

Exchange and Water Loss in Plants

1 A student did an investigation into the loss of water vapour from the leaves of a plant. This is the procedure he followed in order to carry out his investigation.

- Cut three leaves from a plant
- Add a thin waterproof layer of vaseline to the top of one, the bottom of the second and both surfaces of the third leaf
- Measure the mass of each leaf
- Record the mass every 5 minutes for 30 minutes



The table shows the results of the investigation.

Position of vaseline	Mass of Leaf (g)						
	0 mins	5 mins	10 mins	15 mins	20 mins	25 mins	30 mins
Leaf 1 - top only	10.1	9.9	9.6	9.4	9.1	8.8	8.6
Leaf 2 - bottom only	10.5	10.5	10.5	10.5	10.4	10.4	10.4
Both surfaces	9.8	9.8	9.8	9.8	9.8	9.8	9.8

1 (a) (i) Calculate the **loss in mass** of leaf 1, in g/min over the 30 minutes of the experiment.

1.5 / 30 [1 mark]

Loss in mass = 0.05 g/min
(2 marks)

1 (a) (ii) What do the results suggest about water vapour loss from the surfaces of leaves?

Use information from the table in your answer.

Water is lost mostly from the lower surface [1 mark]

Some/a little water is lost from the top surface [1 mark]

(because) leaf 1 lost the most/lost 1.5 g [1 mark]

Leaf 2 only lost a little/0.1 g [1 mark]

Leaf 3 did not lose any water or stayed at the same mass. [1 mark]

You would get marks for using any numbers that support what you say.

(3 marks)

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- 1 (b) In a separate experiment the student did an experiment to investigate the effect of environmental conditions on the water loss from leaves. The two conditions are described in the diagram. The mass was measured before and after the experiment.

Five minutes being
blown by a fan.



Five minutes at 30 degrees



- 1 (b) (i) Another student suggested that there should be another leaf that should:

- be at normal room temperature
- have no air blown on it.

Suggest a reason why would it be useful to have a third leaf with these conditions?

As a comparison or as a control [1 mark]

So you can tell how much each condition affects water loss or you compare to water loss in normal conditions. [1 mark]

(2 marks)

- 1 (b) (ii) Suggest one other environmental factor that affects the rate of water loss from leaves.

Humidity / dryness or dryness of the air or light intensity or brightness /day or night time [1 mark]

- 1 (b) (iii) What is the role of stomata in leaves?

Control water loss or stop wilting [1 mark]

Allow carbon dioxide in [1 mark]

Allow oxygen out [1 mark]

You might drop a mark
if you just said light and
not light intensity

(1 mark)

(2 marks)

(Total 10 marks)

- 2 Plants take in water and mineral ions from the soil through their roots.

Mineral ions are often found in lower concentrations in the soil than in the roots.

Describe in detail the way in which water and mineral ions are taken up from the soil by the roots.

Water By osmosis [1 mark]

Water moves/diffuses from where it is at a high(er) concentration [1 mark]

To where water is at a low(er) concentration [1 mark]

Through membrane of cells/through semi permeable or partially permeable membranes [1 mark]

You can say the movement of water from a dilute to a concentrated solution. What ever you say, don't mix the two up. If you are talking about the concentration of water molecules, make that clear.

(3 marks)

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Mineral ions By active transport [1 mark]

From a lower concentration to a higher concentration [1 mark]

Using energy [1 mark]

You might have used ATP instead of energy,
which will probably be OK in the exam.

or against the concentration gradient [1 mark]

(3 marks)

2 (a) Describe how the structure roots help to maximise the uptake of water and mineral ions.

Have root hairs or root hair cells [1 mark]

which increase the surface area, or provide a high surface area. [1 mark]

(2 marks)

(Total 8 marks)