

8-1 Energy and Life

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.

Autotrophs and Heterotrophs

- Organisms, such as plants, which make their own food, are called **autotrophs**.
- Organisms, such as animals, that must obtain energy from the foods they consume are **heterotrophs**.

Chemical Energy and ATP

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

Energy can be stored in chemical compounds, too.

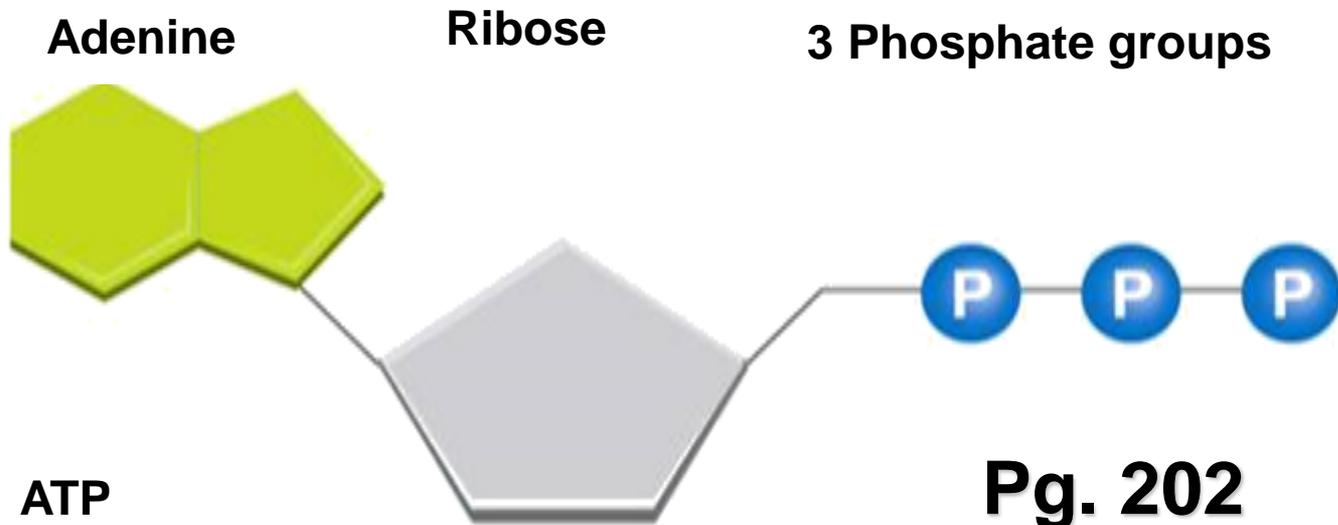
Chemical Energy and ATP

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



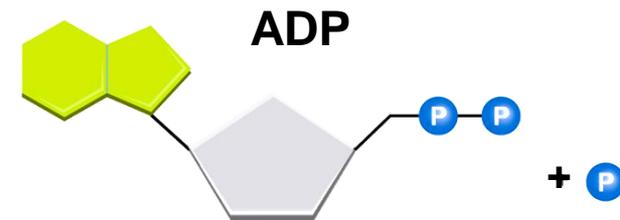
Chemical Energy and ATP

The three phosphate groups are the key to ATP's ability to store and release energy.

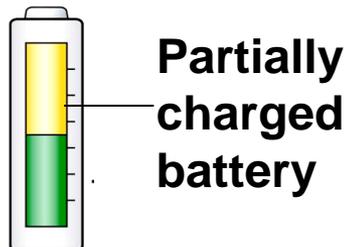
Storing Energy

ADP has two phosphate groups instead of three.

A cell can store small amounts of energy by adding a phosphate group to ADP. **Pg. 202**

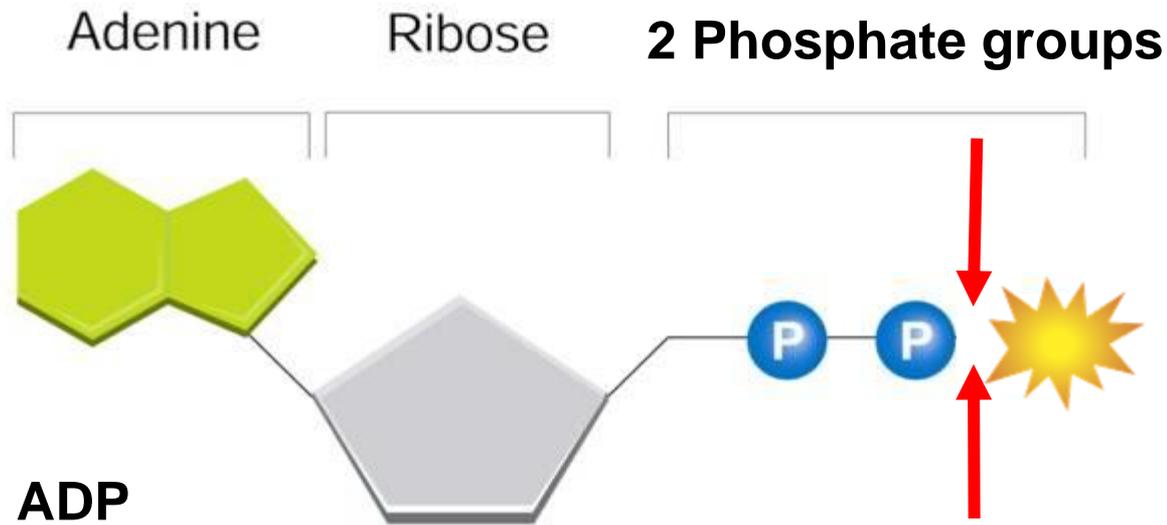


Adenosine Diphosphate
(ADP) + Phosphate



Releasing Energy

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



What is the role of ATP in cellular activities?

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.

8-2 Photosynthesis: An Overview

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.

What is the overall equation for photosynthesis?

The Photosynthesis Equation

The equation for photosynthesis is:



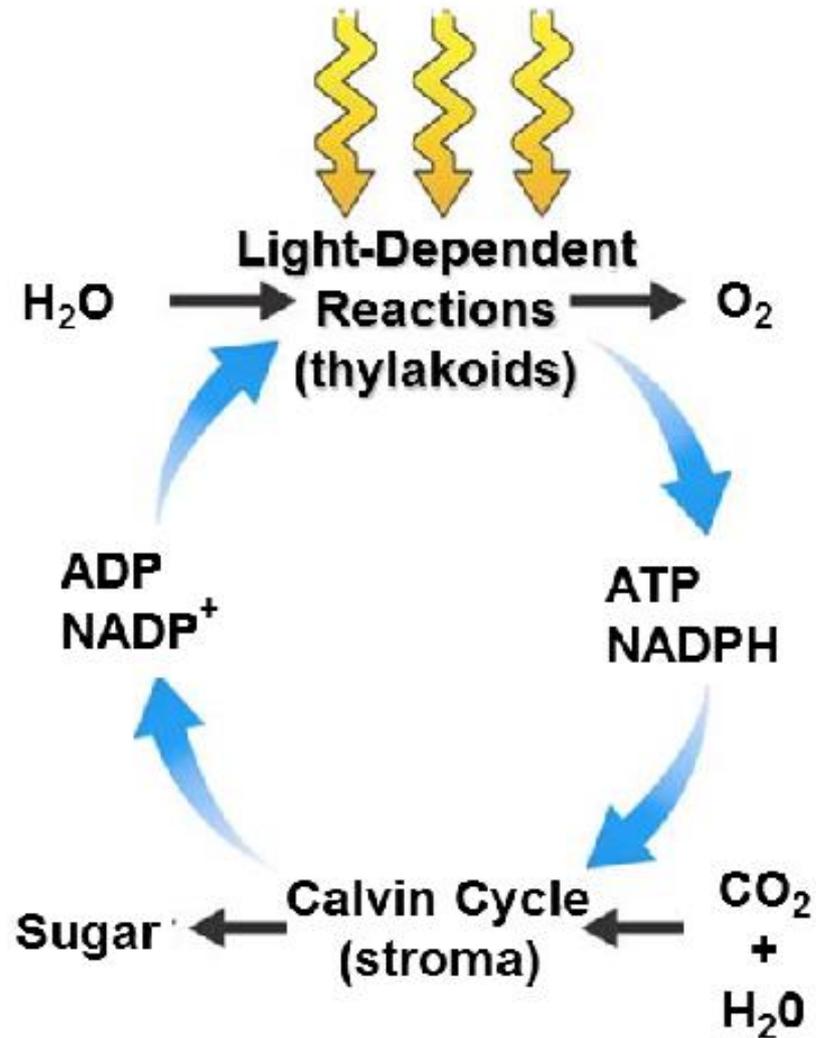
carbon dioxide + water \longrightarrow sugars + oxygen

The Photosynthesis Equation

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

The Photosynthesis Equation

The Photosynthesis Equation



What is the role of light and chlorophyll in photosynthesis?

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**.

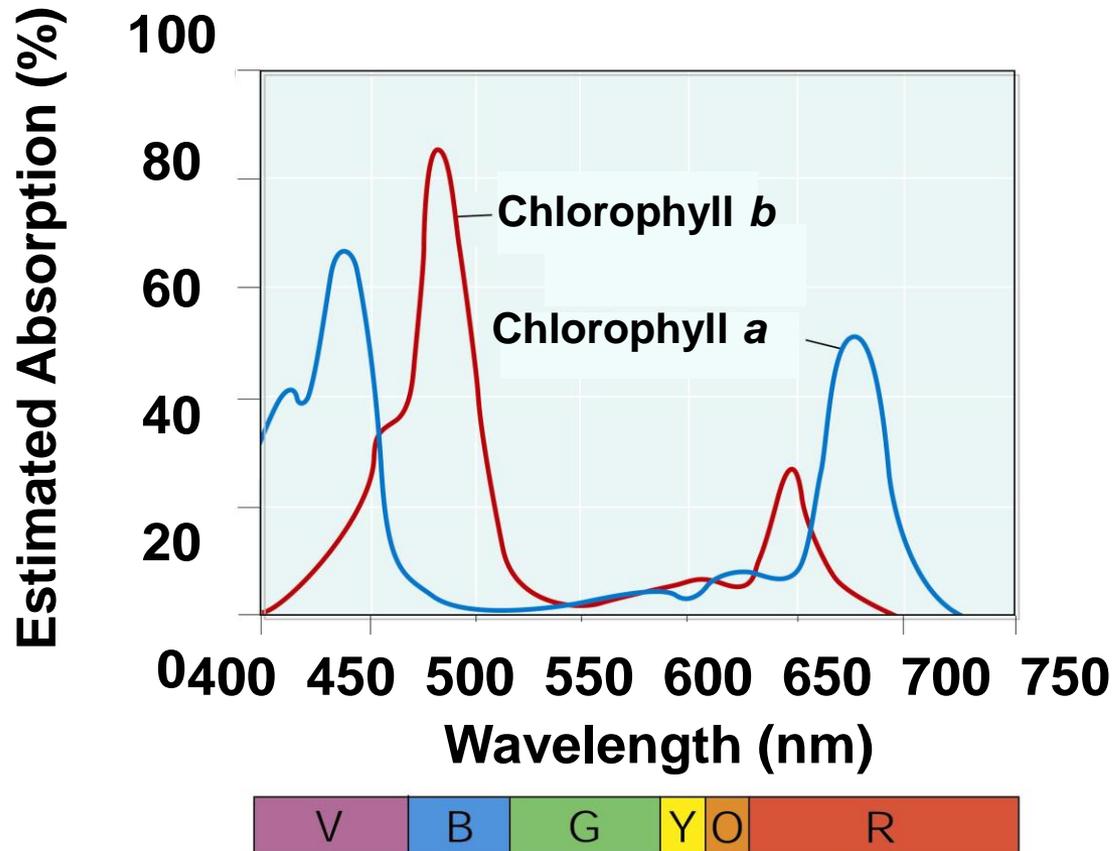
The main pigment in plants is **chlorophyll**.

There are two main types of chlorophyll:

- chlorophyll *a*
- chlorophyll *b*

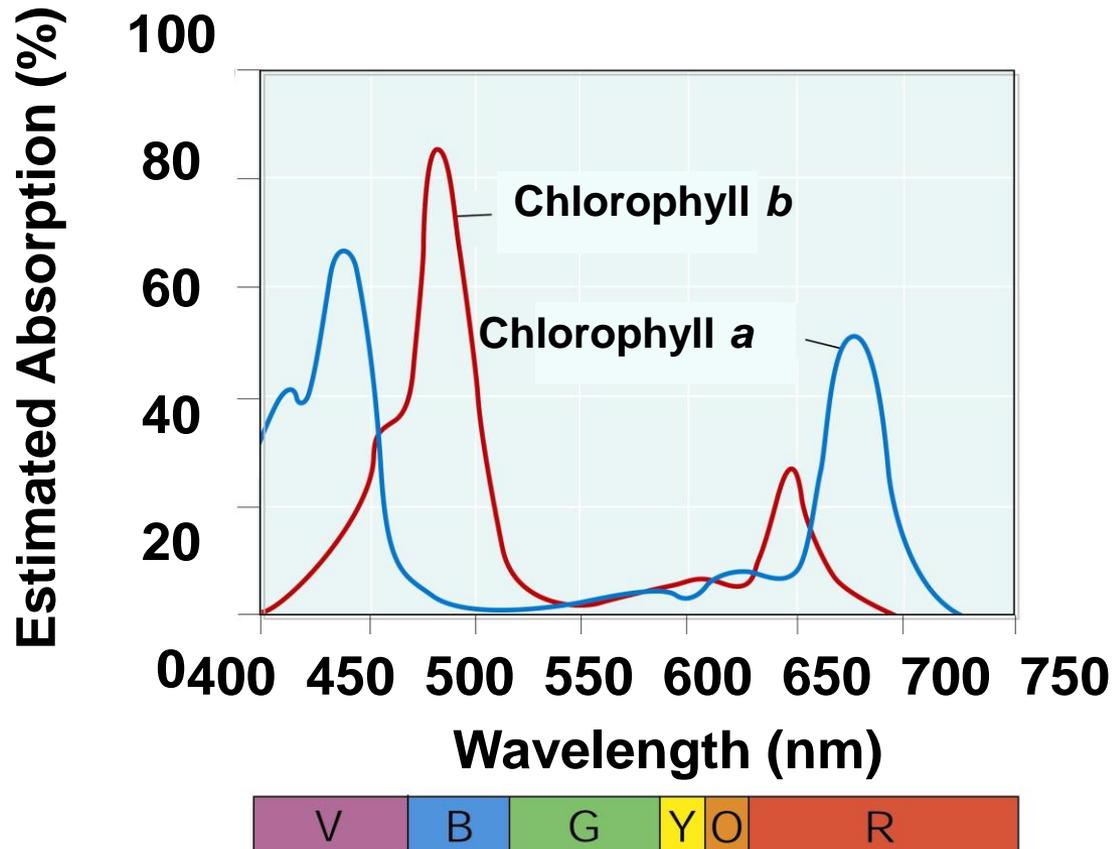
Light and Pigments

Chlorophyll absorbs light in the blue-violet and red regions of the visible spectrum.



Light and Pigments

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



Light and Pigments

Light is a form of energy, therefore compounds that absorb light also absorb energy.

When chlorophyll absorbs light, energy is transferred to electrons in the chlorophyll molecule.

The energy from light energizes these electrons.

These high-energy electrons drive photosynthesis.