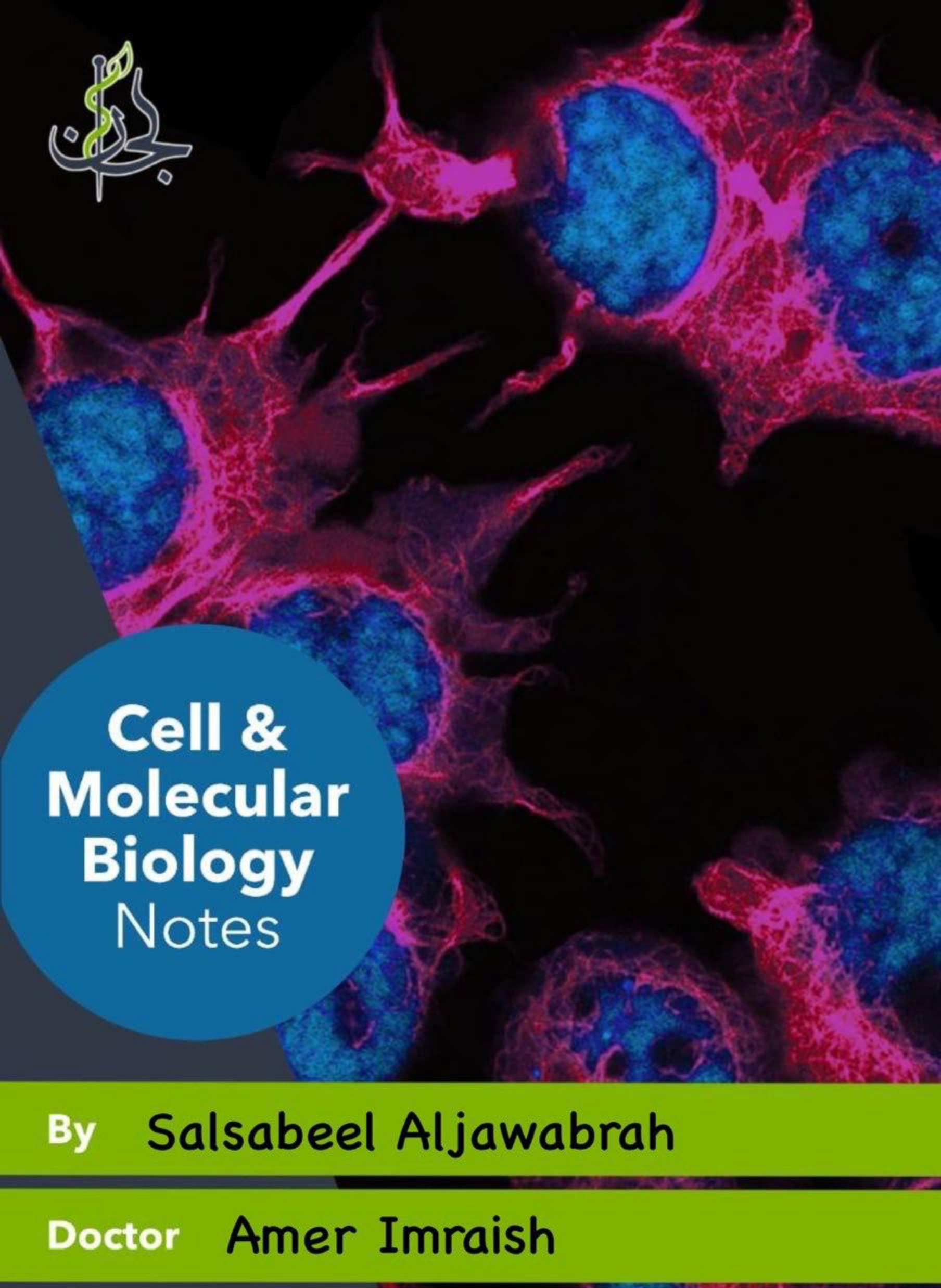

Cell & Molecular Biology Notes

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lec 5

Cell Biology

Salsabeel Jawabreh

8.91 Solute movement across cell membrane.

Selective permeability → Allows for exchange of materials across the plasma membrane.

Substances move across membranes by:

- Passive: without using energy with the concentration gradient
  - Simple diffusion
    - Through the lipid bilayer
    - Through an aqueous protein-lined channel
  - facilitated diffusion
    - By a protein transporter
- Active: with using energy
  - Requires an energy-driven protein "pump" to move substances against a concentration gradient

Diffusion requires ← Concentration gradient
membrane permeability

Lipid permeability depends ← the molecular size
polarity
partition coefficient.

The ratio of solubility in a nonpolar solvent to that in water.

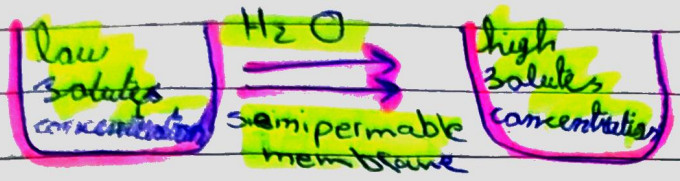
partition coefficient ∝ Diffusion

the Size ∝ 1/diffusion

(hydrophobic) the polarity ∝ 1/diffusion

8.10 | The Osmosis

Semipermeable → permeable for H_2O
unpermeable for Solutes
بتمرر الماء و ما بتمرر الجزيئات مذابة



hypotonic → less solute · (cells swell)
hypertonic → more solute · (shrink)
isotonic → A normal amount of solute (unchanged)

Animal cells → isotonic (without cell wall)
↓ the normal situation
plant cells → hypotonic (with cell wall)
↓ the normal situation
Because the cell wall opposites the internal pressure that pushes against it. (turgor pressure)

In the hypertonic environment the chloroplasts clumpes. (تتكتل) غير طبيعي

aquaporins have (specific amino acid residues) that allow wates to pass (amino acid with positive charge / Oxygen with partially negative)

Ions pass through the specific channels in bi direction (depending on the gradient).
Electrochemical gradient.

Ion channels have been characterized by patch clamping experiments.

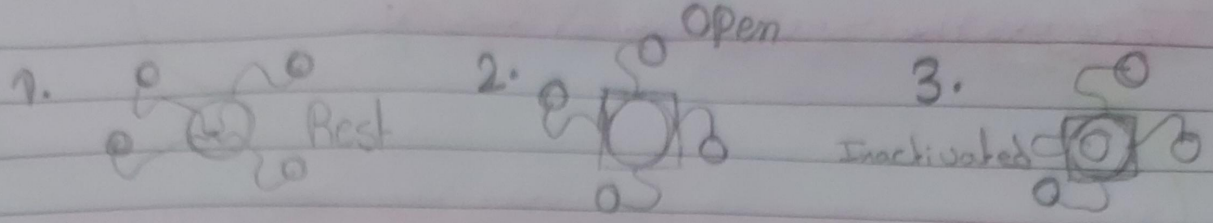
THE TYPES OF CHANNELS

* GATED (open/closed conformation)

1. Voltage-gated channels → differences in the membrane potential.
2. Ligand-gated channels → binding with specific molecule (usually not the solutes that will pass)
3. Mechano-gated channels → the stretch tension that is applied to the membrane.

The channels ase fast passage of ions
ion channels involved in the transporting
of the electrical signals in the nervous cells

Conformational states of a voltage-gated K^+ ion channel.



8.12.1 Facilitated Diffusion

By using facilitative transporters (protein) without using ATP (Energy)

(ممرات بروتين)

involving the change of the shape (Solute binding / releasing) In both direction depending on the relative Concentration.

Specific to the Molecules

Facilitated diffusion depends ← concentration gradient, transporter

Concentration gradient ↑ Rate of simple diffusion ↑ facilitated in the beginning will decrease until it reach to the saturation level and then the rate will be Constant.

GLUT has many types depending on the type of the cell

1. Increasing in blood glucose levels

2. Triggers the secretion of insulin

3. The GLUT4 (which uptakes the glucose) exists on physicals inside the cells
These are a few GLUT4 on the surface of the cells.

4. The production of insulin stimulates GLUT4 to move to the cell surface

5. Cells uptake the glucose when it binds with GLUT4

6. The GLUCOSE concentration in the blood will decrease to the NATURE

8.13 | Active Transport

Simple - facilitated diffusion → equilibrium.

Low Concentration → high Concentration

Active Transporting

Transporting is driven by changes in protein conformation. (against the concentration gradient using energy)

E_1 Conformation → high affinity of Na^+
E_2 Conformation → high affinity of K^+

ATP → مصدر لطاقة الحيوية

The thing that stimulates the change of conformation is the phosphorylation and dephosphorylation In the active transport while in facilitated transport is the binding and releasing.

Sodium - potassium → Animal cell (electrogenic)
bacteria & plants → H^+ pump (electrogenic)

ER → Ca^{+2} ذخیره

Ca^{+2} involved in the signals transduction and the second messenger

Lysosomes' enzymes are active in acidic state, so H^+ is actively transported.