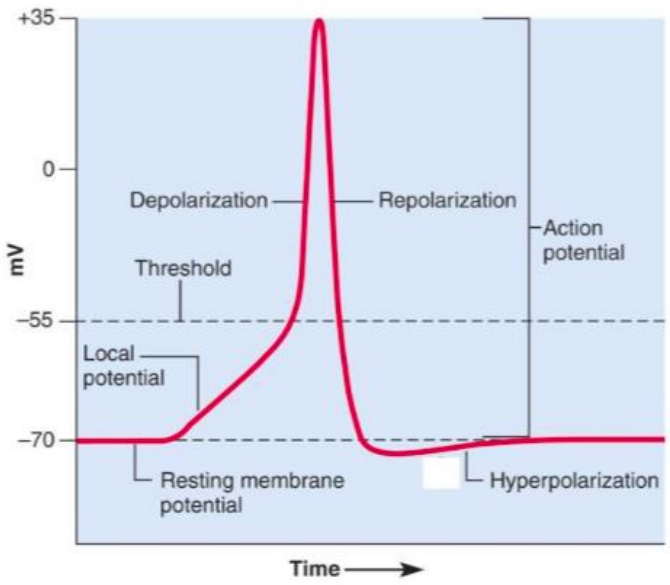

This diagram represents an electrical recording of the events which occur (depolarisation and repolarisation) during an action potential.

The reason for the hyperpolarisation is that the **K^+ channels take longer to close** than the Na^+ channels, letting **slightly more K^+ out** of the cell than the Na^+ that entered. However, inward diffusion of Na^+ through leakage channels soon brings E_m back to resting levels.

Action potentials are different from local potentials as they are not a graded response. If the threshold potential is reached, then an action potential **will** occur and it will travel down the **entire length** of the axon. The action potential **never deviates in size** and so is called an 'all-or-nothing' response.

During the action potential and for a short period after, it's either impossible or difficult to stimulate the membrane to depolarise again – the refractory period. There are two types of refractory periods:

- Absolute refractory period – impossible to stimulate an action potential in the section of the membrane that has just been active, **no matter how strong the stimulus**. This is because Na^+ channels are only open for a short period of time before they shut and become inactivated i.e. impossible to open for a while. This period extends from the **start of depolarisation until the REm is reached again**.
- Relative refractory period – lasts **until hyperpolarisation is over**. During this period Na^+ channels may be opened but K^+ channels are also open so it requires a greater stimulus than normal to open enough Na^+ channels to overcome the opposing effects of K^+ efflux (the flowing of a substance or particle).