

Cellular photosynthesis and respiration essay sample



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Photosynthesis and Cellular Respiration are both processes in Biology which transform energy in one form to another. Photosynthesis is the process in which light energy is converted into chemical energy to produce glucose. Cellular respiration is the metabolic process in which food is broken down to form stored energy in the form of ATP. Although both processes are found in double membraned organelles, photosynthesis occurs in chloroplasts in plant cells and cellular respiration occurs in the mitochondria of animal cells. Photosynthesis uses water and carbon dioxide as reactants to produce glucose and oxygen where as cellular respiration uses glucose and molecular oxygen as reactants to produce water, carbon dioxide, and energy (ATP).

Photosynthesis is a two part process which includes photophosphorylation (light reactions) and carbon fixation (dark reactions). Sunlight in the form of light energy is used to fuel the photophosphorylation process where 2 water molecules break down into 4 H^+ ions, 1 oxygen molecule, and 4 electrons. These excited electrons are transferred through the electron transfer chain to provide energy to reduce $NADP^+$ to NADPH and H^+ ions are pumped into the thylakoid lumen. These H^+ ions create a concentration gradient which is used to pump back H^+ ions into the stroma to regenerate ATP. The next process is called the carbon fixation. Carbon dioxide is reduced to form two 3-carbon sugar phosphate molecules which turns into our glucose at the end of photosynthesis.

Cellular respiration is a three part process which includes glycolysis, Krebs' cycle, and oxidative phosphorylation. In glycolysis glucose is broken down in a ten step process into 2 3-carbon pyruvate molecules. During glycolysis a net gain of 2 ATP is formed. NAD^+ is reduced to NADH and $2H^+$ ions which in

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turn go to the oxidative phosphorylation process. After glycolysis, the 2 pyruvate molecules enter the Krebs's cycle. In the presence of oxygen, acetyl-CoA are formed through glycolysis and these are oxidized by carbon dioxide while at the same time reducing NAD^+ to NADH. A net gain of 6 NADH, 2 FADH_2 , and 2 ATP is formed through the Krebs's cycle. The last step is oxidated phosphorylation, where all the NADH and FADH_2 molecules created from glycolysis and the kreb's cycle are oxidized. Electrons transferred through the ETC create a concentration gradient. Protons move from the Intermembrane Space through the Inner Mitochondrial Membrane into the Mitochondrial Matrix. The H^+ ions move across the ATP synthase to generate ATP. The net gain of ATP from cellular respiration is 38 ATP.

Even though cellular respiration and photosynthesis are related in a few ways such as they both use energy transformation, processes occur in double membraned organelles, and both processes use chemiosmosis. They are also different in the fact that photosynthesis creates glucose and releases oxygen into the atmosphere while cellular respiration creates energy and releases carbon dioxide and water into the atmosphere. In photosynthesis, the calvan cycle anabolizes the carbon molecules where as in cellular respiration, glycolysis and the Krebs's cycle catabolize the carbon molecules. Therefore, cellular respiration and photosynthesis are similar yet different in many ways.