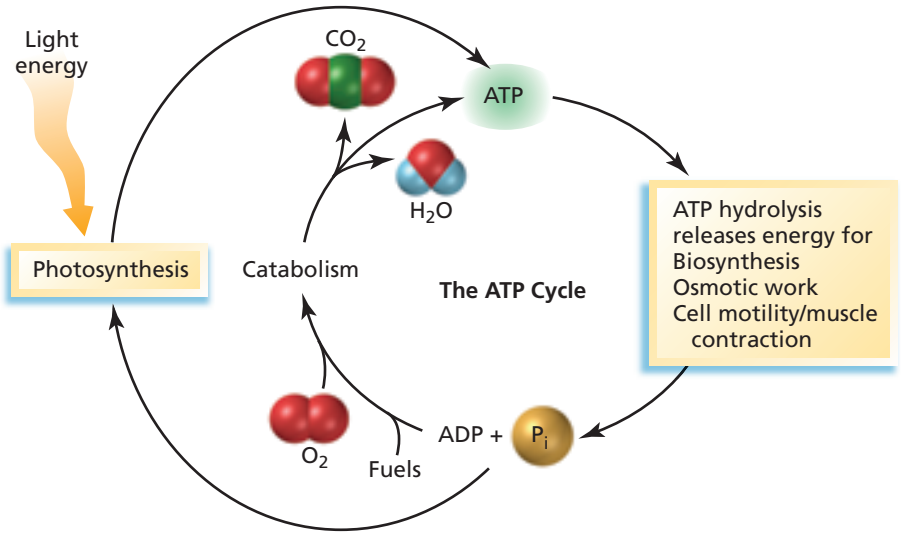


FIGURE 17 ATP is formed by photosynthesis or catabolism. Cell activities that require energy are powered by ATP hydrolysis. "P_i" represents a phosphate.

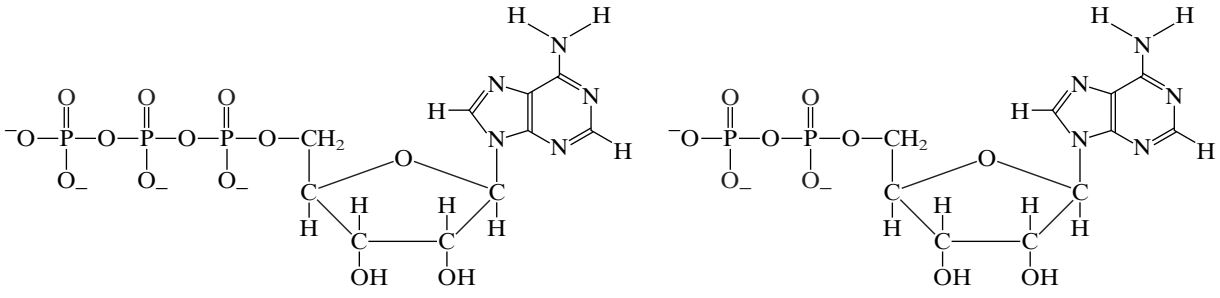
Energy Activities

The cycle between ATP and *ADP, adenosine diphosphate,* is the primary energy exchange mechanism in the body. **Figure 17** provides an overview of the ATP cycle in cells. In this energy cycle, ATP is the molecule that serves to carry energy from energy-storing molecules, carbohydrates, lipids, and proteins to specific energy-requiring processes in cells. When ATP is hydrolyzed to ADP, energy is released to power the cell's activities. The molecular structures of ATP and ADP are closely related, as shown in **Figure 18.**

The difference in the number of phosphate groups between ATP and ADP molecules is the key to the energy exchange in metabolic reactions. The chemical equation below shows the hydrolysis reaction by which ATP is converted into ADP and a phosphate group (represented by the gold-colored ball in **Figure 17**). The free energy for this reaction is –31 kJ, which is the amount of energy available to do work.

$$ATP^{4-}(aq) + H_2O(l) \longrightarrow ADP^{3-}(aq) + H_2PO_4^-(aq)\ \Delta G = -31\ kJ$$

FIGURE 18 The hydrolysis of ATP produces ADP and releases energy.



Adenosine triphosphate (ATP) **Adenosine diphosphate (ADP)**