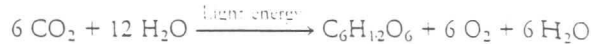
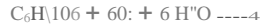


## MAKING THE CONNECTION

In what ways are photosynthesis and aerobic respiration alike, and how do they differ? Both are redox processes that are intimately connected with the energy requirements of organisms. Although the series of steps by which photosynthesis and aerobic respiration occur are quite different, their overall equations are almost exactly opposite.



In aerobic respiration:



6 CO<sub>2</sub> + 12 H<sub>2</sub>O - ATP energy

The following table compares other aspects of these processes.

End products	CO <sub>2</sub> , H <sup>+</sup> C <sub>6</sub> H <sub>12</sub> O <sub>6</sub>	C <sub>6</sub> H <sub>12</sub> O <sub>6</sub> <sup>0</sup> CO <sub>2</sub> , H <sup>+</sup>
Which cells have these processes?	Cells that contain chlorophyll (certain cells of plants, algae, and some bacteria)	Every actively metabolizing cell has aerobic respiration or some other energy-releasing pathway.
Sites involved (in eukaryotic cells) ATP production	Chloroplasts By photophosphorylation (a chemiosmotic process)	Cytosol (glycolysis); mitochondria (By substrate-level phosphorylation and by oxidative phosphorylation (a chemiosmotic process))
Principal electron transfer compound		NAD <sup>+</sup> is reduced to form NADH
Location of electron transport chain		Mitochondrial inner membrane (cristae)
Source of electrons for electron transport chain	In noncyclic phosphorylation: H <sub>2</sub> O (undergoes photolysis to yield electrons, protons, and oxygen)	Immediate source: NADH, FADH <sub>2</sub> Ultimate source: glucose or other carbohydrate
Terminal electron acceptor for electron transport chain	In noncyclic phosphorylation: NADP <sup>+</sup> (becomes reduced to form NADPH)	O <sub>2</sub> (becomes reduced to form H <sub>2</sub> O)

<sup>0</sup>NADPH and NADH are very similar hydrogen (i.e., electron) carriers, differing only in a single phosphate group. However, NADPH general ly works with enzymes in anabolic pathways, such as photosynthesis. NADH is associated with catabolic pathways, such as cellular respiration.