

Past-paper walk-through

Water uptake ■ 8.2

eXercise

Questions in this set

- 0610/22 N25 Q10 ■ 1 mark
- 0610/43 N25 Q3 ■ 20 marks
- 0610/61 N25 Q1 ■ 31 marks

Reading the mark scheme

- **B1** a mark that stands on its own – the point is either made or not.
- **M1** a *method* mark: the right approach, even if the number is wrong.
- **A1** an *answer* mark, and it usually needs its M mark first.
- **C1** a working mark on the way to the answer.
- **//** separates answers the examiner accepts equally.
- **ecf** = error carried forward: a later part is marked on your own earlier answer.
- **owtte** = “or words to that effect” – the wording need not match.

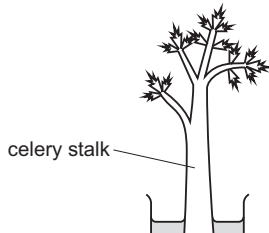
Question 10

0610/22 N25 ■ Q10 ■ 1 mark

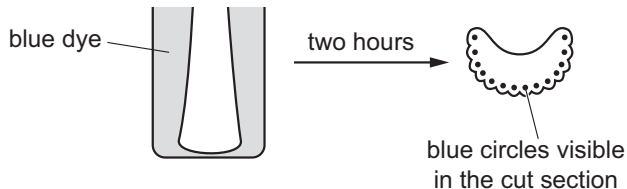
10 A student cut one stalk of celery from a celery plant.

They put the celery stalk into a beaker of blue dye.

The celery stalk was removed from the blue dye after two hours and was cut into sections.



Question 10



What is shown by the blue circles in the cut sections of celery stalk?

- A** position of the cortex cells
- B** position of the palisade cells
- C** position of the phloem cells
- D** position of the xylem vessels

Solution 10

Answer: **D**

Why

- A dye rising up a cut stalk travels in the water-transporting tissue.
- That is the xylem, which forms the vascular bundles.
- So a cross-section shows the dye only in the xylem, arranged in a ring or in strands.

Question 3

0610/43 N25 ■ Q3 ■ 20 marks

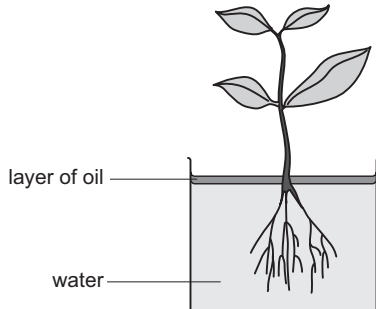
- 3 (a)** Describe the pathway a water molecule takes from the soil to reach the xylem.

Question 3

(b) A student investigated the effect of temperature on transpiration.

The student collected four small plants and placed them in beakers filled with water.

Fig. 3.1 shows the apparatus used.



Question 3

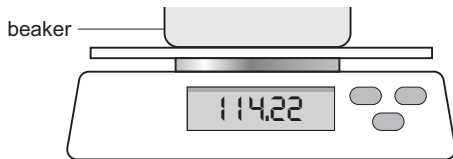


Fig. 3.1

For each plant, the student measured the initial masses of the equipment, water and plant.

Each plant was placed in a different temperature-controlled room for three hours.

After three hours, the student measured the final masses of the equipment, water and plants.

The results are shown in Table 3.1.

Table 3.1

Question 3

temperature/°C	initial mass/g	final mass/g	transpiration rate /g per hour
15	138.2	135.5	0.9
20	136.1	132.5	1.2
25	137.8	128.5	3.1
30	135.7	118.3	

- (i) Using the information in Table 3.1, calculate the transpiration rate in the plant kept at 30°C.

Question 3

Question 3

- (ii) Describe **and** explain the difference in the results for the plants kept at 15 °C and 25 °C.

Question 3

- (iii) The investigation was repeated with a plant kept at 25°C in a lower humidity environment.

Predict the effect of these conditions on the transpiration rate.

Explain your prediction.

Question 3

(iv) Complete the sentences about water movement through the xylem.

Question 3

Question 3

Question 3

Question 3

Question 3

..... between water molecules.

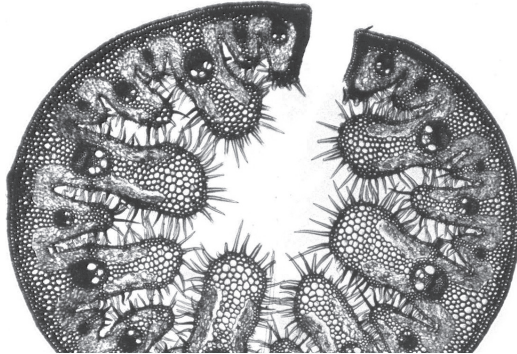
[6]

(c) (i) Explain why wilting occurs.

Question 3

- (ii) Marram grass, *Ammophila arenaria*, is a xerophyte.

Fig. 3.2 is a photomicrograph of a cross-section of a marram grass leaf.



Question 3



Question 3

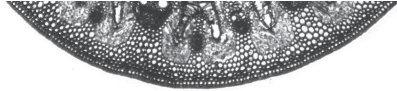


Fig. 3.2

Explain **one** way that the marram grass leaf shown in Fig. 3.2 is adapted to reduce transpiration.

Question 3

[Total: 20]

Solution 3

(a) Mark scheme

- any two from:
- (enters) the root hair (cell) ;
- moves through the (root) cortex (cells to the xylem) ;
- AVP ;
- 2
- e.g. through a partially permeable / cell
- (surface), membrane (by
- osmosis / diffusion)

Solution 3

(b)(i)

Mark scheme

- 5.8 (g per hour) ;
- 1
- 0610/43
- October/November 2025
- Guidance

Solution 3

(b)(ii) Mark scheme

- any four from:
- 1
- as temperature increases, water loss / transpiration, increases ; ora
- 2
- comparative data manipulation with units ;
- 3
- higher kinetic energy (of water molecules) / description of molecules having
- more energy to, move / collide / AW ; ora

Solution 3

- 4
- increases (the rate of) evaporation (inside leaf) ; ora
- 5
- water evaporates from the surface of mesophyll cells ;
- 6
- increases (the rate of) diffusion (of water vapour) through the stomata ; ora
- 7
- more stomata open / stomata open wider, at high(er) temperatures ; ora
- 4

Solution 3

(b)(iii)

Mark scheme

- increased rate of transpiration ;
- increased concentration gradient (of water vapour for diffusion through the stomata) ;
- 2

Solution 3

(b)(iv) Mark scheme

- 1
- (mineral) ions ;
- 2
- tube / vessel / AW ;
- 3
- lignin ;
- 4
- pull ;

Solution 3

- 5
- column / AW ;
- 6
- forces (of attraction) / attraction / AW ;
- 6

Solution 3

(c)(i) Mark scheme

- any three from:
- 1
- (plants / cells) exposed to, extreme heat / high temperatures ;
- 2
- (plants / cells have) inadequate / not enough / no, water OR dehydration ;
- 3
- (rate of) water uptake is less than, (rate of) water loss / transpiration ; ora
- 4

Solution 3

- water moves out of cells (by osmosis) ;
- 5
- cells, become flaccid / lose turgor (pressure) / plasmolyse ;
- 6
- ref. to plants / leaves / cells, rely on (turgor) pressure of water on (inelastic)
- cell walls for, (structural) support
- / to stay firm / AW ;
- 7
- AVP ;
- 3

Solution 3

- e.g. wilting can occur because of a
- nutrient deficiency
- 0610/43
- October/November 2025
- Guidance

Solution 3

(c)(ii) Mark scheme

- any one from:
 - 1
 - inner surface of leaf is folded / AW ;
 - 2
 - hairs / AW ;
 - 3
 - sunken stomata or stomata in, pits / AW ;
- any two from:

Solution 3

- 4
- trap moist air / water vapour / reduce air, flow / movement ;
- 5
- reduce water (vapour) diffusion gradient (out of stomata) ;
- OR
- 6
- curled / rolled / AW, leaf ;
- 7
- (rolling) traps air / reduce air movement / shields leaf from heat / reduces
- exposed surface ;

Solution 3

- 8
- reduce water (vapour) diffusion gradient (out of stomata) ;
- OR
- 9
- few stomata ;
- 10 few sites where water exits the leaf / AW ;
- OR
- 11 thick (waxy) cuticle ;
- 12 reduces evaporation (from the leaf surface) / creates a waterproof layer ;
- 2

Solution 3

- 0610/43
- October/November 2025
- Guidance

Question 1

0610/61 N25 ■ Q1 ■ 31 marks

- 1 A student investigated the effect of temperature on the movement of water in celery stalks. The water contained a blue dye.

In plant stems such as a celery stalk, water moves in the xylem tissue within the vascular bundles.

The student used this method:

Step 1 Take two stalks of celery and cut them so that they are both 10 cm long.

Step 2 Prepare an ice-cold water-bath **C** and a warm water-bath **W**.

Place a beaker of blue dye into each water-bath, as shown in Fig. 1.1.



Question 1

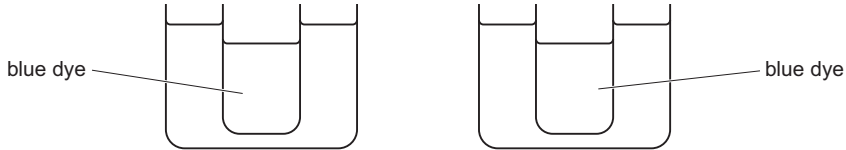


Fig. 1.1

- Step 3 Measure the temperatures of the water in water-bath **C** and water-bath **W**.
- Step 4 Let the blue dye equilibrate in the water-baths for three minutes.
- Step 5 After three minutes, place one celery stalk into each beaker of blue dye, as shown in Fig. 1.2.

Keep the celery stalks in the blue dye for ten minutes.

}

{

Question 1

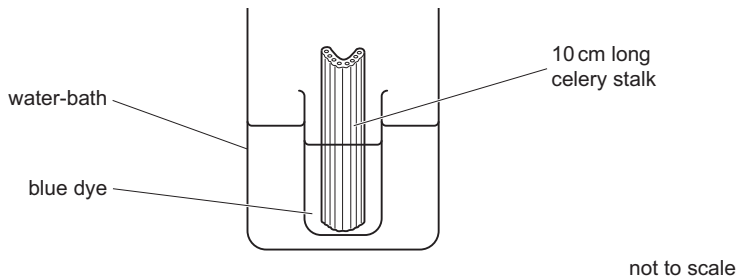


Fig. 1.2

Step 6 After ten minutes, measure the final temperatures of the water in water-bath **C** and water-bath **W**.

- (a) (i) Complete Table 1.1 by calculating the change in the water temperature for each water-bath.

Question 1

Table 1.1

water-bath	water temperature in step 3/°C	water temperature in step 6/°C	change in water temperature /°C
C	4	15	
W	40	28	

[1]

Step 7 Remove the celery stalk from the blue dye in water-bath **C** and put it on a white tile.

Step 8 Cut a section across the celery stalk 5 mm from the end that was in the blue dye, as shown in Fig. 1.3.



Question 1

~~11. The following is a list of the names of the~~

Question 1

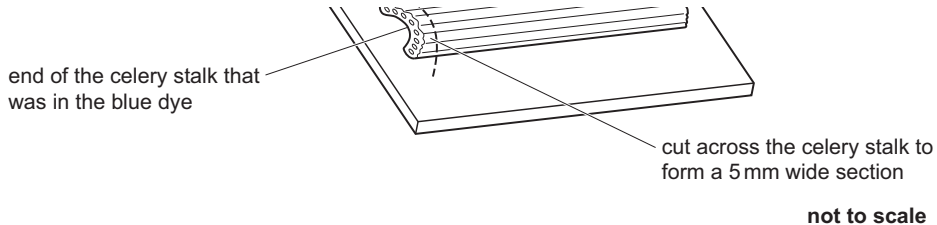


Fig. 1.3

Step 9 Examine the xylem tissue of the cut section of celery stalk to see if the blue dye is visible.

Fig. 1.4 shows the position of the xylem tissue in a cut section of a celery stalk.



Question 1

Question 1



Fig. 1.4

Step 10 If the blue dye is still visible in the celery stalk, cut another 5 mm wide section from the dyed end of the remaining part of the celery stalk.

Continue cutting 5 mm wide sections from the celery stalk until the blue dye is no longer visible in the cut section.

Step 11 Count the number of sections you have cut from the celery stalk that contain the blue dye.

Step 12 Repeat steps 7 to 11 with the celery stalk from water-bath **W**.

The student's results are shown in Fig. 1.5.



Question 1

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

Question 1

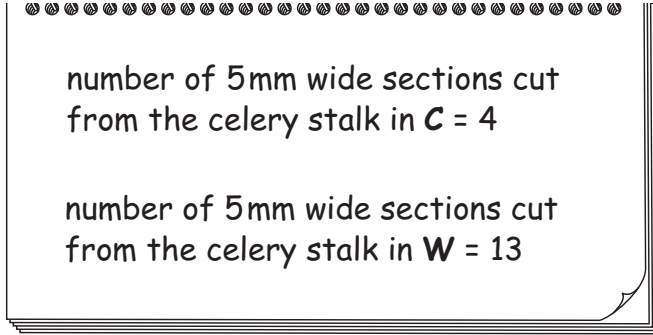


Fig. 1.5

- (ii) Prepare a table and record the results shown in Fig. 1.5.

Include the number of sections cut and the total distance moved by the blue dye in each

Question 1

include the number of sections cut and the total distance moved by the blue dye in each

Question 1

celery stalk.

-

-

Question 1

[4] _

- (iii) Calculate the rate of movement of the blue dye in the celery stalk in beaker **W**.

Include the unit.

Question 1

(iv) State a conclusion for this investigation.

Question 1

- (v) This investigation was only done once.

Explain why it is better to repeat an investigation.

Question 1

(b) Identify **two** variables that were kept constant in this investigation.

Question 1

[2]

- (c) (i) The data you have recorded in Table 1.1 may indicate that there is a source of error with the method used in this investigation.

Identify the possible error, and describe an improvement to the method to reduce the effect of this error.

Question 1

[2]

- (ii) In step 9, it is difficult to determine precisely the final position of the blue dye in the xylem.

Suggest an improvement to the method that would reduce this source of error.

Question 1

(d) Xylem forms cylinder-like structures in a celery stalk.

Calculate the volume of a cylinder which is 100 mm long and has a diameter of 0.06 mm.

Use this formula: $v = \pi r^2 h$

Use a value for π of 3.14.

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

Space for working.

Question 1

Question 1

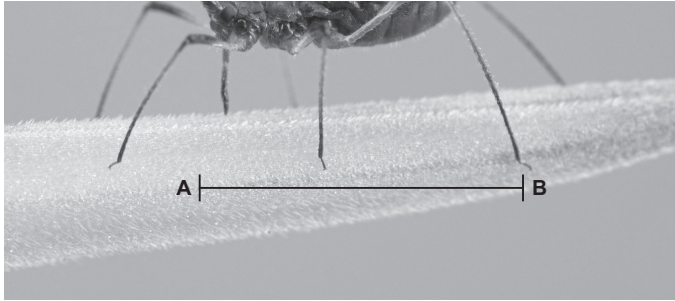
- (e) Celery plants can be damaged by insect pests feeding on them. This can reduce the growth of the celery plants.

A black aphid and the larvae of a leaf miner fly are both insect pests that damage celery plants.

Fig. 1.6 is a photograph of a black aphid.



Question 1



magnification $\times 35$

Fig. 1.6

Fig. 1.7 is a photograph of a leaf miner fly.

Question 1



magnification $\times 11$

Fig. 1.7

- (i) Line **AB** represents the body length of the black aphid.

Measure the length of line **AB** in Fig. 1.6.

Question 1

Question 1

Calculate the actual body length of the black aphid using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line **AB** in Fig. 1.6}}{\text{actual body length of the black aphid}}$$

Give your answer to **one** significant figure.

Space for working.

Question 1

Question 1

[3]

- (ii) State **three** ways that the leaf miner fly shown in Fig. 1.7 differs from the black aphid shown in Fig. 1.6.

Question 1

Question 1

Question 1

[3]

(f) Fig. 1.8 is a photograph of a celery leaf.



Question 1



Fig. 1.8

Draw a large diagram of the celery leaf shown in Fig. 1.8.

Question 1

[4]

7/1/2021

Question 1

Total: 261 / -

Solution 1

(a)(i)

Mark scheme

- $C = 11$ and $W = 12$;
- 1

Solution 1

(a)(ii) Mark scheme

- table drawn with correct number of columns and a header line ;
- appropriate column / row headings, with units for distance ;
- recording of correct number of sections for both C and W ;
- recording of correct total distances for both C and W ;
- 4 e.g.
- temperature
- number
- of

Solution 1

- sections
- total
- distance
- / mm
- cold / C
- warm / W
- 4
- 13
- 20
- 65

Solution 1

(a)(iii)

Mark scheme

- 6.5 ;
- mm per minute ;

(a)(iv)

Mark scheme

- the higher the temperature the greater the (rate of) dye / water movement ;
- 1 ecf from 1(a)(ii)

Solution 1

(a)(v)

Mark scheme

- to identify, anomalous results / outliers / results that do not follow the trend ;
- 1

Solution 1

(b) Mark scheme

- any two from:
- both used celery OR same, species / type, of plant ;
- length of celery (stalk) ;
- both used blue dye OR type / colour of dye ;
- time to equilibrate ;
- length of time in the dye ;
- width of sections ;
- 2

Solution 1

(c)(i) Mark scheme

- error from Table 1.1
- temperature (of the water-bath) not controlled / AW ;
- improvement
- thermostatically controlled water-bath ;
- 2
- 0610/61
- October/November 2025
- Guidance

Solution 1

(c)(ii)

Mark scheme

- cut smaller / thinner sections OR cut the celery vertically / longitudinally ;
- 1

Solution 1

(d)

Mark scheme

- 0.28 (mm³) ;
- 2 MP1 correct calculation to any number of
- decimal places
- MP2 correct rounding to two decimal
- places
- ecf from previous MP

Solution 1

(e)(i) Mark scheme

- line $AB = 60 \pm 1$ (mm) ;
- 2 (mm) ;;
- 3 MP1 correct measurement of line AB
- MP2 correct calculation of actual size to
- any number of significant figures
- MP3 correct rounding to one significant
- figure
- 0610/61

Solution 1

- October/November 2025
- Guidance

Solution 1

(e)(ii) Mark scheme

- any three differences from:
- leaf miner fly / Fig. 1.7
- black aphid / Fig. 1.6
- 1
- larger
- OR
- smaller
- 2

Solution 1

- shorter antennae / AW
- OR
- longer antennae / AW
- 3
- has wings
- AND
- no wings
- 4
- hairs on body
- AND

Solution 1

- no hairs on body
- 5
- larger eye
- OR
- smaller eye
- 6
- lack of two projections
- / AW, sticking out of
- abdomen / back
- AND

Solution 1

- two projections / AW
- sticking out of
- abdomen / back
- 7
- shorter legs
- OR
- longer legs
- 8
- thicker legs
- OR

Solution 1

- thinner legs
- 9
- only three legs (visible)
- AND
- six legs
- 10
- larger head
- OR
- smaller head
- ;;;

Solution 1

- 3 one mark per correct row

Solution 1

(f) Mark scheme

- single clear outline with no shading ;
- drawing larger than half the available space ;
- detail 1: deep V-shaped cleft correctly located on the upper right third of the
- leaf ;
- detail 2: between three and five separate veins coming from the same level
- at the top of the petiole ;
- 4
- 0610/61

Solution 1

- October/November 2025
- Guidance
- 2
- total of six from:
 - 1
 - independent variable
 - at least two pH values , tested / stated ;
 - 2
 - dependent variable
 - time for iodine solution to stay yellow-brown / time for disappearance of

Solution 1

- starch/colour of iodine (solution) after a set period of time ;
- 3, 4 + 5 variables kept constant ;;;
- ■
- concentration of amylase / enzyme (solution)
- ■
- volume of amylase / enzyme (solution)
- ■
- temperature
- ■
- volume of starch (suspension)

Solution 1

- ■
- concentration of starch (suspension)
- ■
- sampling interval time, stated / described
- ■
- buffer / pH (solution) volume
- ■
- iodine concentration / volume / number of drops
- 6 & 7 method ;;
- ■

Solution 1

- equilibration (both solutions in the water bath before mixing)
- ■
- take samples
- ■
- use of, spotting / white, tile
- ■
- use of buffer
- 8
- repeat investigation twice more / at least two replicates ;
- 9

Solution 1

- relevant safety precaution ;
- 6
- 0610/61
- October/November 2025
- Guidance