Living together – food and ecosystems – 2022 GCSE 21st Biology Combined Science B

1. June/2022/Paper_J260/05/No.1

Transpiration takes place in plants.

(a) Complete the sentences to describe transpiration.

Put a (ring) around each correct answer.

Water is **absorbed / lost / translocated** through the stomata in a plant's leaves.

This causes **sugars / water / water and sugars** to move up the

meristem / phloem / xylem tissue in the plant's stem.

[3]

(b) **Fig. 1.1** shows one of the stomata from a leaf.

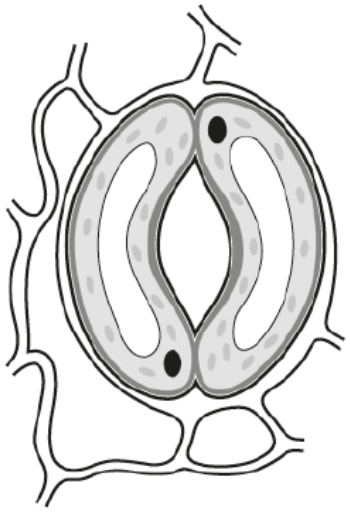

Fig. 1.1

Add **two** labels to **Fig. 1.1**.

Label 1 The pore through which water diffuses.

Label 2 A guard cell.

[1]

(c) Complete the sentences to describe how to set up a light microscope to look at a slide of stomata from a leaf.

Put a (ring) around each correct answer.

First, turn to the **×4 / ×10 / ×20** objective lens.

Use the coarse focus knob to move the objective lens to its **lowest / middle / highest** position.

Then clip the slide onto the **eyepiece / objective lens / stage**.

[2]

(d) Amir sets up a leafy twig in a bubble potometer as shown in **Fig. 1.2**.

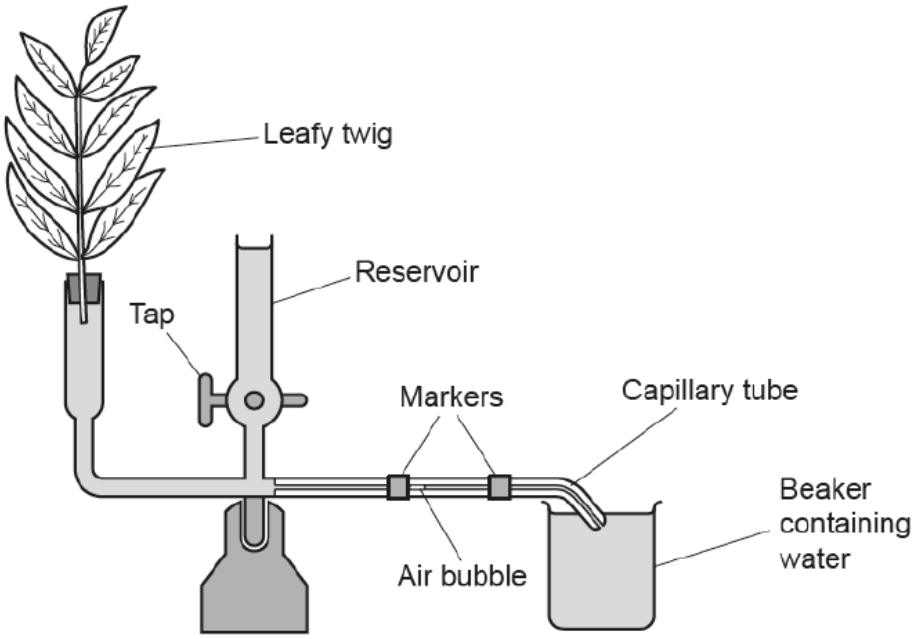

Fig. 1.2

Amir wants to use the bubble potometer to investigate the rate of transpiration in the leafy twig.

(i) Describe the **two** measurements Amir would need to make.

1 .....

2 .....

[2]

(ii) Suggest the purpose of the reservoir **and** tap.

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..... **[2]**

(e) Amir investigated the rate of transpiration in the leafy twig in four different experiments.

The table shows Amir's results.

Experiment	Temperature (°C)	Wind speed (m/s)	Light level	Calculated mean rate (mm/s)
A	22	0.1	Dull	1.27
B	22	0.1	No light	0.61
C	20	4.8	Bright	1.54
D	28	0.3	Dull	

Amir has not yet calculated the mean rate for experiment **D**. The results from his three repeats of experiment **D** were 4.55, 4.17 and 0.75 mm/s.

(i) Discuss arguments for and against ignoring the result of 0.75 mm/s for experiment **D**.

For .....

.....

Against .....

.....

[2]

(ii) Amir decides to keep all three results for experiment **D**.

Calculate the mean rate for experiment **D**.

Give your answer to **two** decimal places.

Mean rate = ... mm/s **[3]**

(f) Amir wants to make a conclusion about the effect of light level on the rate of transpiration.

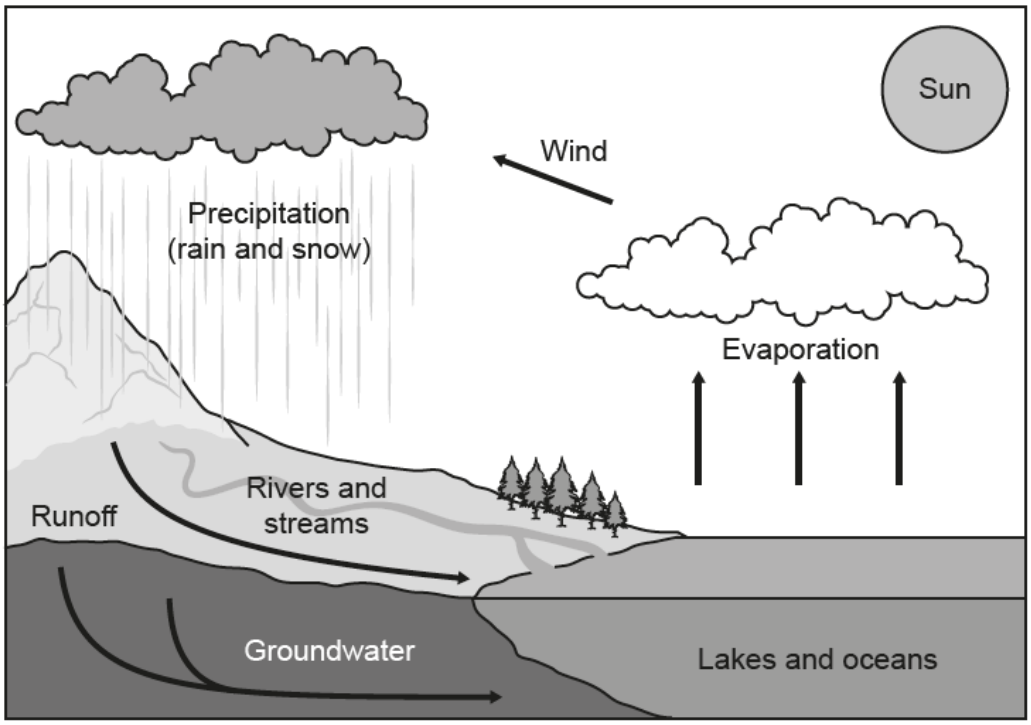
Explain why he can **only** do this by comparing experiments **A** and **B**.

.....

..... **[1]**

2. June/2022/Paper_J260/01/No.6

The diagram shows an incomplete model of the water cycle.



(a)* The diagram does **not** show the roles of plants and animals in the water cycle.

Explain the roles of plants and animals in the water cycle, and why water is needed by plants and animals.

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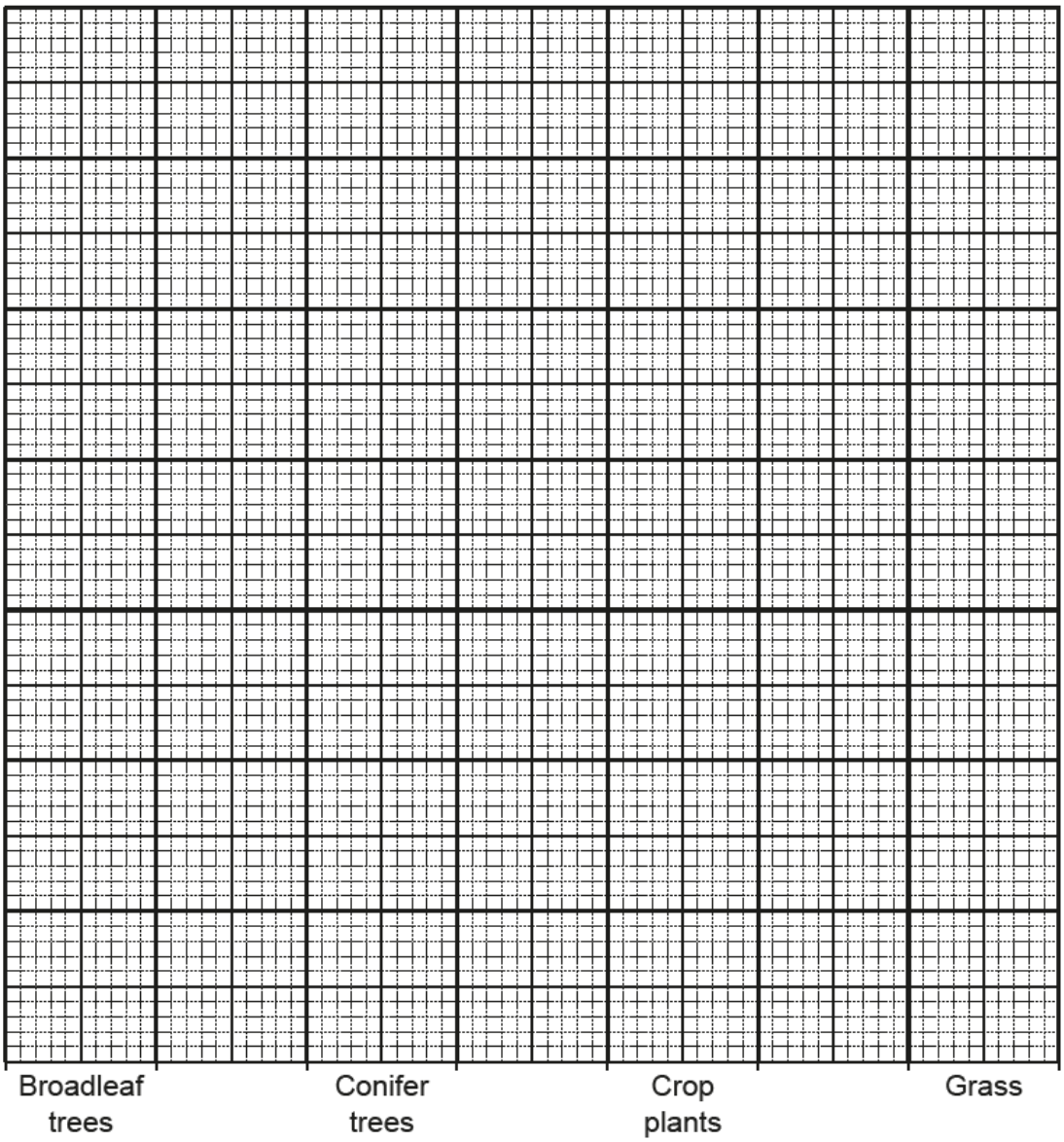
..... **[6]**

(b) Some of the rain that falls on land evaporates.

The table shows how the type of plants growing on the land affects the percentage of rain that evaporates per year.

Type of plants growing on the land	Percentage of rain that evaporates per year (%)
Broadleaf trees	51.0
Conifer trees	67.5
Crop plants	40.0
Grass	50.0

Plot a bar chart of the results from the table on the graph.



[4]

(c) The UK has a target to plant new trees in 300 km^2 of land each year to help manage the water cycle. New trees were planted in 150 km^2 of land in 2020.

Calculate the simplest ratio of planted area : target area in 2020.

Simplest ratio = ... : ..... **[2]**

(d) Water and carbon are both cycled through ecosystems.

Complete the table to show which parts of an ecosystem each substance is cycled through.

Tick (✓) **one** box in each row.

Substance	**Cycled only through the abiotic parts**	**Cycled only through the biotic parts**	**Cycled through both parts**
Water			
Carbon			

[2]

3. June/2022/Paper_J260/01/No.7

Duckweed is a plant that grows in pondwater.

Each duckweed plant is made of one leaf and one root, as shown in **Fig. 7.1**.

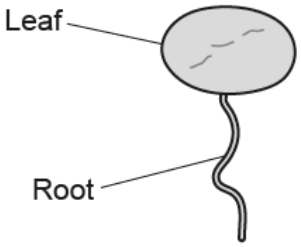


Fig. 7.1

(a) Photosynthesis in the leaf makes food, which allows the plant to reproduce.

Some students want to find out the pH at which duckweed photosynthesises best.

They put 100 duckweed plants in each of four beakers of water. **Fig. 7.2** shows the pH of the water in each beaker.

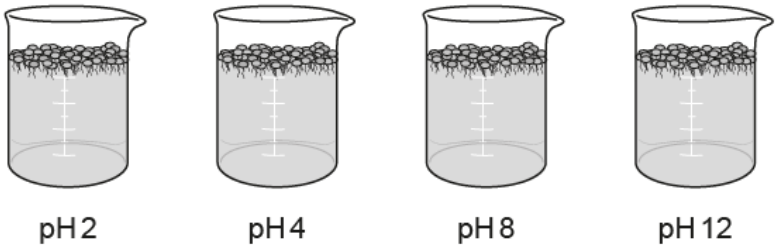


Fig. 7.2

Describe **two** variables that the students should keep the same for each beaker.

1 .....

2 .....

[2]

(b) After seven days the students count the number of living duckweed plants in each beaker.

The table shows their results.

pH	Number of living duckweed plants
2	0
4	110
8	120
12	0

The students conclude that duckweed photosynthesises and reproduces best at pH 8.

They could investigate whether their conclusion is based on an **accurate** result by growing duckweed in two more beakers of water.

What should the pH of the water in these **two** beakers be?

Tick (✓) **two** boxes.

pH 1 ☐

pH 3 ☐

pH 7 ☐

pH 9 ☐

pH 13 ☐

[2]

4. June/2022/Paper_J260/01/No.10

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meristem / phloem / xylem tissue in the plant's stem.

[3]

(b) **Fig. 10.1** shows one of the stomata from a leaf.

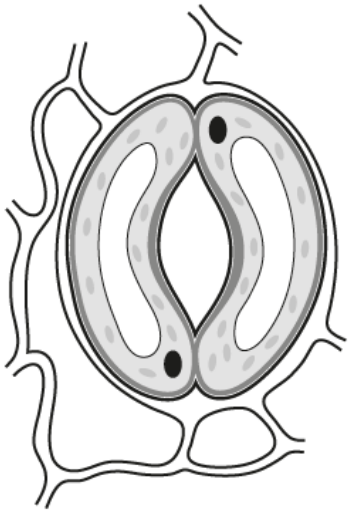

Fig. 10.1

Add **two** labels to **Fig. 10.1**.

Label 1 The pore through which water diffuses.

Label 2 A guard cell.

[1]

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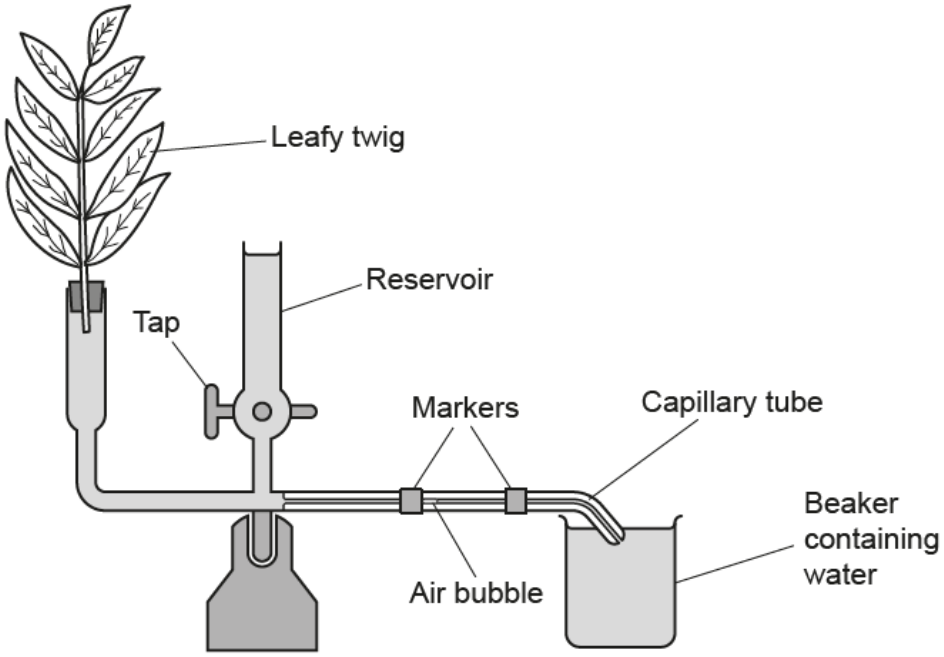

Fig. 10.2

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Mean rate = ... mm/s **[3]**

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