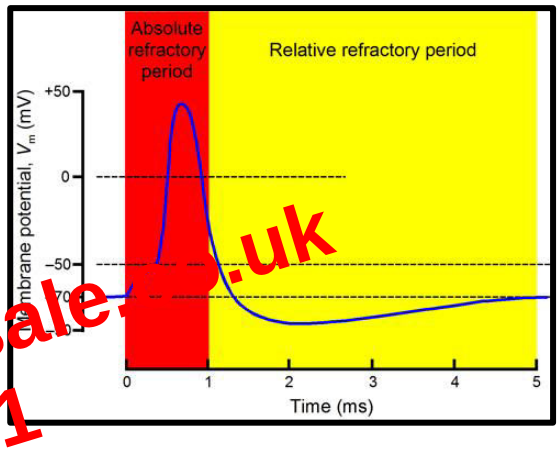
The Nervous System Part 3

- An axon transmits an action potential from the axon initial segment, downwards towards the terminals
  - Once initiated, the action potential is **self-propagating**
    - In **nonmyelinated axons**, each **successive segment of membrane is depolarised then repolarised**
    - It differs in myelinated fibres (see later)
  - The action potential **can only travel down the axon as the Na^+ channels behind it are still inactive**

- **All action potentials are alike and are independent of stimulus intensity**
  - Neurones can tell the difference between a weak stimulus and a strong one by the frequency of impulses

- The refractory period that occurs due to the inactivity of sodium channels, occurs in two stages (see right):
  - **Absolute refractory period**
    - **This is the period of time from the opening of the Na^+ channels until the resetting of the channels**
      - This ensures that an action potential is either triggered or not, no in-between
      - It also ensures that the action potential is one way
  - **Relative refractory period**
    - This stage **follows the absolute refractory period**
      - **Most Na^+ channels have returned to their resting state**
      - **Some K^+ channels are open**
      - **Depolarisation is occurring**
      - **The threshold for another action potential is increased** and therefore, only very strong stimuli can stimulate another action potential



- The rate of an action potential traveling down an axon depends on two factors:
  - **The axon diameter**
    - Large diameter – faster conduction
  - **The degree of myelination in the axon**
    - Unmyelinated – continuous conduction
      - This is relatively slow
    - Myelinated axon – saltatory conduction
      - This is fast

- **Myelinated fibres transmit an action potential faster due to the nodes of Ranvier**
  - The action potential is only generated in the nodes of Ranvier and so does not have to depolarise the whole length of the axon

- **Multiple sclerosis** is an autoimmune disease that affects young adults
  - In multiple sclerosis, the **myelin sheaths are destroyed when the immune system attacks the myelin**
    - This **turns the myelin into harden lesions called scleroses**
    - The **impulses conduct slower and eventually stop**
    - Demyelinated axons gradually express Na^+ channels causes cycles of relapse and remission