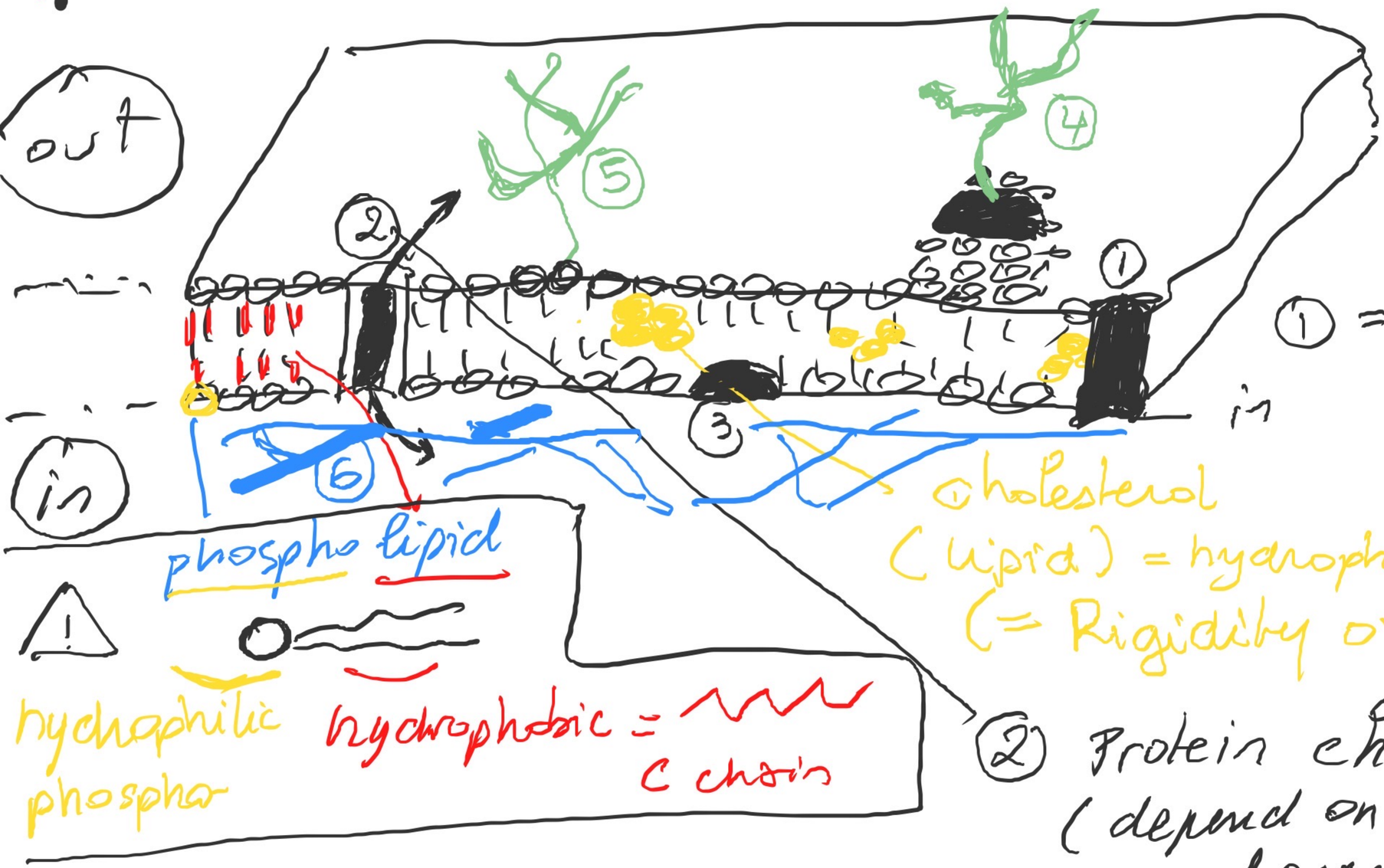
plasmic membrane :



≠ membrane moves (like surface of ocean)

(1) = integrale membrane protein.

cholesterol (lipid) = hydrophobic (= Rigidity of the membrane)

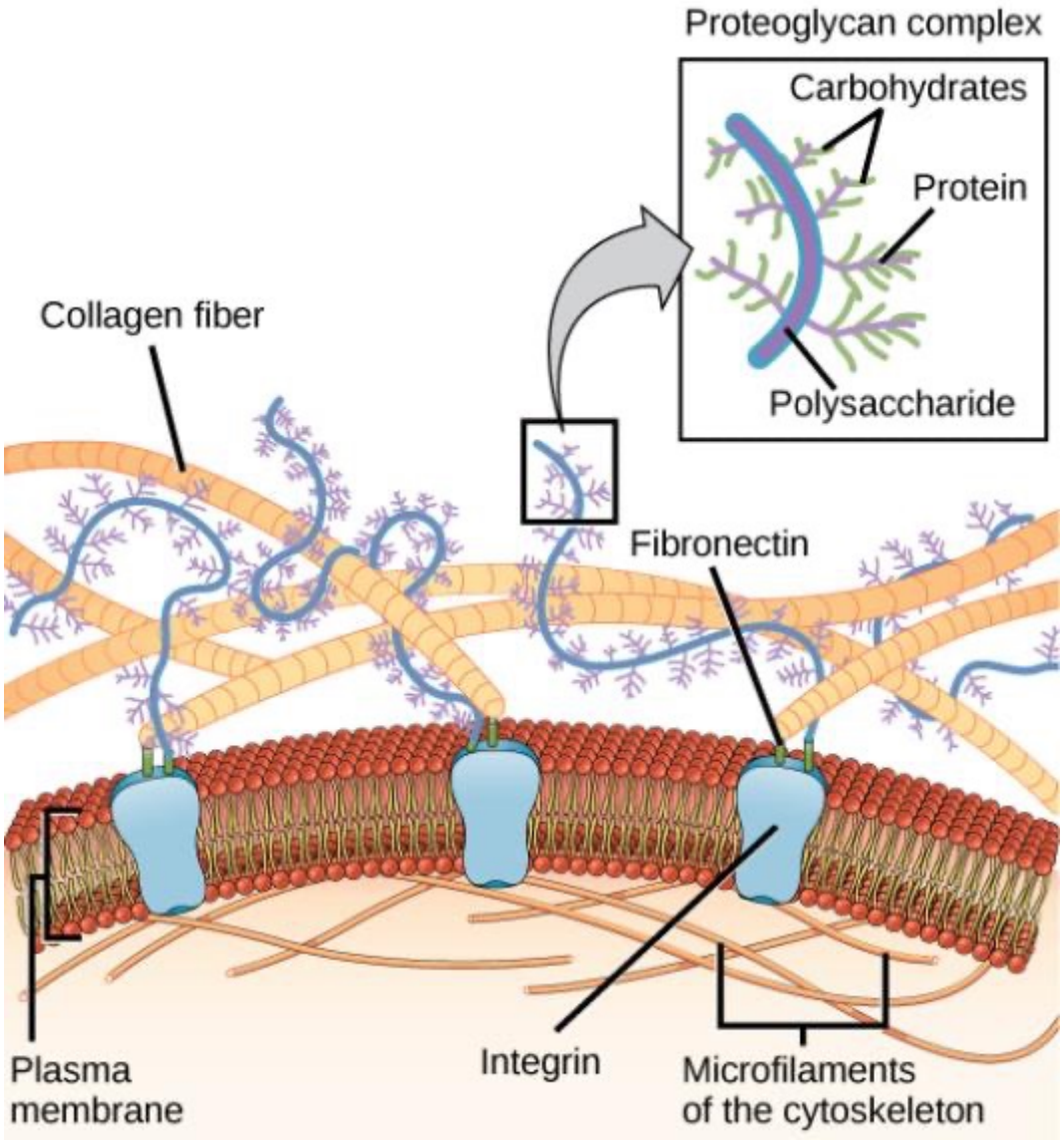
(2) Protein channel (depend on the size and charge of the molecule to transport).

(3) Peripheral membrane protein.

(4) GLYCOPROTEIN : sugar ⊕ protein

(5) GLYCOLIPID sugar ⊕ lipid

(6) Filament of the cytoskeleton



- The extracellular matrix consists of a network of substances secreted by cells.

out

in

polysaccharide
(= polymer made of ≠ unit of monosaccharide (Sugar, Glucose, mannose ...)

microfilament of the cytoskeleton

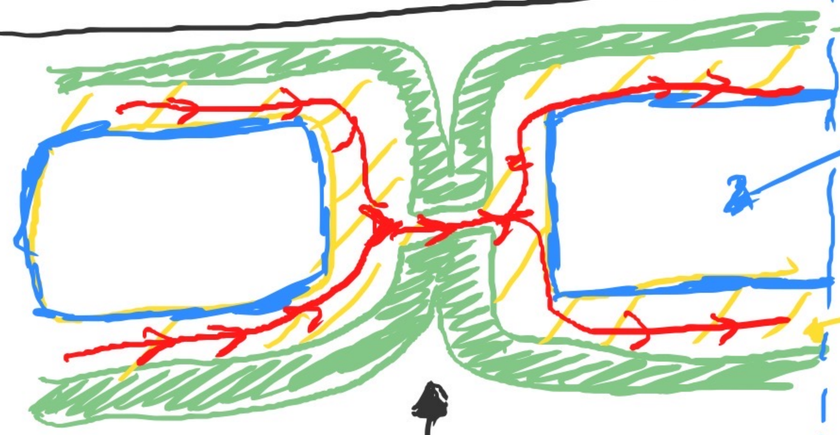
Fibronectin

= COLLAGEN FIBER

Zoom

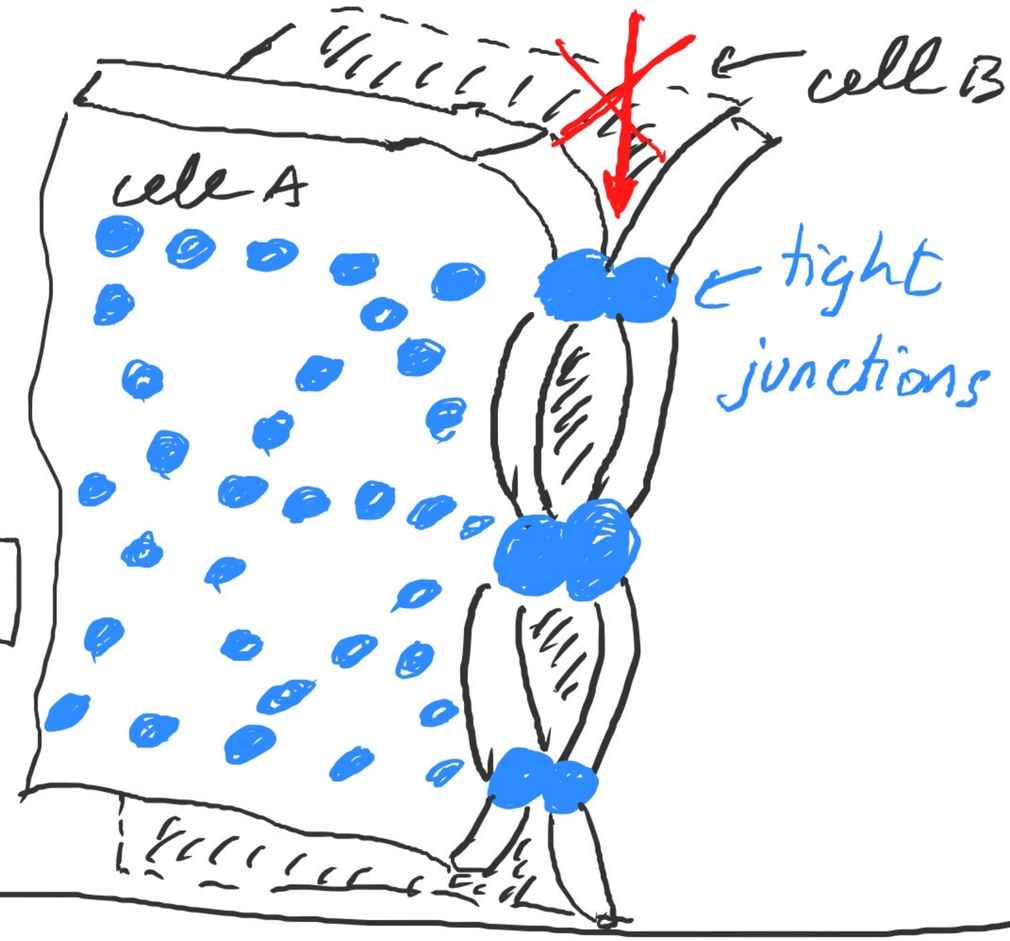
: Extracellular matrix.

Junctions between cells:

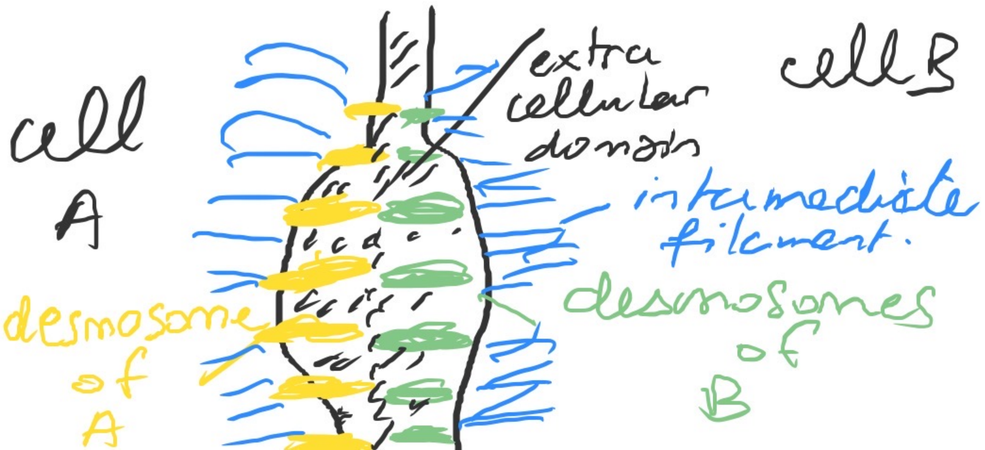


(a)

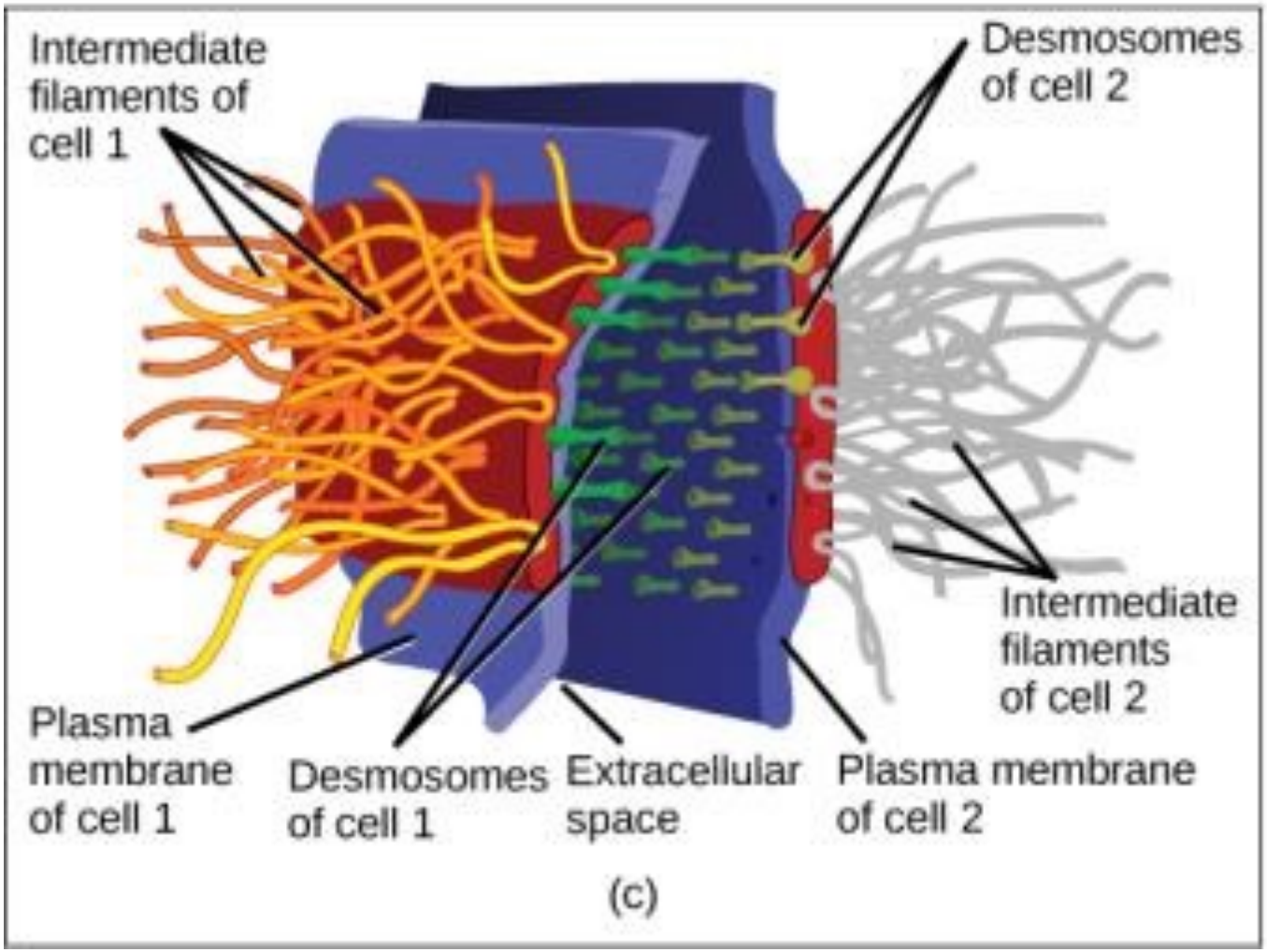
(b)



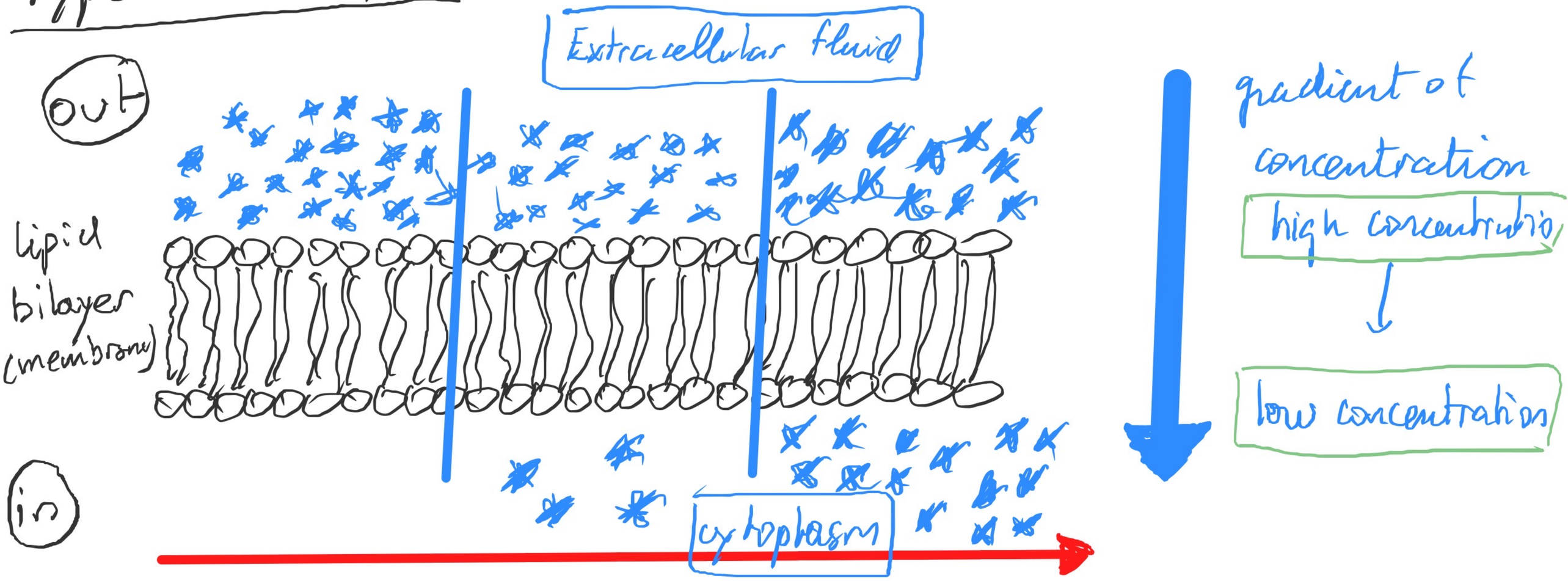
(c) see slide given after this pages.



(d)


Intermediate filaments of cell 1
Desmosomes of cell 2
Intermediate filaments of cell 2
Plasma membrane of cell 1
Desmosomes of cell 1
Extracellular space
Plasma membrane of cell 2
(c)

type of transport:

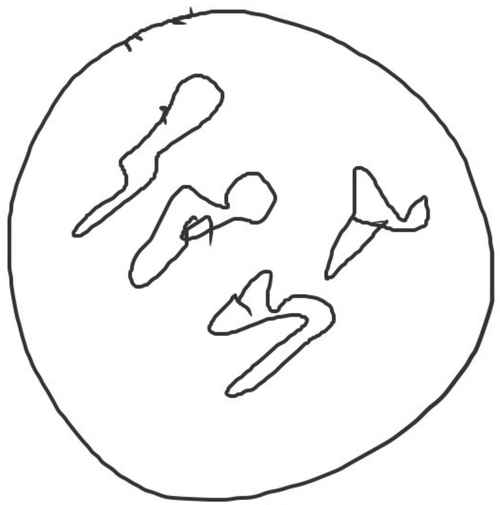


= DIFFUSION through a permeable membrane follow the concentration gradient.

⚠ membrane was permeable to that specific molecule ✱

what is the link with bio ? Ex: Red blood cells.

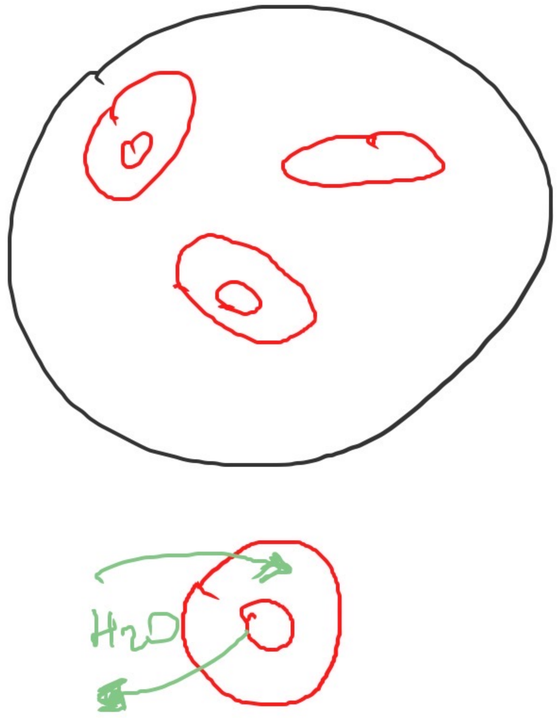
HYPERTONIC



« skrinked " cell

Concentration of salt in external domaine > cell

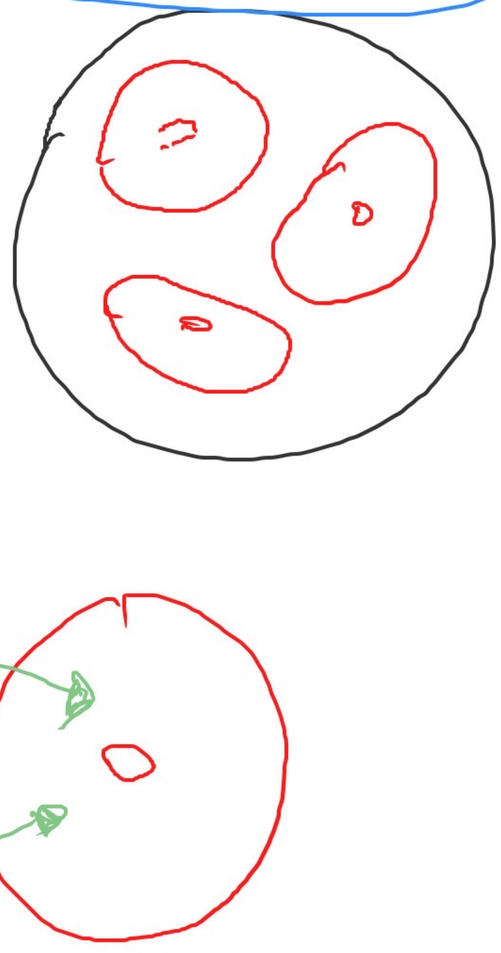
ISOTONIC



Conc. salt = con. cell

cell culture media

HYPOTONIC

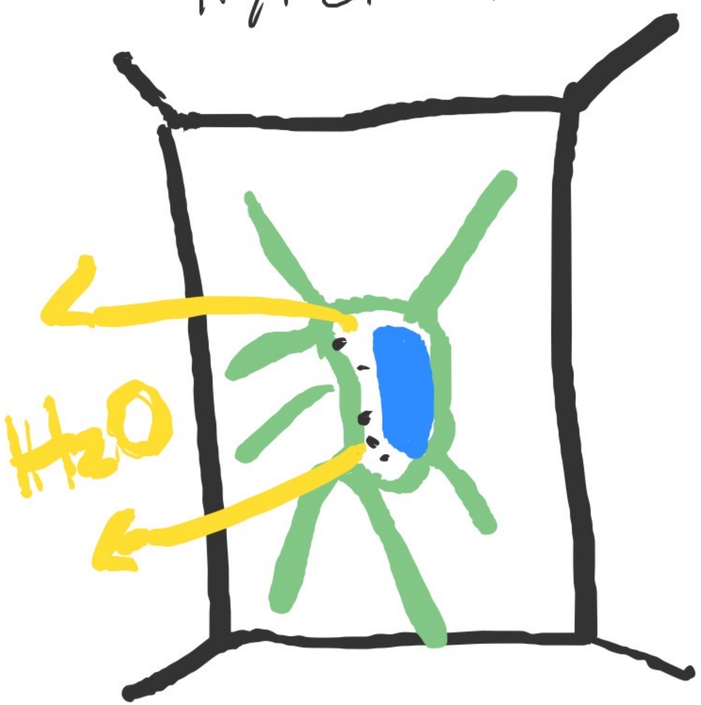


Concentration salt < cell

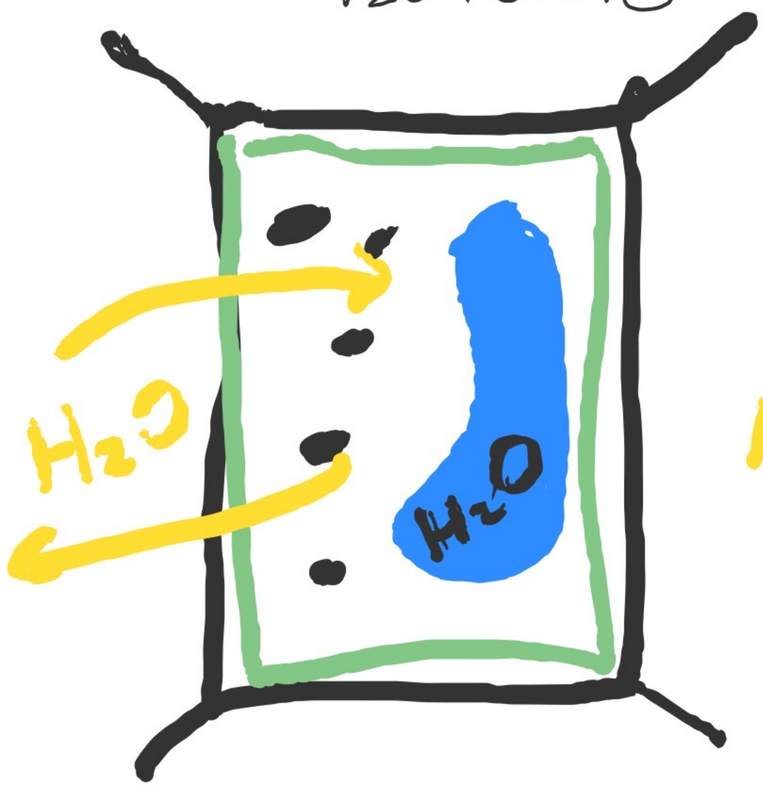
OSMOTIC PRESSURE EFFECT ON CELLS.

Plant cells:

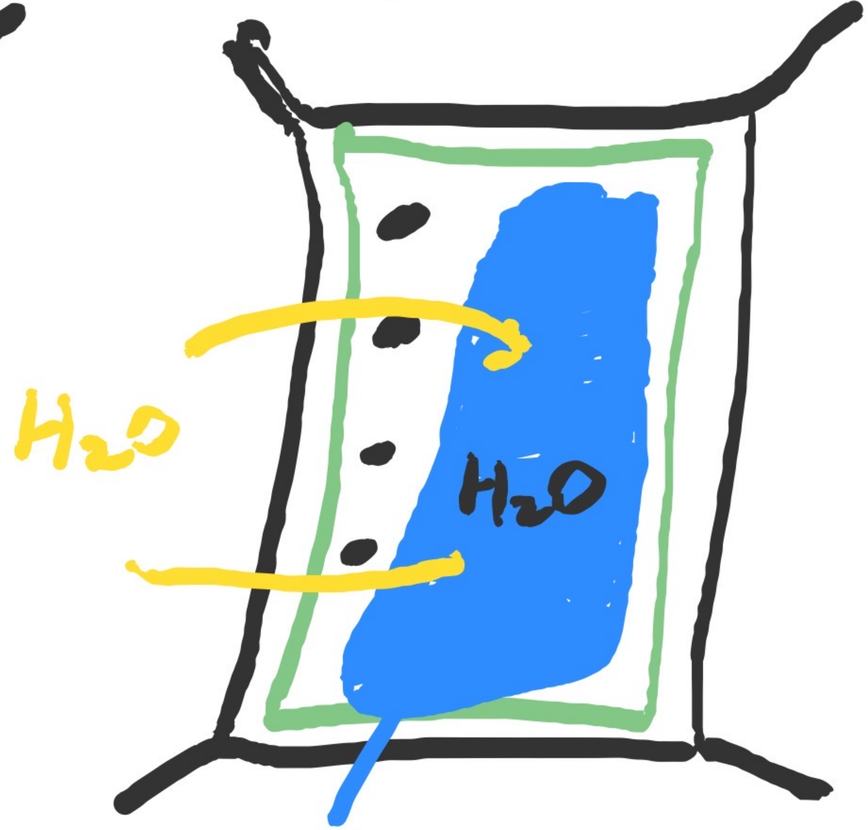
HYPERTONIC



ISOTONIC

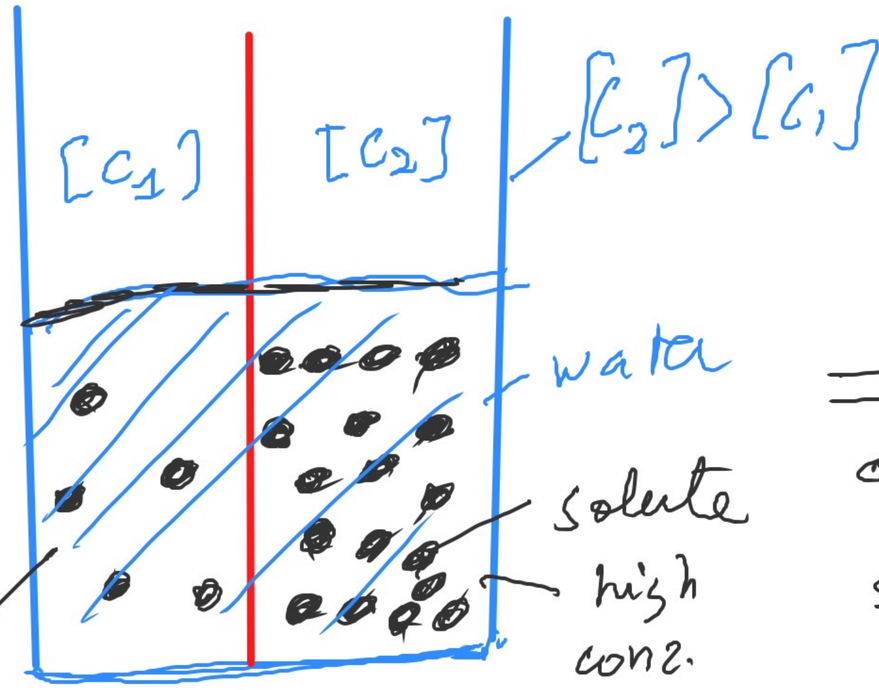


HYPOTONIC



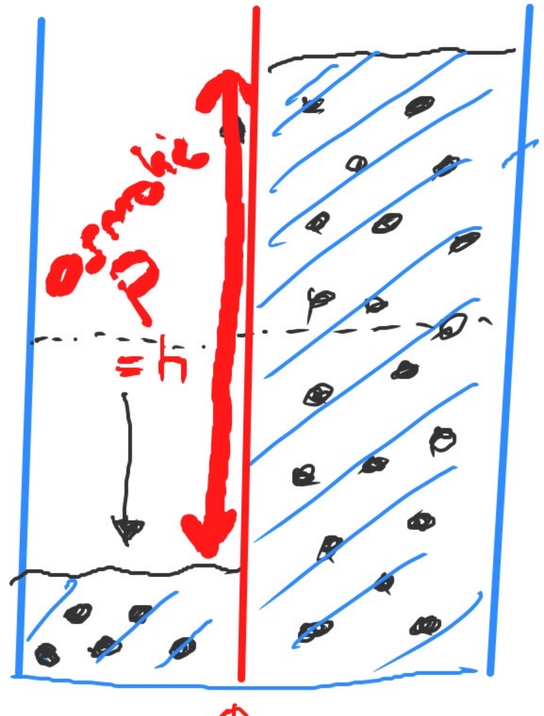
vacuole

beaker 1



diffusion of solvent

beaker 2



semipermeable membrane
(only permeable to the solute)

Definition: NaCl solution (salt) : Na^+; Cl^- = solute
H_2O = solvent

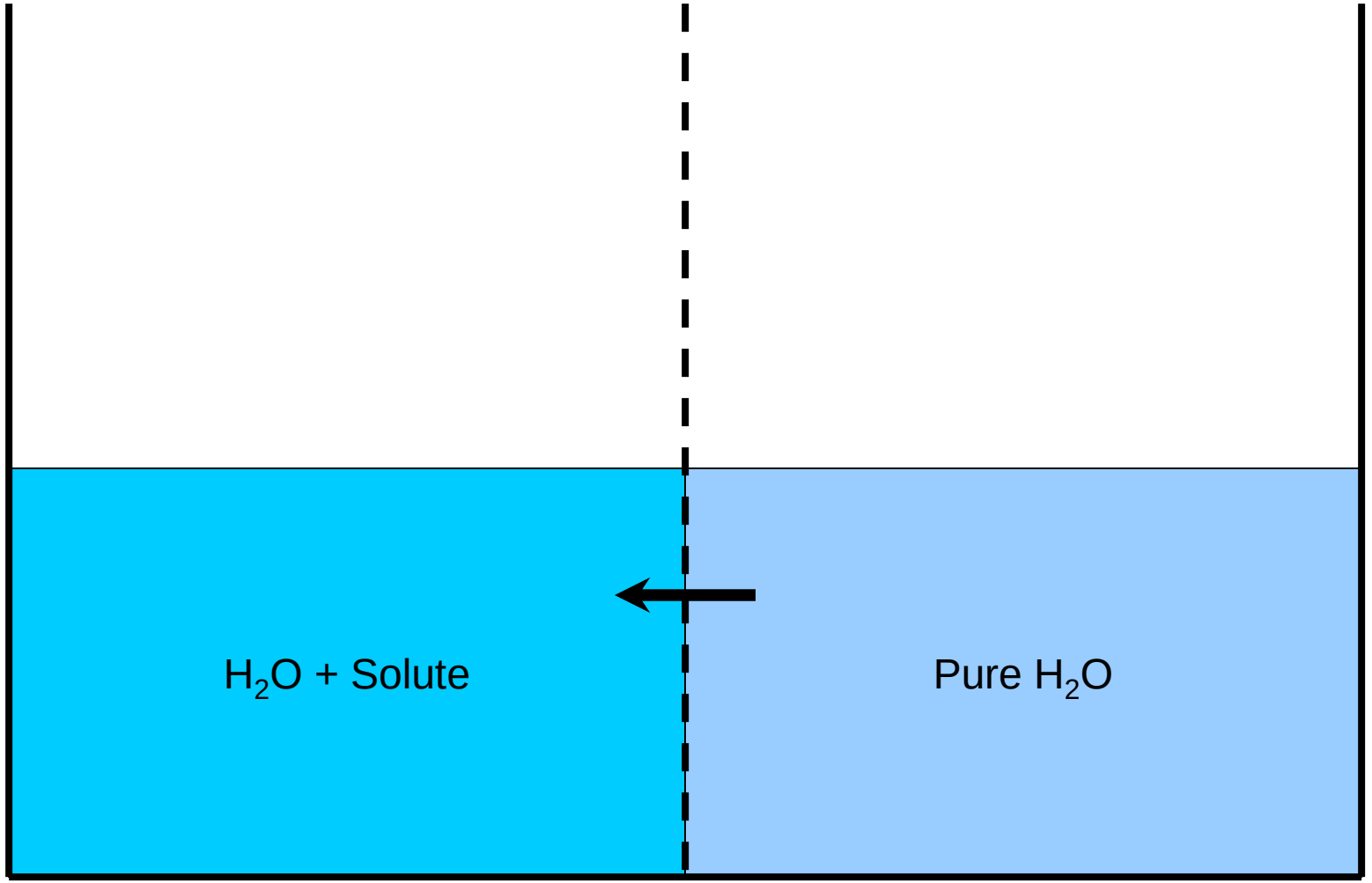
if we want to calculate Posmotic $\Rightarrow \Pi = i M R T$ (i: van't Hoff factor, M molarity ($mol \cdot l^{-1}$), R ideal gas const., T: Temperature (K))

$P = \rho g h$ — elevation of level of solvent
volumic mass solvent, gravity

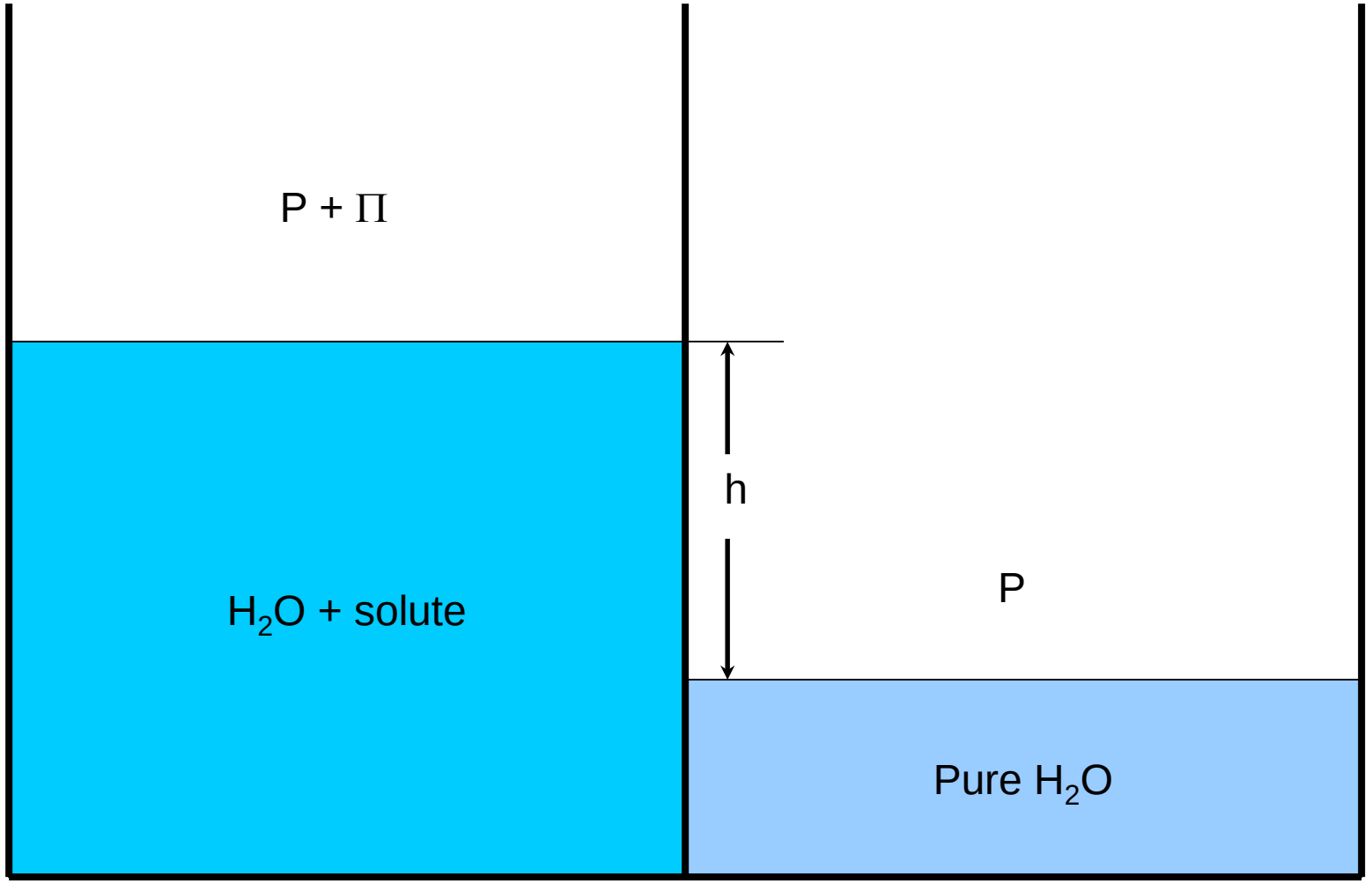
$\boxed{\Pi = P}$

Addition for OSmotic Pressure comprehension.
I had a great question at the end of the class by a student:
"Is the concentration equal at the end of the diffusion of semi permeable membrane?"
answer : NO
Please the difference of concentration "starts" the phenomen of osmotic pressure but this "elevation of solvent" wont necessarly equilibrate the concentration...

Osmotic pressure arises from an imbalance in equilibrium state when solute is added to one compartment

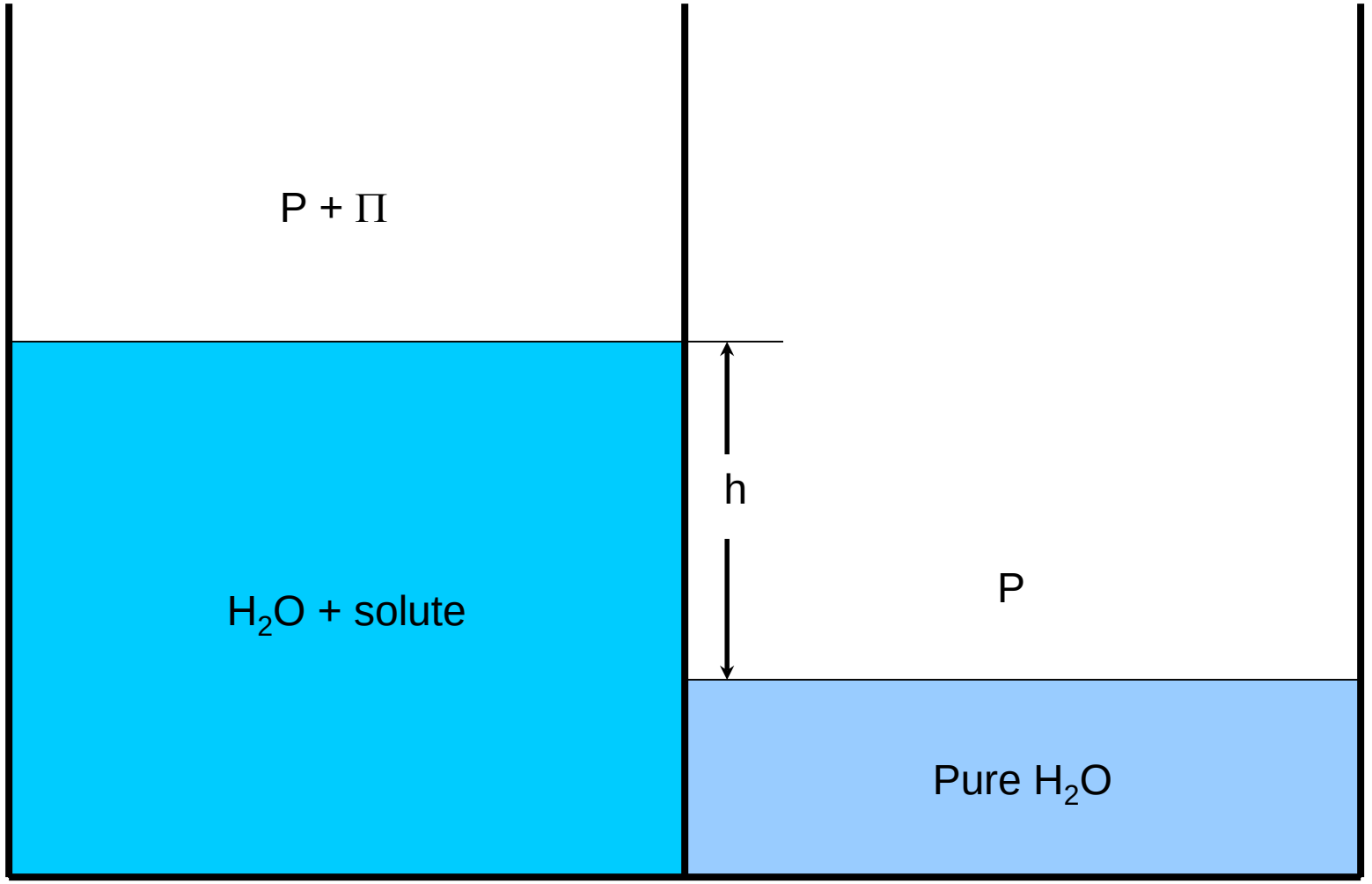


The flow of solvent leads to an increase in hydrostatic pressure



Hydrostatic pressure

$$\Pi = \rho g h$$



Osmotic pressure

Thus, we can compute the osmotic pressure from

$$\Pi V = n_2 RT$$

or

$$\Pi = cRT$$

where c is the molarity, n_2 expresses the number of moles of solute, and n_2/V, of the solution.
This equation is called the van't Hoff equation for osmotic pressure. The osmotic pressure can be used to determine the molecular masses of solutes, particularly solutes with large molecular masses such as polymers and proteins.

Question

What is the height of a column of water that will result from addition of enough NaCl to make a 0.1 M solution.

A. 25 m
B. 2.5 m
C 0.25 m
D 0.025 m

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A. 25 m
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$$\Pi = cRT = \rho g h$$

$$h = cRT/\rho g = \frac{(100\ mol/m^3)(8.31\ J/mol\text{–}K)(298\ K)}{(1000\ kg/m^3)(9.8\ m/s^2)}$$

$$= 25\ m$$

Use of osmotic pressure to determine molar mass

The van't Hoff equation can be modified to form used for the determination of molar mass by osmometry.

$$\Pi = cRT \qquad \Pi = \frac{wRT}{M_m}$$

Here we related to the concentration c in moles/liter to the concentration w in grams/liter and the molar mass M_m in grams/mole.

The experimental configuration uses the measurement of height as an estimate of the osmotic pressure. The equation $\Pi = \rho gh$ is used ($h = \Pi/\rho g$).

Use of osmotic pressure to determine molar mass

A sample of 1.5 mg. of a protein of unknown molar mass is added to an osmometer. The solution volume is 1 mL. The solution height increases by 1 cm. The measurement temperature is 298 K. What is the molar mass of the protein?

A. 37,900

B. 39,700

C. 79,300

D. 97,300

Use of osmotic pressure to determine molar mass

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$$M = \frac{wRT}{\Pi} = \frac{wRT}{\rho gh} = \frac{(1.5\ kg/m^3)(8.31\ J/mol\text{–}K)(298\ K)}{(1000\ kg/m^3)(9.8\ m/s^2)(0.01\ m)}$$

$$= 37.9\ kg\ /\ mol$$

$$= 37{,}900\ g\ /\ mol$$