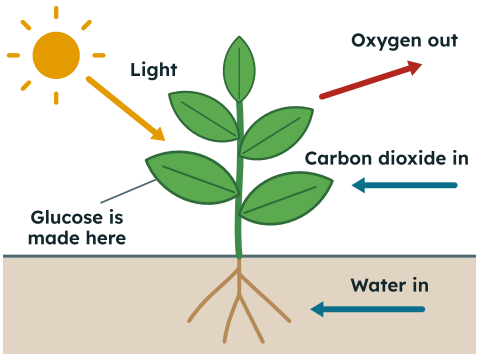
KS3 SCIENCE · BIOLOGY

Photosynthesis revision sheet

Name _____

1. How plants make food



What a plant takes in and what it makes

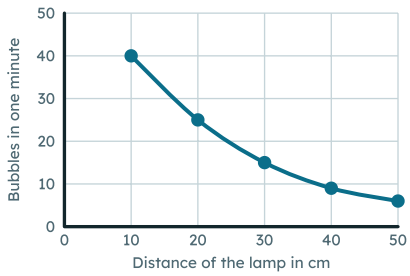
- Plants and algae do not eat. They make their own food, **glucose**, by **photosynthesis**.
- A plant takes in **carbon dioxide** from the air, through its leaves, and **water** from the soil, through its roots.
- It makes **glucose** and gives out **oxygen**.
- The energy is transferred from **light**. Photosynthesis happens in the **chloroplasts** of leaf cells. They hold **chlorophyll**, a green substance that absorbs the light.
- The plant uses the glucose for energy, uses it to build new tissue, or stores it as **starch**.
- Soil is not a plant's food. A plant takes only water and a few minerals from the soil.

2. The word equation

$$\text{carbon dioxide + water} \xrightarrow[\text{chlorophyll}]{\text{light}} \text{glucose + oxygen}$$

- **Reactants** (used up): carbon dioxide and water. **Products** (made): glucose and oxygen.
- **Light** and **chlorophyll** are written above the arrow. The reaction needs both, but neither is a reactant.

Two experiments



Pondweed gives off bubbles of oxygen. Move the lamp away and there are fewer bubbles: less light, slower photosynthesis.

Testing a leaf for starch

1. Keep the plant in the dark for two days to use up its starch, then in bright light for a day. Dip a leaf in **boiling water**. This kills it and softens it.
2. Warm it in **ethanol**, in a beaker of hot water. This takes out the chlorophyll. Ethanol is flammable, so turn the Bunsen burner off first.
3. **Rinse** it in water to soften it again.
4. Add **iodine solution**. It turns from orange-brown to **blue-black** where there is starch.



Under a strip of foil: no light, so no starch



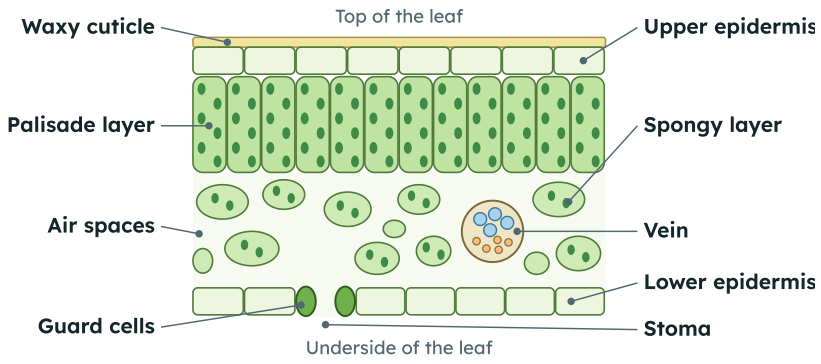
White edge of a variegated leaf: no chlorophyll, so no starch



3. Leaves built for the job

FEATURE OF A LEAF	HOW IT HELPS
Broad and flat	A large surface area catches a lot of light
Green	Chlorophyll absorbs the light
Thin	Carbon dioxide has only a short way to go to reach every cell
Stomata (tiny pores)	Let carbon dioxide in and oxygen out
Veins	Bring water, and carry away the sugars the leaf makes
Waxy top	Stops the leaf losing too much water

4. Inside a leaf



A slice through a leaf, seen from the side

- **Palisade cells** are tall and packed with chloroplasts. They are near the top of the leaf, where the light is brightest. Most photosynthesis happens here.
- **Stomata** are tiny pores, mostly on the underside. Carbon dioxide diffuses in through them. Oxygen and water vapour diffuse out.
- Two **guard cells** open and close each stoma.
- **Air spaces** in the spongy layer let the gases reach every cell.

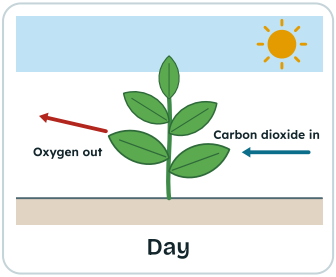


5. Water and minerals from roots

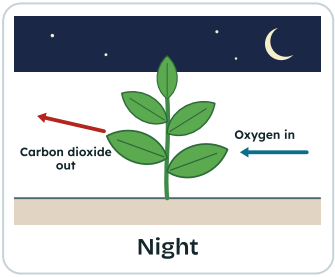
- Roots hold a plant in the soil and take in water and minerals.
- A **root hair cell** has a long, thin hair. This gives it a large surface area, so it takes in water quickly.
- Water, with minerals dissolved in it, travels up the stem to the leaves in **xylem** vessels. Most of it leaves the leaves through the stomata as water vapour. This is called transpiration.
- Minerals are not food. A plant needs small amounts of them to stay healthy.

MINERAL	NEEDED TO MAKE	WITHOUT IT
Nitrates	Proteins, for growth	The plant stays small
Magnesium	Chlorophyll	The leaves turn yellow

6. Why all life depends on it



Day



Night

- Plants and algae are **producers**: they make food. Every food chain starts with a producer, such as grass → rabbit → fox.
- Animals cannot make food. They eat plants, or animals that ate plants.
- Photosynthesis takes carbon dioxide out of the air and puts oxygen in. Respiration does the opposite.
- Plants respire all the time. **By day** they photosynthesise faster than they respire, so carbon dioxide goes in and oxygen comes out. **At night** they only respire, so oxygen goes in and carbon dioxide comes out.

Key words

Photosynthesis: how plants and algae make glucose, using energy from light
Chlorophyll: the green substance that absorbs light

Carbon dioxide: the gas a plant takes in for photosynthesis
Reactant: a substance that is used up in a chemical reaction
Starch: a store of glucose in a plant
Stomata: tiny pores in a leaf that let gases in and out
Palisade cell: a tall leaf cell packed with chloroplasts

Xylem: tubes that carry water up from the roots

Magnesium: the mineral a plant needs to make chlorophyll

Glucose: the sugar made in photosynthesis: a plant's food

Chloroplast: the part of a plant cell where photosynthesis happens
Oxygen: the gas given out in photosynthesis

Product: a substance that is made in a chemical reaction

Iodine solution: turns blue-black when starch is there
Guard cells: the pair of cells that open and close a stoma
Root hair cell: a root cell with a large surface area for taking in water
Nitrates: minerals a plant needs to make proteins for growth
Producer: a living thing that makes its own food, at the start of a food chain

The pictures are illustrations made for this sheet, not real photographs.