Name	
Class	
Handout #	

At the bottom of every food chain are producers ... those organisms which make food from ingredients readily available in their environment. Green plants are a good example ... they make their own food from sunlight. Here are some words you need to be familiar with:

Photosynthesis is the process where green plants use sunlight, carbon dioxide, and water to make food and oxygen.

Respiration is the process where cells use this food to release stored energy.

Photosynthesis and Cellular Respiration

On this page, we'll examine each of these processes in a little more detail, and relate them to the parts of a cell responsible for each function.

An individual <u>cell</u> is a small component from which living tissue is made, and there are many kinds of cells, each containing parts within them that perform various functions.

Plant cells contain **chloroplasts**. These little 'factories' within the plant cells use the compound **chlorophyll** to take the energy from sunlight, and combine it with carbon dioxide and water ... to produce oxygen and glucose (a form of sugar). The chemical equation describing this reaction, **photosynthesis**, could be written this way:

$6CO_2 + 6H_2O + energy --> 6O_2 + C_6H_{12}O_6$

This means that in each individual reaction, the chloroplast needs **6 carbon dioxide molecules** and **6 water molecules**, and also some sunlight **energy**. From these it can manufacture, by breaking down the molecules and rearranging the individual atoms, exactly **6 oxygen molecules** and **1 glucose molecule**.

Notice that the glucose molecule is large, containing a total of 24 atoms. It **takes energy** to create this big molecule, and this energy remains **stored in the molecule** until it is released in respiration. In this way, energy can be moved from place to place.

Other 'factories' within the cell make use of the glucose molecule; these cell parts are called the **mitochondria**. Each mitochondrion takes glucose, breaks it down into atoms, and by mixing it with the atoms from more oxygen, produces carbon dioxide, water and energy ... energy in a form that can be used by all cells.

The chemical equation describing this reaction, **<u>cellular respiration</u>**, could be written this way:

$6O_2 + C_6H_{12}O_6 --> 6H_2O + 6CO_2 + energy$

This means that in each individual reaction, the mitochondrion needs **6 oxygen molecules** and a **glucose molecule**. From these, using the energy stored in the bonds of the glucose molecule, it can produce **6 carbon dioxide molecules**, **6 water molecules**, and a new form of **energy**.

Cellular respiration can use other molecules besides glucose, but it always results in carbon dioxide, water, and energy. The energy produced in this way by the mitochondria is in a form that can be *easily utilized by all cells*.

This energy is stored by building a special molecule called **ATP**, or **adenosine triphosphate**, in which the **covalent bonds** between atoms (in particular, between the phosphate components of the molecule) store a

lot of energy.





The other products of respiration, carbon dioxide and water, can be reused by the cells doing photosynthesis. The ATP is sent out to the other cells in the organism to provide them with an energy source. This is particularly important for plants, because they can't get new energy when the sun isn't out, so ATP also provides a way for them to store up energy supplies.

The tissues of the plant contain organic compounds (compounds made by a living organism), and all of these compounds

contain some of the ATP the plant has made. The plant then becomes a source of energy for *other* organisms ... **consumers**, like insects or cows, which eat the plants.