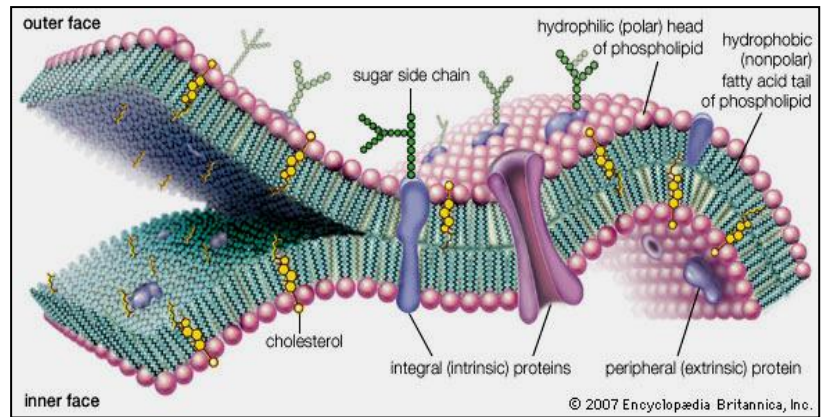


Lab. 8: Permeability

The ability of a membrane to allow the material passing through it, or move through it. So it is the membrane feature not of passage material.

The membranes divided into the flowing type:

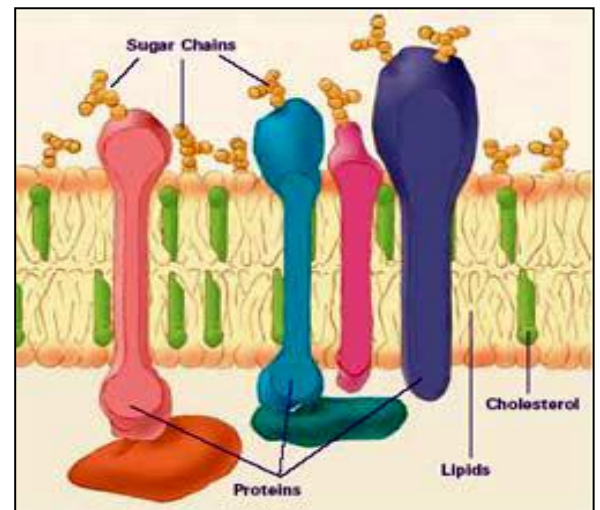
1. Impermeable membrane.
2. Permeable membrane.
3. Semi-permeable membrane.
4. Differential permeable membrane.



Factors affecting on permeability:

1. Size and weight of particle or molecule. (*Conversely*)
2. Kinetic (movement) energy. (*correspondently*)
3. Solubility of particles or molecules in membrane. (*correspondently*)

Plasma membrane is composed of lipids and proteins materials, so the material which has more solubility in lipid is passing more than other through this membrane.



The polarity: membrane diffusion rates decrease with increasing the polarity of the substance, because this increasing means more interactions to form hydrogen bounds with water, and that causes increasing in molecule size.

Polar groups like (OH, CHO, CO, COOH, NH₂, CONH₂, SH) reduce the permeability,

- Increases the length of carbon chain reduces polarity and increase solubility and consequently increases permeability.

- Urea slowly passes through the membrane (NH₂-CO-NH₂) the replacement of O₂ with sulfur (S) thiourea increase solubility in lipids consequently increases the velocity of permeability.

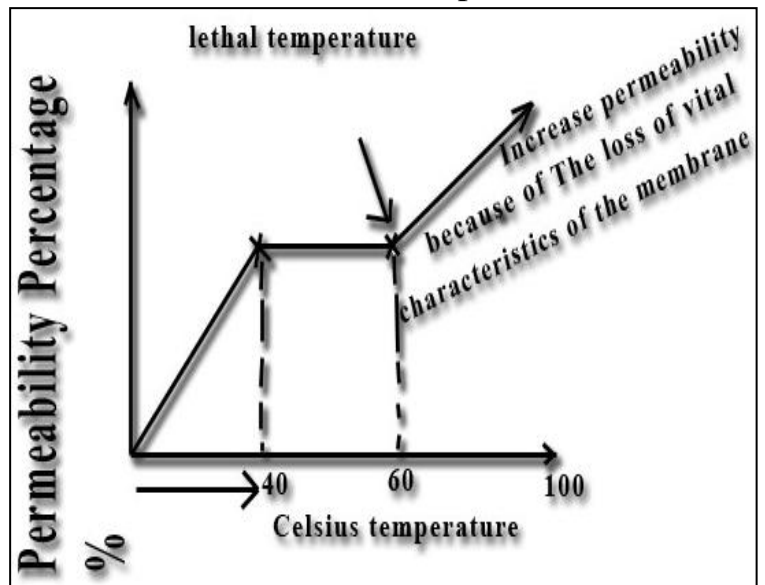
The permeability of ionized substance depends on:

1. **The diameter of the ions** which released from the break down, as well as to the hydrated layer thickness that surrounds it.

2. **Ions equivalent:** The positive ions like (Na^{+1}) more readily and quickly pass through the lipid membrane than the di equivalent positive ions like (Ca^{+2}) and the last more than (Fe^{+3}), the equivalent of the ions have relation with the hydrated layer of ions .

More no. of electron \rightarrow ions diameter \rightarrow thickness of hydrated layer around the ion \rightarrow more polarity & less permeability

4. **Temperature:** the permeability rates increase with (T) increasing, but increase the (T) than (60C) called **lethal t.**, in this case the cell membranes losses their selective characteristics and become absolute permeable, this due to denaturation of the cell, lessees the viscosity of cytoplasm, or maximize the kinetic energy for the passing molecules. As well as the $0\text{ }^{\circ}\text{C}$ lead to the freezing water presents in the cell and intercellular which cause to the torn the membrane results of increases of water volume and the permeability become never (absolute).



5. **The light effect (Correspondently)**, but the effect of radiation (gamma, Alpha, x-ray) (Conversely). Don't know why.

6. **Interactions of ions influence:** we have two cases:

- antagonism: ion permeability inhibited by another have the same charge like NH_4 & K .
- synergism: an ion permeability activated by another ion has the same charge, like Li & Rb .

The positive ions which have only one charge pass very quickly through membrane and cause damage the membrane lead to dead of cell. So the solution with one salt has the toxin effect on plant cell irrespective that its have importance in the plant life. Ions with two or three charges present in external solution, the permeability of membrane well reduce. The toxicity of (NaCl) reduced by adding a quantity of the other salts such as (CaCl_2), and vanished their toxicity effects by addition of potassium chloride (KCl).

(Briefly: the difference ions change the chemical composition of membrane and follow this difference of distribution rate for difference matter).

7. The effect of pH: Low (pH) degree → more break down rates of the substance in that solution → minimize the polarity for the substance more permeability . As well as the (pH) of medium outside the cell effect on their cell membrane structure & morphology.

8. The effect of toxic substances and drugs: The harmful effect of these materials such as (Ether and Chloroform) interpret that working as solvents for lipids of membrane and cytoplasm, or reduce the tension interoperability between cytoplasm and external solutions, change the membrane composition and finally change the physiological properties.

Collecting some ions inside the cell more than outside the cell or opposite.

Cl ⁻	K ⁺	Na ⁺	
0.628	0.591	0.043	In fallonia Algae cell
0.580	0.012	0.498	In sea water

Notice that the concentration of (Cl⁻, K⁺) inside the fallonia algae cell more than outside the cell (sea water)

And this type of transport called as **active transport**, it is happen through the selective permeable membrane and need the energy in the form of ATP released from the respirator. **Or** happen by several **ions pump** or **carriers**.

Practice part:

Experiments: 1, 2, 3, 4

For study of temperature, pH, dissolved materials (antagonism and synergism) and drug materials effects.

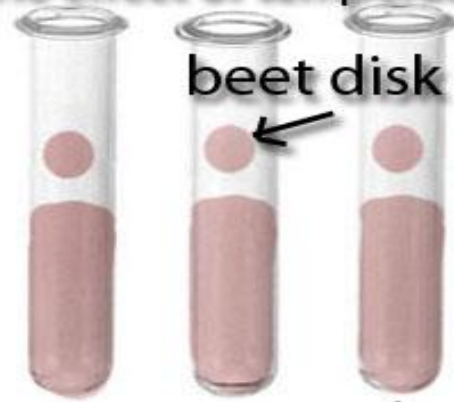
Cylinder of beet with 1cm diameter cut off it to disk with 0.2cm thickness, weigh the 2 gram of this disk and put them into the test tube after wash them carefully with water to get rid of (anthocyanin) stain.

2. Effect of PH

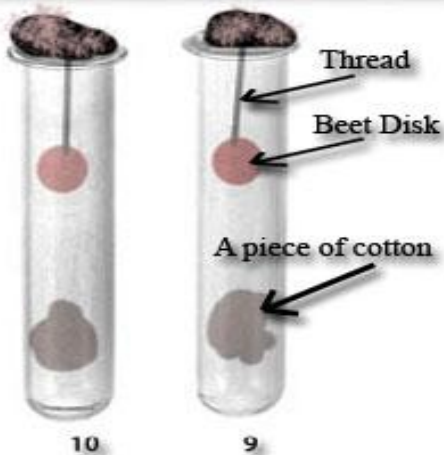


- 5
4
- (4) 5MI of HCl 0.1N PH = 1
(5) 5MI of NaOH 0.1N PH = 13

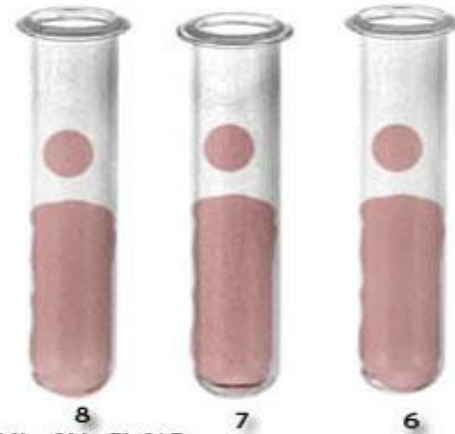
1. The effect of temperature



- 3 2 1 PH = 7
- (1) 5MI of D.W in room temp
(2) 5MI of D.W put it in refrigerator to freezing then put it in room temp.
(3) 5ml of D.W put it in high temp after that put it in room temp



- 10 9
- (9) 3MI of D.W
(10) 3MI of Ether or Chloroform



- 8 7 6
- (6) 5MI of NaCl %5
(7) 5MI of CaCl₂
(8) 5MI of CaCl₂ %5 + NaCl %5

4. Effect of drugs substance

3. Effect of dissolved materials antagonism and synergism

Why the water colored in some above cases and don't colored in other?
Explain that?