# ACTIVE TRANSPORT

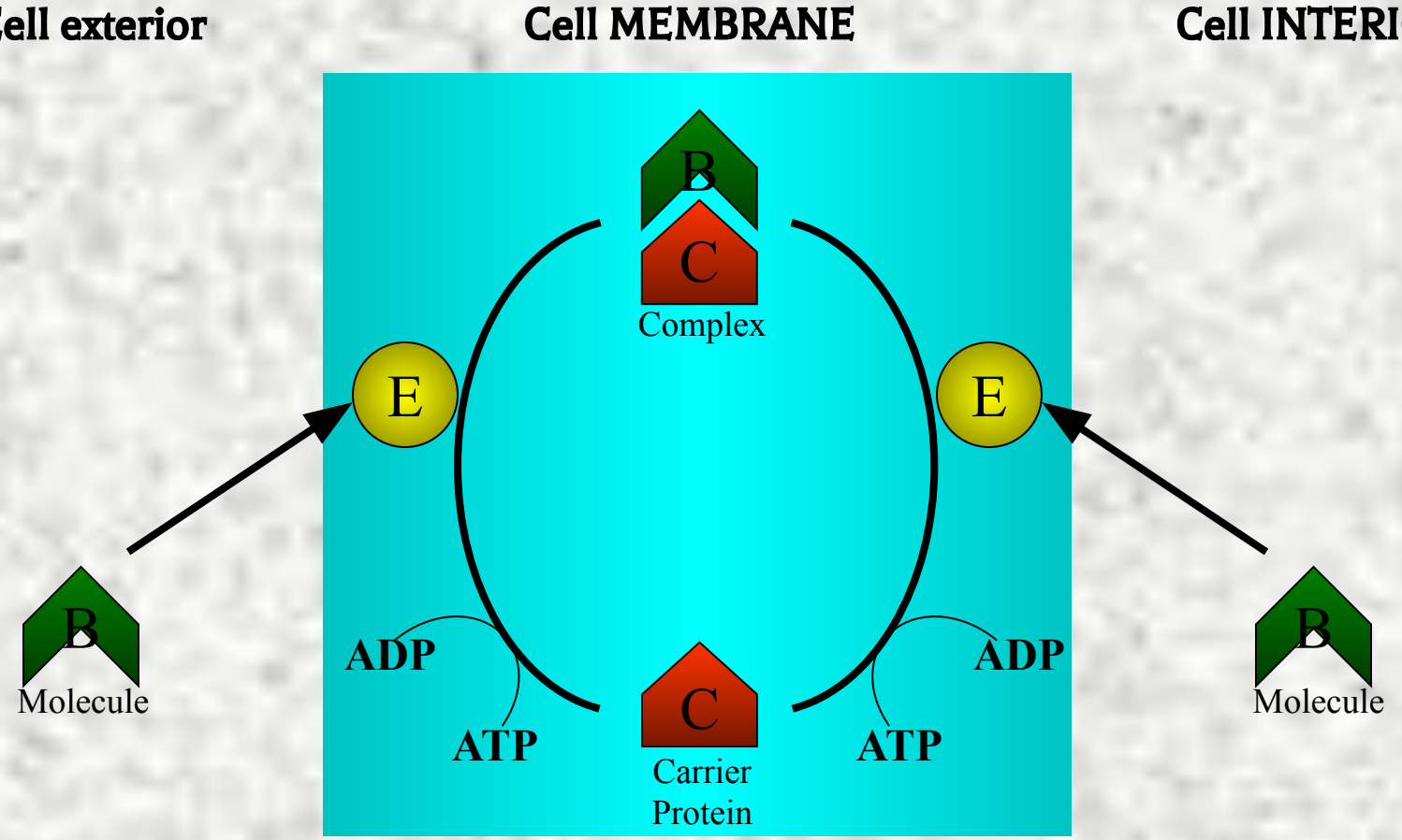
- The molecules normally move from high concentration to low concentration by diffusion.

- But what is negative in diffusion is that it stops at a time and there can not be any transportation after a period of time.

- The cell already needs some molecules more than diffusion can provide and also the cell must excrete some molecules which can not be excreted by diffusion sufficiently.

- The molecules which are needed more and which are not needed can only be excreted by energy consumption.

✔ Transportation of the molecules from low concentration to high concentration by energy consumption is named as **active transportation**.




**ACTIVE TRANSPORTATION**

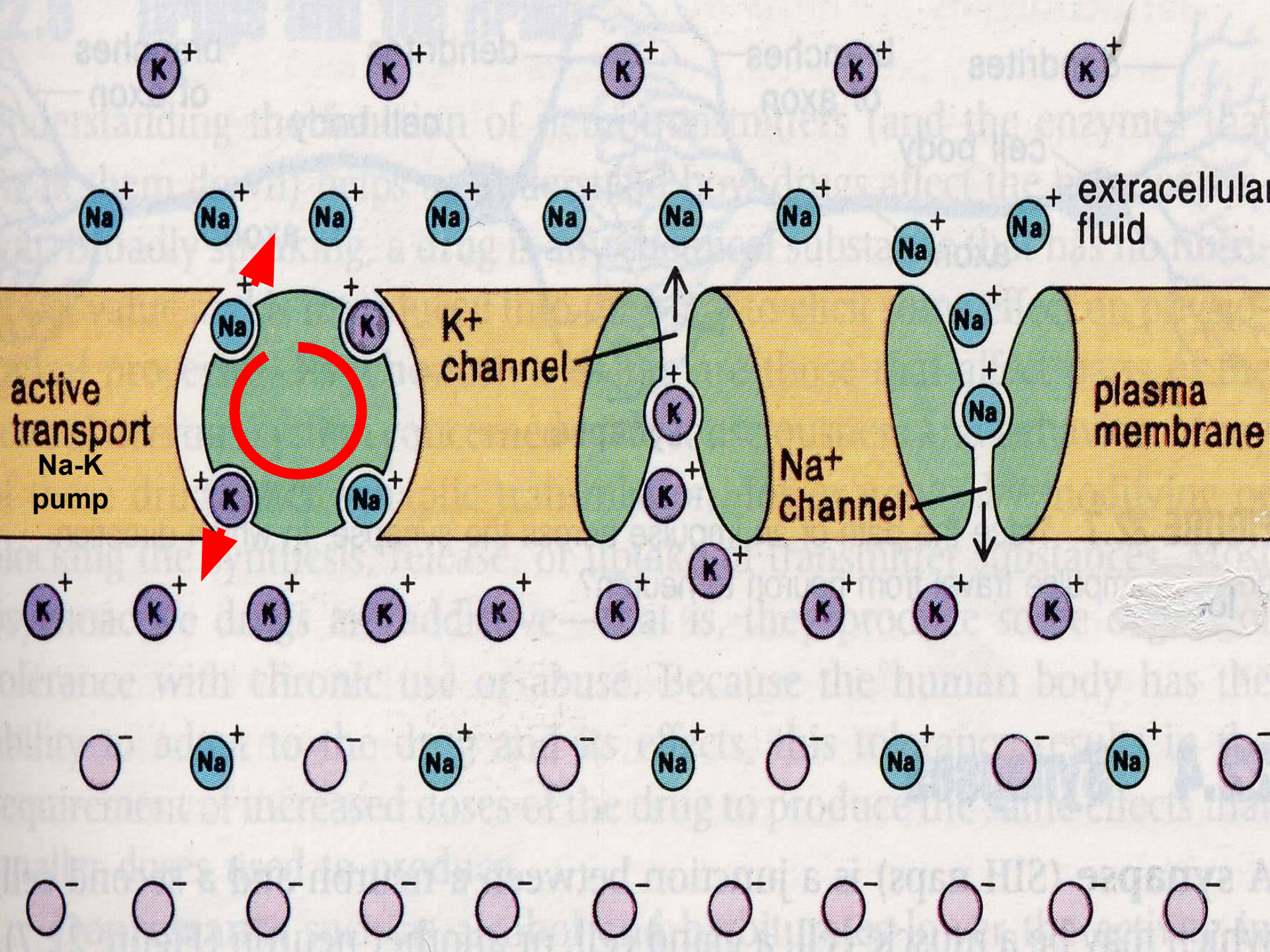
## Na-K pump is a good example for active transportation;

- In a neuron for the transmission of a nerve impulse, K ions must be inside the cell and Na ions outside.

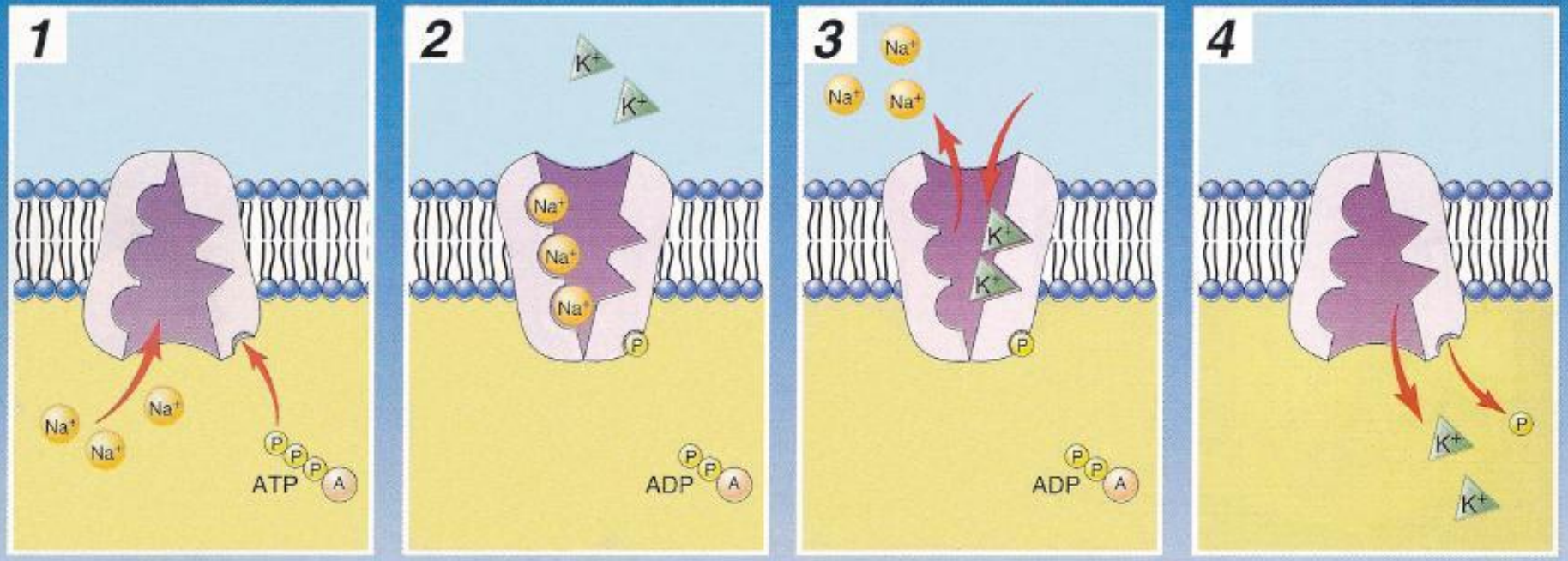
- Provision of such a state is only possible by using energy. Because K ions have a tendency to be out of the cell where Na ions have a tendency to be inside.

- To provide this state the cell uses energy to even accept / send the smallest amount of K / Na ions.

- This mechanism in our nervous system provides the transmission of impulses. Thus, provides the normal functioning of our body.


extracellular fluid
active transport
Na-K pump
K+ channel
Na+ channel
plasma membrane

# SODIUM-POTASSIUM PUMP



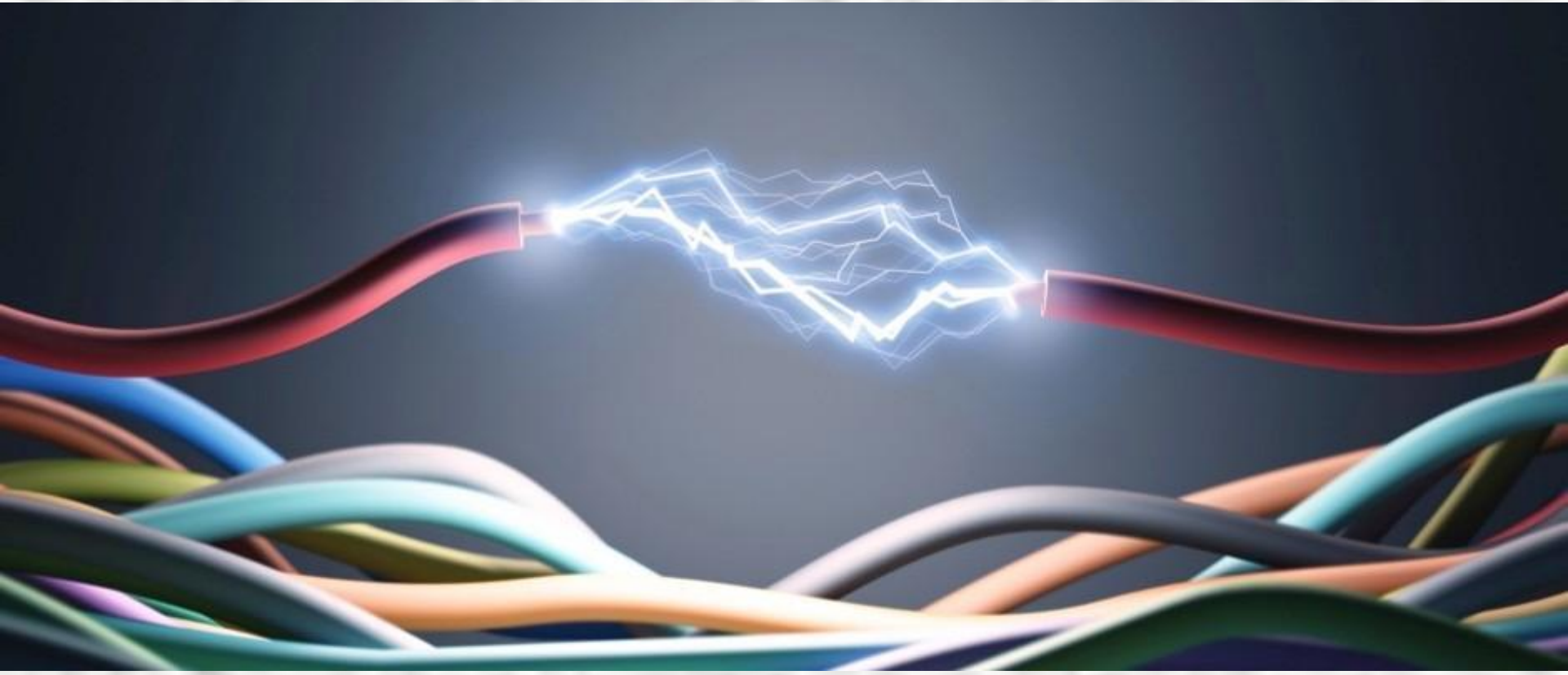

The sodium-potassium pump binds three sodium ions and a molecule of ATP.

The splitting of ATP provides energy to change the shape of the channel. The sodium ions are driven through the channel.

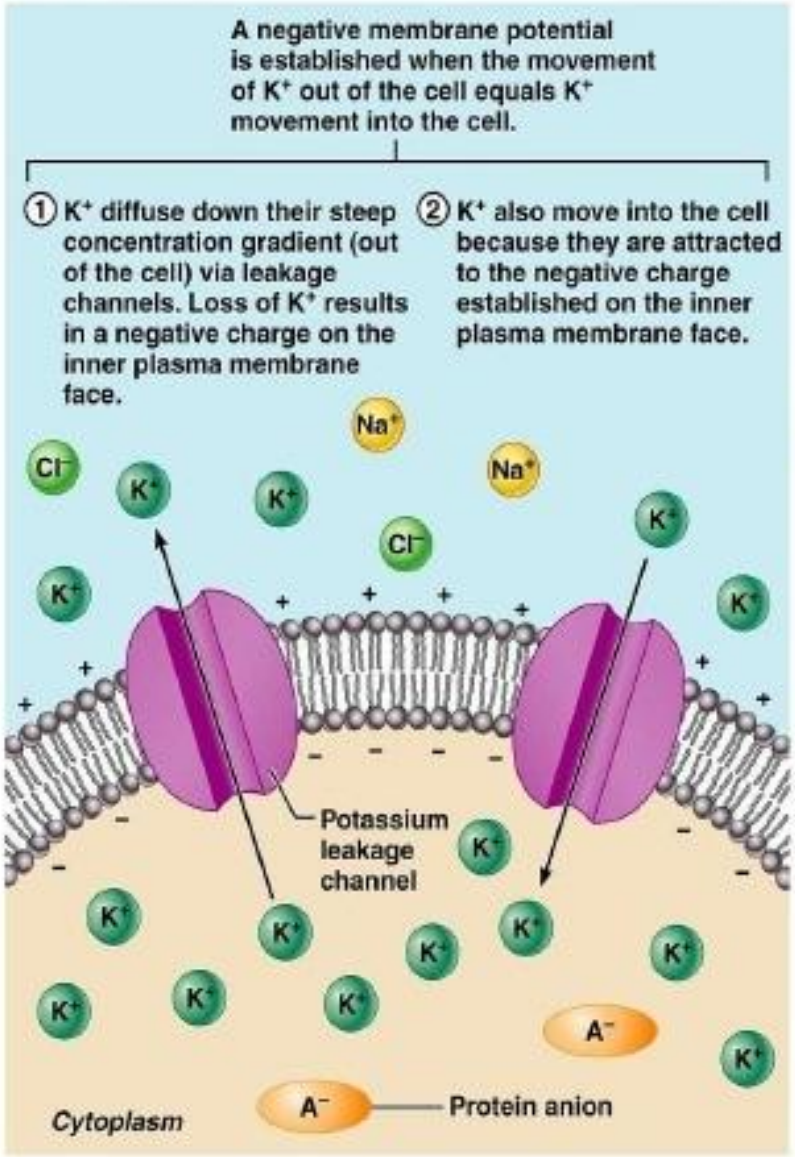
The sodium ions are released to the outside of the membrane, and the new shape of the channel allows two potassium ions to bind.

Release of the phosphate allows the channel to revert to its original form, releasing the potassium ions on the inside of the membrane.

https://www.youtube.com/watch?v=xweYA-IJTqs

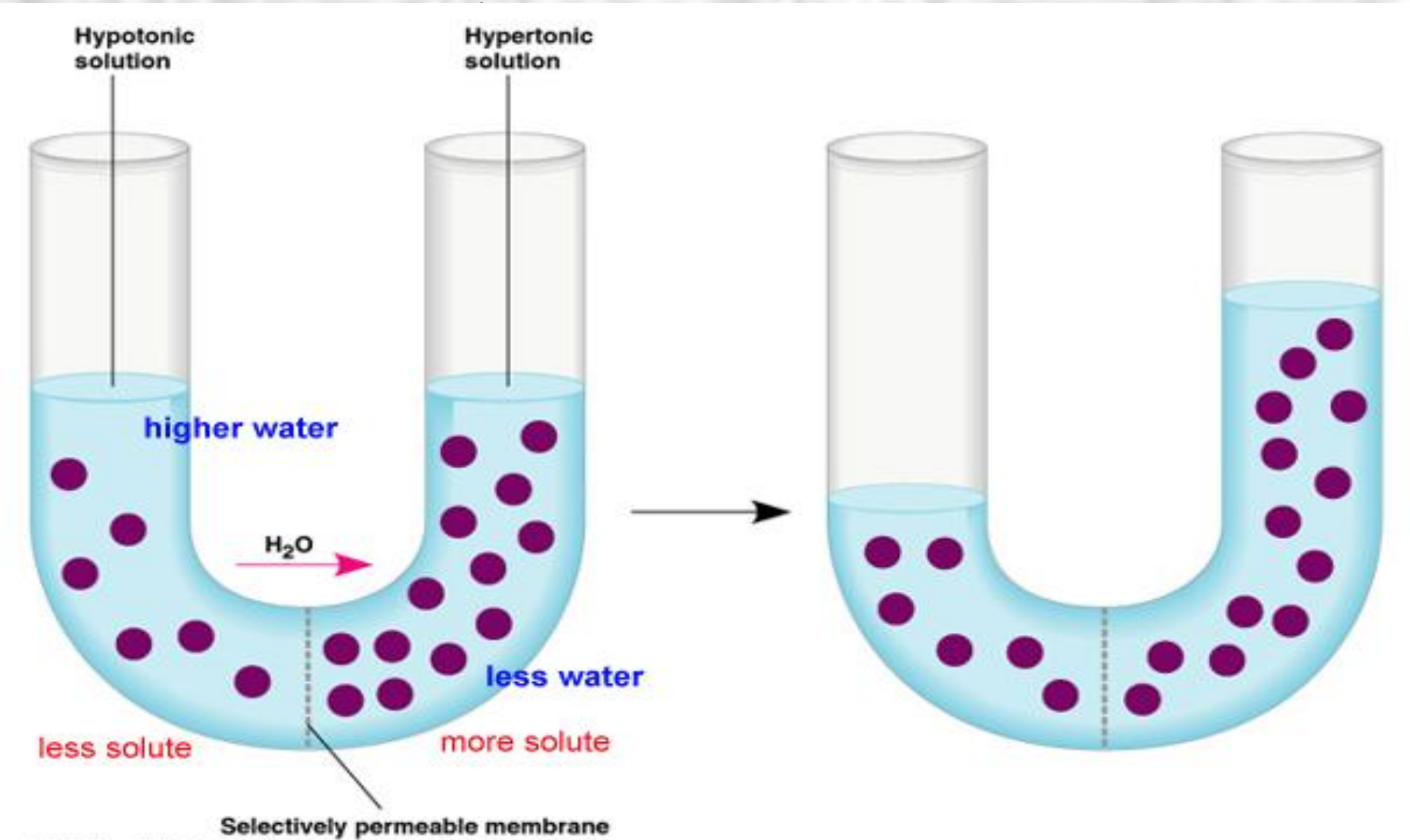


# Resting Membrane Potential



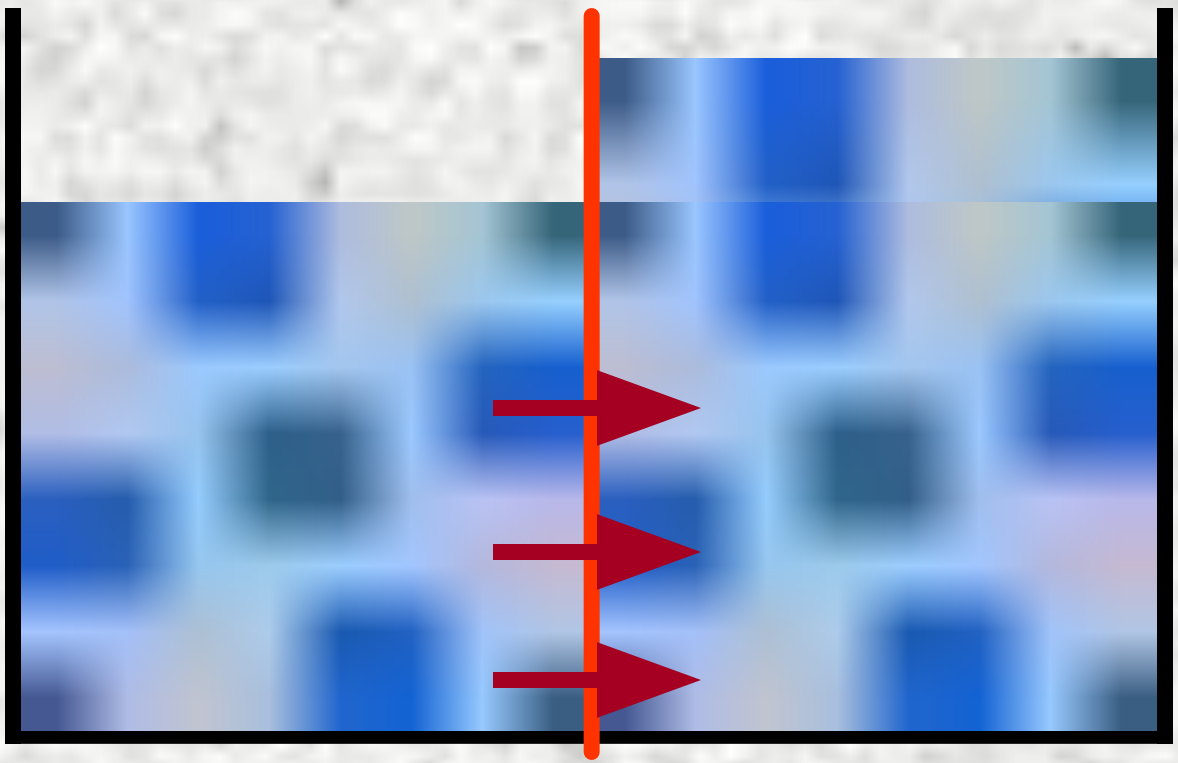

- Selective permeability allows for the generation of a membrane potential (voltage)
- At rest, the cell membrane has a (-) membrane potential
- Important to excitable tissue like nervous tissue

- Water moves from low concentration to high concentration.
- Or in other words; water moves from <u>high water</u>



✔ How can we understand where the concentration of water is high or low?

**1st and the most common method**
**[according to the solute's percentage]**



10% salt solution

30% salt solution

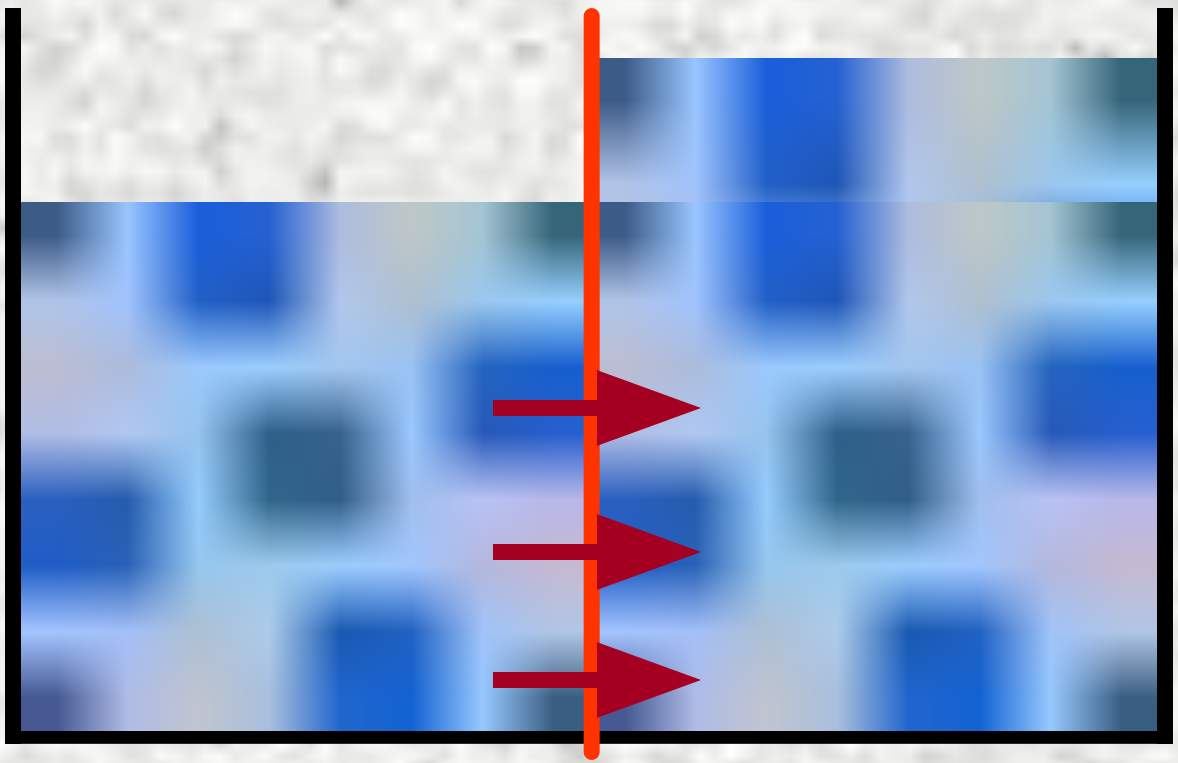
**LOW CONCENTRATION**

**HIGH CONCENTRATION**

✔ How can we understand where the concentration of water is high or low?

**2nd method**

**[according to the solvent's (water's) percentage]**



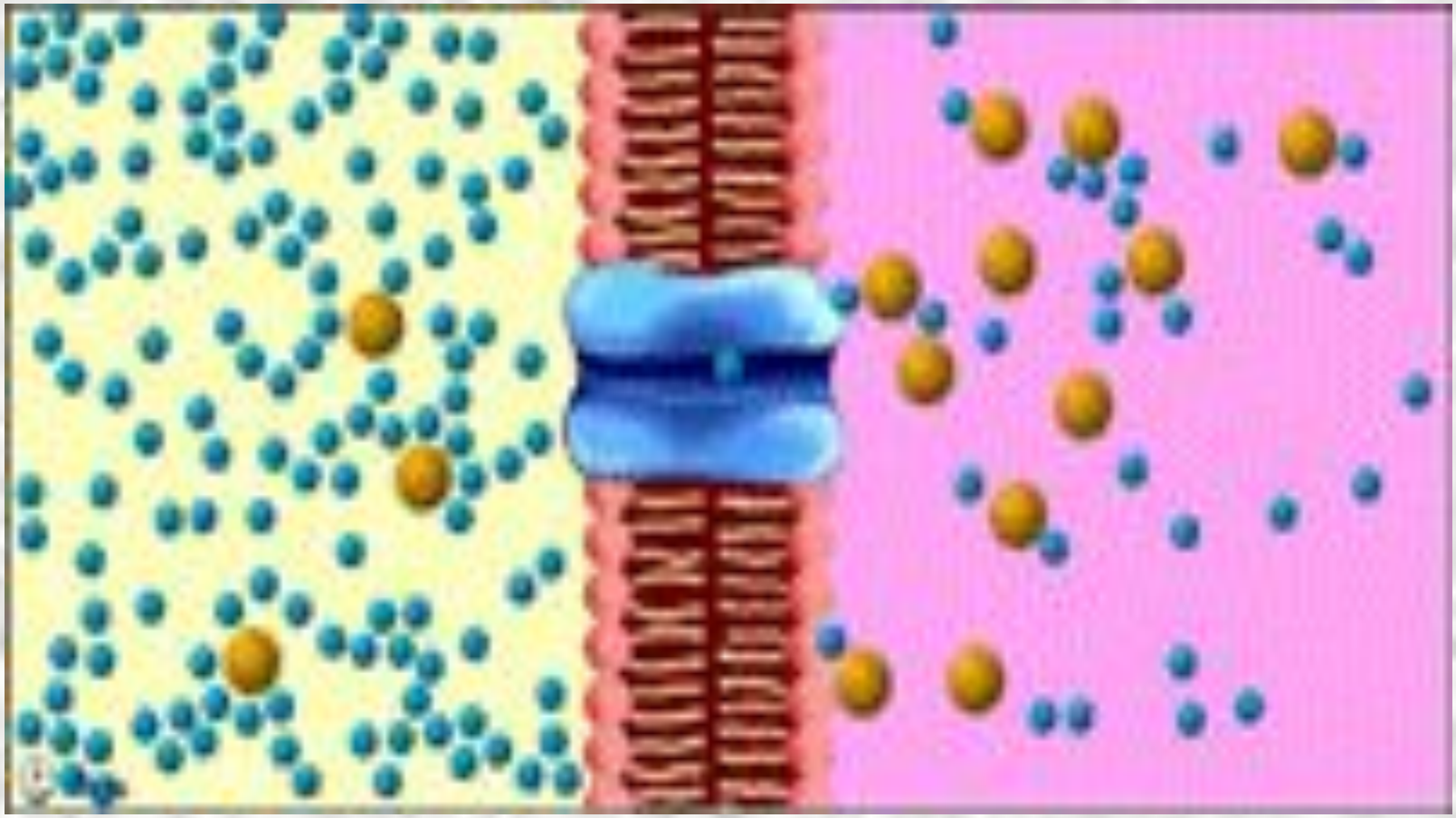
90% salt solution

70% salt solution

**HIGH WATER CONCENTRATION**

**LOW WATER CONCENTRATION**

- As a definition we have said that "Osmosis is the diffusion of water across a semi-permeable membrane"
- The second method tells us this fact since water moves from high water concentration to low water concentration.



The animation above show the passage of water molecules from low to high concentration

The mediums (solutions) are named as;

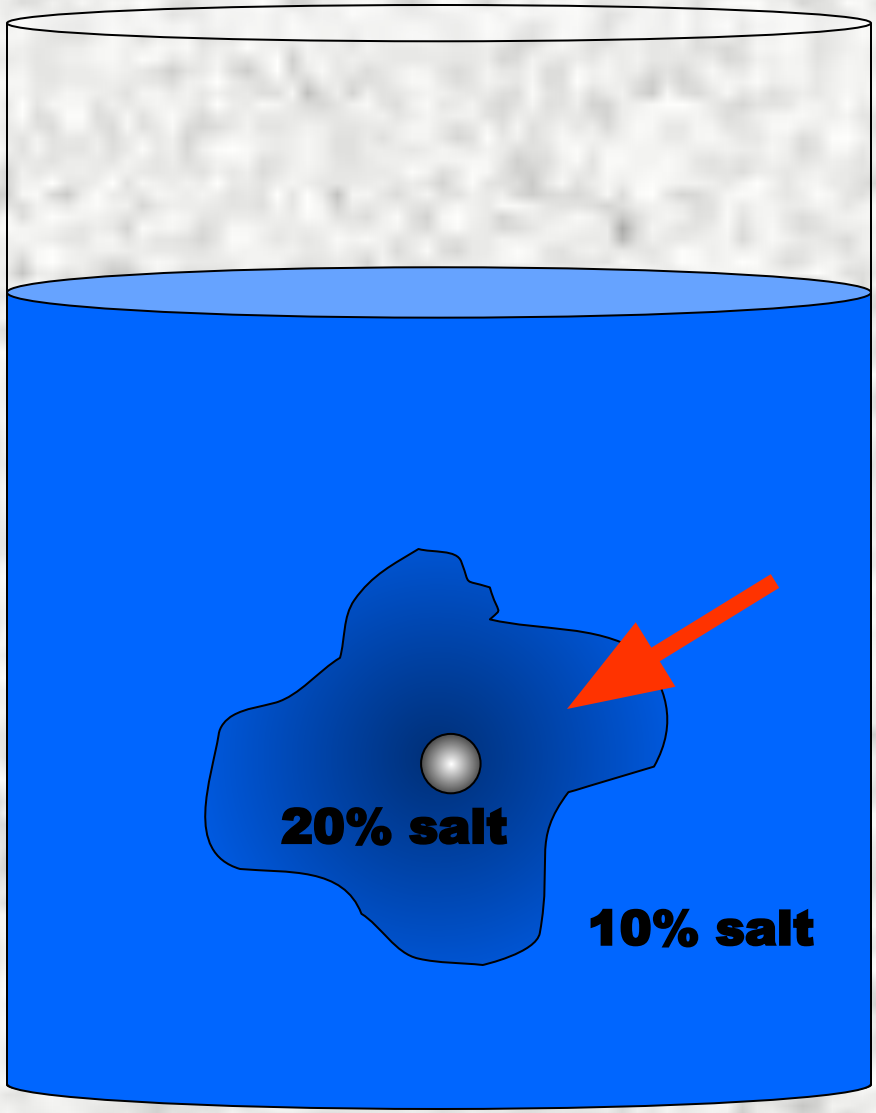
1) Hypotonic medium (solution)
2) Isotonic medium (solution)
3) Hypertonic medium (solution)

1) In Hypotonic mediums water concentration is high but matter concentration is low.

2) In Isotonic mediums the water and the matter concentrations are equal.

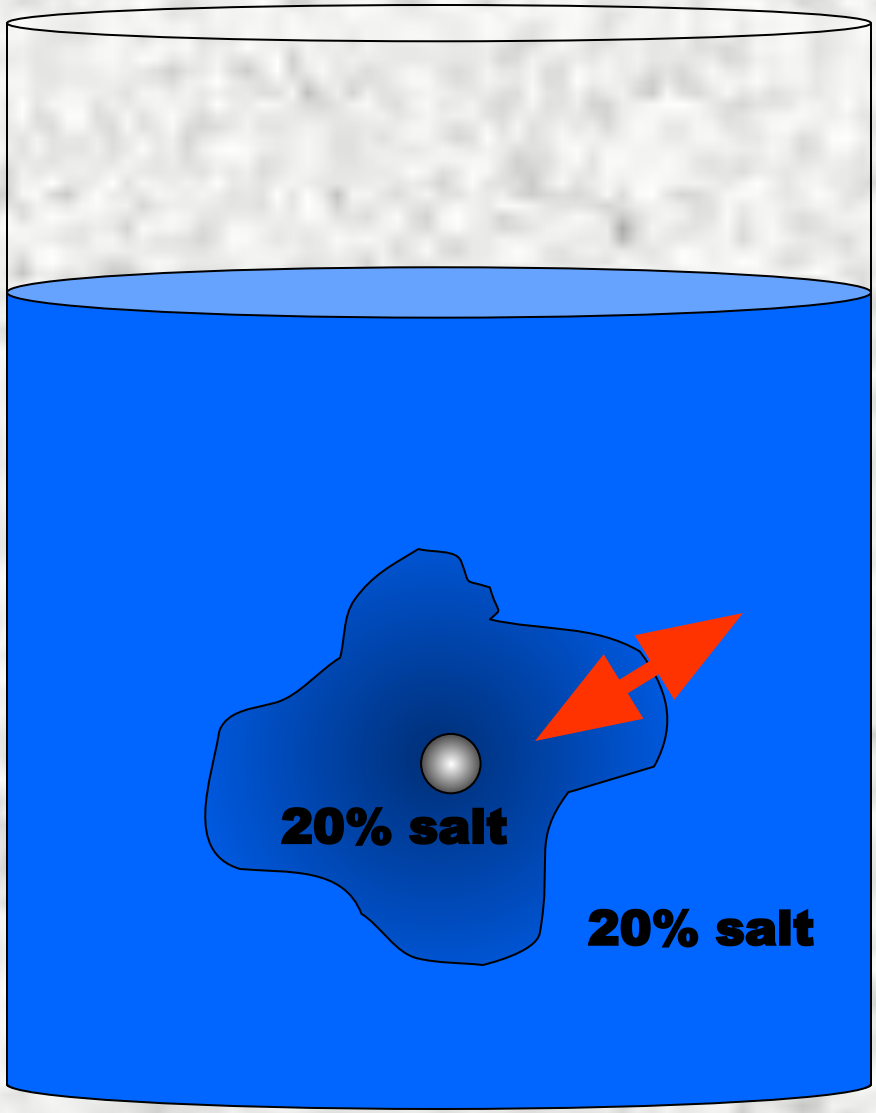
3) In Hypertonic mediums the water concentration is low but the matter concentration is high.

# Example for Hypotonic medium;



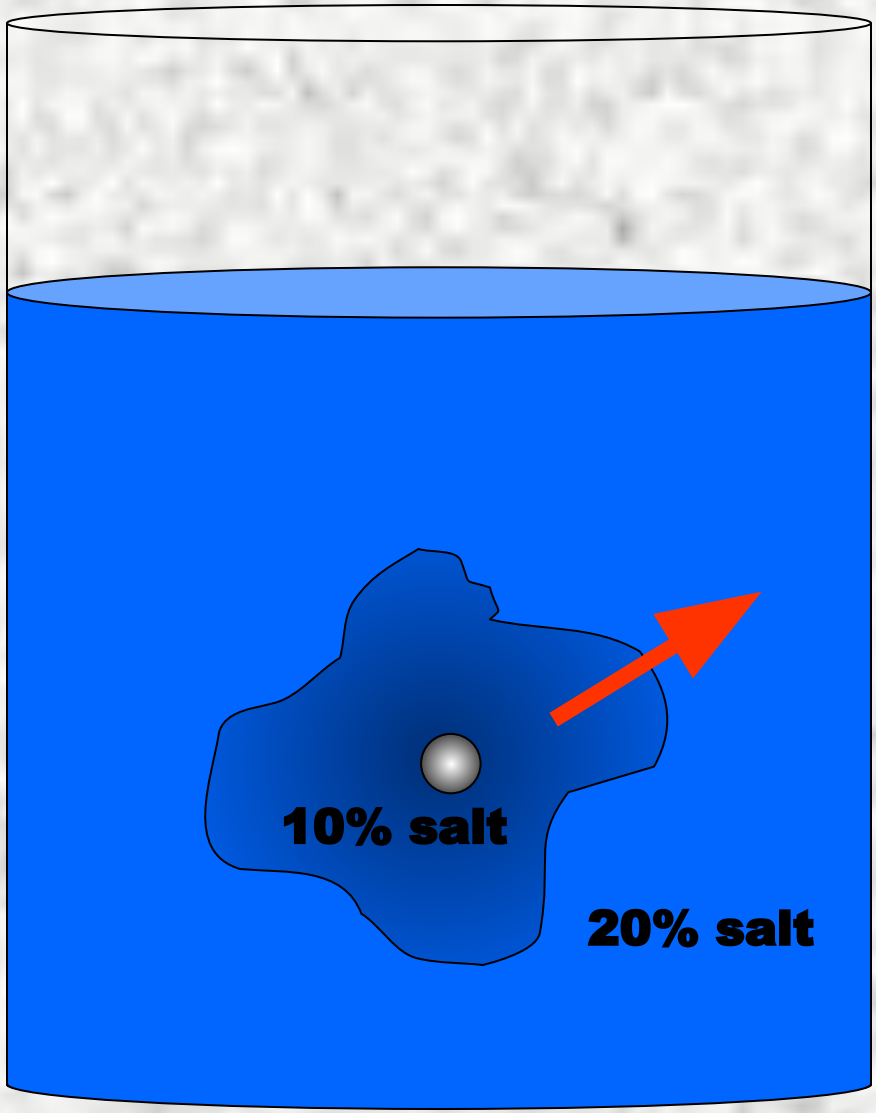

- The word "HYPO" means less
- In this case there are less solute (salt) molecules outside the cell, since salt sucks, water will move into the cell.
- The cell will gain water and grow larger.

# Example for Isotonic medium;




- **"ISO"** means the same
- If the concentration of solute (salt) is equal on both sides, the water will move back in forth but it won't have any result on the overall amount of water on either side.

# Example for Hypertonic medium;



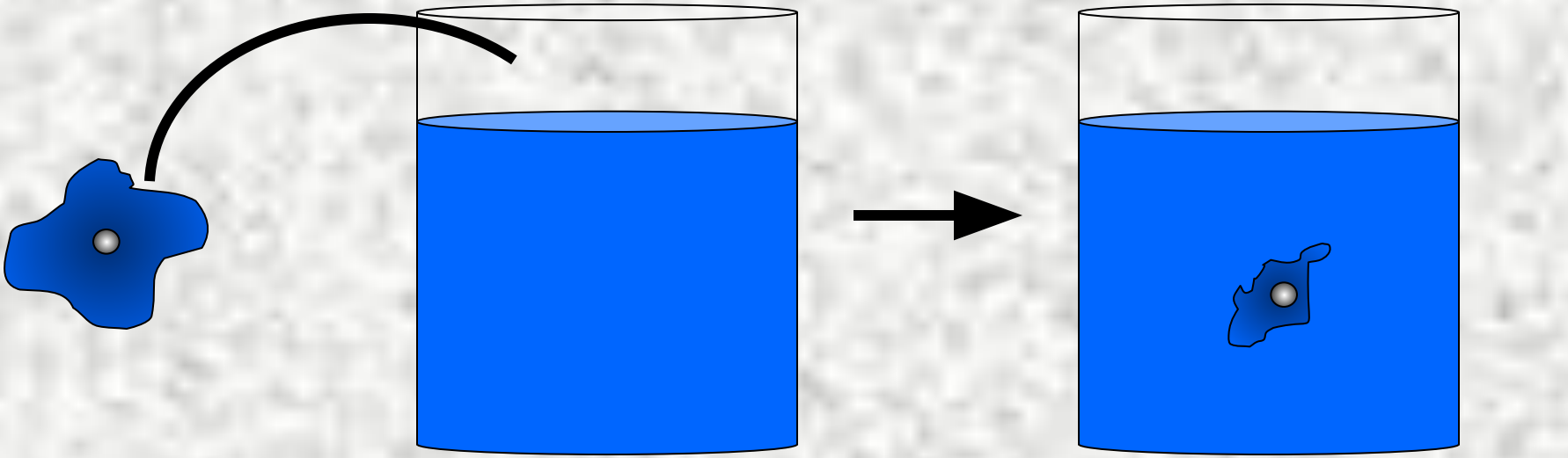

- The word "HYPER" means more
- In this case there are more solute (salt) molecules outside the cell, which causes the water to be sucked in that direction.

https://www.liveworksheets.com/il687754hr

- If we put a cell in these three mediums some extreme conditions like PLASMOLYSIS and DEPLASMOLYSIS take place.

## PLASMOLYSIS:

- If a cell is replaced in a hypertonic medium, the cell shrinks. Because the cell looses water. We call the shrinking of the cell as plasmolysis.
- In this case the cell may die.



**Hypertonic medium**

**The cell shrinks.**

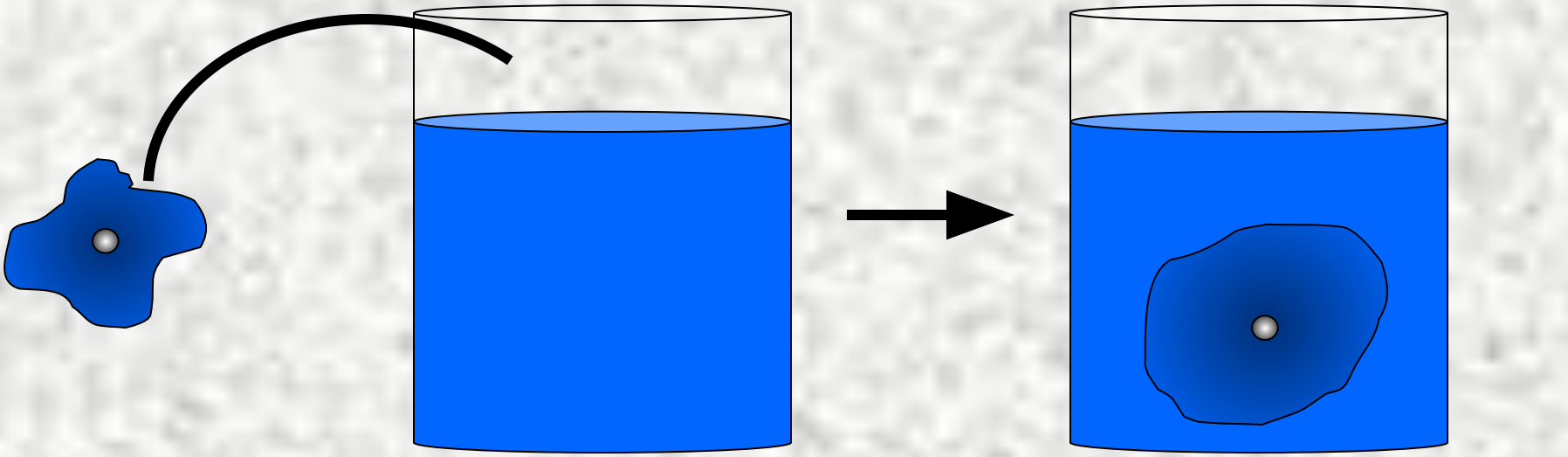
**It undergoes plasmolysis**


- In jam production osmosis is one of the most important events.

1) The material is prepared
2) Sugar is added on it.
3) Sugar sucks the juices in the material until the next day.


# DEPLASMOLYSIS

- If a cell is replaced in a hypotonic medium, the cell swells. Because of the water transportation from outside to of the cell to inside of the cell.We call this swelling as deplasmolysis.

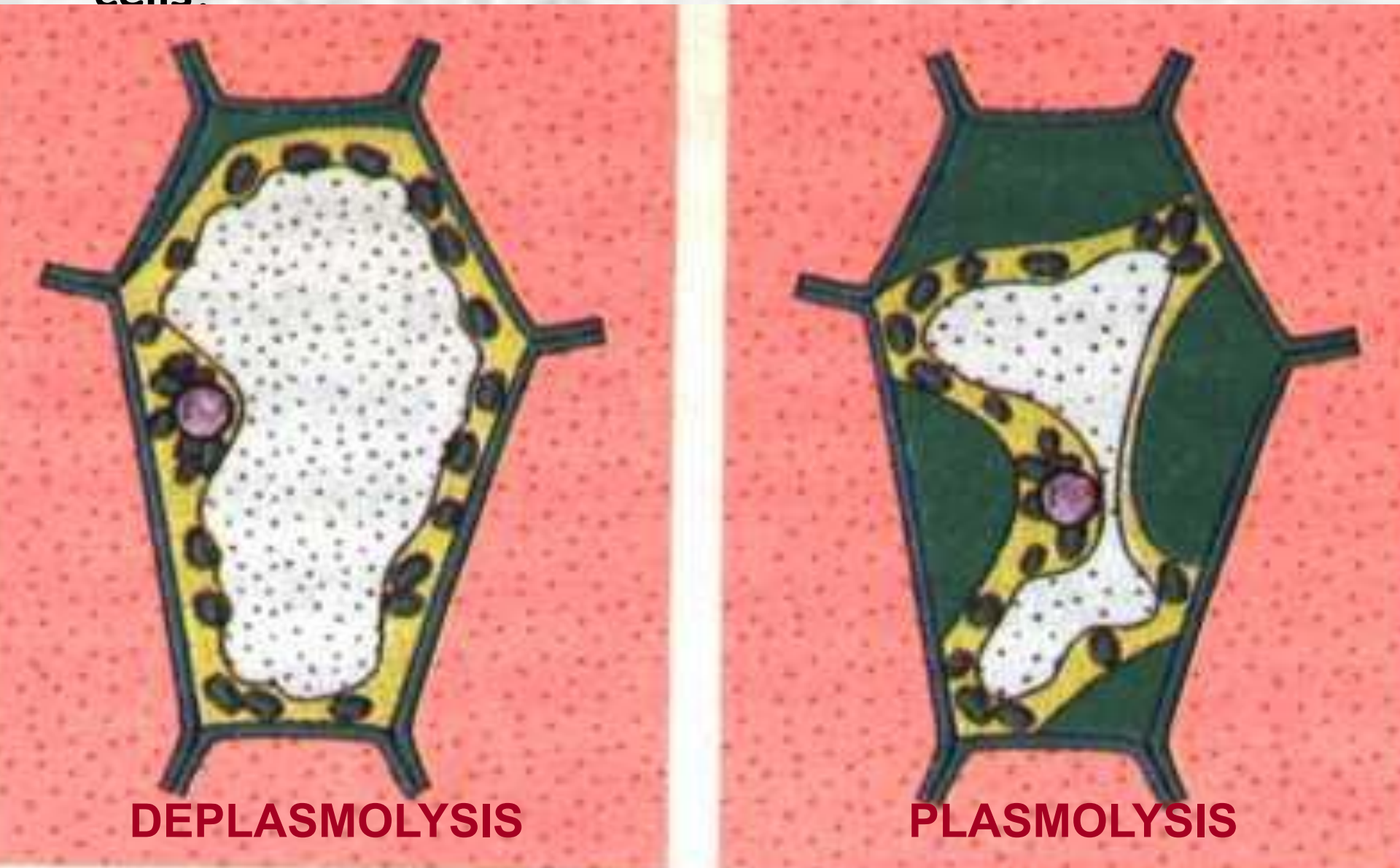


**Hypotonic medium**

**The cell swells.**

**It undergoes deplasmolysis**

✔ The plant cells are protected by the cell wall and its hard to see plasmolysis and deplasmolysis in plant cells.



https://www.youtube.com/watch?v=VPwLN6U1spk