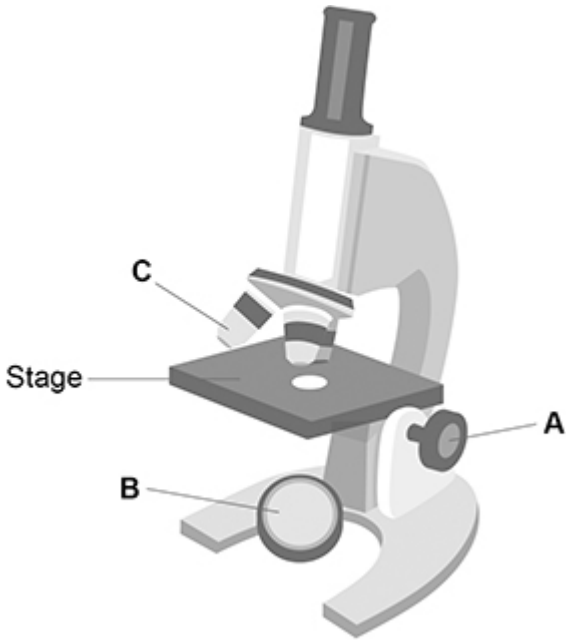
Questions are for both separate science and combined science students

Q1.

Figure 1 shows a microscope.

Figure 1



(a) Draw **one** line from each part of the microscope to the function of the part.

Part of the microscope	Function
	To adjust the focus of the microscope
A	To direct light into the viewer's eye
B	To hold a slide in place
C	To magnify the image of a specimen
	To support the microscope

(3)

A student prepared some onion cells.

The student viewed the onion cells using a microscope.

This is the method used.

1. Cut an onion into pieces using a sharp knife.
2. Peel off a thin layer of cells from one piece.
3. Place the layer of cells onto a microscope slide.
4. Add three drops of iodine solution to the layer of cells.
5. Cover with a cover slip.
6. Place the slide on the stage of the microscope.

(b) Why was iodine solution added to the layer of onion cells?

Tick (✓) **one** box.

To dry the cells ☐

To separate the cells ☐

To stain the cells ☐

(1)

(c) Why was a **thin** layer of onion cells used?

Tick (✓) **one** box.

To allow light to pass through the cells ☐

To allow oxygen to pass through the cells ☐

To allow water to pass through the cells ☐

(1)

(d) The student was worried about using a sharp knife to cut the onion.

The student wrote a risk assessment for using a knife.

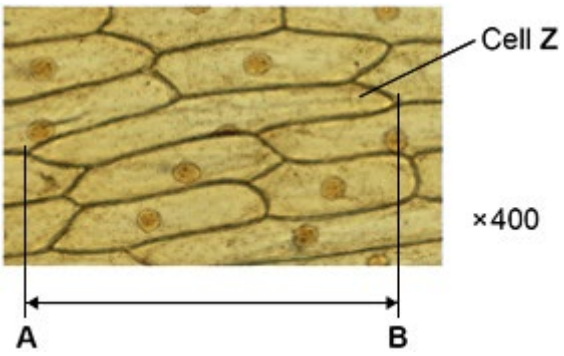
Draw **one** line from each part of the risk assessment to the description of the part.

Part of risk assessment	Description
	Call a first aider
Hazard	
	Cut the onion on a chopping board
	The onion is cut into pieces
Plan to minimise risk	
	The knife is sharp

(2)

Figure 2 shows what the student saw using the microscope at a magnification of ×400.

Figure 2



(e) Line **A**–**B** in **Figure 2** shows the length of cell **Z**.

Calculate the real length of cell **Z**.

Complete the following steps.

Measure the length of line **A**–**B** in millimetres (mm).

Length of line **A**–**B** = _____ mm

Give your measurement of the length of line **A**–**B** in micrometres (μm).

1 mm = 1 000 μm

_____

_____

Length of line **A**–**B** = _____ μm

Calculate the real length of cell **Z**.

Use the equation:

$$\text{real length of cell } \mathbf{Z} \text{ (in μm)} = \frac{\text{length of line } \mathbf{A}\text{–}\mathbf{B} \text{ (in μm)}}{\text{magnification}}$$

_____

_____

_____

_____

Real length of cell **Z** = _____ μm

(4)

(f) How would onion cells look different if they were seen using an electron microscope?

Tick (✓) **two** boxes.

The cells would be coloured.	☐
The cells would have no nuclei.	☐
The cells would look larger.	☐
The cells would look more blurred.	☐
The cells would show more internal structures.	☐

(2)

(g) **Figure 2** is repeated below.

Figure 2

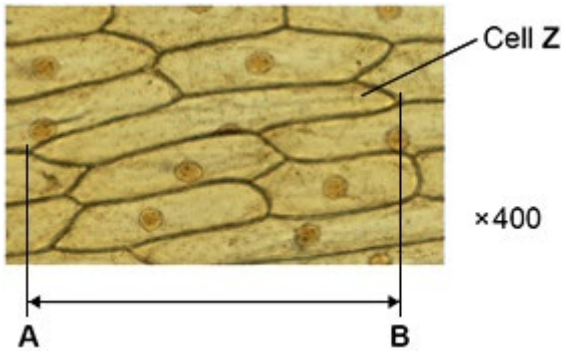
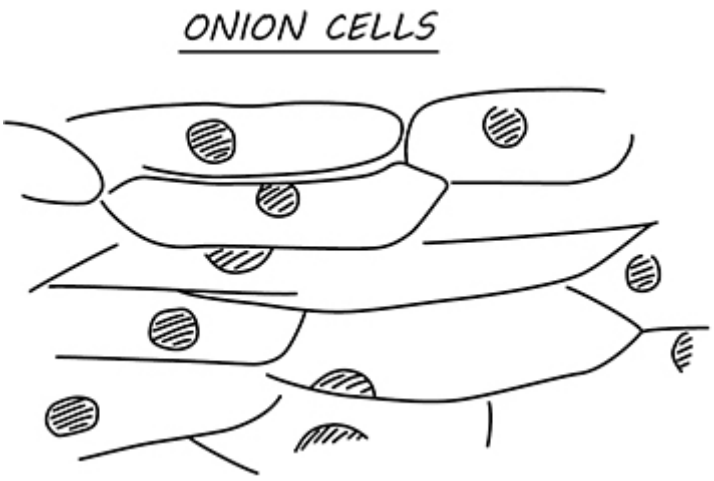


Figure 3 shows the student's drawing of **Figure 2**.

Figure 3



What **two** improvements could the student make to the drawing in **Figure 3**?

Tick (✓) **two** boxes.

Add colour to the cells.	☐
Complete the cell walls.	☐
Draw each cell on a separate piece of paper.	☐
Include the magnification.	☐
Use a ruler to draw the cells.	☐

(2)

(Total 15 marks)

Q2.

This question is about cells and transport.

(a) Complete **Table 1**.

Table 1

	Contains genetic information
Mitochondria	
	Controls the movement of substances into and out of the cell

(3)

Cells in potatoes are plant cells.

Cells in potatoes do **not** contain chloroplasts.

(b) What is the function of chloroplasts?

_____

_____

(1)

(c) Name **one** type of cell in a potato plant that does **not** contain chloroplasts.

_____

(1)

A student investigated the effect of salt concentration on pieces of potato.

This is the method used.

1. Cut three pieces of potato of the same size.

2. Record the mass of each potato piece.

3. Add 150 cm^3 of 0.4 mol/dm^3 salt solution to a beaker.

4. Place each potato piece into the beaker.

5. After 30 minutes, remove each potato piece and dry the surface with a paper towel.

6. Record the mass of each potato piece.

7. Repeat steps 1 to 6 using different concentrations of salt solution.

(d) What is the independent variable in the investigation?

Tick (✓) **one** box.

Concentration of salt solution	☐
Mass of potato piece	☐
Time potato is left in salt solution	☐
Volume of salt solution	☐

(1)

(e) Why did the student dry the surface of each potato piece with a paper towel in step **5**?

_____

_____

(1)

The student calculated the percentage change in mass of each potato piece.

(f) For one potato piece:

- the starting mass was 2.5 g
- the end mass was 2.7 g.

Calculate the percentage increase in mass of the potato piece.

Use the equation:

$$\text{percentage increase in mass} = \frac{\text{increase in mass}}{\text{starting mass}} \times 100$$

_____

_____

_____

_____

Percentage increase in mass = _____ %

(2)

The student used the results from each potato piece to calculate the mean percentage change in mass at each concentration.

Table 2 shows the results.

Table 2

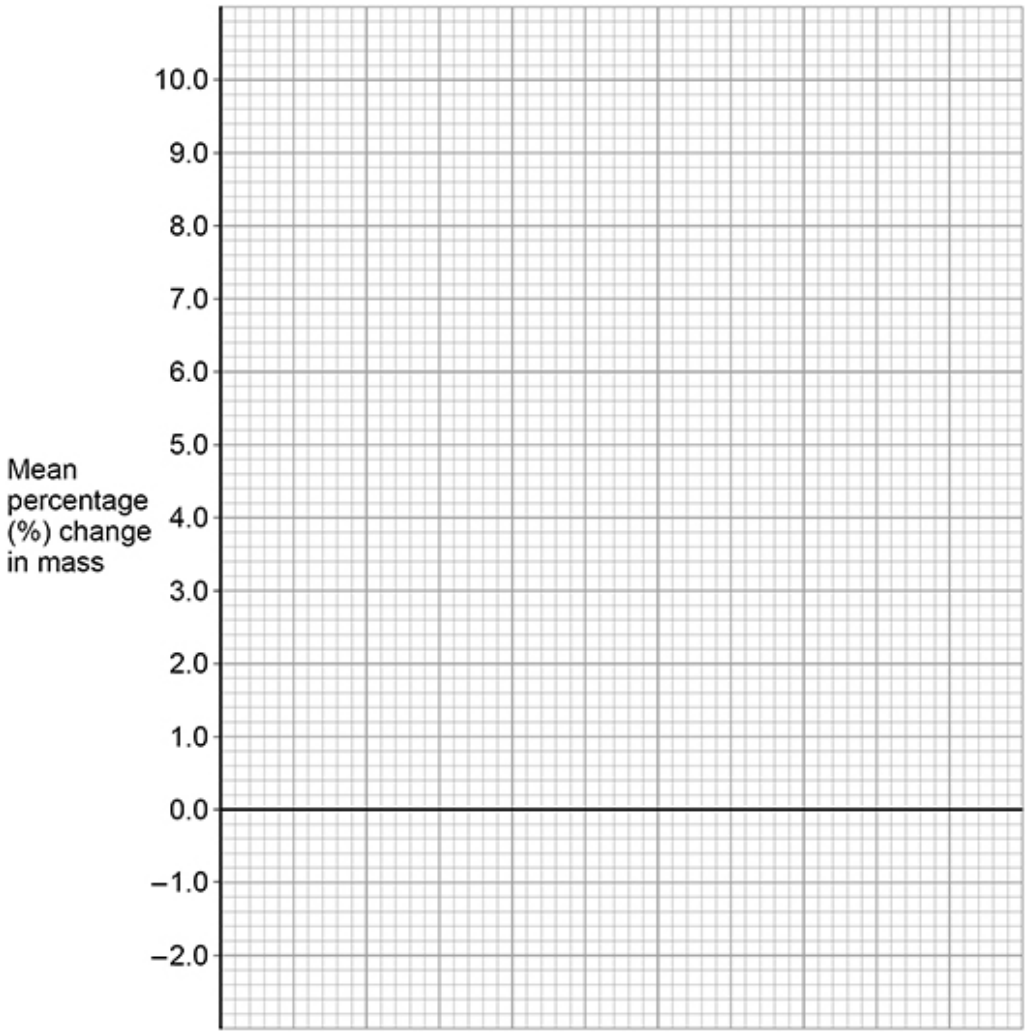
Concentration of salt solution in mol/dm^3	Mean percentage (%) change in mass
0.0	9.8
0.1	9.5
0.2	7.0
0.3	0.4
0.4	−1.4

(g) Complete the graph below.

You should:

- label the x-axis
- use a suitable scale for the x-axis
- plot the data from **Table 2**
- draw a line of best fit.

(4)



(h) What concentration of salt solution was equal to the concentration of the solution inside the potato pieces?

Use the graph above.

Concentration = _____ mol/dm^3

(1)

(i) Explain why the potato pieces in the 0.4 mol/dm^3 salt solution decreased in mass.

_____

_____

_____

_____

_____

(3)

(Total 17 marks)