1. Question part 1/2 | 5090 May-June 2023 P4 V1 Q2

2 Fig. 2.1 is a photograph of a small animal that has an external shell.

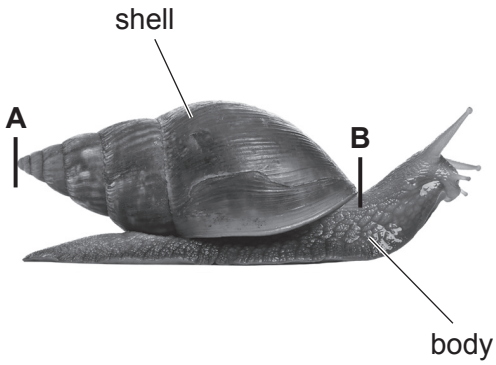


Fig. 2.1

(a) In the space below make a large drawing of the animal and its shell as shown in Fig. 2.1. Do **not** include the surface detail of the body of the animal.

[5]

(b) (i) Draw a straight line on the photograph to join lines **A** and **B**.

Measure and record the length of this line.

length of line **A–B** ..... mm [1]

(ii) On your drawing, draw a line at the same location as the line **A–B**.

Measure and record the length of this line.

length of line on drawing ..... mm [2]

1. Question part 2/2 | 5090 May-June 2023 P4 V1 Q2

(iii) Use your measurements in **(b)(i)** and **(ii)** to calculate the magnification of your drawing compared to the photograph. Give your answer to 1 decimal place.

Space for working.

magnification × ..... [2]

[Total: 10]

2. Question part 1/2 | 5090 May-June 2023 P4 V2 Q2

2 Fig. 2.1 is a photograph of a leaf from a potato plant.

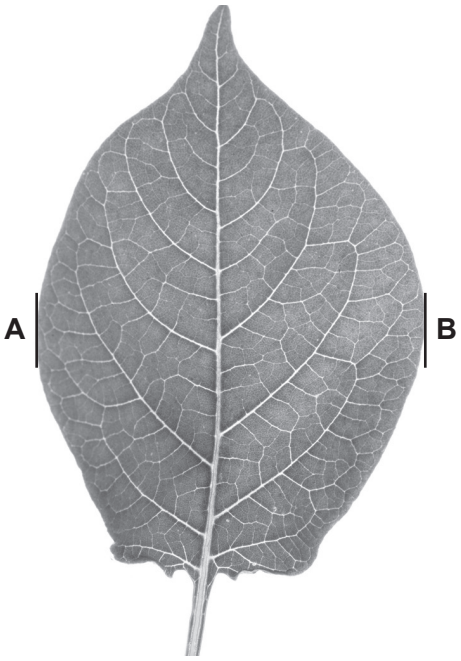


Fig. 2.1

(a) In the space below make a large drawing of the leaf as it appears in Fig. 2.1.

[3]

(b) **(i)** Draw a straight line on the photograph to join lines **A** and **B**.

Measure and record the length of this line.

length of line **A**–**B** ..... mm [1]

(ii) On your drawing, draw a line at the same location as the line **A**–**B**.

Measure and record the length of this line.

length of line on drawing ..... [2]

(iii) Use your measurements in **(b)(i)** and **(ii)** to calculate the magnification of your drawing compared to the photograph. Give your answer to 1 decimal place.

Space for working.

magnification × ..... [2]

(c) Fig. 2.2 is a photograph of a leaf from a sweet potato plant.

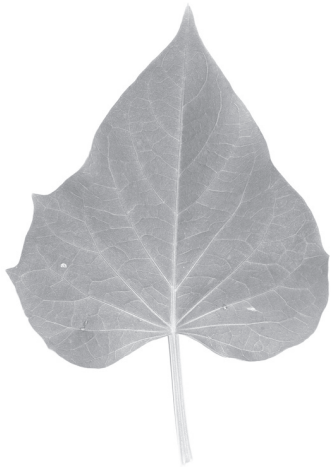


Fig. 2.2

Describe **one visible** difference and **one visible** similarity in the structure of the potato leaf in Fig. 2.1 and the sweet potato leaf in Fig. 2.2.

difference .....

similarity .....

[2]

[Total: 10]

3 Fig. 3.1 is a photomicrograph of a section through a kidney showing some kidney tubules.

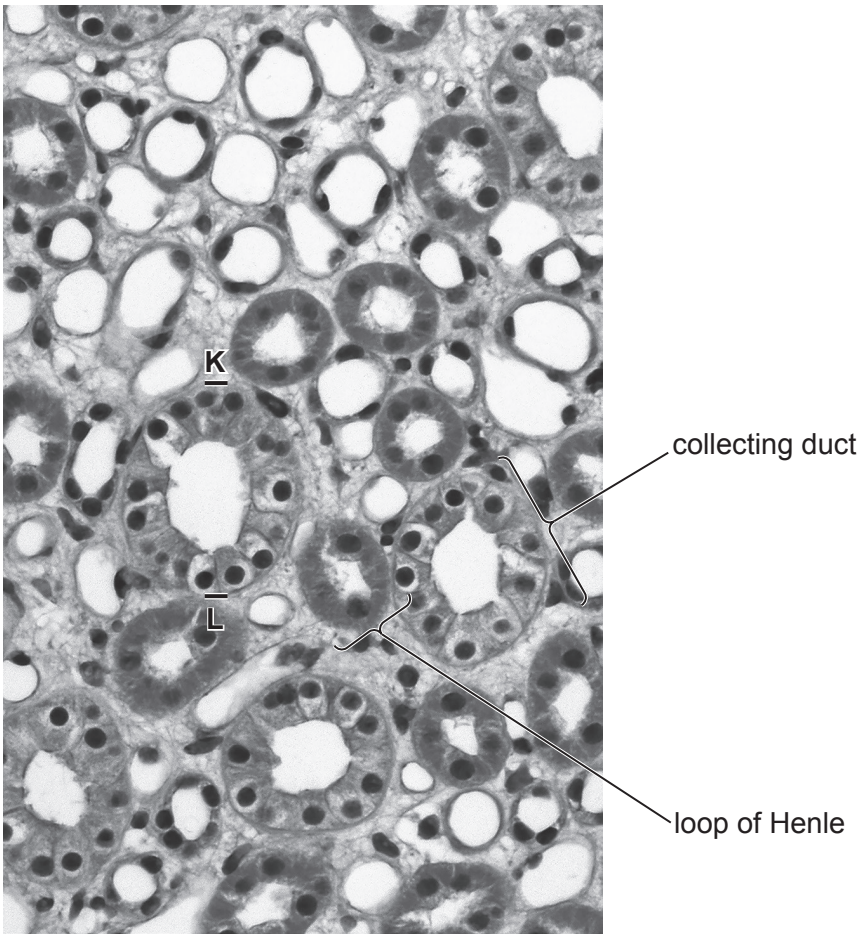


Fig. 3.1

(a) (i) **K** and **L** indicate the diameter of a collecting duct. Draw a straight line to join **K** and **L** on the collecting duct in the photomicrograph.

Measure the length of the line and record it.

.....

The actual distance between **K** and **L** is 0.06 mm.

Calculate the magnification of the photomicrograph and record it to the nearest whole number.

Space for working.

magnification × .....

[3]

(ii) In the space below make a large drawing of the collecting duct and loop of Henle that are labelled in Fig. 3.1. Draw them as they appear in the photomicrograph.

[5]

(b) A person suffering from Type 1 diabetes produces urine containing glucose.

Describe a test that could be carried out to detect whether glucose is present in a sample of urine.

description of test .....

.....

positive result .....

[2]

[Total: 10]

3 When a seed germinates, the radicle emerges to start developing into the root. A student decided to investigate the growth of the radicle as a seed germinated.

The student used a seed that had been germinating for a few days. Eight equally spaced lines were marked on the radicle as shown in Fig. 3.1.

The seed was then placed in suitable conditions in the dark with the radicle pointing vertically downwards. Two days later, the radicle had grown as shown in Fig. 3.1.

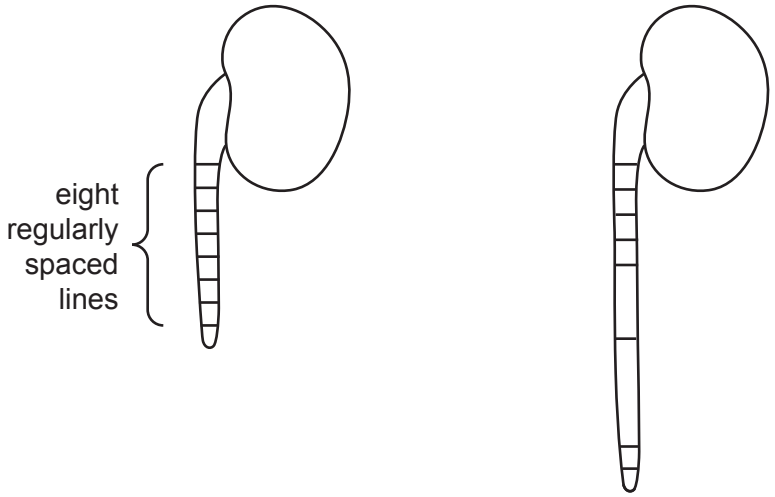


Fig. 3.1

(a) (i) Describe the observable changes that occurred in the two days after marking the radicle.

.....

.....

.....

..... [2]

(ii) Suggest why the student placed the seed with the radicle pointing vertically downwards instead of horizontally.

.....

..... [1]

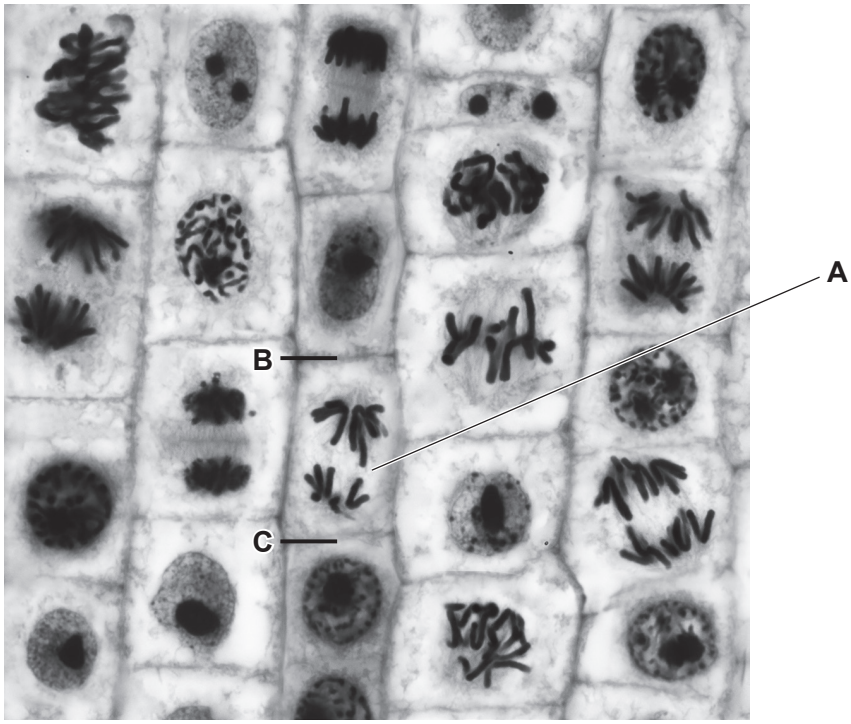
(iii) State **two** environmental conditions, other than light, that the student could control to ensure maximum growth of the radicle.

1 .....

2 .....

[2]

(b) The student examined a section of a root tip under the microscope and saw cells undergoing mitosis as shown in the photomicrograph in Fig. 3.2.



magnification ×600

Fig. 3.2

(i) In the space below make a large drawing of the cell labelled **A** as it appears in the photomicrograph in Fig. 3.2.

[4]

(ii) Lines **B** and **C** indicate the length of cell **A**. Draw a straight line **on the photomicrograph** to join **B** and **C**. Measure the length of this line and record it.

.....

Calculate the actual length of the cell and record it to the nearest two decimal places.

Space for working.

..... mm [3]

[Total: 12]

3 The potato is a plant that can store starch grains in its cells. Fig. 3.1 shows some of these starch grains as seen under a microscope.

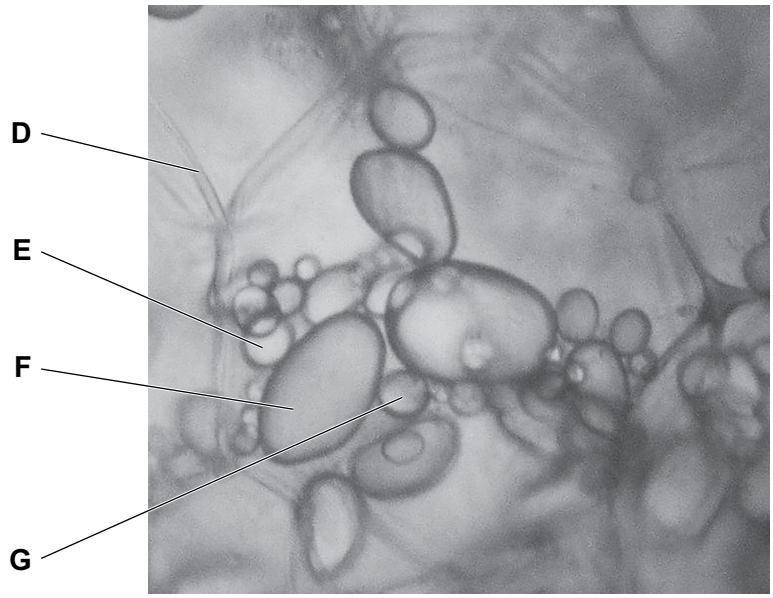


Fig. 3.1

(a) Identify the structure labelled **D**.

..... [1]

(b) Draw the starch grains labelled **E**, **F** and **G** as they appear in Fig. 3.1.

Grain **F** should be at least 60 mm long.

[3]

(c) (i) **On your drawing**, draw a line to indicate the maximum length of grain **F**.

Measure this length and record it.

..... mm [2]

(ii) The actual length of grain **F** is 0.03 mm. Calculate the magnification of your drawing to the nearest whole number.

Space for working

magnification × ..... [2]

(d) Describe how to prepare a slide of potato tissue to observe starch grains as clearly as possible under a microscope.

.....

.....

.....

.....

.....

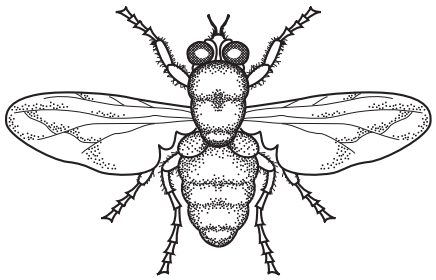
.....

..... [3]

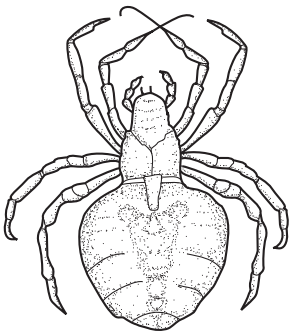
[Total:11]

2 (a) (i) Fig. 2.1 shows four arthropods.

1 *Musca*



2 *Araneus*



3 *Macromia*



4 *Lithobius*

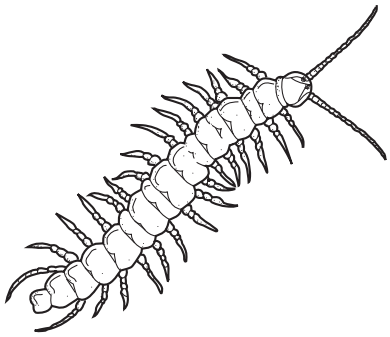


Fig. 2.1

Use the key to identify each arthropod. Complete the key by writing one genus name in each of the four boxes. [3]

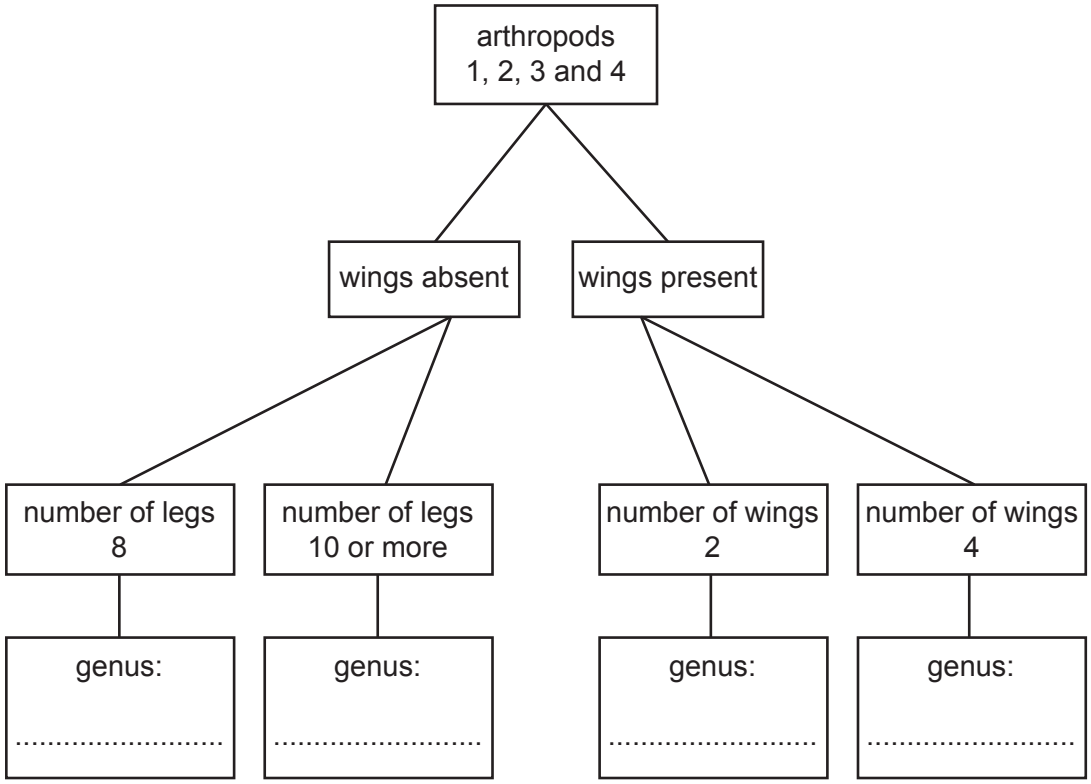


Fig. 2.2

(ii) Describe a difference in **one other** feature, not used in the key, to distinguish between *Araneus* and *Lithobius*.

Araneus .....

.....

Lithobius .....

..... [1]

(b) Fig. 2.3 is a photograph of an immature arthropod that lives in water.

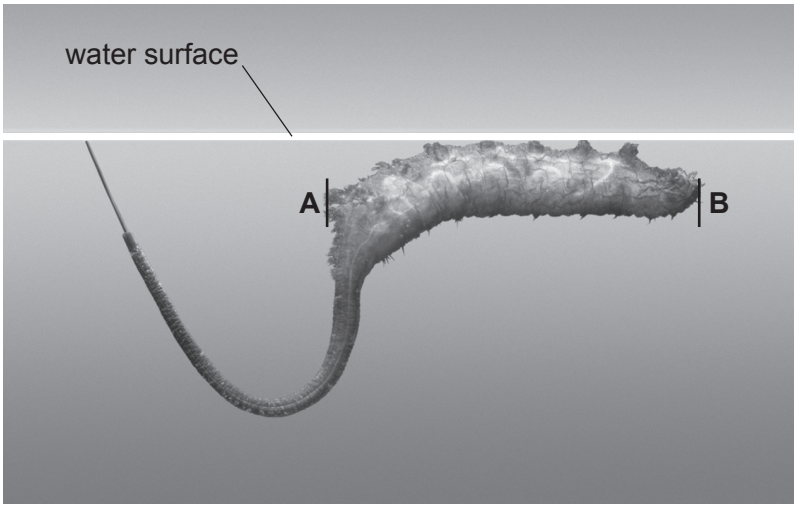


Fig. 2.3

(i) In the space below make a large drawing of the immature arthropod as it appears in the photograph. [5]

(ii) Draw a straight line to join **A** and **B** on the photograph in Fig. 2.3. This is the length of the body of the arthropod as it appears in the photograph. Measure and record this length.

..... [1]

(iii) The length of the body of the **actual** arthropod is 16 mm. Use this value to calculate the magnification of the photograph to 1 decimal place.

Space for working.

..... [1]

[Total: 11]

2 Fig. 2.1 is a photomicrograph of a section of a celery plant.

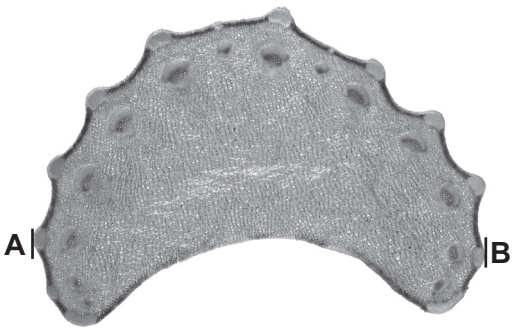


Fig. 2.1

(a) In the space below, make a large drawing of the plant section as it appears in the photomicrograph.

[5]

(b) (i) Draw a straight line to join **A** and **B** on Fig. 2.1. This is the length of the plant section in the photomicrograph. Measure and record this length.

length **A**–**B** ..... mm [1]

(ii) **On your drawing**, draw a straight line in the same position as the line **A**–**B** you have drawn on the photomicrograph. Measure and record the length of this line.

length of line on drawing ..... mm [1]

(iii) Use your measurements in **(b)(i)** and **(b)(ii)** to calculate the magnification of your drawing compared to the photomicrograph. Record your answer to 2 decimal places.

Show your working.

magnification × ..... [3]

[Total: 10]

8. Question part 1/2 | 5090 Oct-Nov 2025 P4 V1 Q3

3 A student investigated a plant that had some stems with flowers and some stems with **no** flowers. The student picked one leaf from a stem with flowers and one leaf from a stem with **no** flowers. Fig. 3.1 shows the two leaves.



magnification ×1

leaf from stem with flowers



magnification ×2

leaf from stem with **no** flowers

Fig. 3.1

(a) (i) Complete Table 3.1 to compare the size and shape of the leaves.

Table 3.1

feature of leaf	leaf from stem with flowers	leaf from stem with no flowers
size		
shape		

[2]

(ii) Suggest what the student needs to do to be certain that the two leaves they picked are representative of the leaves on the two types of stem.

.....

.....

.....

..... [2]

8. Question part 2/2 | 5090 Oct-Nov 2025 P4 V1 Q3

(b) In the space below, make a large drawing of the leaf from the stem with **no** flowers as it appears in Fig. 3.1.

[3]

[Total: 7]

9. Question part 1/2 | 5090 May-June 2026 P4 V1 Q2

2 Figure 2.1 is a photograph of a section through a human organ from a healthy individual.

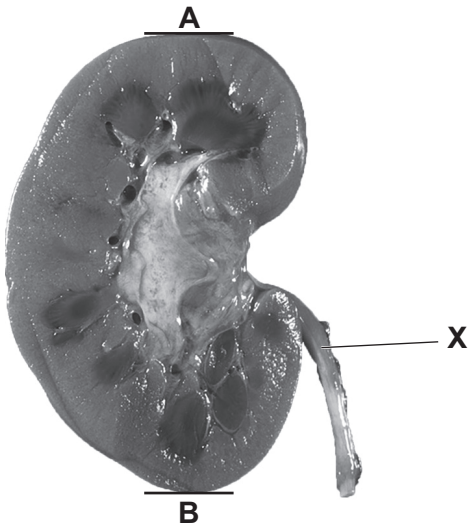


Figure 2.1

(a) (i) Identify this organ ..... [1]

(ii) Name the structure labelled **X** ..... [1]

(iii) In the space below, make a large drawing of the section of the organ as it appears in the photograph.

[5]

(b) (i) On **Figure 2.1**, draw a straight line to join **A** and **B**.

On your drawing, draw a straight line in the same position and label it **A–B**. [1]

(ii) Measure and record the length of these **two** lines.

length of line **A–B** on Figure 2.1 .....

length of line **A–B** on your drawing .....
[2]

(iii) Calculate the magnification of your drawing compared to Figure 2.1.

Record your answer to **one** decimal place.

Space for working.

magnification × ..... [3]

[Total: 13]

10. Question part 1/3 | 5090 May-June 2026 P4 V2 Q2

2 **(a)** Figure 2.1 is a photomicrograph of onion cells.

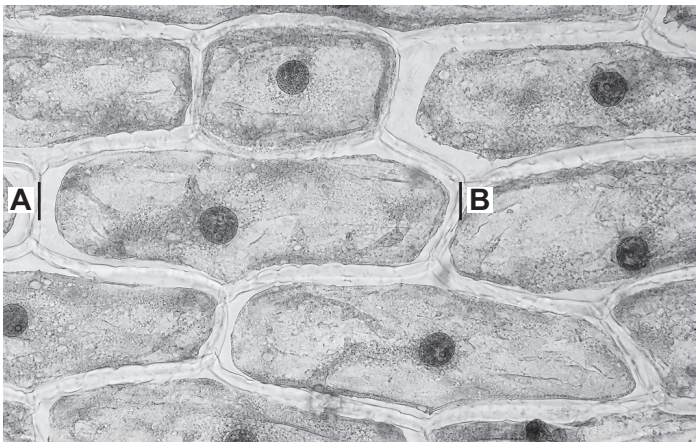


Figure 2.1

(i) On Figure 2.1, draw a line to a cell wall and label it **W**. [1]

(ii) In the space, make a large drawing of the **three whole** cells as they appear in Figure 2.1.

[5]

10. Question part 2/3 | 5090 May-June 2026 P4 V2 Q2

(b) (i) **On Figure 2.1**, draw a straight line to join **A** and **B**.

On your drawing, draw a straight line in the same position and label it **A–B**. [1]

(ii) Measure and record the lengths of these **two** lines.

length of line **A–B** on Figure 2.1 .....

length of line **A–B** on your drawing .....
[2]

(iii) Calculate the magnification of your drawing compared to Figure 2.1.

Record your answer to **one** decimal place.

Space for working.

magnification × ..... [3]

(c) Figure 2.2 is a photomicrograph of some cheek cells.

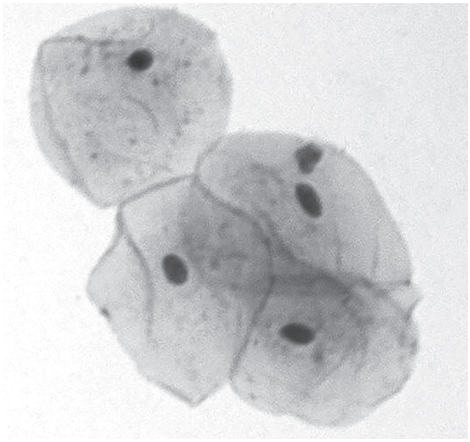


Figure 2.2

Describe **two** visible differences and **one** similarity between the onion cells in Figure 2.1 and the cheek cells in Figure 2.2. The figures are not to the same scale.

difference 1 .....

.....

difference 2 .....

.....

similarity .....

.....

[3]

[Total: 15]