

A cycle is a biological pathway or process in which the end product of one cycle ...

[Science](#), [Chemistry](#)



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A cycle is a biological pathway or process in which the end product of one cycle becomes the starting point for the next cycles Write an essay about cycles. Respiration Cells in the body use ATP as a direct source of energy. The conversion of glucose into ATP takes place during respiration. There are 2 different types of respiration, the more common and frequent one is aerobic respiration which is the production of ATP for energy. The less common one is anaerobic respiration, the production of lactate during which the muscles have a limited supply of oxygen, and however keep working despite this. Aerobic respiration requires oxygen and glucose present to work, and occurs in 4 stages: 1) Glycolysis- the splitting of a 6-carbon glucose molecule into 2 3-carbon pyruvate molecules. There is a net gain of 2 ATP's produced. 2) Link reaction- the conversion of the 3-carbon pyruvate molecule into carbon dioxide and a 2-carbon acetyl co-enzyme A molecule. No ATP is produced during this stage. 3) Krebs cycle- the introduction of acetyl co-enzyme A into a cycle of oxidation-reduction reactions that yield some ATP and a large number of electrons. 4) Electron transport chain (ETC) - electrons used from Krebs cycle to synthesise ATP with water produced as a by-product. Glycolysis is the initial stage of aerobic respiration, and it takes place in the cytoplasm of cell. It is the breakdown of glucose into pyruvate, (which then goes in to initiate the second stage, the link reaction, and so forth) although there are a number of smaller enzyme controlled reactions for tis to take place. 1. Activation of glucose by phosphorylation. Before glucose can be split into 2 pyruvate molecules, it first must be made more reactive by the addition of 2 phosphate molecules, donated by the hydrolysis

of 2 ATP molecules to ADP. This provides the energy to activate glucose. 2. Splitting of the phosphorylated glucose. Each glucose is split into 2 3-carbon molecules of triose phosphate. 3. Oxidation of triose phosphate. Triose phosphate is oxidized transferring 2 hydrogen molecules to a hydrogen-carrier, NAD to produce reduced NADH. 4. Production of ATP. Enzyme-controlled reactions convert each triose phosphate into 3-carbon pyruvate. 2 molecules of ATP are regenerated from ADP. The pyruvate molecules produced in the cytoplasm during glycolysis are actively transported into the matrix of the mitochondria where the link reaction takes place. Pyruvate undergoes a series of reactions to be made into acetyl co-enzyme A. the following changes occur. * Pyruvate is oxidised by the removal of hydrogen. This hydrogen then binds to NAD to produce reduced NADH (which is later used to produce ATP late). * The 2-carbon molecule acetyl group that is thereby formed combines with a coenzyme, coenzyme A (CoA) to produce Acetyl CoA. * A carbon dioxide molecule is formed from each pyruvate. $\text{Pyruvate} + \text{NAD} + \text{CoA} \rightarrow \text{acetyl CoA} + \text{reduced NADH} + \text{CO}_2$ The Krebs cycle involves a series of oxidation-reduction reactions that take place in the matrix of mitochondria. * the 2-carbon acetyl CoA from the link reaction with a 4-carbon molecule to produce a 6-carbon molecule. * This 6-carbon molecule loses carbon dioxide and hydrogen's to give a 4-carbon molecule and a single molecule of ATP produced as a result of substrate-level phosphorylation. * The 4-carbon molecule can now combine with a new molecule of acetyl CoA to begin the cycle again. The ETC takes place in the cristae of the mitochondria, where ATP is synthesised using the ETC as

followed; * The H^+ atoms produced during glycolysis and the Krebs cycle combine with the NAD and FAD that are attached to the cristae. * The reduced NAD and FAD donate the e^- of the hydrogen atoms they are carrying to the first molecule in the ETC * This releases the protons from the hydrogen atoms and these protons are actively transported across the inner mitochondrion membrane. * The e^- meanwhile, pass along the ETC molecules in a series of oxidation-reduction reactions. The e^- lose energy as they pass down the chain, some of this is used to combine ADP and inorganic phosphate to produce ATP. The remaining energy is used to form heat. * The protons accumulate in the space between the 2 mitochondrion membranes before they diffuse back into the mitochondrion matrix via protein channels. * At the end of the chain the e^- combine with the protons and oxygen to form water. Oxygen is therefore the final acceptor in the ETC.

Photosynthesis

Photosynthesis occurs in 2 stages. The light-dependent reaction which takes place in the thylakoid, and the light-independent which takes place in the stroma. Both are vital for the production of ATP. The light-dependent needs light to undergo its reactions. The thylakoid contains chlorophyll which absorbs light. Photophosphorylation occurs during this reaction which is the making of ADP plus an inorganic phosphate to make ATP. NADP is also reduced during this reaction into NADPH. As well as this happening in the light-dependent reaction, water is split via photolysis into protons and electrons and oxygen which diffuses out of the leaf. The light-independent reactions do not require light to process, however it does rely on 2 major products of the light-dependent reaction to take place, ATP and NADPH. This

reaction is shown in the form of the Calvin cycle. * CO₂ enters the stroma from the light-dependent reaction, and produces 2 3-carbon glycerate-3-phosphate. * 2 ATP molecules then donate 2 phosphate molecules to produce ADP. And NADPH is oxidized to produce NADP. This goes on to form 2 3-carbon triose phosphate molecules. * 1-carbon from the triose phosphate molecule is then stored to contribute to making glucose. ATP is then reduced again donating a phosphate molecule to produce 5-carbon rubiscose biphosphate, this in turn then produces and enzyme rubisco which catalyses the whole cycle again. * This cycle must happen 6 times in order to make 1 glucose molecule.