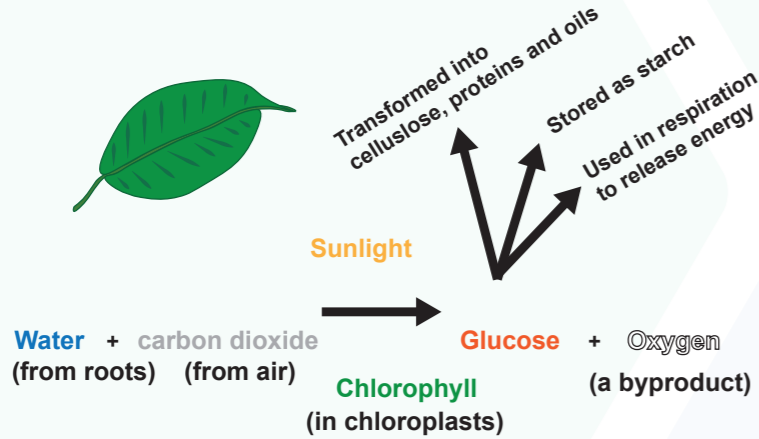
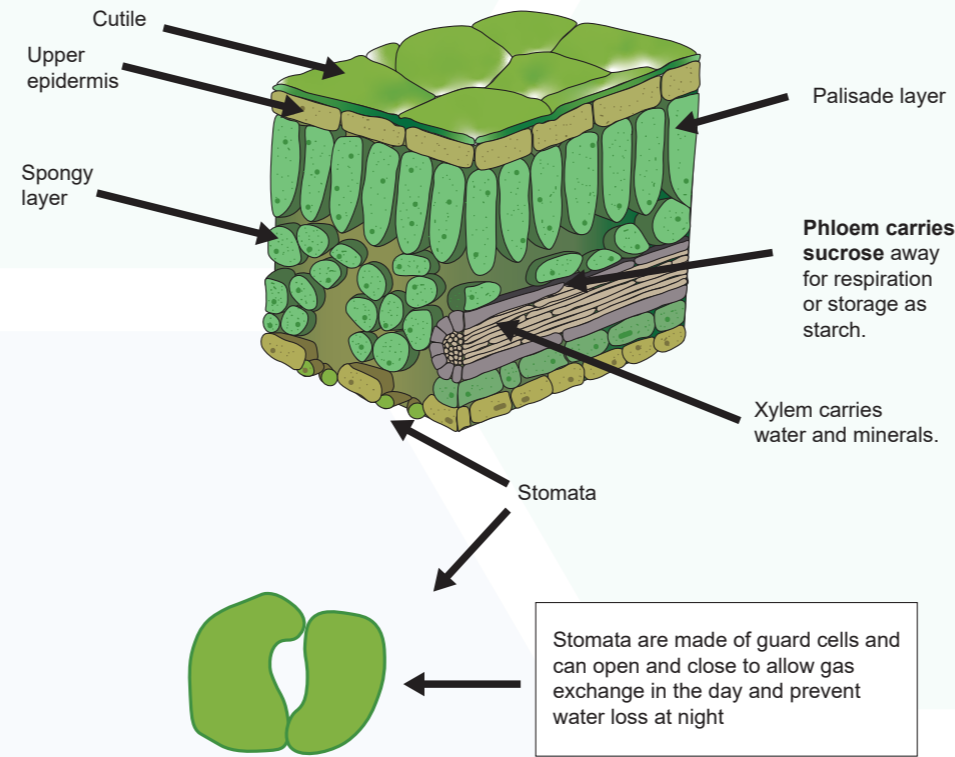


## Photosynthesis

A series of enzyme-controlled reactions in plant cells. Chlorophyll absorbs light energy for the reaction. The leaf is the organ of photosynthesis.



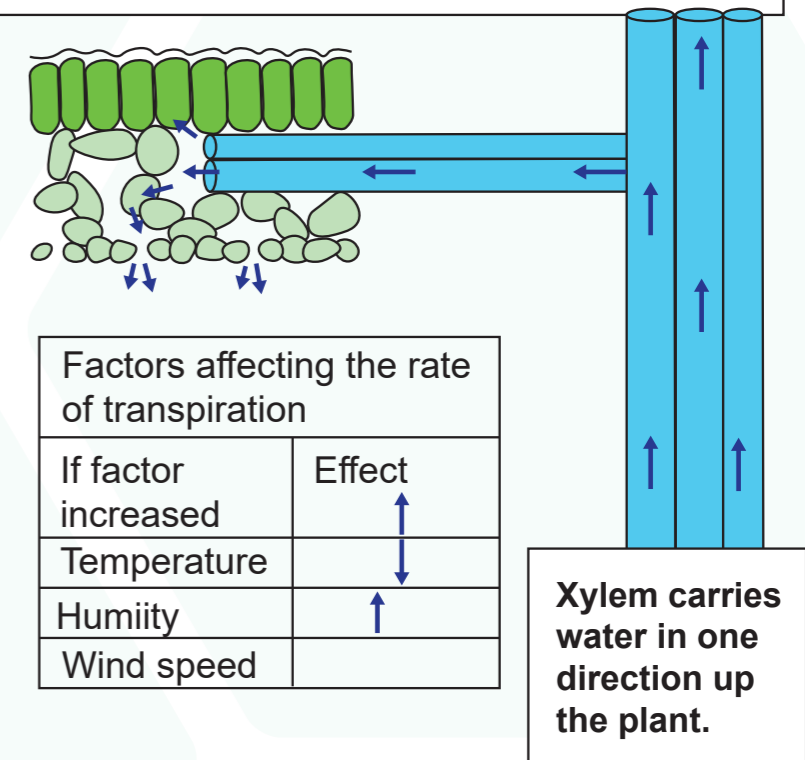
## The leaf separate science only



## The importance of water - separate science only

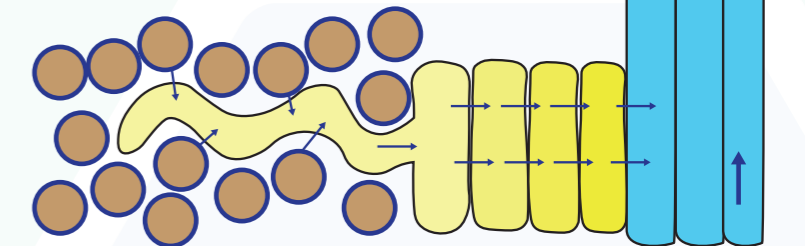
Water is used in photosynthesis, transport of minerals and provides support by filling the cell vacuoles which push against cell walls. This keeps cells turgid and prevents cells becoming flaccid and wilting.

**Leaf** Water from the xylem evaporates into air spaces. Some water vapour is lost from the stoma. This is transpiration.



Factors affecting the rate of transpiration

If factor increased	Effect
Temperature	↑
Humidity	↓
Wind speed	↑

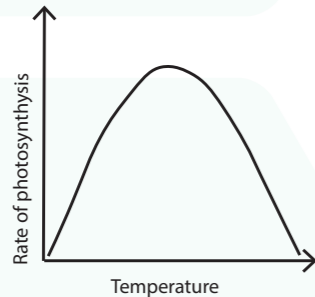


**Roots**  
The root hairs **increase the surface** area for absorption of water. Minerals are **actively transported into** the cells which allows water to be drawn by osmosis into the root cells and then to the xylem.

The active transport means that root cells are actively respiring requiring lots of oxygen.

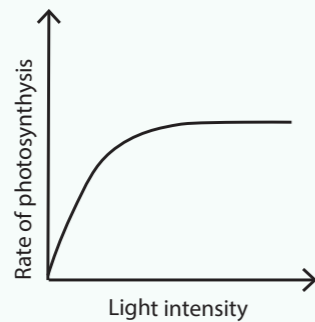
## Factors affecting photosynthesis - Limiting factors

**Temperature** - Rate of photosynthesis is usually measured by recording the volume of oxygen produced.



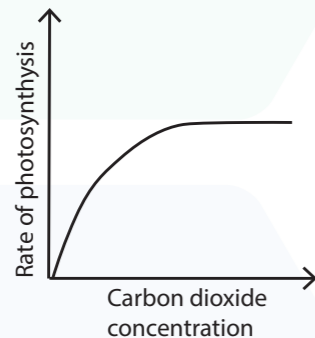
As photosynthesis is controlled by enzymes as the temperature increases the rate of photosynthesis increases to an optimum then decreases.

**Light intensity** - Usually investigated by moving a plant closer to a light source and recording the O<sub>2</sub> produced.



As light intensity increases so does the rate of photosynthesis until lack of another factor e.g. CO<sub>2</sub> limits any further increase.

**Carbon dioxide** - When investigating the effect of CO<sub>2</sub> on photosynthesis scientists enclose the leaf in a transparent bag/jar with **sodium hydroxide, this chemical absorbs CO<sub>2</sub>.**



As CO<sub>2</sub> increases the rate of photosynthesis increases until another factor limits the increases e.g. light intensity.

## Testing a leaf for starch

Leaves kept in the dark for 24 hrs are **destarched**. They can be used to investigate photosynthesis in different conditions. If a plant has been photosynthesising its leaf will contain starch.

The test:

- Boil** the leaf to **kill it**
- Decolourise** using **ethanol**
- Wash to soften
- Test with iodine**- a blue/black colour shows the presence of starch.

## Minerals - separate science only

Plants need certain minerals for healthy growth. A deficiency of certain mineral cause specific growth problems.

Deficient mineral	Growth problem
Nitrates	Poor growth
Potassium	Yellowing of leaf
Phosphates	Poor root growth