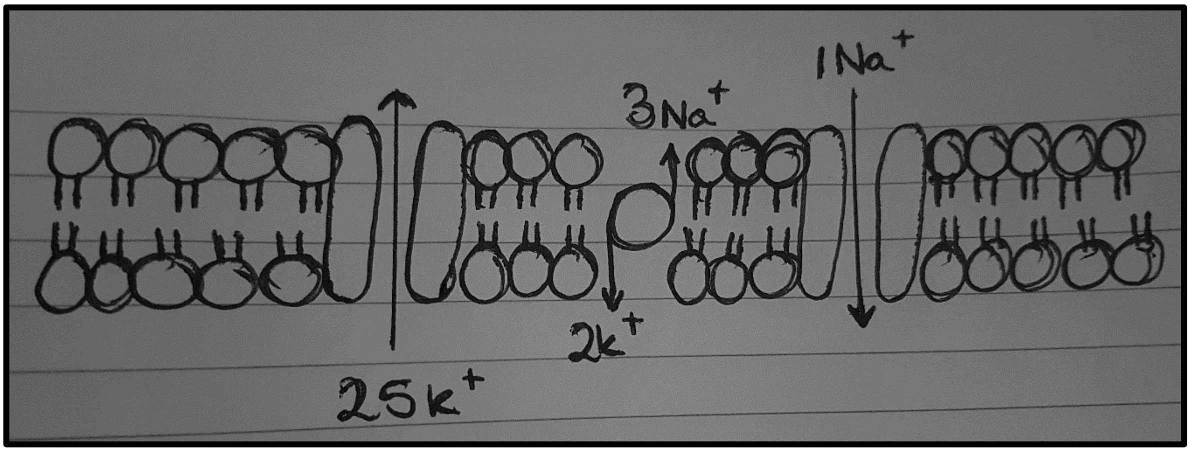
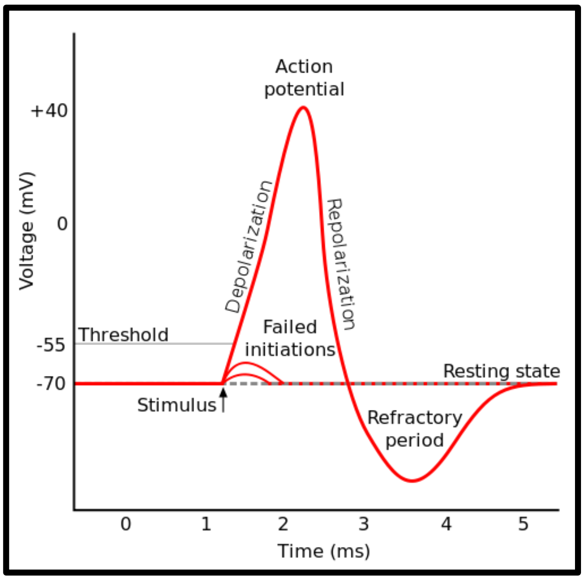
- Differences in plasma membrane permeability
    - The membrane is **impermeable to large anionic proteins**, but is **quite permeable to Cl^-**
    - It is **slightly permeable to Na^+**
        - However, it is **25 times more permeable to K^+ than Na^+**
        - The **sodium-potassium pump stabilises the resting membrane potential by moving 3 sodium ions out and moves 2 potassium ions in**
            - This **removes one positive charge**
- See below, the different proteins in action:



- Membrane potential changes when:
    - **The concentration of ions changes**
    - **The membrane permeability to ions changes**

- The change in membrane potential can produce one of two signals:
    - **Graded potential**
        - **Incoming signals operating over short distances**
    - **Action potential**
        - **Long distance axon signal**

- The membranes potential changes can be measured on a **voltage-time graph**:
    - The membrane is resting at **-70mV**
    - During **depolarisation**, both **potassium and sodium channels open** causing sodium to enter and potassium to leave
        - At the **threshold** (~-55mV) **positive feedback causes all sodium channels to open**
    - At the peak of the action potential (+40mV), the **sodium channels become refractory and so no more enters**
    - During **repolarisation**, **potassium continues to leave the cell, returning it to resting potential**
    - When the membrane becomes **hyperpolarised**, **potassium channels close and sodium channels reset** in order **to restore the membrane** to its resting potential



- Action potentials are the primary way that neurones send long distance messages:
    - They **only occur in muscle cells and neurone axons**
    - **Action potentials do not degrade over long distances** unlike graded potentials