

Photosynthesis and limiting factors Which organisms are the main producers of food and biomass?	Photosynthesis and limiting factors What is biomass?
Photosynthesis and limiting factors What does endothermic mean?	Photosynthesis and limiting factors Word equation for photosynthesis
Photosynthesis and limiting factors Symbol equation for photosynthesis	Photosynthesis and limiting factors What is the energy source for photosynthesis?
Photosynthesis and limiting factors What is a limiting factor?	Photosynthesis and limiting factors Name the three limiting factors of photosynthesis.

The mass of living material. Plants build it from the glucose made in photosynthesis.

Photosynthetic organisms: plants and algae.

carbon dioxide + water → glucose + oxygen, using light energy.

A reaction that takes in energy from the surroundings.

Light energy, absorbed by chlorophyll in the chloroplasts.



Temperature, light intensity and carbon dioxide concentration.

A factor in short supply that stops the rate of a process from increasing.

Photosynthesis and limiting factors

Why does the rate of photosynthesis fall at high temperatures?

Photosynthesis and limiting factors

What does a flat part of a rate graph tell you?

Photosynthesis and limiting factors **Higher tier**

How can you tell which factor limits a plateau when two factors interact?

Photosynthesis and limiting factors **Higher tier**

Two light intensity curves have different plateaus. What does the higher plateau show?

Photosynthesis and limiting factors

Core practical: how is light intensity changed?

Photosynthesis and limiting factors

Core practical: how is the rate of photosynthesis measured?

Photosynthesis and limiting factors

Core practical: name three variables to control.

Photosynthesis and limiting factors

Core practical: why is a heat shield or water bath used?

The factor being changed is no longer limiting. Another factor is.

The enzymes are denatured, because their active site changes shape, so substrates cannot bind.

The other factor, such as carbon dioxide concentration or temperature, was higher and was limiting the lower curve.

It is the factor that is in shortest supply. Increasing it raises the plateau.

Count the bubbles of oxygen released per minute, or measure the volume of gas collected.

By changing the distance between the lamp and the pondweed.

To keep the temperature constant, because the lamp warms the water.

Temperature, carbon dioxide concentration (sodium hydrogencarbonate) and the plant used.

Photosynthesis and limiting factors **Higher tier**

How is the rate of photosynthesis related to light intensity when light is limiting?

Photosynthesis and limiting factors **Higher tier**

State the inverse square law for light intensity.

Photosynthesis and limiting factors **Higher tier**

A lamp is moved to three times the distance. What happens to light intensity?

Transport in plants

Give three adaptations of a root hair cell.

Transport in plants

How do root hair cells take in mineral ions?

Transport in plants

How does water enter a root hair cell?

Transport in plants

What does xylem carry?

Transport in plants

Why are xylem cells lignified and dead?

Light intensity is proportional to $1 \div \text{distance}^2$ from the light source.

Directly proportional.

Long thin projection for a large surface area, thin wall, and many mitochondria for active transport.

It falls to one ninth ($1 \div 3^2$).

By osmosis, because the cell sap is more concentrated than the soil water.

By active transport, using energy from respiration.

Dead cells with no end walls form a hollow tube for water, and lignin strengthens the walls.

Water and mineral ions, from the roots to the rest of the plant.

Transport in plants

What does phloem carry?

Transport in plants

Why are phloem cells living?

Transport in plants

What is the role of companion cells?

Transport in plants

What is transpiration?

Transport in plants

Put the path of water in order.

Transport in plants

What are stomata?

Transport in plants

How do guard cells close a stoma?

Transport in plants

What is translocation?

They use energy from respiration to transport sucrose.

Sucrose, dissolved in water, around the plant.

The loss of water vapour from the leaves, which pulls water and mineral ions up through the plant.

They have many mitochondria and release the energy needed for the transport of sucrose in the phloem.

Pores in the leaf surface, each surrounded by two guard cells, which let gases in and out.

Root hair cell → xylem → leaf cells (evaporation) → air spaces → out through the stomata.

The transport of sucrose around the plant in the phloem.

They lose water and become limp, which reduces water loss.

Transport in plants

Where does sucrose move to and from in translocation?

Transport in plants

Does translocation need energy?

Leaves, water uptake and extreme environments

How does increasing light intensity affect water uptake?

Leaves, water uptake and extreme environments

How does increasing air movement affect water uptake?

Leaves, water uptake and extreme environments

How does increasing temperature affect water uptake?

Leaves, water uptake and extreme environments

What does a potometer measure?

Leaves, water uptake and extreme environments

How do you calculate a rate of water uptake?

Leaves, water uptake and extreme environments

How do you calculate percentage change in mass?

Yes. It is carried out by the living cells of the phloem, using energy from respiration.

From the leaves to the parts of the plant that use or store it, such as roots, shoots and fruits.

It increases it, because water vapour is carried away, keeping a steep concentration gradient.

It increases it, because the stomata open and more water vapour diffuses out.

The rate of water uptake of a leafy shoot, from the movement of an air bubble in a capillary tube.

It increases it, because water evaporates faster and water vapour diffuses out faster.

$(\text{change in mass} \div \text{original mass}) \times 100.$

$\text{Rate} = \text{change in quantity (such as distance moved or volume)} \div \text{time}.$