

# 9.1 Transport in the Xylem of Plants

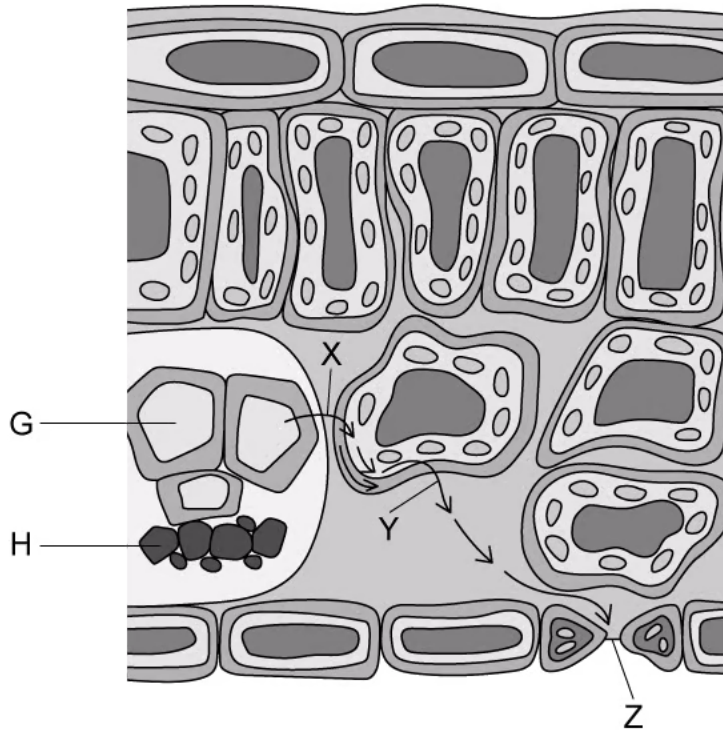
## Question Paper

Course	DP IB Biology
Section	9. Plant Biology (HL Only)
Topic	9.1 Transport in the Xylem of Plants
Difficulty	Easy

**Time allowed:** 60  
**Score:** /44  
**Percentage:** /100

### Question 1a

a)  
The image shows the cross section of a leaf.



Identify the substance which is represented by the arrows in the diagram.

[1 mark]

[1 mark]

### Question 1b

b)  
Draw three lines to correctly identify the method of particle movement shown in the diagram from part a).

X	Osmosis
Y	Diffusion
Z	Active transport
	Evaporation
	Cohesion

[3 marks]

[3 marks]

### Question 1c

c)  
i)  
Identify the letters from the diagram in part a) that represents the xylem.

[1 mark]

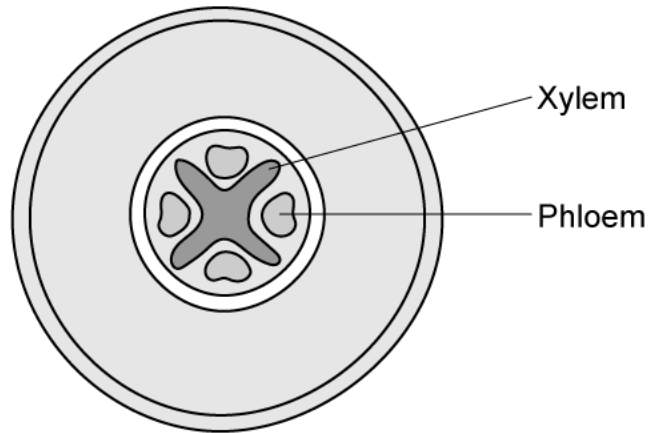
ii)  
Describe **one** adaptation of the xylem which makes it suitable for its function.

[1 mark]

[2 marks]

### Question 1d

d)  
The diagram below represents a plant organ.



State the name of this organ.

[1 mark]

[1 mark]

### Question 2a

a)  
The transpiration stream relies on cohesion to maintain a continuous column of water in the xylem.

Define the meaning of the term 'cohesion'.

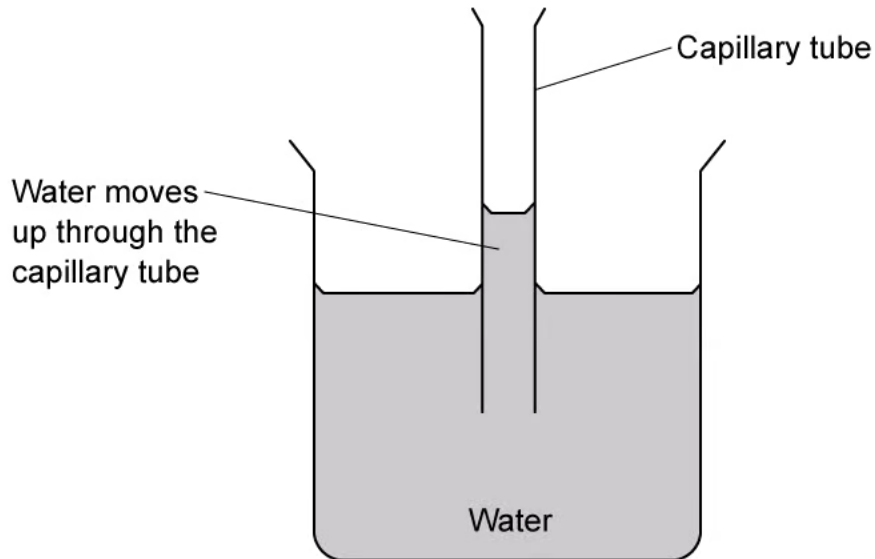
[1 mark]

[1 mark]

### Question 2b

b)

Capillarity is a term used to describe the movement of water through narrow diameter tubing, called capillary tubing, against the force of gravity. This phenomenon is represented by the image in the diagram.



In combination with the cohesion described at part **a)**, identify **one** other property of water which allows transport through the capillary tube.

[1 mark]

[1 mark]

### Question 2c

c)

Capillary tubing, such as that shown in part **b)**, can be used to model the process of transpiration.

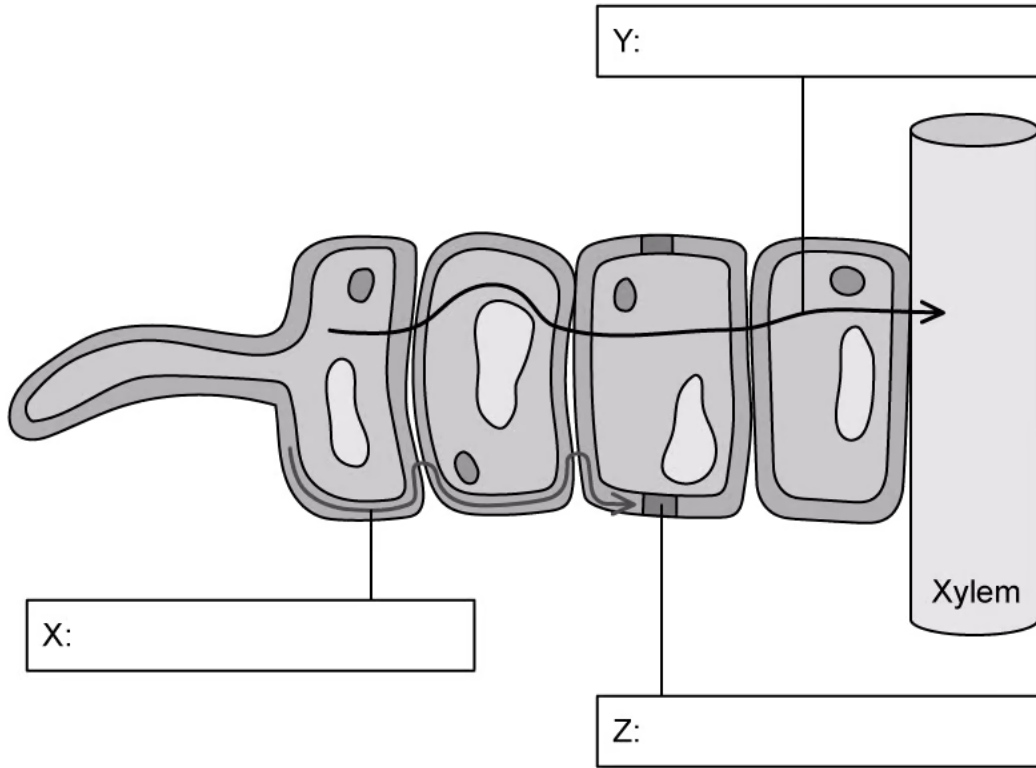
State a reason for the use of models in science.

[1 mark]

[1 mark]

**Question 3a**

a)  
The image shows the movement of water through the cells in the root.



Label the diagram by adding the following to the correct parts:

- Apoplast pathway
- Symplast pathway
- Casparian strip

[3 marks]

[3 marks]

**Question 3b**

b)  
Explain the effect that the casparian strip have on the movement of water through the root.

[2 marks]

[2 marks]

### Question 3c

c)

Movement of water into the root occurs by osmosis.

Describe the process used by plant roots to ensure the osmolarity of the root cells is higher than the surrounding soil.

[2 marks]

[2 marks]

### Question 3d

d)

Some plants develop mutualistic relationships with soil fungi.

Identify the key benefit to the fungus of this relationship with the plant.

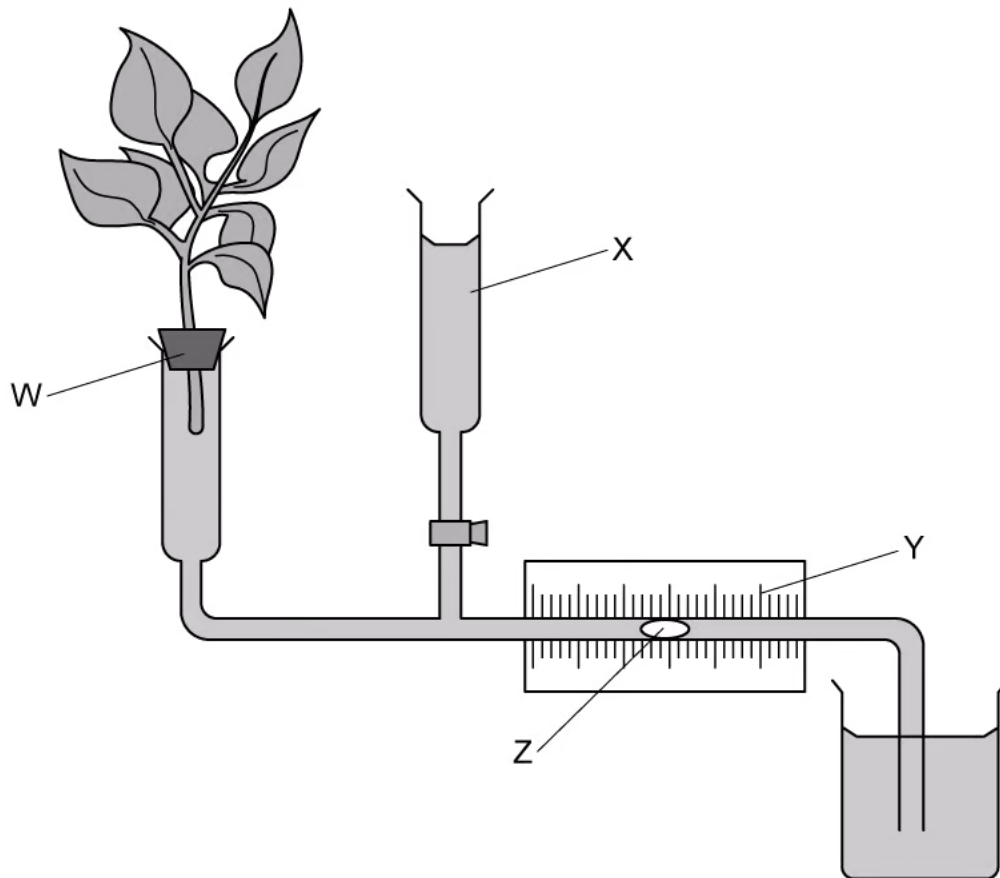
[1 mark]

[1 mark]

**Question 4a**

a)  
A bubble potometer can be used to investigate the rate of transpiration.

The diagram shows the apparatus required in a bubble potometer.



The table shows some of the functions of this apparatus.

Function	Letter
Used to measure the distance moved by the bubble in cm	
Prevents evaporation of water from the equipment	
Adds water to the equipment to reset the bubble	
Indicates the volume of water used in transpiration	

Complete the table with the letters which correctly represent the feature described.

[3 marks]

[3 marks]



### Question 4b

b)

Some students set up a potometer similar to the one in part **a)**, in a classroom at 20 °C with no air movement. Over the course of 25 minutes, they calculated that 7.5 mm<sup>3</sup> of water was lost through transpiration.

Calculate the rate of transpiration shown by the shoot, in mm<sup>3</sup> hr<sup>-1</sup>.

[2 marks]

[2 marks]

### Question 4c

c)

To see the effect of different environmental factors on the rate of transpiration, the students adjusted the temperature, air movement, humidity and light intensity in the room.

Identify what the students would expect to happen to the rate of transpiration in the following scenarios, by completing the table below:

Scenario	Effect on transpiration (increase/decrease/no effect)
Increased the room temperature	
Turned on a fan	
Turned on a humidifier	
Surrounded the plant by lamps	

[4 marks]

[4 marks]

### Question 4d

d)

During the set up of the potometer shown in part **a)**, the plant stem was cut underneath water before being positioned in the equipment as shown.

Explain why is it necessary to cut the stem underneath the water for this investigation.

[2 marks]

[2 marks]

### Question 5a

*One mark is available for clarity of communication throughout this question.*

a)

Draw a labelled diagram of the vascular system seen in the cross section of a plant stem.

[4 marks]

[4 marks]

### Question 5b

b)

Outline the features of xerophytes which make them adapted for living in areas where water is scarce.

[6 marks]

[6 marks]

### Question 5c

c)

Describe the route of water as it moves through a plant in the transpiration stream.

[5 marks]

[5 marks]