

# Energy and Life

**EQ How is ATP used in cells?  
What is photosynthesis?**



Living things need energy to survive.

This energy comes from food. The energy in most food comes from the sun.



**Where do plants get the energy they need to produce food?**

# Autotrophs and Heterotrophs



**Plants and some other types of organisms are able to use light energy from the sun to produce food are called autotrophs.**

**Organisms that obtain their energy from the food they eat are called heterotrophs.**

# Chemical Energy and ATP

Energy comes in many forms including light, heat, and electricity.

Energy can also be stored in chemical compounds.





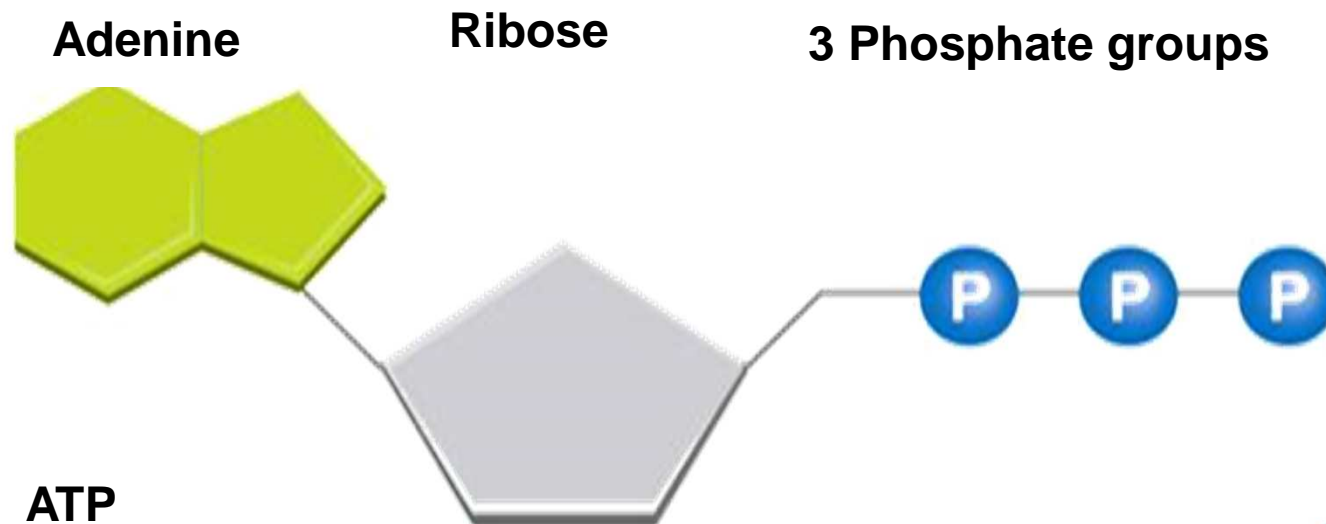
## 8-1 Energy And Life → Chemical Energy and ATP

An important chemical compound that cells use to store and release energy is **adenosine triphosphate**, abbreviated **ATP**.

ATP is used by all types of cells as their basic energy source.

ATP consists of:

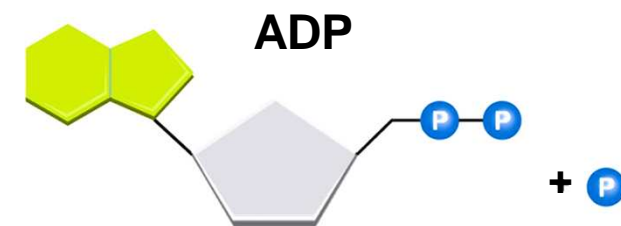
- adenine
- ribose (a 5-carbon sugar)
- 3 phosphate groups



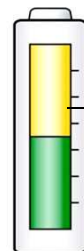
## Storing Energy

ADP has two phosphate groups instead of three.

A cell can store small amounts of energy by adding a phosphate group to ADP.



Adenosine Diphosphate  
(ADP) + Phosphate

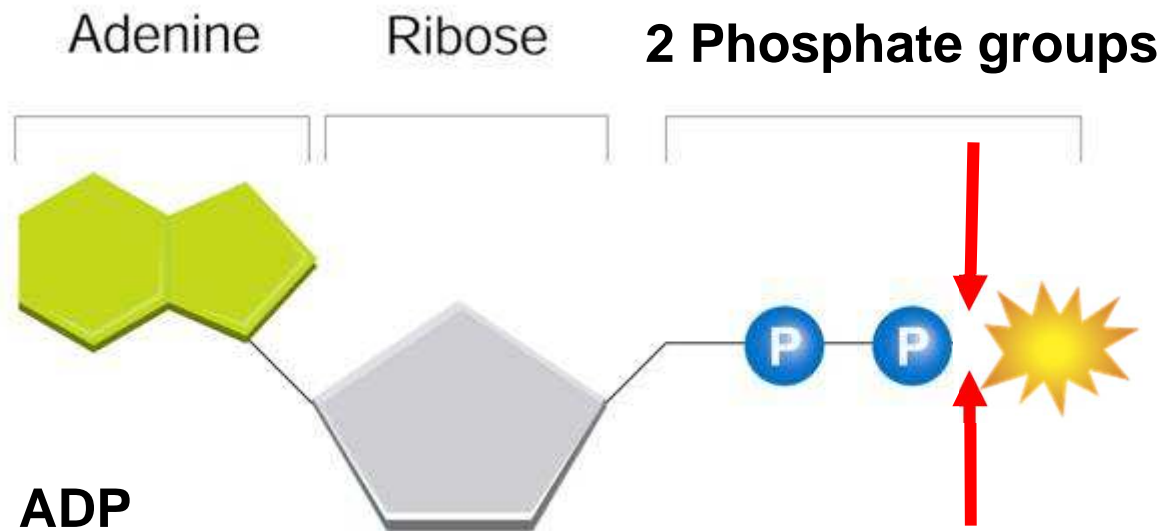


Partially  
charged  
battery



## Releasing Energy

Energy stored in ATP is released by breaking the chemical bond between the second and third phosphates.



The energy from ATP is needed for many cellular activities, including active transport across cell membranes, protein synthesis and muscle contraction.



**ATP's characteristics make it exceptionally useful as the basic energy source of all cells.**

## Using Biochemical Energy

Most cells have only a small amount of ATP, because it is not a good way to store large amounts of energy.

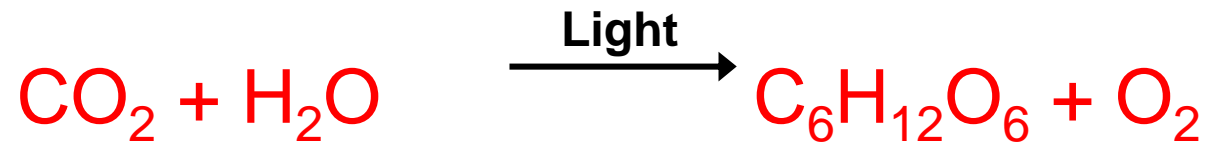
Cells can regenerate ATP from ADP as needed by using the energy in foods like glucose.

The key cellular process identified with energy production is **photosynthesis**.

Photosynthesis is the process in which green plants use the energy of sunlight to convert water and carbon dioxide into high-energy carbohydrates and oxygen.

# The Photosynthesis Equation

The equation for photosynthesis is:

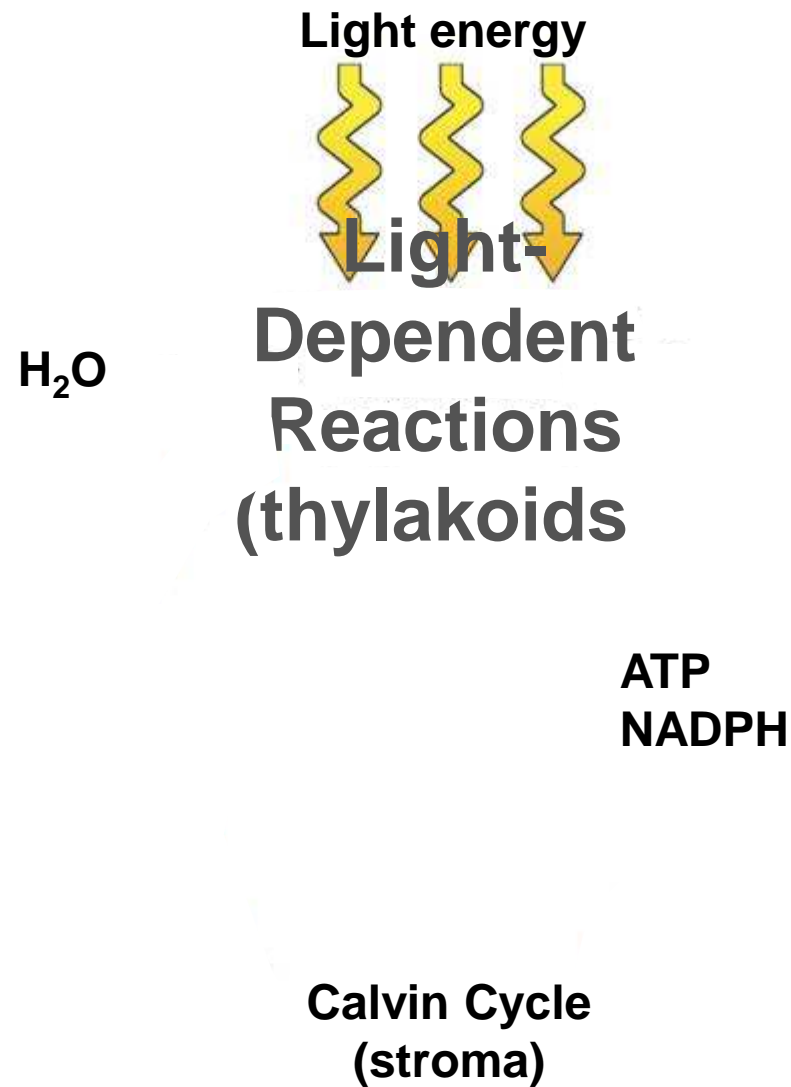


carbon dioxide + water  $\xrightarrow{\text{Light}}$  sugars + oxygen

**Photosynthesis uses the energy of sunlight to convert water and carbon dioxide into high-energy sugars and oxygen.**



## 8-1 Energy And Life → The Photosynthesis Equation



# Light and Pigments

How do plants capture the energy of sunlight?



**In addition to water and carbon dioxide, photosynthesis requires light and chlorophyll.**

Plants gather the sun's energy with light-absorbing molecules called **pigments**.

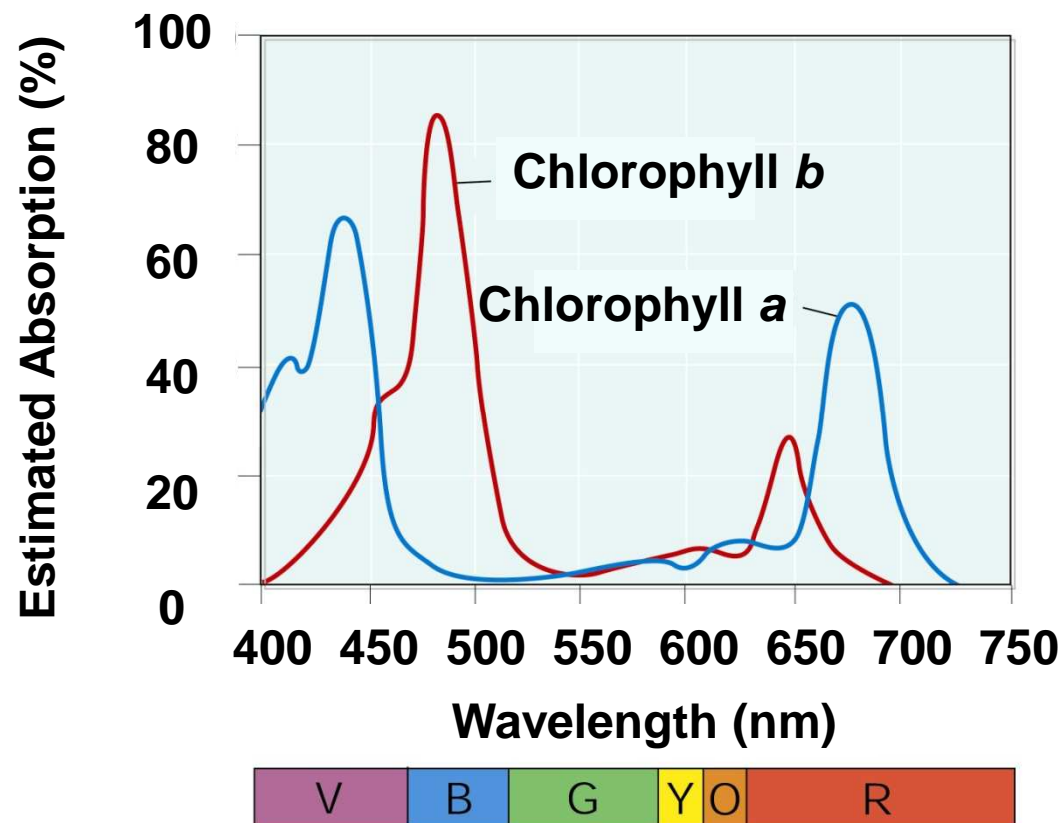
The main pigment in plants is **chlorophyll**.

There are two main types of chlorophyll:

- chlorophyll *a*
- chlorophyll *b*

## 8-1 Energy And Life → Light and Pigments

Chlorophyll does not absorb light well in the green region of the spectrum. Green light is reflected by leaves, which is why plants look green.



# Left Side Activity

- Read pages 201-207 in the text book.
  - Answer questions 1-4 on page 203
  - Answer questions 1-4 on page 207