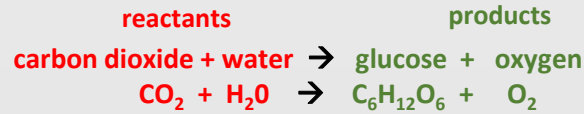
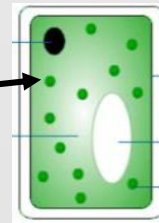


1) Photosynthesis

Photosynthesis is a chemical reaction where plants make glucose (sugar) and oxygen from carbon dioxide and water. This uses **energy** from the **sunlight**.



- Photosynthesis takes place inside the **leaves** of plants
- Plant cells contain **chloroplasts** which is where photosynthesis happens
- Chloroplasts contain a green substance called **chlorophyll** which absorbs the light energy

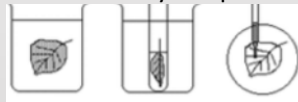


2) Testing a Leaf for Starch

When plants photosynthesise they produce **glucose which can be stored as starch** and then used at a later date by the plant.

Method

1. Boil the leaf for 5 minutes.
2. Place the leaf in hot ethanol to decolourise.
3. Spread on a white tile and cover with iodine solution.

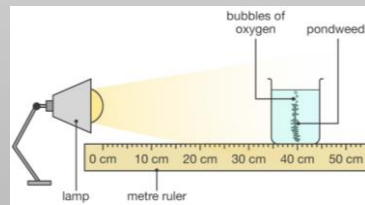


If the **iodine** changes colour from **orange to blue/black** it means that **starch is present**. If it stays orange starch is not present.

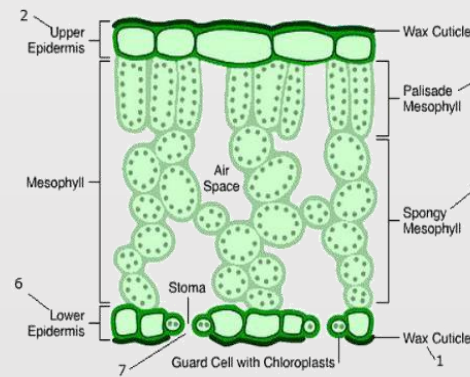
3) Investigating Photosynthesis

The rate (speed) of photosynthesis is affected by light intensity, temperature and CO₂ concentration. These factors can be investigated using pondweed and measuring the number of oxygen bubbles produced in a set time.

- **Independent variable** - what you change
- **Dependant variable** - what you measure
- **Control variables** - what you keep the same



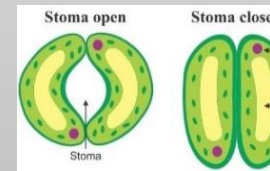
4) Structure of a Leaf



Adaptations	Function
Thin	Provides a short diffusion distance for carbon dioxide to move into the leaf
Waxy cuticle	Waxy layer that prevents water loss
Upper epidermis	Thin and transparent allowing light to pass through
Palisade mesophyll	Palisade cells contain lots of chloroplasts for photosynthesis
Spongy mesophyll	Contains air spaces between cells allowing fast and efficient gas exchange
Stomata	Allows carbon dioxide to move by diffusion into the leaf and oxygen to move out
Guard cells	Controls the opening and closing of the stomata
Network of tubes	Transport water (xylem) and sugars (phloem)

5) Stomata

Stomata are tiny **holes** on the **underside** of a leaf. Carbon dioxide moves into the leaf and oxygen moves out. These gases move by **diffusion** through the stomata.

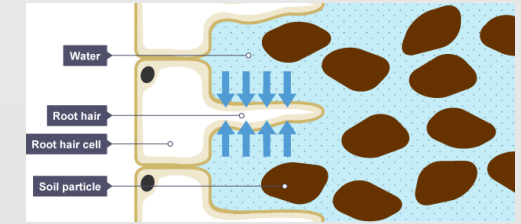


Guard cells control the **opening and closing** of the stomata. Stomata are usually open in the day (as it is light) so photosynthesis can happen.

6) Movement of Water in Plants

Water needed for photosynthesis is absorbed through the roots and transported through xylem vessels to the leaf.

Roots have specialised cells called **root hair cells** that absorb water and mineral ions from the soil. They have a **large surface area** and **thin walls** which lets water pass into them easily.



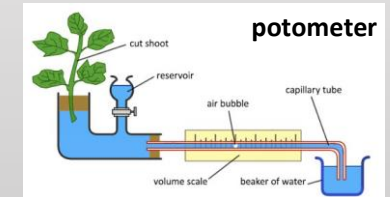
7) Transpiration

Transpiration is **water loss from a plant**. It is caused by **evaporation** and **diffusion** of water from a leaf through the stomata.

- If a plant has little water then they close the stomata to minimise transpiration

The rate of transpiration can be measured using a **potometer**. The rate of transpiration is affected by several factors. These include:

- temperature
- humidity
- air movement
- light intensity



8) Plant Minerals

Plants need mineral ions for **good growth** and to make substances they need. If a plant doesn't have the correct minerals it is said to have a mineral ion **deficiency**.

- **Nitrate ions** are needed to build proteins for growth
- **Phosphate ions** are needed to ensure good root growth
- **Magnesium ions** are needed to make chlorophyll for photosynthesis
- **Potassium ions** are needed for making flowers and fruit