

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

رَبِّهَا أَيُّهَا النَّاسُ قَدْ جَاءَكُمْ مَوْعِظَةٌ مِّن رَّبِّكُمْ
وَشِفَاء لِّمَا فِي الصُّدُورِ وَهُدًى وَرَحْمَةٌ
لِّلْمُؤْمِنِينَ.

صدق الله العظيم

(سورة يونس - الآية 57)



Diffusion

By

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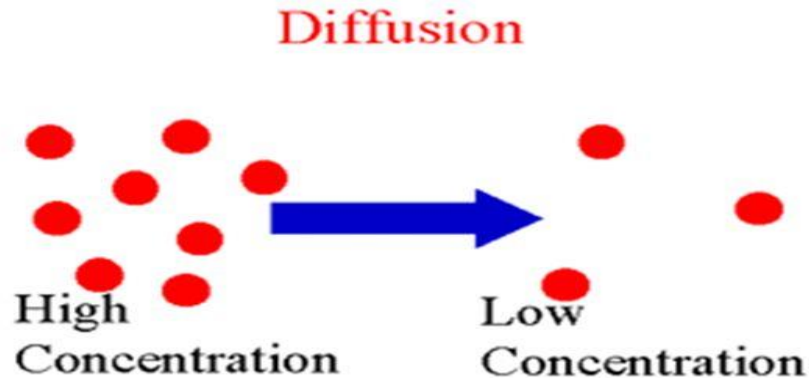
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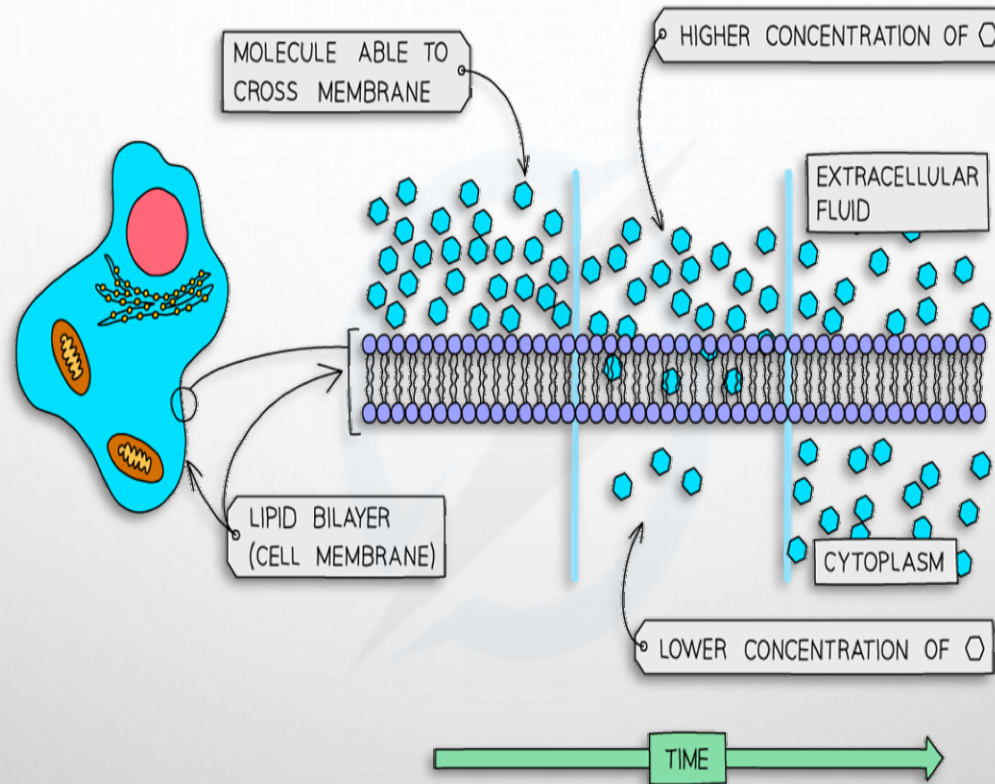
Diffusion in Living Organisms

- ✓ **Diffusion** is the **movement of molecules** from a region of its **higher concentration** to a region of its **lower concentration**, until equilibrium is reached.
- ✓ **Osmosis** is a type of diffusion which is the movement of solvent molecules through a semipermeable membrane. Essentially, it is the process by which water moves through the cell membrane.

- Diffusion is the movement of molecules from a high concentration to a low concentration.
- Many molecules diffuse across cell membranes



Molecules move **down a concentration** gradient, as a result of their **random movement**.



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Diffusion across the cell membrane

- ❑ For **living cells**, the principle of the movement down a concentration gradient is the same, but the cell is surrounded by a **cell membrane** which can **restrict the free movement of the molecules**.
- ❑ The cell membrane is a **partially permeable membrane**: this means it allows some molecules to cross easily, but others with difficulty or not at all.
- ❑ The simplest sort of selection is based on the size of the molecules
- ❑ Diffusion helps living organisms to:
 - i. obtain many of their **requirements**.
 - ii. get rid of many of their **waste products**.
 - iii. carry out **gas exchange for respiration**.

Examples of diffusion in living organisms

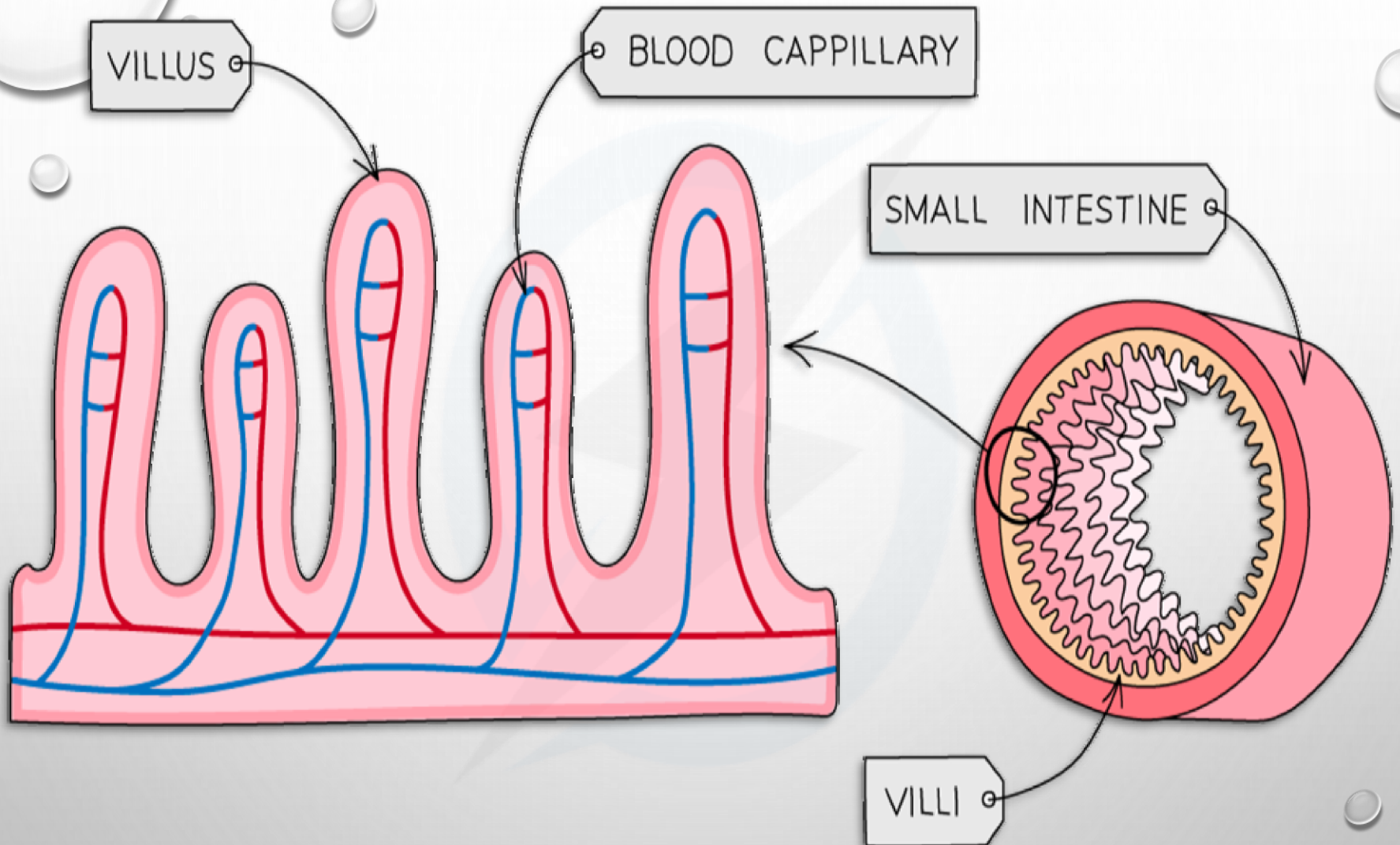
Don't forget that **plants require oxygen for respiration at all times**, as well as **carbon dioxide for photosynthesis** when conditions for photosynthesis are right (e.g. enough light and a suitable temperature).

Factors that Influence Diffusion

Surface area to volume ratio:

The surface area divided by the volume is called **the surface area to volume ratio**:

- I. A smaller cell has more surface area in relation to its volume **or** the smaller its surface area to volume ratio.
 - II. A larger cell has a smaller amount of surface area in relation to its volume.
- ❖ Many cells which are adapted for diffusion have **increased surface area** in some way.
 - ❖ **Example:** root hair cells in plants (which absorb water and mineral ions) and cells lining the ileum in animals (which absorb the products of digestion).
 - ❖ If the cell grows beyond a certain limit, not enough material will be able to cross the membrane fast enough to accommodate the increased cellular volume.



The highly folded surface of the small intestine increases its surface area

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Three factors that affect the rate of diffusion and therefore the movement of molecules through membranes:

A. Distance

- The smaller the distance molecules have to travel the faster transport will occur.
- This is why blood capillaries and alveoli have walls which are only one cell thick, ensure the rate of diffusion across them is as fast as possible.

B. Temperature

- The higher the temperature, the faster molecules move as they have more energy.
- This results in more collisions against the cell membrane and therefore a faster rate of movement across them.

C. Concentration Gradient

- The greater the difference in concentration either side of the membrane, the faster movement across it will occur.
- This is because on the side with the higher concentration, more random collisions against the membrane will occur.

Factors affecting the exchange of Materials across Membranes

I. Chemical Factors

- ❑ Many uncharged molecules such as ethanol, can easily penetrate the cell membrane **because** they dissolve in the phospholipid bilayer.
- ❑ Hydrophilic charged ions such as sodium and potassium cannot cross the hydrophobic center of the membrane.

II. Physical Factors

- ❖ Size and shape affect the movement of substances across the cell membrane.
- ❖ Glucose and amino acids are examples of large molecules that use carrier proteins to move through the cell membrane.
- ❖ However, very large molecules move out of the cell through the process of endocytosis and exocytosis.

III. Concentration Gradient

- If the concentration gradient is high then the substance will diffuse rapidly.
- However, if it is low, then it would take ages for it to diffuse.
- When the concentration reaches equilibrium there will be no movement between the cells.

Different between active and passive:

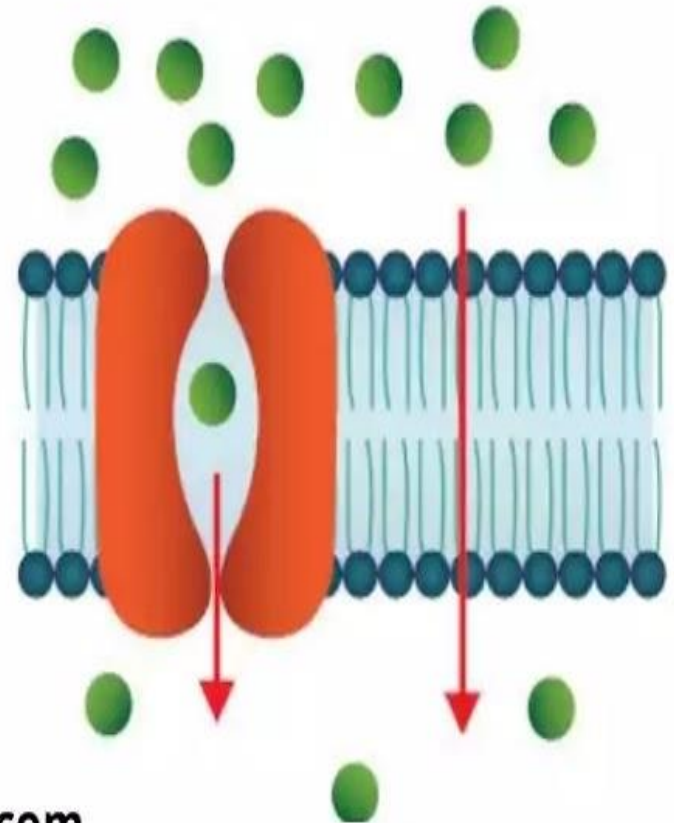
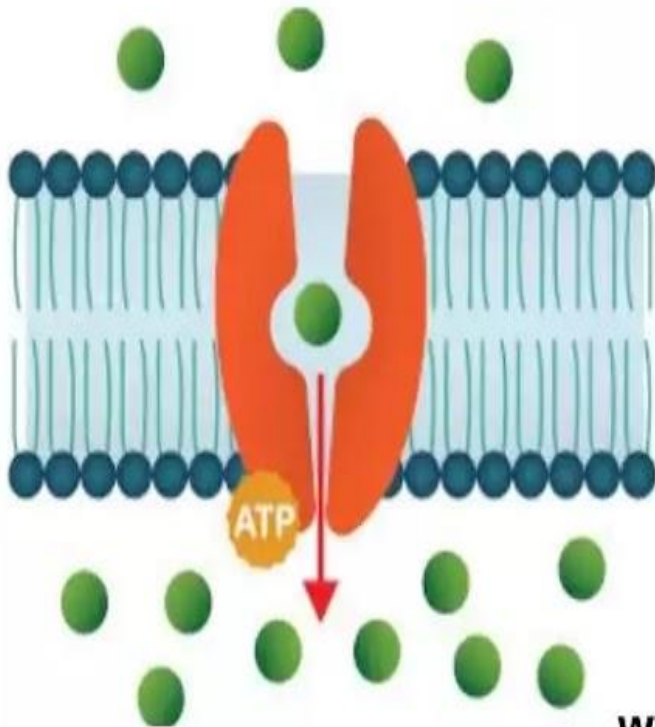
Active Transport	Passive Transport
1- Active transport is the movement of molecules from a region of low concentration to a region of high concentration gradient.	1- Passive transport is the movement of molecules from a region of high concentration to a region of low concentration gradient.
2- This movement involves the use of energy in the form ATP	2- No energy need, No ATP require.
3- Facilitated diffusion require the use protein carrier / transport molecule.	3- Some type require the use protein carrier / transport molecule.
4-Example: Endocytosis and Exocytosis. Exocytosis: is the process by which special substances are transported to the external environment of the cell.	4- Example: Endocytosis. Endocytosis: When a large particle wants to enter the cell, the cell membrane can change its shape to surround the particle and engulf it by the process of endocytosis.
5- Movement of large molecule occur by active transport.	5- Only small molecule or water molecule are transport passively.
6- It's a rapid movement.	6- It's a slow movement.
7- Its involve movement of molecule against the concentration gradient.	7- Its involve movement of molecule along the concentration gradient.

Difference Between

Active Transport

VS

Passive Transport



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