CHEMISTRY IN PLANTS AND ANIMALS

Chemistry in Plants

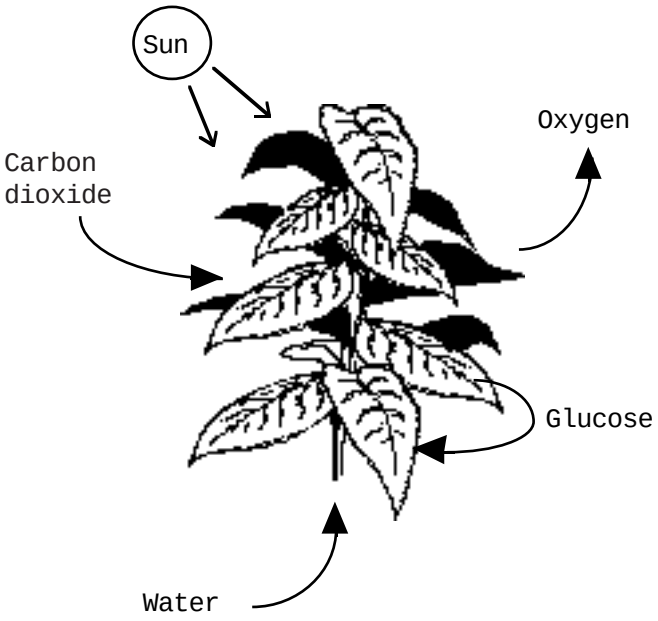
Plants make their own food by a chemical reaction called **photosynthesis**:

1. Carbon dioxide from the air is absorbed through the leaves.

2. Water is drawn up through the roots.

3. Light energy from the sun is absorbed by Chlorophyll - the green substance in the leaves.

4. The plants use this light energy to make the Carbon dioxide and Water react to form Glucose (a sugar) and Oxygen gas.



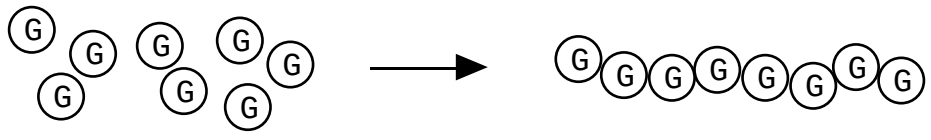
PHOTOSYNTHESIS:

Carbon dioxide + Water + Energy -> Glucose + Oxygen

5. The Oxygen gas is released into the air through the leaves.

6. The Glucose remains in the leaves and some is used as a food for the plant.

   The plant links the rest of the Glucose molecules together to make Starch molecules:



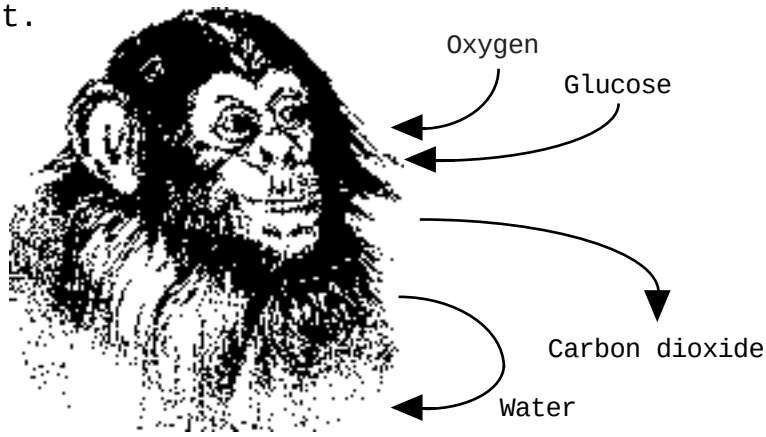
Glucose molecules Starch molecule

Thus the Glucose is stored, in Starch, as an energy supply for the plant's future use.

Chemistry in Animals

Animals need energy for warmth and movement. They obtain this energy from a chemical reaction called **respiration**:

1. The animal eats the plant.



2. The Glucose from the plant reacts with the Oxygen breathed in by the animal forming Carbon dioxide, Water and energy.

RESPIRATION

Glucose + Oxygen -> Carbon dioxide + Water + Energy

This is just the reverse of Photosynthesis.

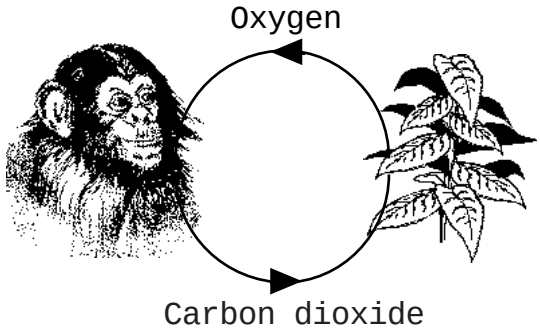
3. The Carbon dioxide is breathed out.
4. The Water remains within the animal.
5. The Energy is used by the animal.

The Greenhouse Effect and Global Warming

The combined effects of phtosynthesis and respiration maintain constant amounts of Carbon dioxide and Oxygen in the air:

Carbon dioxide is breathed out by animals but taken in by plants.

Oxygen is given off by plants but breathed in by animals.



Unfortunately man is upsetting the balance of Carbon dioxide in the atmosphere.

Extensive clearing of forests reduces the amount of Carbon dioxide removed from the air by photosynthesis. This is causing an increase in the amount of Carbon dioxide in the air.

Increased burning of fossil fuels also contributes to the increasing amount of Carbon dioxide in the air.

Carbon dioxide in the air traps the sun's heat - a process known as the 'Greenhouse Effect'. The increasing amount of Carbon dioxide in the atmosphere is causing the Earth to gradually get warmer - a process known as 'Global Warming'.

'Global Warming' could result in changes in the Earth's climate and melting of the polar ice-caps resulting in an increase in sea-levels. How many feet above the sea do ***you*** live .... at the moment?!

Chemicals and Plants

We can use the following chemicals to help plants to survive:

* **Fungicides**

  These are chemicals which kill fungi which cause disease in plants.

* **Herbicides**

  These are chemicals which kill weeds which use up essential plant foods in the soil.

* **Pesticides**

  These are chemicals which kill pests like insects and slugs which eat the plants. Pesticides are toxic, however, and must be used with care. Natural predators can be used instead e.g. greenfly larvae are eaten by ladybirds.

* **Fertilisers**

  These are chemicals which provide plants with the three essential elements needed for normal, healthy growth: Potassium, Nitrogen and Phosphorus.

  Compounds containing these elements are naturally found in the soil. Solutions of these compounds are taken in through the roots of plants.

  After a time, the nutrients in the soil begin to get used up. Nature has various ways of putting these nutrients back into the soil:

  * Some plants such as clover, beans and peas have root nodules in which Nitrogen from the air is converted into nitrates - compounds containing Nitrogen which can be used by the plant.

  * In areas of natural vegetation (woodlands, bogs, moorlands etc) the decay of dead plants and animals returns all the essential elements to the soil.

Harvesting plants for food, however, prevents their natural decay - plant foods are not returned to the soil. In this case, ***we*** must add fertilisers to the soil to restore the essential elements.

Fertilisers can be

* Natural materials recycled by man e.g. compost, manure etc

* Artificial (Synthetic) compounds, made by the chemical industry.

Though it seems sensible to use natural matarials as much as possible, the increased demand for food has resulted in an increasing use of artificial fertilisers which are easier to produce in bulk.

The main types of synthetic fertilisers are:

* Ammonium compounds
* Nitrates
* Phosphates
* Potassium compounds

To be taken in through the roots of plants, these artificial fertilisers must be soluble in Water.

Since artificial fertilisers are soluble in water, however, they get washed out of the soil and into rivers and lochs and end up in the public water supply! Nitrate fertilisers are particularly toxic and can kill all life in a river or stream.