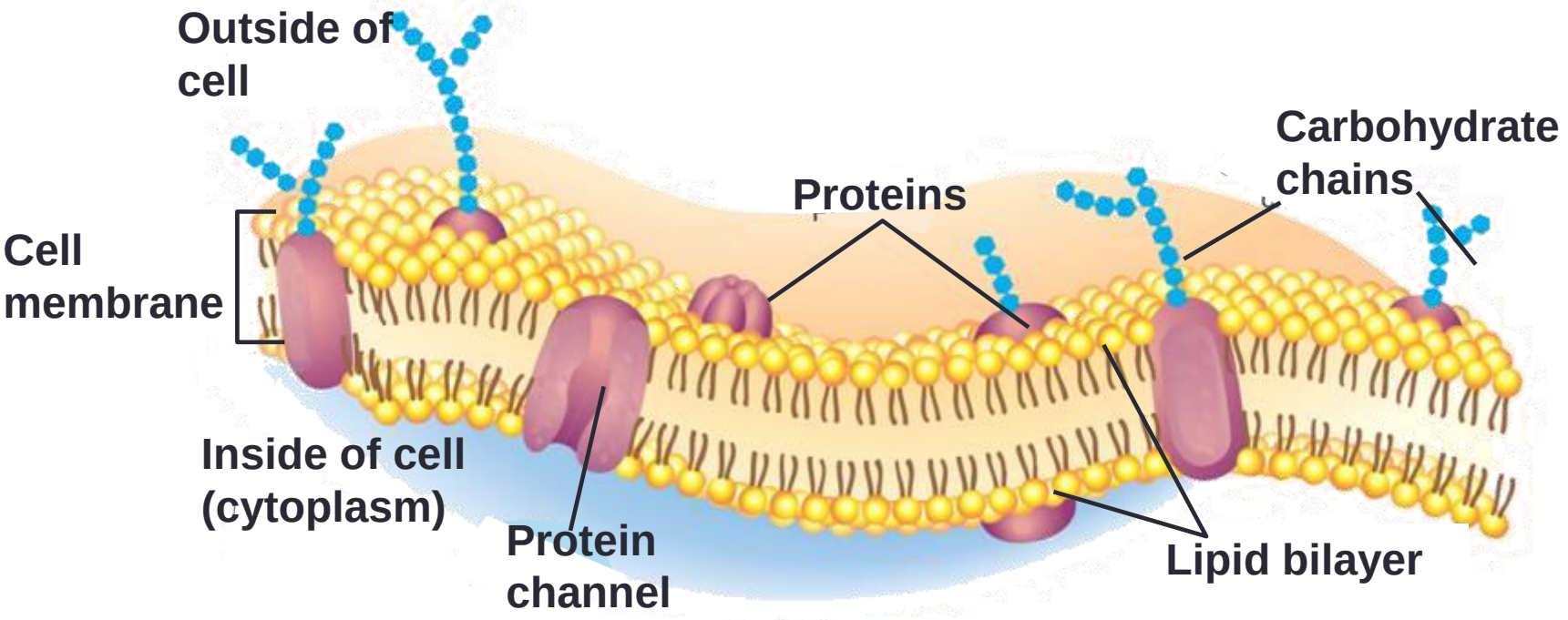
TRANSPORT ACROSS THE CELL MEMBRANE

How things move in and out of the cell.

Transport Across Cell Membranes

- Cells need to maintain **homeostasis** (balance).
- The cell membrane is a selective barrier: it chooses what it will allow in and what it will not.



Transport Across Membranes

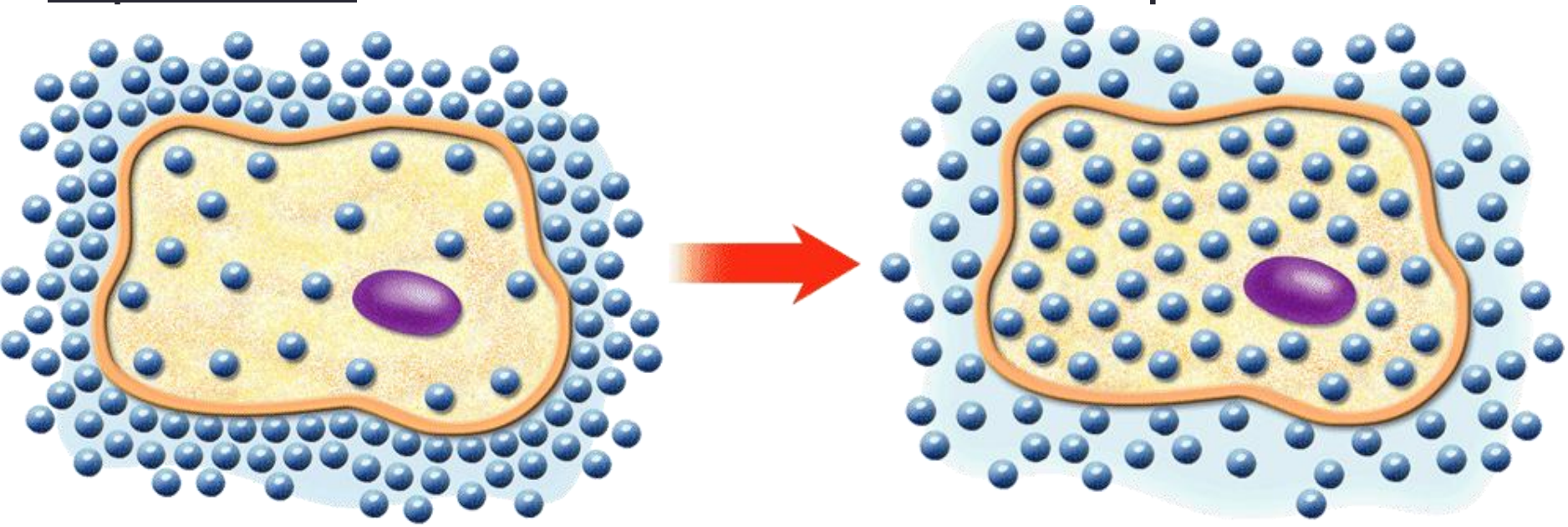
- The cell decides how things will move across the membrane depending on the **concentration** of the solutions on each side.
- The concentration of a solution is the amount of solute in the volume of liquid (solvent).
- **HIGH concentration = LOTS of solute**.

2 Ways that the Cell Moves Things Across the Membrane

1. Passive Transport
   - **No ENERGY** NEEDED!
   - Moves DOWN concentration gradient.
2. Active Transport
   - NEEDS **ENERGY**!
   - Moves UP concentration gradient.

Passive Transport: Diffusion

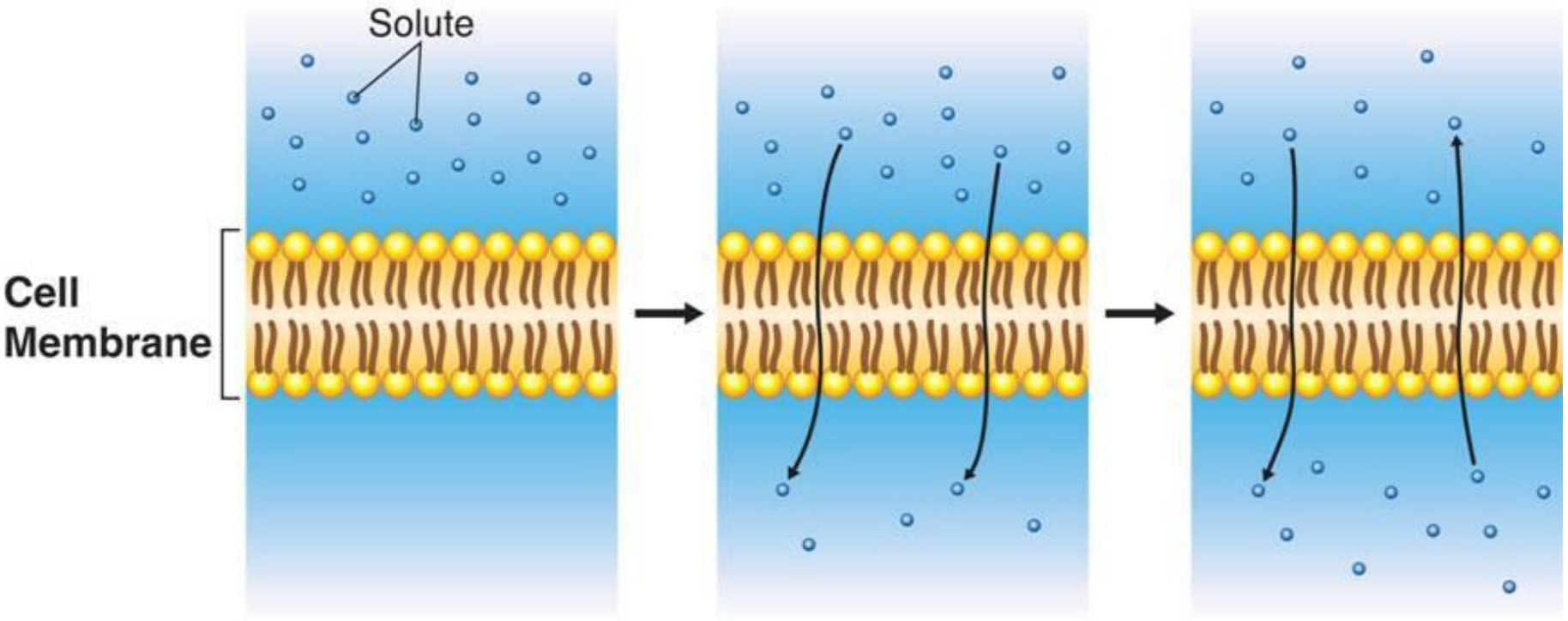
- Diffusion: when molecules move from an area of higher concentration to an area of lower concentration.
- Molecules move from where it is crowded to where it is less crowded.
- Equilibrium: when concentrations are equal.



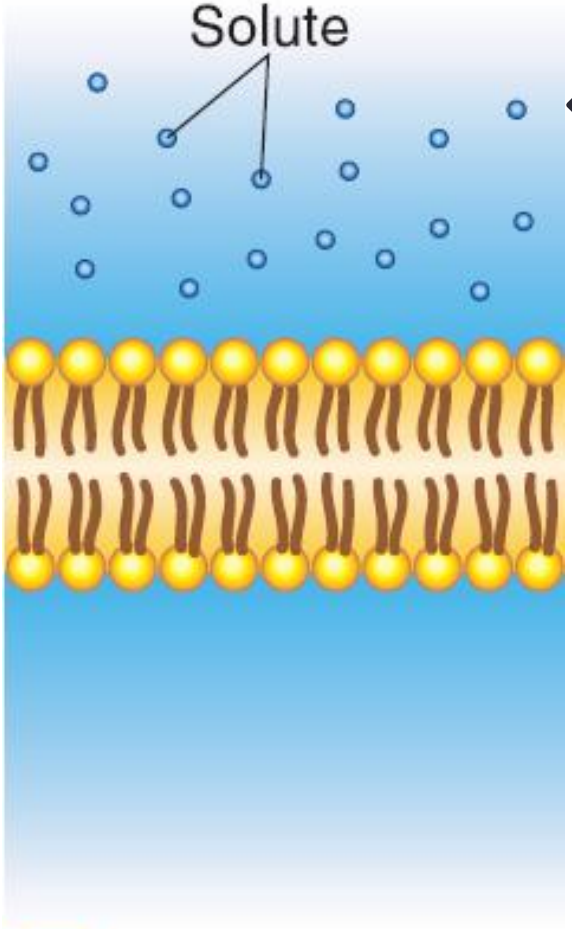
Before Diffusion
There is a higher concentration of oxygen molecules outside the cell than inside the cell.

After Diffusion
The concentration of oxygen molecules is the same outside and inside the cell.

Diffusion Through Cell Boundaries

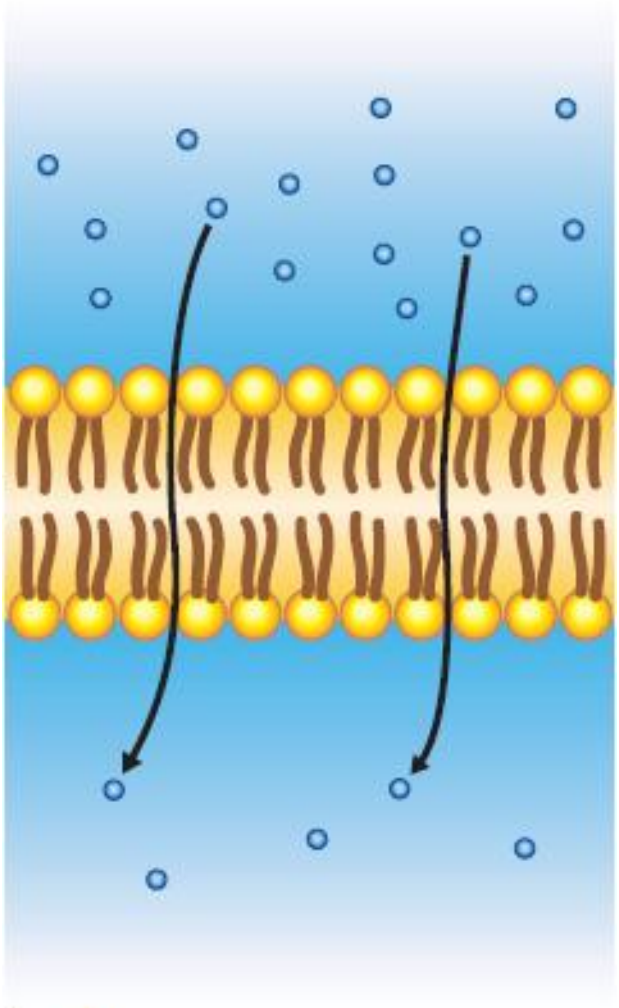


Diffusion Through Cell Boundaries



There is a higher concentration of solute on one side of the membrane (more crowded).

Diffusion Through Cell Boundaries

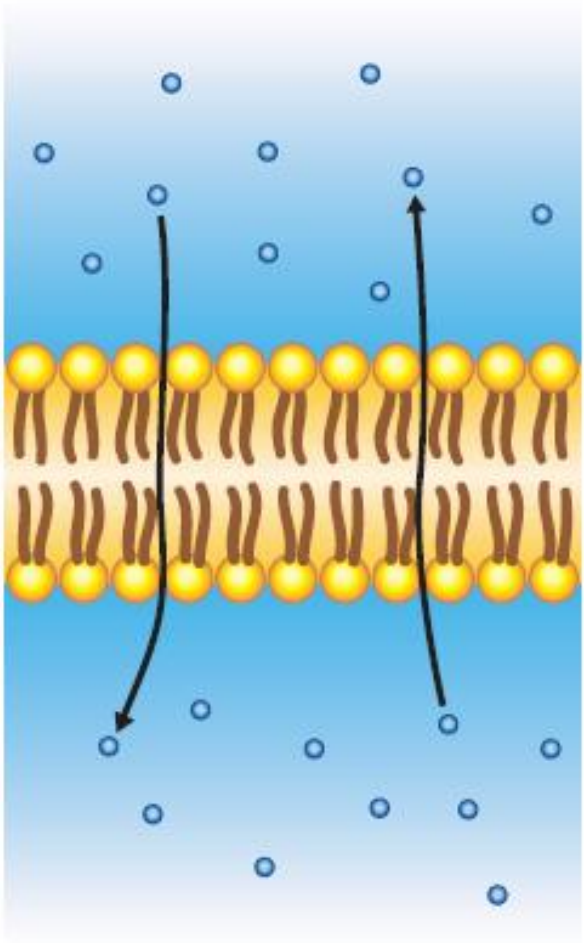


Solute particles move from the side of the membrane with a higher concentration of solute to the side of the membrane with a lower concentration (less crowded) of solute.

HIGH → LOW

The solute particles will continue to move across the membrane until **equilibrium** is reached.

Diffusion Through Cell Boundaries

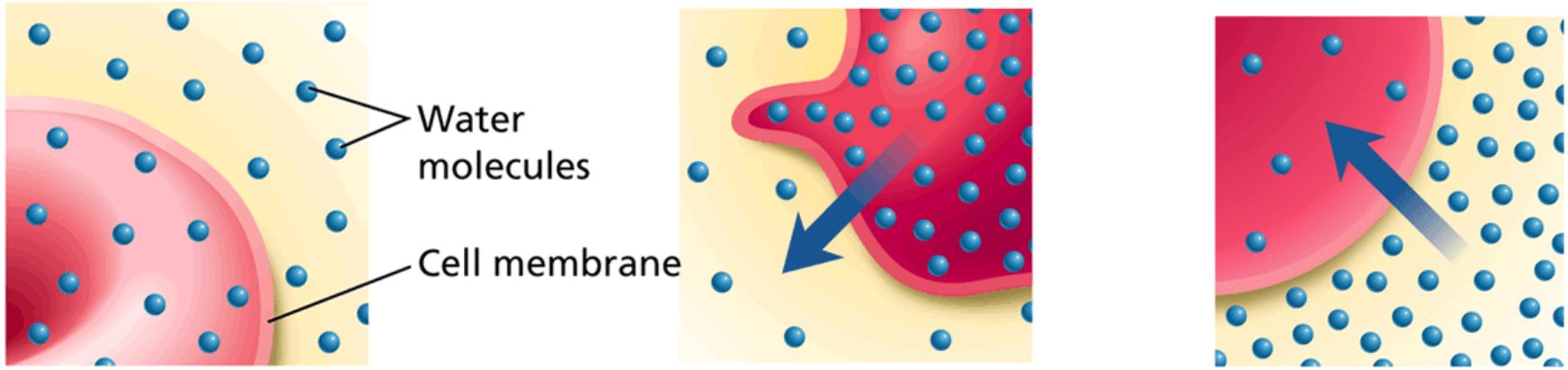


C

- When equilibrium is reached (same amount of solutes on both sides), **solute particles continue to diffuse** across the membrane in both directions.

Passive Transport: Osmosis

- **Water** diffuses through a **selectively permeable membrane**.



A **Normal Red Blood Cell**
Concentration of water inside the cell is the same as outside.

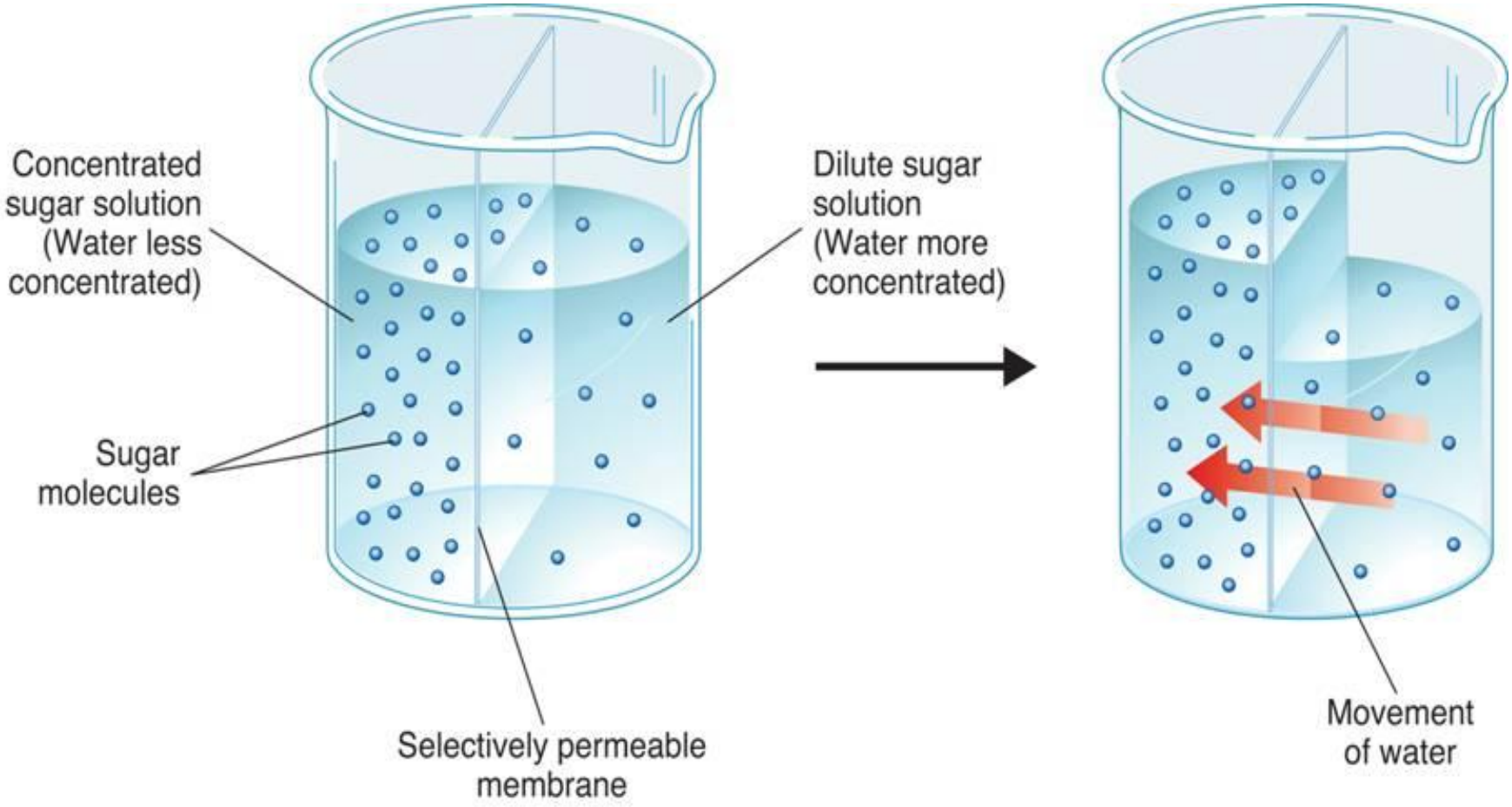
B **Low Water Concentration Outside Cell**
Water moves out of the cell during osmosis.

C **High Water Concentration Outside Cell**
During osmosis, water moves into the cell.

• When a membrane is **selectively permeable**, it means that **only certain things can pass through it** (like water or very small ions/solutes). If it is **NOT permeable** to a solute, that solute can **NOT get through**.

Passive Transport: Osmosis

- Water will always move from where there is **MORE water (high concentration) to where there is LESS water (lower concentration)**.

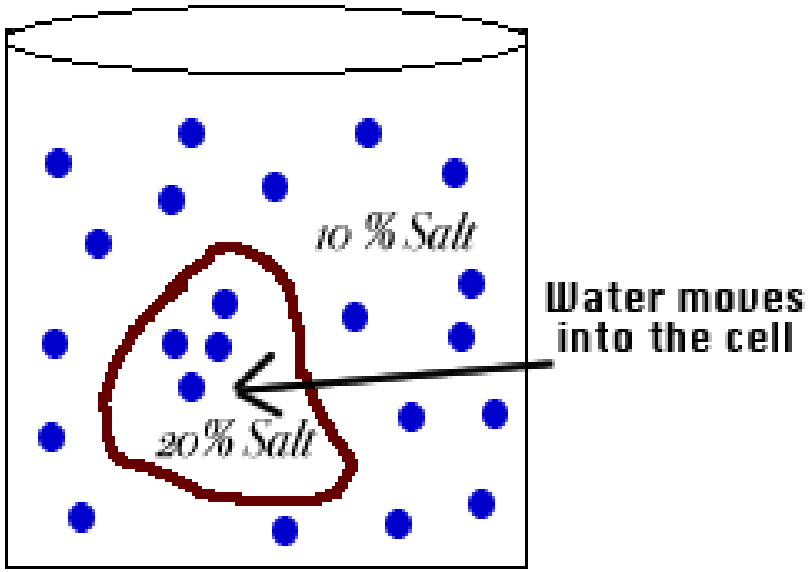


Passive Transport: Osmosis

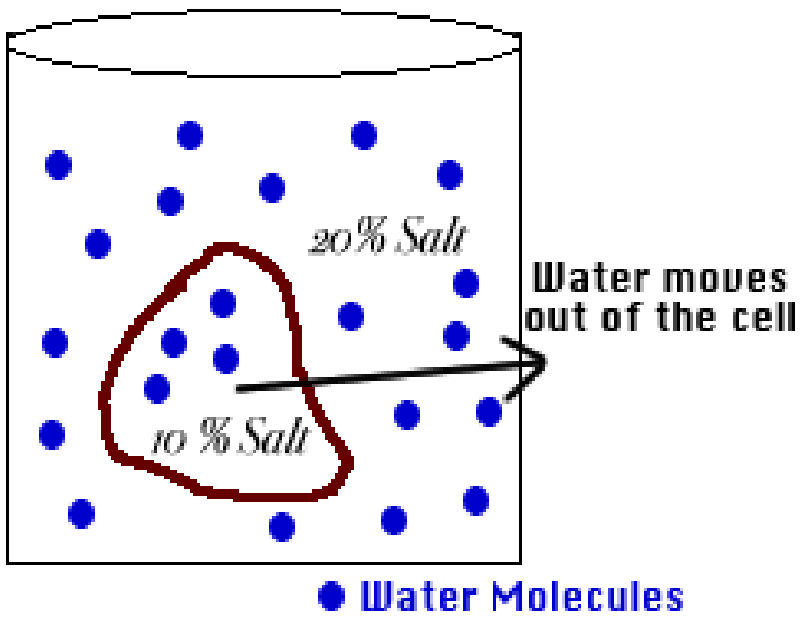
- When a cell is in a solution, that solution may be **hypertonic, hypotonic, or isotonic to the cell.**

- **Hypertonic**- when a solution has a **higher concentration of solutes** (and less water) than the cell
- **Hypotonic-** when a solution has a **lower concentration of solutes** (and more water) than the cell.
- **Isotonic**- when a solution has the **same concentration of solutes** as the cell.

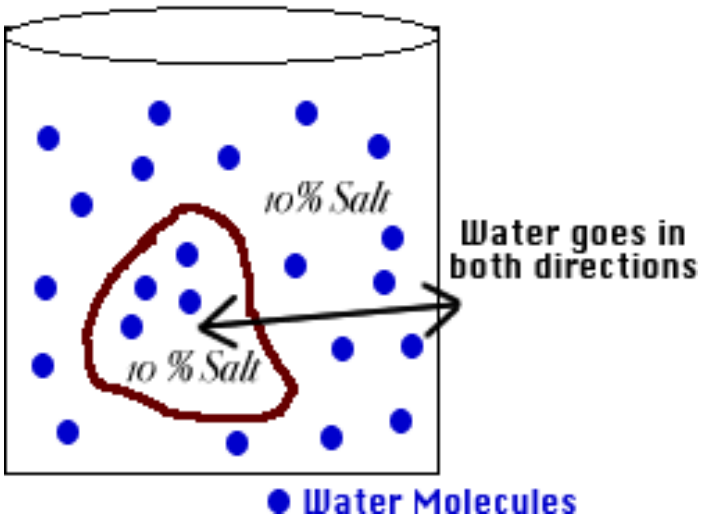
Solution is Hypotonic

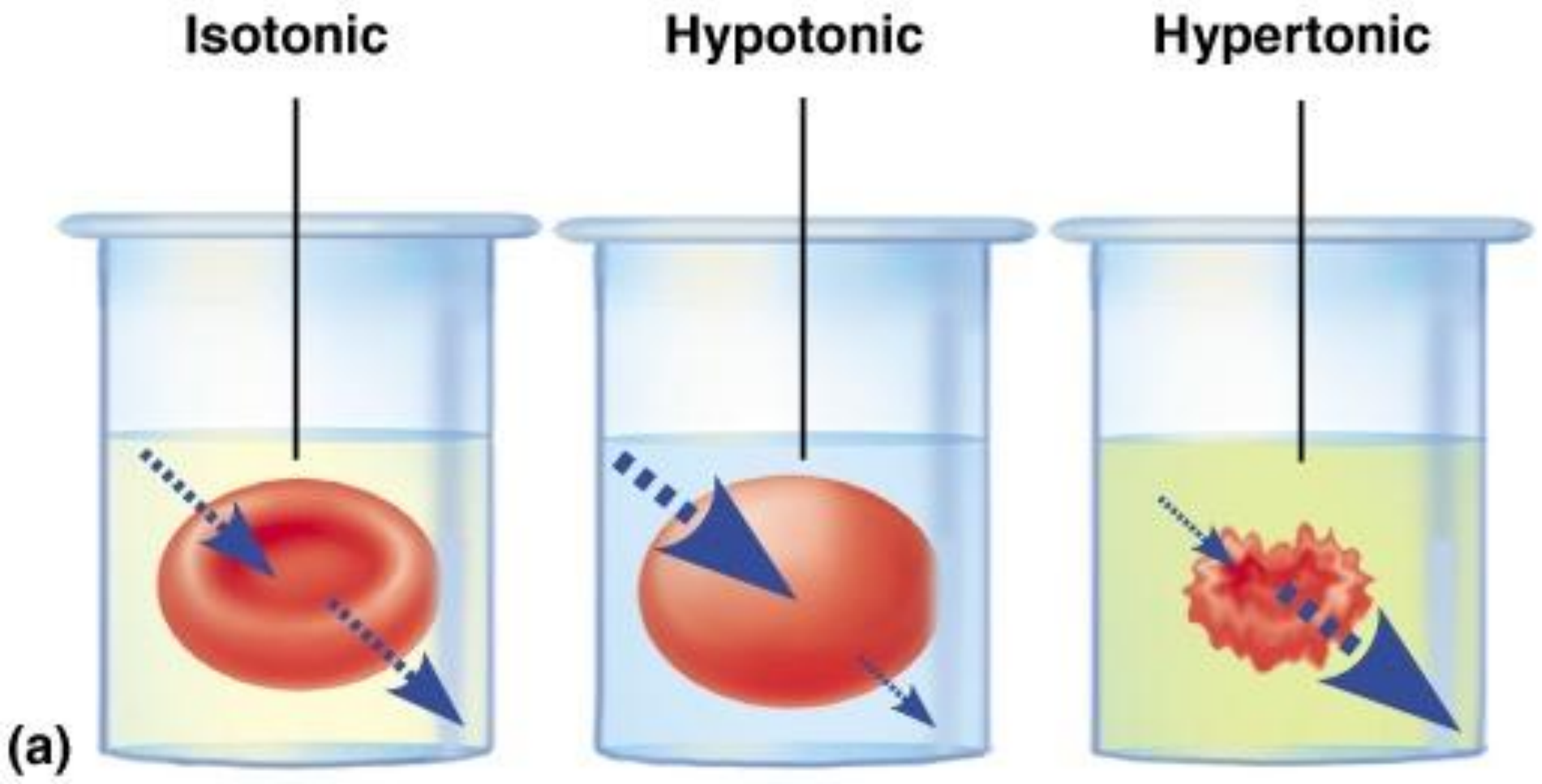


Solution is Hypertonic



Solution is Isotonic



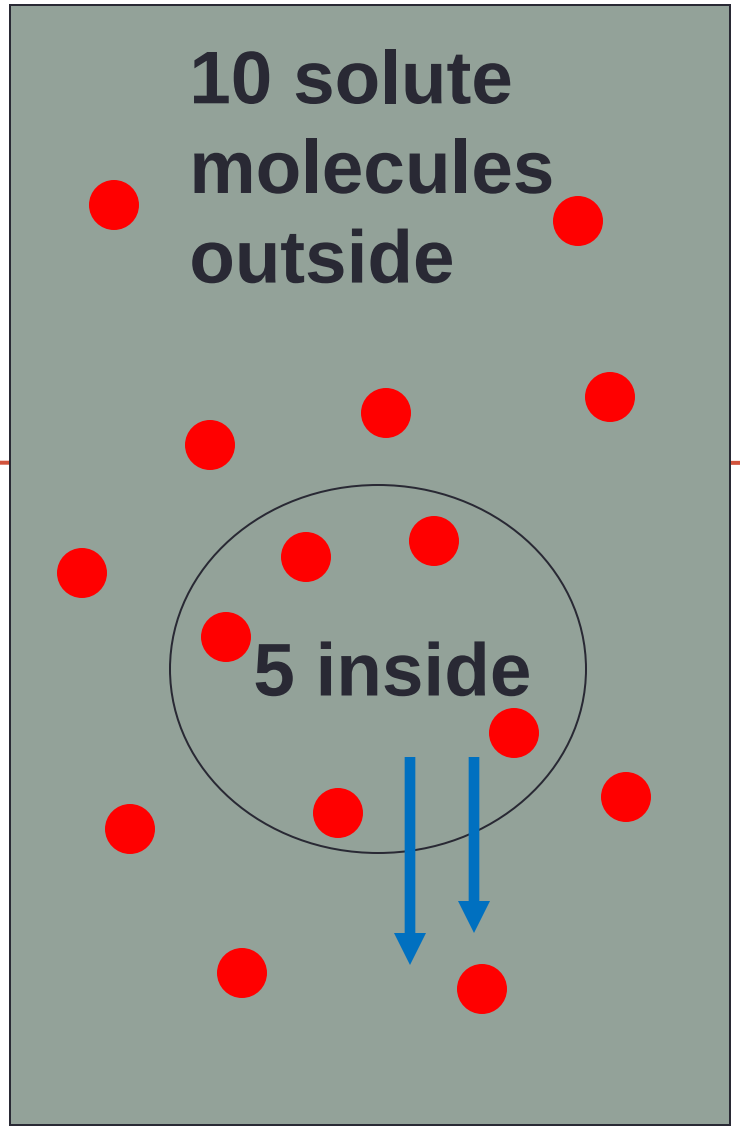


Solution with **same** solute concentration as cell (water moves both ways)

Solution with **lower** solute conc. than cell (water moves **INTO** cell)

Solution with **higher** solute conc. than cell (water moves **OUT** of cell)

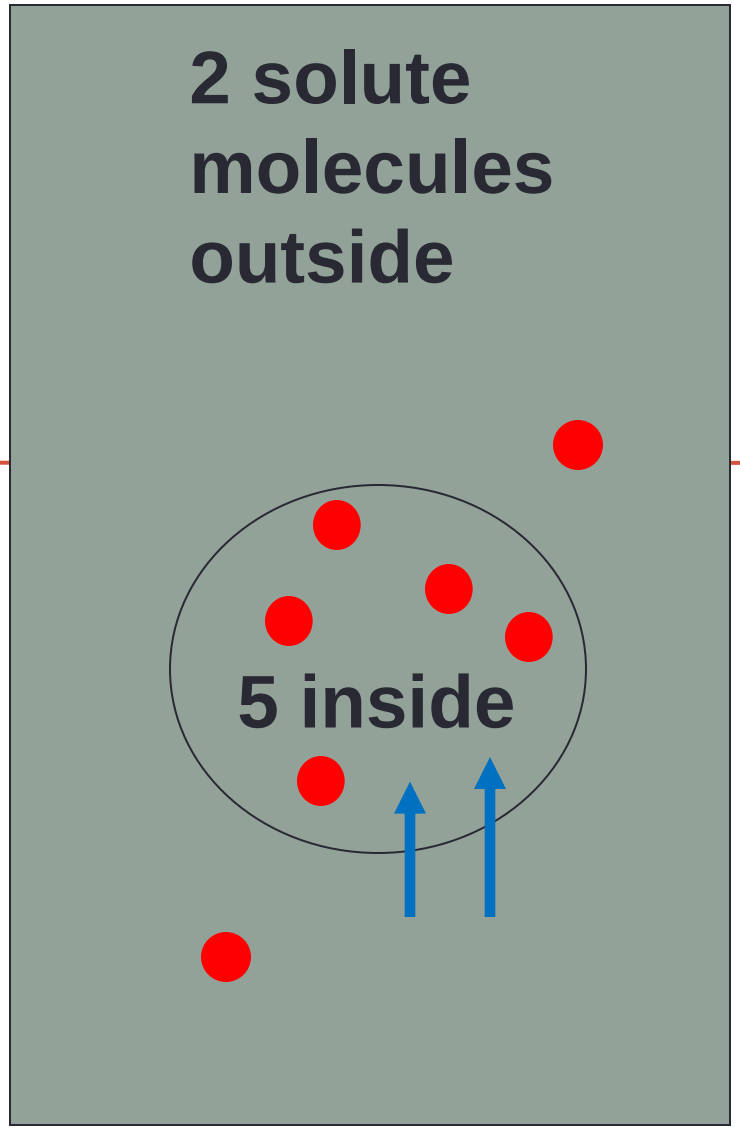
Draw a cell in a **hypertonic** environment



● = solute molecule

Which way will the water travel?

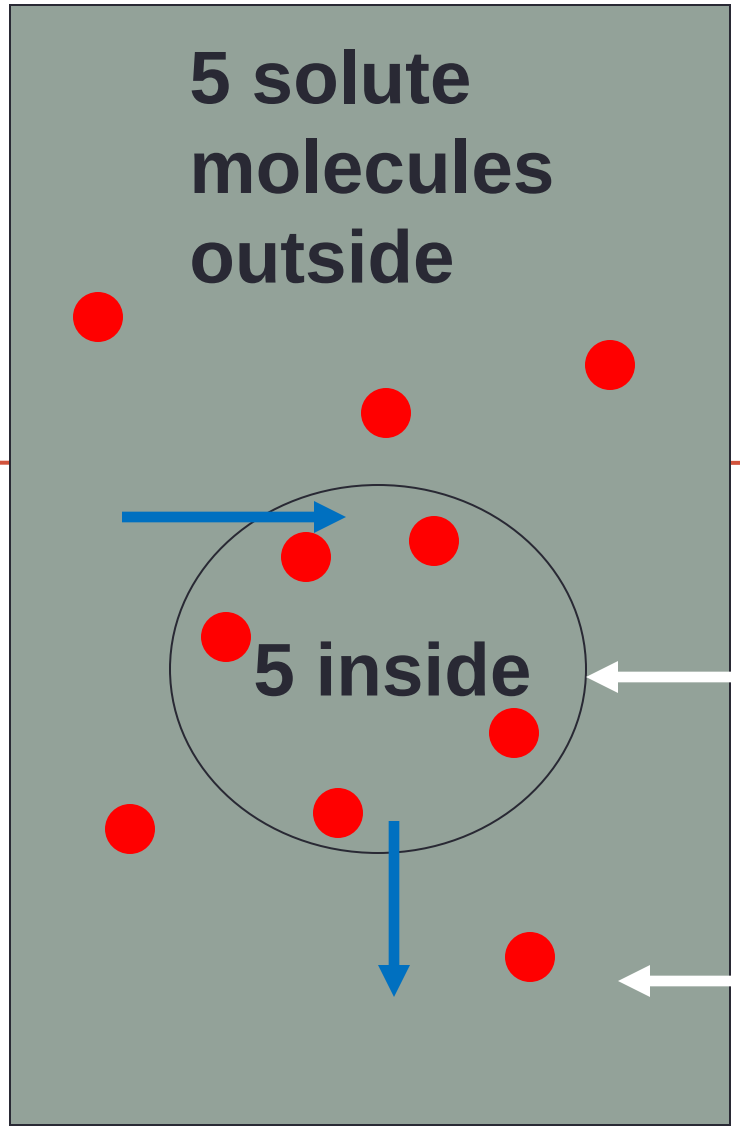
Draw a cell in a **hypotonic** environment



● = solute molecule

Which way will the water travel?

Draw a cell in an **isotonic** environment



● = solute molecule

Which way will the water travel?