

Science – B6 – Plant Structures and their Functions (Autumn Term 1)
Key Vocabulary

Photosynthesis - A series of enzyme-catalysed reactions carried out in the green parts of plants. Carbon dioxide and water combine to form glucose. This process requires energy transferred by light.

Chloroplast - A green disc containing chlorophyll, found in plant cells. This is where the plant makes glucose through photosynthesis.

Palisade cell - Tall, column-shaped cell near the upper surface of a plant leaf.

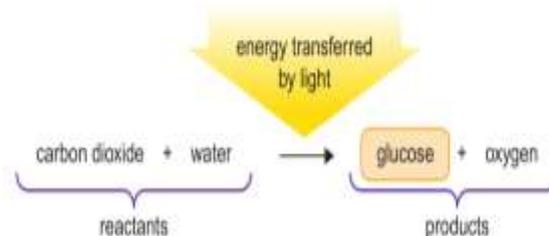
Stoma - A tiny pore in the lower surface of a leaf, which, when open, allows gases to diffuse into and out of the leaf. Plural is stomata.

Limiting factor - A single factor that, when in short supply, can limit the rate of a process such as photosynthesis.

Osmosis - The overall movement of solvent molecules in a solution across a partially permeable membrane, from a dilute solution to a more concentrated one.

Active transport - The movement of particles across a cell membrane from a region of lower concentration to a region of higher concentration (against the concentration gradient). This process requires energy.

Root hair cell - A cell found on the surface of plant roots that has a large surface area to absorb water and dissolved mineral salts quickly from the soil.

Important Information


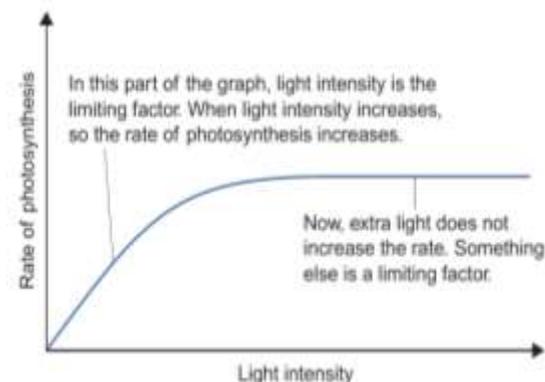
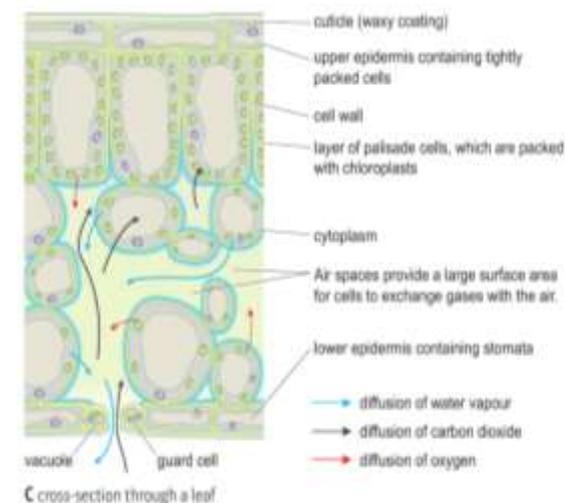
B a summary of photosynthesis

Photosynthesis occurs in **chloroplasts**, which contain a green substance called chlorophyll that traps energy transferred by light. Since energy enters from the surroundings, the products of photosynthesis have more energy than the reactants and so this is an **endothermic reaction**.

A factor that prevents a rate increasing is a **limiting factor**. Carbon dioxide concentration, temperature and light intensity can all be limiting factors for photosynthesis. The maximum rate of photosynthesis is controlled by the factor in shortest supply.

Active transport

Mineral salts are naturally occurring ionic compounds. Plants need ions from these compounds to produce new substances. For example, **nitrate** ions are needed to make **proteins**.

Graphs and Diagrams


C An increase in light intensity increases the rate of photosynthesis until a limiting factor stops further increases.

Phloem tissue - Living tissue formed of sieve tubes and companion cells that transports sugars and other soluble compounds around a plant.

Translocation - The transport of sugars (mainly sucrose) and other soluble compounds in the phloem tissue of a plant.

Companion cell - A specialised cell located in the phloem tissue of plants. They pump sucrose into sieve cells.

Sieve tube/cell - Tubes formed of phloem sieve cells (so called because the cells have holes in their ends). The tubes carry sugars and other soluble compounds around the plant.

Xylem vessel/cell - A long, thick-walled tube found in plants, formed from many dead xylem cells. The vessels carry water and dissolved mineral salts through the plant.

Plant hormone - A substance released by certain cells in a plant that has an effect on other cells, usually causing the cells to grow and develop in a certain way.

Auxins - A group of plant hormones that affect the growth and elongations of cells.

Gibberellins - A group of plant hormones that cause seeds to germinate and flowers and fruits to form.

Tropism - A response to a stimulus in which an organism grows towards or away from the stimulus. A positive tropism is a growth towards a stimulus, and a negative tropism is a growth away from the stimulus.

Phloem

Plants make sucrose from the glucose and starch made by photosynthesis. Sucrose is **translocated** (transported) in the **sieve tubes** of the **phloem tissue**. The large central channel in each sieve cell is connected to its neighbours by holes, through which sucrose solution flows.

Companion cells actively pump sucrose into or out of the sieve cells that form the sieve tubes. As sucrose is pumped into sieve tubes (e.g. in a leaf), the increased pressure causes the sucrose solution to flow up to growing shoots or down to storage organs.

Xylem

During their development, xylem cells die and their top and bottom cell walls disintegrate. This creates long empty vessels (tubes) through which water can move easily. Xylem vessels are rigid because they have thick side walls and rings of hard **lignin**, and so water pressure inside the vessels does not burst or collapse them. The rigid xylem vessels also help to support the plants.

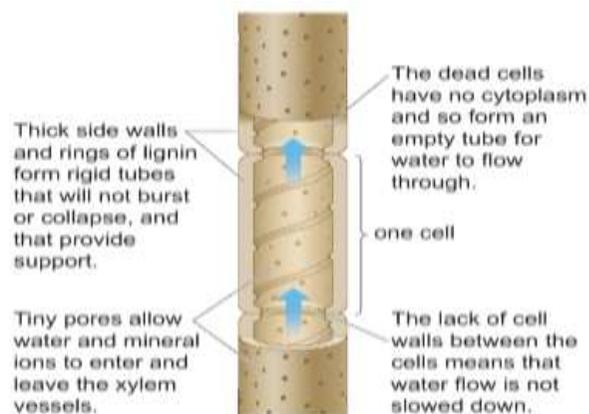
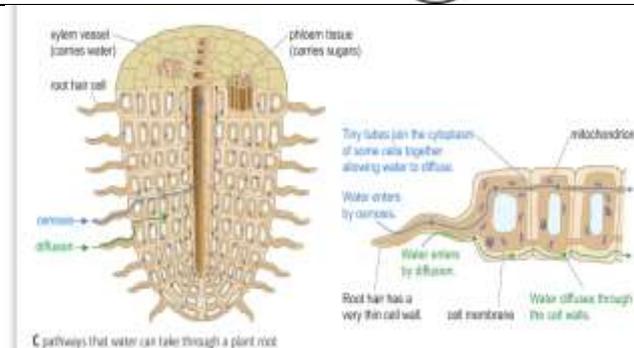
Phototropism

Responding to a stimulus by *growing towards or away from it* is called a **tropism**. A tropism caused by light is a **phototropism**. A tropism towards a stimulus is a positive tropism. Plant shoots are positively phototropic, so the plant gets enough light for photosynthesis. Plant roots are negatively phototropic.

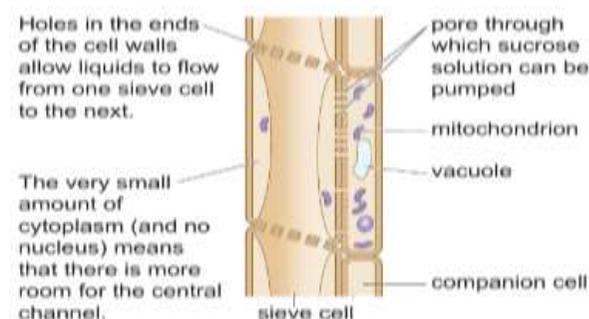
Auxins are produced in the tips of a shoot, where they cause elongation of the cells. If a shoot is grown with light coming from only one direction, auxins move to the shaded side of the shoot. This makes the cells on the shaded side elongate more, which in turn causes the shoot to grow towards the light.

Other plant hormones

Plant hormones called **gibberellins** help seeds to germinate and start to grow roots and shoots. **Ethene** gas is a plant hormone that helps fruit to ripen.



C xylem adaptations



D phloem adaptations