

# Contents



- Photosynthesis
- Leaves
- Transport in Plants
- Water Uptake & Transpiration

# Photosynthesis

Plant cells trap the energy from the sun inside a pigment which it makes called \_\_\_\_\_ . The sun's energy is used to make water and carbon dioxide \_\_\_\_\_ together. What is produced is \_\_\_\_\_ which is used for its energy and \_\_\_\_\_ which is released as a waste product. \_\_\_\_\_ energy is eventually converted to \_\_\_\_\_ energy. The glucose can be used directly in \_\_\_\_\_ or converted and stored as \_\_\_\_\_ for energy storage or made into \_\_\_\_\_ for transport. The starch can be stored inside granules inside the \_\_\_\_\_. The glucose can also be made into the structural polysaccharide \_\_\_\_\_. Sucrose is better to transport around the plant than glucose because it is less \_\_\_\_\_ but still quite soluble. When inside the cell, the sucrose can be broken and converted into \_\_\_\_\_ .

**BIZARRE BIOLOGY** : There is a cool animal which can also photosynthesize. Ask your teacher to show you a photo.

## Questions

1. Write the word equation and below it the balanced symbol equation for photosynthesis. (4)
  
2. Which inorganic substances does a plant use to make carbohydrate? (2)

Score /19



## Extension

Explain why the transfer of energy from light to chemical energy in plant cells is essential for life on Earth.

## Knowledge Boss

Created by [lanebiologytutor.com](http://lanebiologytutor.com)

There is an old saying that talking to your plants helps them grow. Do you think this could be correct and why or why not correct?

# Photosynthesis

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respiration glucose	cellulose chloroplasts	react light	reactive sucrose	starch (2x) chemical	chlorophyll oxygen
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# Photosynthesis



Chlorophyll

React

Glucose

Oxygen

Sunlight

Chemical

Respiration

Starch

Sucrose

Chloroplasts

Cellulose

Reactive

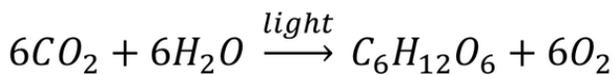
Starch

(1 mark)

(light)

(1 mark)

1. carbon dioxide + water  $\xrightarrow{\text{light}}$  glucose + oxygen



(1 mark)

(1 mark)

2.

Water

Carbon dioxide

**Knowledge Boss:** google a photo of the green sea slug.

**Extension:**

Plants start food chains on land because they capture the sunlight energy and convert it into carbohydrate/sugar/food

**Knowledge Boss:**

Students who give a reason may say yes because of the extra  $CO_2$  it is receiving from the person which is logical thinking but there is enough  $CO_2$  in the air for this not have an affect.

However:

In a study performed by the Royal Horticultural Society, researchers discovered that talking to your plants really can help them grow faster. As they respond to the vibrations. They also found that plants grow faster to the sound of a female voice than to the sound of a male voice

(March 2021)

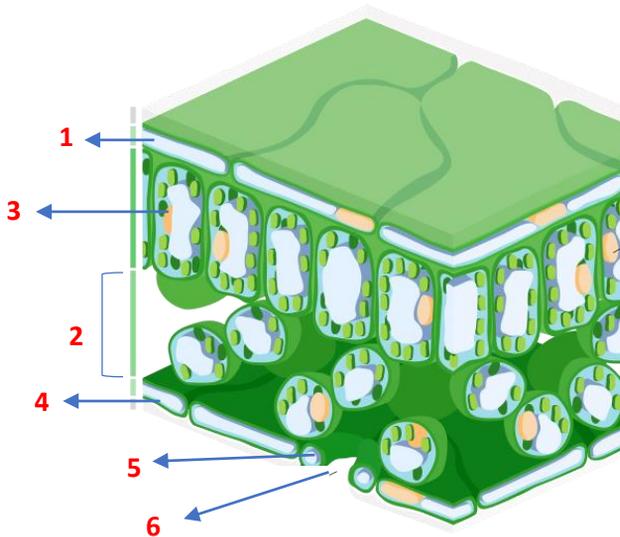
# Leaves

Leaves have a large \_\_\_\_\_ and are \_\_\_\_\_ to maximise light absorption. They have a top and bottom layer called the \_\_\_\_\_ which do not contain \_\_\_\_\_ and function as protection for the inner cells. The wax cuticle on the surface of the \_\_\_\_\_ epidermis helps to prevent \_\_\_\_\_ of water. On the lower epidermis there are small openings called \_\_\_\_\_. The middle layers are called the \_\_\_\_\_ and contain lots of \_\_\_\_\_. The \_\_\_\_\_ mesophyll cells are packed together in rectangular arrangements and the \_\_\_\_\_ mesophyll are loosely packed and are rounder. This allows air spaces which help the \_\_\_\_\_ of gases. Running through the mesophyll are \_\_\_\_\_ vessels for water transport and \_\_\_\_\_ tubes for sucrose transport away from the leaf.

**BIZARRE BIOLOGY** : Lettuce leaves are the worlds most popular salad ingredient.

## Questions

1. Label the structures of the leaf. (7)



2. What are stomata (stoma) and guard cells and what do they do? (2)

Score /23



## Extension

Explain why a transparent epidermis is an adaptation for photosynthesis.

## Knowledge Boss

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Explain why the leaves on some trees in autumn go a brown colour.

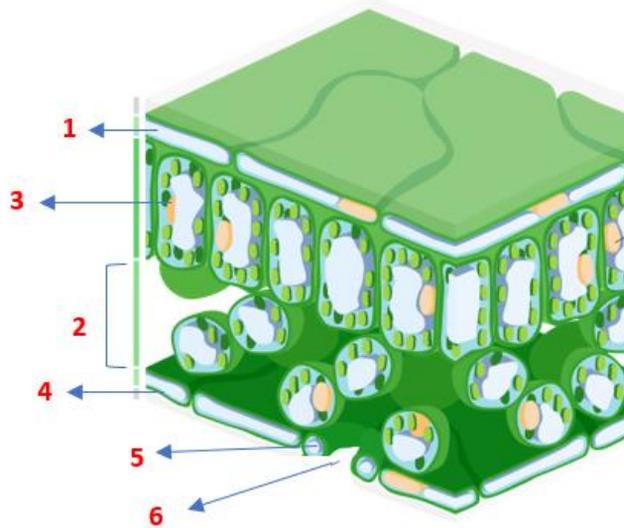
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xylem	upper	chloroplasts (2x)	diffusion	evaporation	palisade	mesophyll
surface area	epidermis	phloem	thin	stomata	epidermis	spongy

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# Leaves



Surface area	Mesophyll
Thin	Chloroplasts
Epidermis	Palisade
Chloroplasts	Spongy
Upper	Diffusion
Evaporation	Xylem
Stomata	Phloem

1. Upper epidermis
2. Spongy mesophyll
3. palisade mesophyll
4. lower epidermis
5. Guard cells
6. Stomata (stoma)

2.
  - Stomata are the holes which are created by the guard cells which allow diffusion of gases/ $\text{CO}_2$ ,  $\text{O}_2$ .
  - Guards cells open and close to create the stomata

## Extension:

- Allows as much light as possible to pass through the epidermal layer/cells
- To the palisade layer/cells below

## Knowledge Boss:

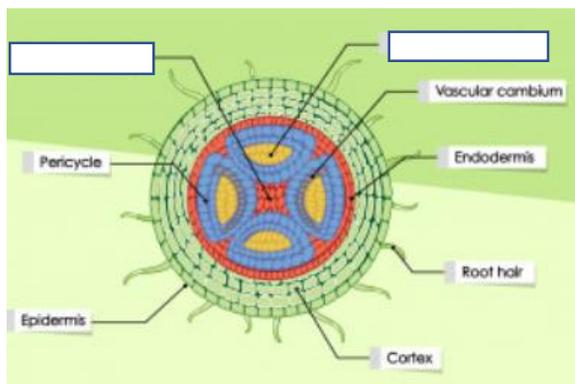
They absorb their chlorophyll back into the inner tree parts to conserve it. The leaves lose their chlorophyll and turn brown

# Transport in Plants

There are two types of transport vessel in plants, the \_\_\_\_\_ which transports \_\_\_\_\_ and dissolved mineral ions and the \_\_\_\_\_ which transport dissolved food materials like \_\_\_\_\_ and amino acids. The xylem form long, hollow tubes and are made from \_\_\_\_\_ cells. The substances in the xylem always travel \_\_\_\_\_ from roots to leaves. Phloem cells are living and transport substances in both directions. The transport of these substances in the phloem is called \_\_\_\_\_ and occurs in \_\_\_\_\_ directions. The leaves which carry out photosynthesis and therefore translocating the sucrose and amino acids is called a \_\_\_\_\_. The part of the plant to which these are being translocated to is called a \_\_\_\_\_ which is often the roots as they grow a lot and can not carry out photosynthesis. The phloem and xylem tissue when found close to each other is called the \_\_\_\_\_ bundle.

**BIZARRE BIOLOGY** : The Mesquite tree which survive in very arid (dry) places can have roots which go 60m into the ground.

## Questions



1. Label the xylem and phloem on the diagram. (2)

2. List 2 similarities and two differences between xylem and phloem vessels. (4)

Score /17



## Extension

Explain why xylem tubes are hollow.

## Knowledge Boss

Consider the advantages of xylem tubes being made of dead cells.

# Transport in Plants

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translocation  
dead

phloem  
source

sink

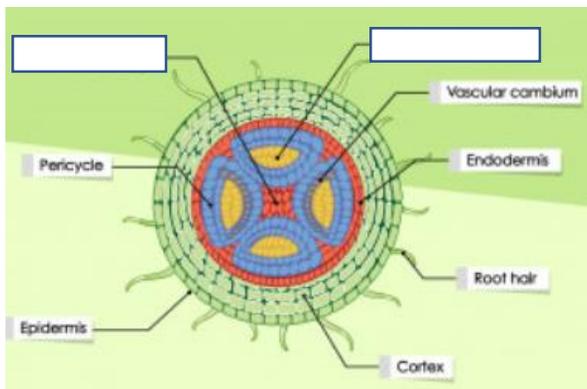
vascular  
water

sucrose  
upwards

xylem  
both

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# Transport in Plants

Xylem

Water

Phloem

Sucrose

Dead

Upwards

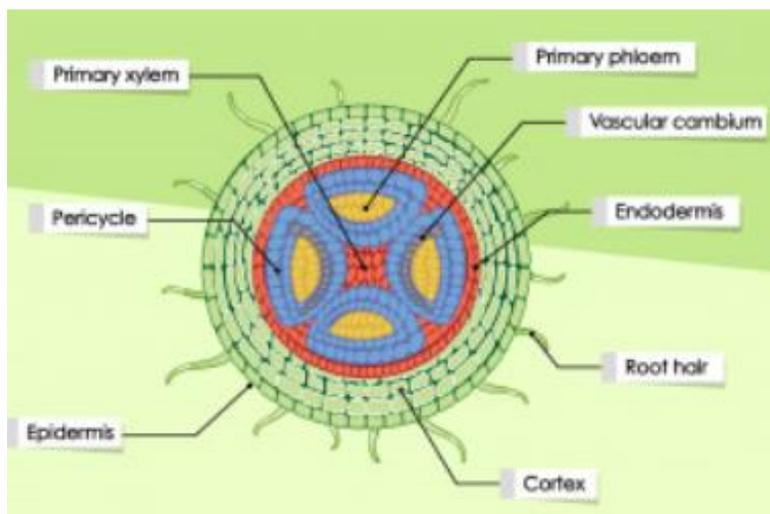
Translocation

Both

Source

Sink

Vascular



2.

## Similarities

- Tubes
- Transport substances around a plant

## Differences

- Xylem one direction, phloem both directions
- Xylem has some dead cells, phloem has living cells
- Xylem transports water and ions, phloem food substances
- Xylem tubes are hollow, phloem is not hollow

## Extension:

To allow the water and ions to travel easily through the tubes with being restricted by the cell contents like cytoplasm and organelles.

## Knowledge Boss:

- If they were living they would require water and there would be less transported to the leaves.
- Living cells require energy to maintain.
- They are dead because they can be strengthened with lignin which is a structural polysaccharide to provide plant support

# Water Uptake and Transpiration

Plants absorb water through the \_\_\_\_\_ cells which are adapted for efficient water uptake because they have a high \_\_\_\_\_. Water enters by \_\_\_\_\_ due to there being a higher \_\_\_\_\_ in the \_\_\_\_\_ than inside the cells. Mineral ions like nitrates enter by \_\_\_\_\_ because normally their concentration is higher inside cells than in the soil.

The loss of water vapour which mostly occur in the leaves is called \_\_\_\_\_. Water \_\_\_\_\_ out of the cells in the leaves and \_\_\_\_\_ out of the air spaces inside the leaves into the atmosphere through the holes called \_\_\_\_\_. The movement of water from roots, xylem, mesophyll and out the stomata is known as the \_\_\_\_\_. Humidity and \_\_\_\_\_ can affect the \_\_\_\_\_ of transpiration.

temperature	active transport	root hair	evaporates	rate	surface area	diffuses
soil	transpiration stream	water potential	transpiration	transpiration	stomata	osmosis

**BIZARRE BIOLOGY** Plants can grow without soil as long as their roots are placed in a nutrient solution. This type of plant cultivation is known as Hydroponics.

## Questions

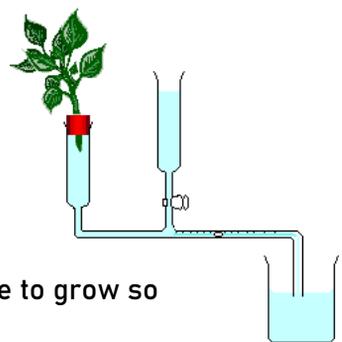
1. Why would the stomata in plants close at night? (3)
  
  
  
  
  
  
  
2. List some points as to why a plant needs to carry out transpiration (3)

Score /19



## Extension

What effect will placing a plastic bag over a plant have and why?



## Knowledge Boss

Consider why this branch with leaves in this potometer would not be able to grow so well even when placed in sunlight.

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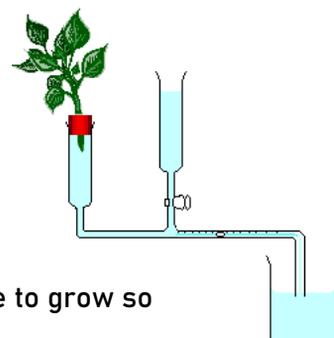


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# Water Uptake and Transpiration



root hair  
surface area  
osmosis  
water potential  
soil  
active transport  
Transpiration  
Evaporates  
Diffuses  
Stomata  
Transpiration stream  
Temperature  
rate

1.
  - No photosynthesis
  - So does not need carbon dioxide from the air
  - Closes to reduce water loss

2.
  - transporting mineral ions
  - providing water to keep cells turgid in order to support the structure of the plant
  - providing water to leaf cells for photosynthesis
  - keeping the leaves cool (the conversion of water (liquid) into water vapour (gas) as it leaves the cells and enters the airspace requires heat energy.

## Extension:

Transpiration will decrease because there is a lower water potential gradient between leaves and atmosphere as the atmosphere has more water vapour due to the water vapour leaving the leaves and being trapped inside the bag.

## Knowledge Boss:

- It is only receiving water but not minerals such as nitrate which it needs to make amino acids and grow.
- It may have been distressed from being cut from the plant.

# Sourced Images

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<https://nohat.cc/f/diagram-showing-internal-root-structure-free-vector/3a9b85c6a2274dcc8651-201912192042.html>

Diagram showing internal root structure Free Vector

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