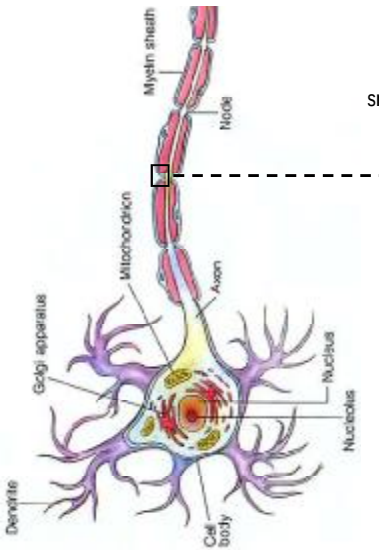
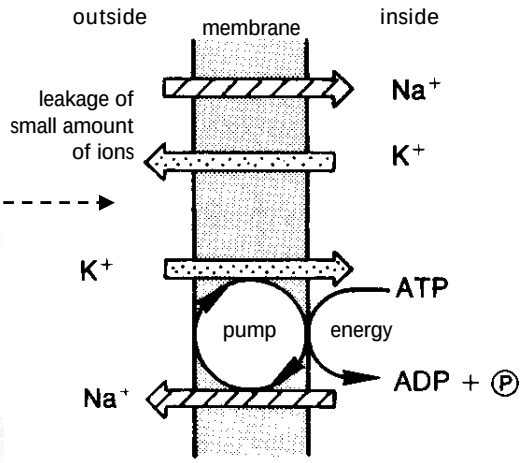
Worksheet: Date:

The sodium-potassium pump: a specific case of active transport

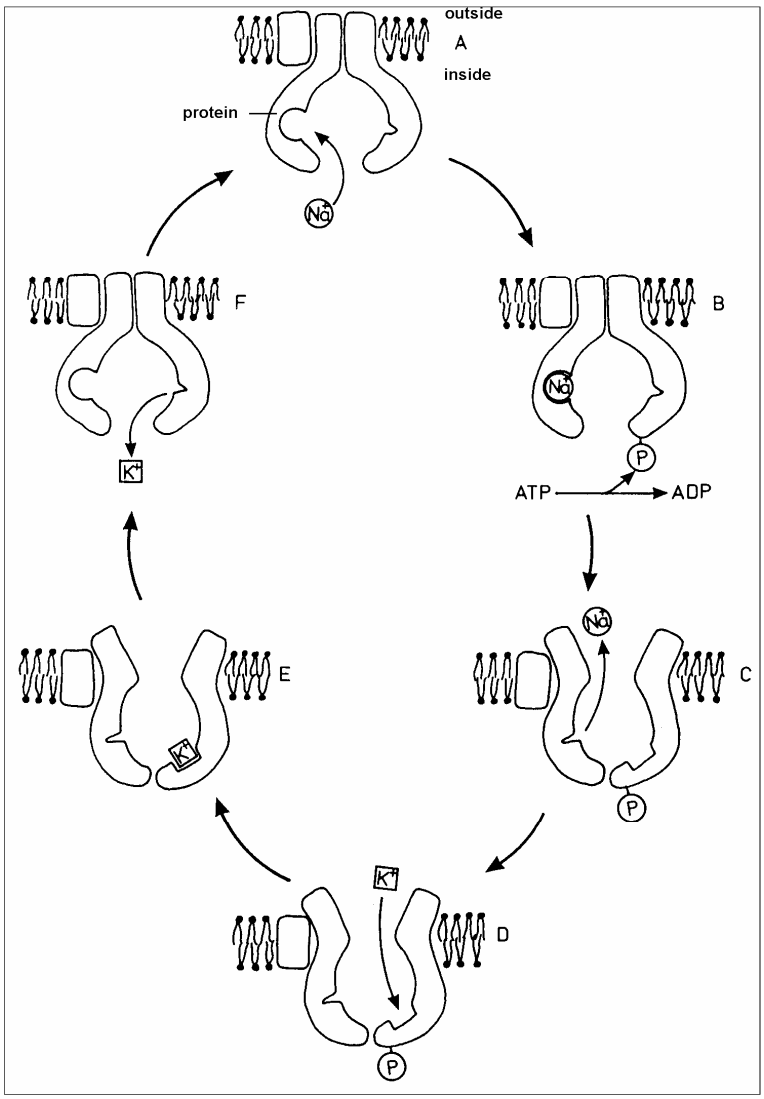
neuron (nerve cell)





sodium-potassium pump (overview)

details



When studying neurons (nerve cells) scientists noticed that electrochemical potentials [elektrochemische Spannung] are necessary to make the nervous system in animals and humans work. If the concentration of particular ions, such as sodium (Na^+) and potassium (K^+), inside and outside neurons is measured, it is found that the cells usually need different concentrations of these ions inside and outside. The cells cannot manufacture inorganic ions, so they must be able to accumulate [anhäufen] them against a concentration gradient. This requires energy.

The transport system is illustrated in the following diagram!

Na^+ = sodium ion
K^+ = potassium ion
ATP = adenosin-triphosphat
ADP = adenosin-diphosphat

ATP stores energy. The energy is supplied by the molecule ATP which is produced during respiration inside the cell. ATP stores the energy and supplies the energy needed (ATP is broken down into ADP + P) to make the carrier protein change shape as illustrated in the diagram.
(The energy which is released when glucose is broken down is used to make ATP out of ADP + P → extra sheet!)

Tasks:

1. *Make statements about the concentration (high/low) of sodium (Na^+) and potassium (K^+) inside and outside the neuron! (Which ions are usually found in a higher concentration inside/outside the cells?)*
2. *Use the diagram and explain how the ions are pumped across a membrane against a concentration gradient!*

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