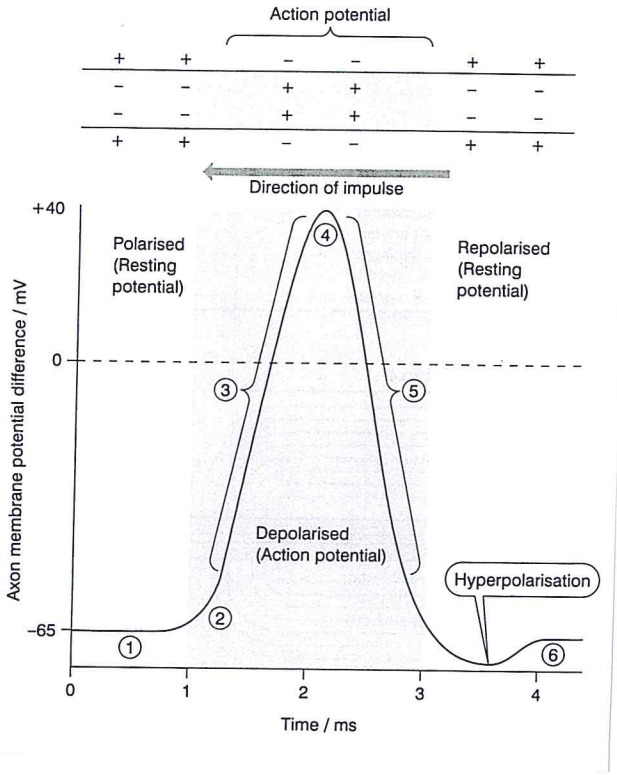
Action potential (depolarization and repolarization)

An action potential is the reversal and restoration of the electrical potential across the plasma membrane of a cell, as a nerve impulse passes along it:



1. The sodium – potassium pump pumps 3 Na^+ out, and 2 K^+ in, causing a resting potential of – 65 mV (**polarization**).

2. **Local currents** (diffusion of Na^+ to the next part of the axon) at the leading edge of the nerve impulse reduce the resting potential until it reaches its action potential threshold, and **voltage-gated sodium channels** open; Na^+ move into the axon by facilitated diffusion along their electrochemical gradient.

3. As Na^+ enter, more sodium channels open so Na^+ enter rapidly, and the inside of the axon becomes positive relative to the outside (**depolarization**).

4. Once the action potential of + 40 mV has been reached, the sodium channels close and the **voltage-gated potassium channels** open.

5. As K^+ leave, more potassium channels open so K^+ leave rapidly by facilitated diffusion along their electrochemical gradient (**repolarization**).

   The outward diffusion of K^+ causes the temporary overshoot of the electrical gradient and the inside becomes more negative than usual (**hyperpolarization**).

6. The potassium channels close, and the sodium-potassium pumps start pumping 3 Na^+ out of the axon and 2 K^+ in to re-establish the resting potential.

The nerve impulse is then **propagated** (moved along the axon) by depolarization of the next part of the axon.