFERENCE?

Endocytosis



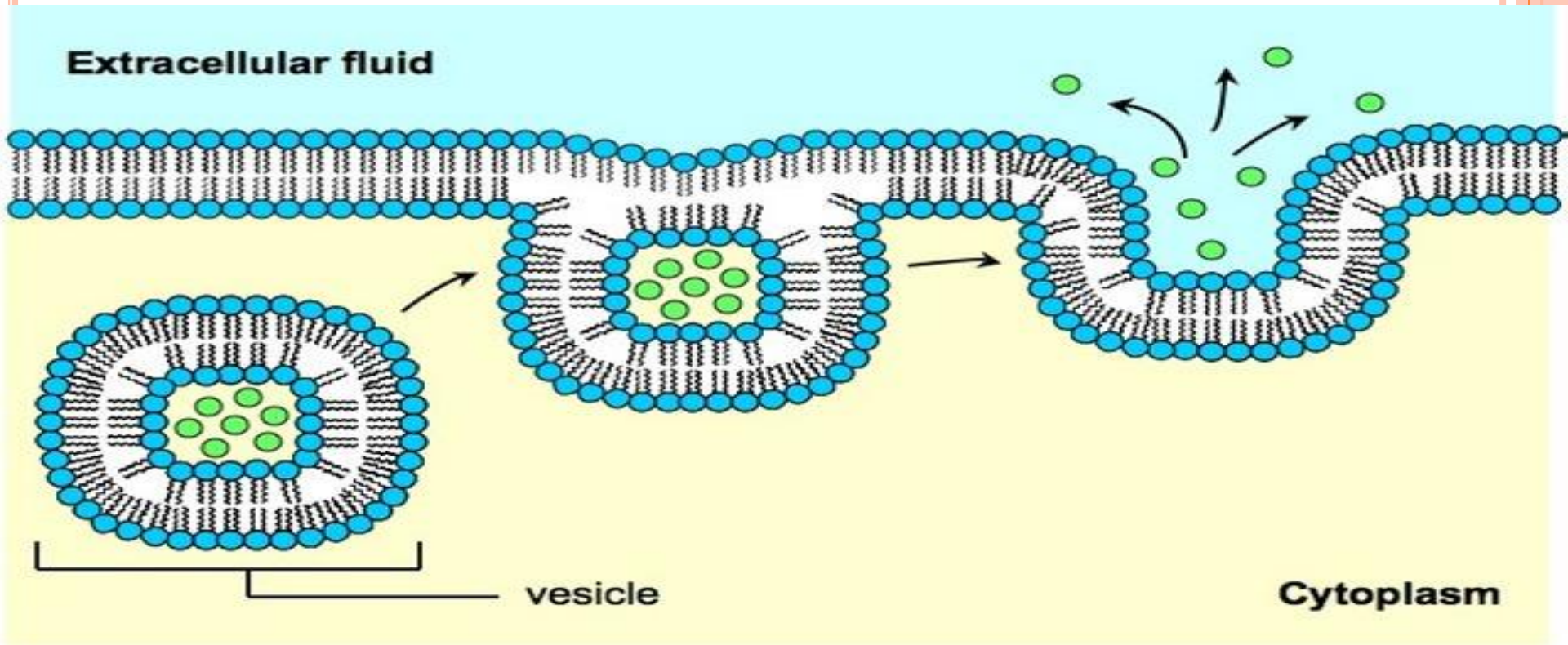
(a) PHAGOCYTOSIS



(d) PINOCYTOSIS

Exocytosis

- Large amounts of material released from the cell.
- The membrane of the vacuole surrounding the material fuses with the cell membrane, forcing the contents out of the cell.



Activity

- With the items brought into class, I want you to design the three ways substances cross the phospholipid bilayer
- Groups of 2-3
- Each group choose a different manner:
  - Diffusion
  - Facilitated Diffusion
  - Active Transport