

CARBOHYDRATES

Carbohydrates are compounds containing Carbon, Hydrogen and Oxygen with the Hydrogen and Oxygen in the ratio 2:1 e.g.

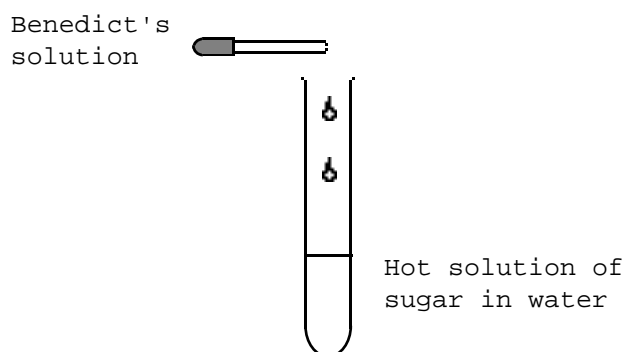
Glucose	$C_6H_{12}O_6$	Fructose	$C_6H_{12}O_6$
Sucrose	$C_{12}H_{22}O_{11}$	Maltose	$C_{12}H_{22}O_{11}$
Starch	$C_{600}H_{1000}O_{500}$		

Sugars

Glucose, Fructose and Sucrose, are found in fruits and used to make confectionary.

Maltose is present in malted barley.

Experiment: add a few drops of Benedict's solution to hot solutions of each of the above sugars in turn:



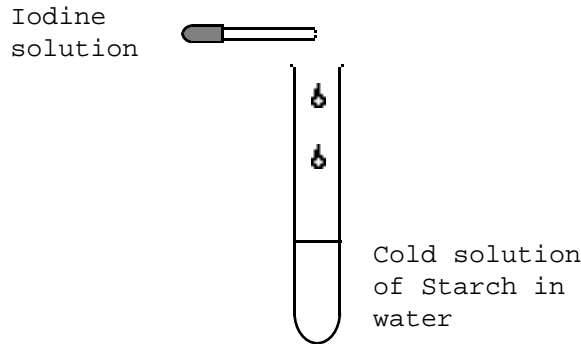
Results:

Sugar	Observation
Glucose	Brick-red precipitate
Fructose	Brick-red precipitate
Maltose	Brick-red precipitate
Sucrose	No change to blue solution

Starch

Starch is found in potatoes and seeds and is used to make biscuits, cakes and bread.

Experiment: add a few drops of Iodine solution to a cold solution of Starch:

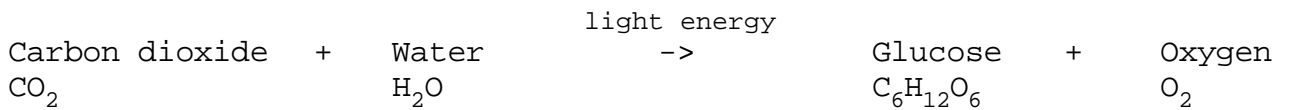


Result:

A blue/black solution is produced.

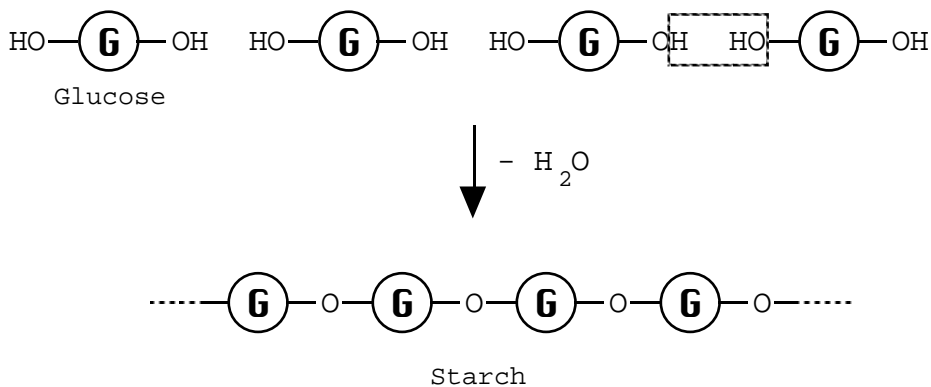
All carbohydrates are made in plants.

Glucose is made by **photosynthesis**:



All the other carbohydrates are made in the plant from Glucose

e.g. The plant converts the Glucose into Starch by joining lots of Glucose molecules together forming a polymer:



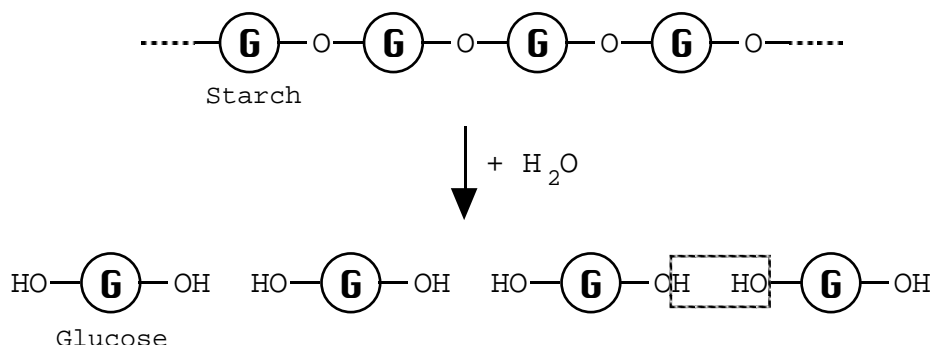
This 'joining together with loss of Water' is known as **condensation**.

The Starch is used by the plant as an energy store.

DIGESTION

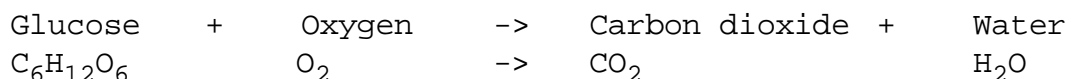
Carbohydrates are important foods for animals.

The animal first converts the carbohydrate into Glucose e.g. Starch is broken down into Glucose by reaction with Water - **Hydrolysis**:



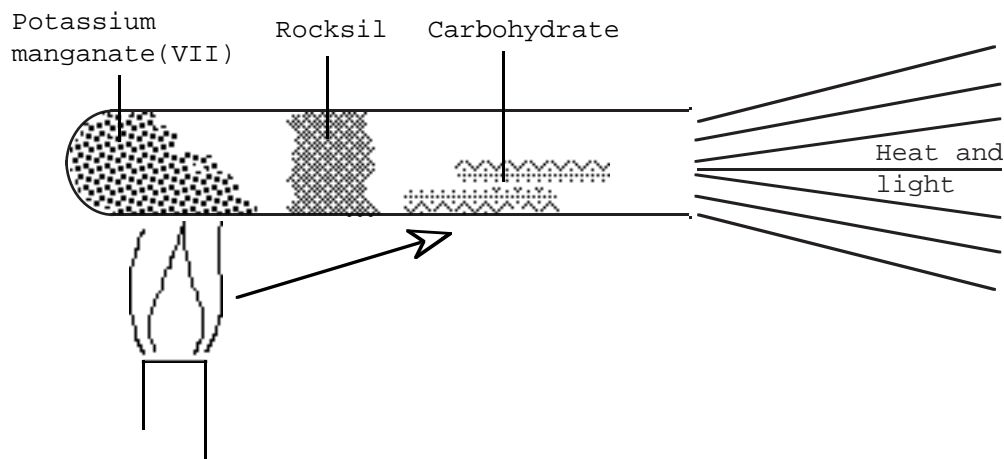
This hydrolysis is catalysed by stomach acids and enzymes present in the intestine. These enzymes work best at 37 °C (body temperature); they are destroyed at higher temperatures.

The Glucose is thus carried in the blood stream to the body cells where it is combined with Oxygen to produce Carbon dioxide, Water and energy - a reaction known as **respiration** :



Experiment:

The energy released when carbohydrates burn can be demonstrated as follows :



Heating Potassium manganate(VII) gives off Oxygen. The Oxygen passes across the hot carbohydrate which bursts into flames giving out heat and light energy.

Pure Oxygen relights a glowing splint - wood is also a carbohydrate!