1. Electrodics

Cell

Pipette

Ag, AgCl electrodes

\[ e^- + AgCl \rightarrow Cl^- + Ag \]

\[ Cl^- + Ag \rightarrow AgCl + e^- \]

2. A lipid vesicle

- A lipid membrane is an electrical insulator
- A bilayer surrounded by ionic media is like a capacitor.
- When a battery is connected to a capacitor, it gets charged!

\[ C = \frac{Q}{V} \]

- A biological membrane has a specific capacitance of \( 1 \mu F/cm^2 \)

- 100 mV across a membrane (1 cm^2) will charge the membrane with

\[ Q = CV = 10^{-6} F \times 0.1 V = 10^{-7} C \]

- How many ions does 10^{-7} C correspond to? To answer this, we need to know about the "Faraday" constant!
As it was established by Faraday, the movement of \( \approx 96,500 \) Coulomb of electricity (1 Ampere = 1 Coulomb/s) moves 1 Mole of any charged substance.

\[
\text{Moles} = \frac{\text{Coulombs}}{\approx 96,500}
\]

Thus, \( \frac{10^{-7} \text{ C}}{1.96,500} \approx 10^{-12} \text{ moles} \)

Given Avogadro's number of \( 6 \times 10^{23} \frac{\text{molecules}}{\text{mol}} \)

\( 10^{-12} \text{ moles} \Rightarrow 10^{-12} \times 6 \times 10^{23} = 6 \times 10^{11} \text{ molecules} \)

- No, a cell membrane (1 cm²) charged to 100 mV accumulates \( 6 \times 10^{11} \text{ molecules/cm}^2 \)

3.- Where do batteries come from?

- From ionic gradients and ion channels!