

Chemiosmosis works by building up protons in the intermembrane space, they diffuse back through the stalked particles

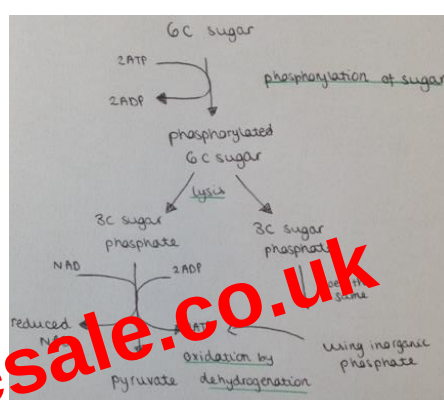
Protons come from reduced hydrogen carriers, such as NAD. Hydrogen splits into protons (H^+) and electrons (e^-). The protons are pumped into the intermembrane space fuelled by the electron energy. An electrochemical gradient is formed. The electrons are passed along a series of electron carriers- stalked particles- until they eventually join with a proton and oxygen to form water. The enzyme is ATP synthase. The production of ATP using a proton pump is chemiosmosis and in the mitochondria, occurs in conjunction with the electron transport chain.

Respiration

Respiration is the process in which organic molecules act as a fuel which is broken down in a series of stages to release chemical potential energy which is used to synthesis ATP.

Glycolysis

Glycolysis is the breakdown of sugar and doesn't require oxygen. Glucose ($C_6H_{12}O_6$) enters the cytoplasm, and has to be altered to ensure that it remains there and to make it more reactive. It first meets phosphatase enzymes which attach 2 phosphate molecules to glucose, forming glucose-2-phosphates.



The phosphate molecules come from ATP. 2ATP breaks down to 2ADP and 2 phosphate molecules. The phosphate molecules attach to the glucose. This stage is **phosphorylation**. Remember that it uses 2ATP molecules to provide 2 phosphate groups. This makes it unstable so it's easier to break down and harder to pass out.

This then breaks into two. A process called **lysis**. This forms two 3carbon sugar phosphates (triose phosphates).

The triose sugar is then converted to pyruvate. ADP is converted to ATP which uses the phosphate, taken from the triose phosphate. Then ADP and inorganic phosphate (lies free in the cytoplasm) make 2 molecules of ATP.

The hydrogen is taken from triose phosphate and this gives energy to make the ATP. The hydrogen has to be picked up by a hydrogen carrier; NAD. The enzyme dehydrogenase encourages hydrogen to come away from the triose phosphate. This is **dehydrogenation**.

This means that in total; 2 molecules of pyruvate, 2 molecules of reduced NAD, 4 molecules of ATP- but 2 molecules are used at the start, so 2 molecules of ATP are produced.

The reduced NAD is needed as it will go on to make lots of ATP.

The link reaction

If oxygen is available, pyruvate moves into the mitochondria in the matrix because of the concentration gradient. A carbon is removed by decarboxylation, which also removes hydrogen, as they're both part of the pyruvate molecule. This gives acetyl which has 2