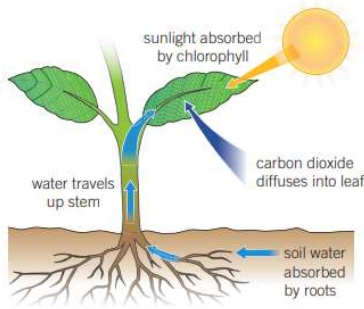
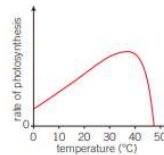
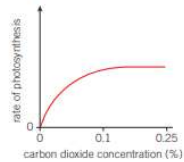
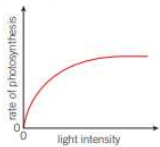


Photosynthesis

- **Photosynthesis** is the process which occurs in the chloroplasts to produce glucose using sunlight
- Any organism that can use photosynthesis to produce its own food is known as a **producer**, these are not just limited to plants but can include other organisms such as **algae**



- The rate of photosynthesis can be affected by:
 - Light intensity – the higher the light intensity the higher the rate of photosynthesis up to a point
 - Carbon dioxide concentration – the higher the carbon dioxide concentration the higher the rate of photosynthesis up to a point
 - Temperature – the optimum temperature is the temperature at which photosynthesis occurs at the highest rate, before and after this the rate will be less



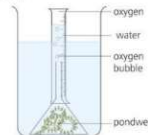
Photosynthesis Experiments

1) Testing



To do this you should first take the leaf you are about to test and, using forceps, place it in a beaker of boiling water to kill it. Then place the leaf into a boiling tube of boiling ethanol to remove all the chlorophyll. Wash the leaf with water to remove the ethanol and soften the leaf, and spread it out on a white tile. Add a few drops of **iodine** solution onto the leaf. If starch is present, the iodine will turn from yellow-brown to blue-black.

1) Investigating the rate of Photosynthesis



You can measure how fast a plant is growing by measuring the amount of oxygen it produces in a given time. There are two ways to do this.

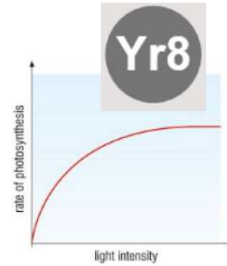
Place an upturned test-tube over an aquatic plant such as pondweed. This will collect the gas given off by the plant. You can then:

- count the number of bubbles given off in a specific time period
- time how long it takes to collect a specific volume of gas.

Limiting Factors

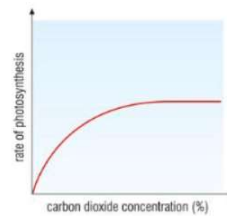
Light

The higher the light intensity, the faster the rate of photosynthesis. It will get faster until photosynthesis reaches its maximum rate. In very low light levels, or if there is no light, photosynthesis stops.



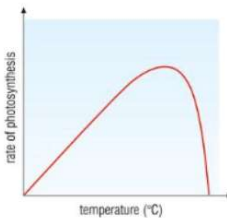
Carbon Dioxide

Carbon dioxide is one of the reactants of photosynthesis. The greater the concentration of carbon dioxide, the faster the rate of reaction.



Temperature

In general, the higher the temperature, the faster the rate of photosynthesis. This is because photosynthesis involves enzymes, which speed up the reaction as the temperature increases. However, at a certain temperature the enzymes stop working, so photosynthesis stops.



Plant minerals

Plants need minerals for healthy growth, if they do not have enough of these minerals this is known as a **mineral deficiency**

Mineral	What is it used for?	What happens if there is not enough?
nitrate (contain nitrogen)	healthy growth	poor growth and older leaves yellow
phosphate (contain phosphorus)	healthy roots	poor growth, younger leaves look purple
potassium	healthy leaves and flowers	yellow leaves with dead patches
magnesium	making chlorophyll	leaves will turn yellow

Fertilisers can be used to stop plants from suffering with mineral deficiencies

Leaves

- To best adapt for photosynthesis leaves have a number of adaptations
- They are thin to allow the most light through
- There is a lot of **chlorophyll** to absorb light
- They have a large surface area to absorb as much light as possible

