

B1- Cell Structure and Transport Exam Practice 2

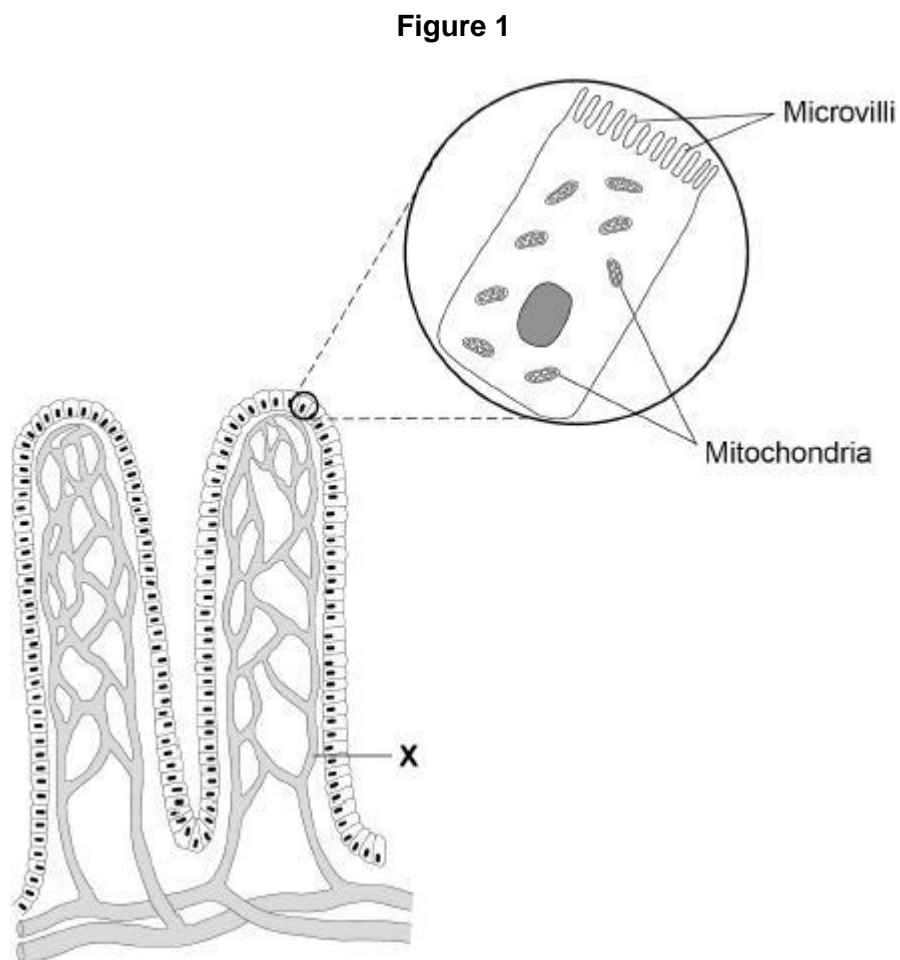
Name:

Score:

Q1.

Figure 1 shows two villi.

Figure 1 also shows one cell on the surface of a villus as seen using an electron microscope.



- (c) Give **one** advantage of using an electron microscope compared with using a light microscope.

(1)

(e) The real length of one villus is 0.8 mm

Calculate the image length if the villus is viewed at a magnification of $\times 20$

Use the equation:

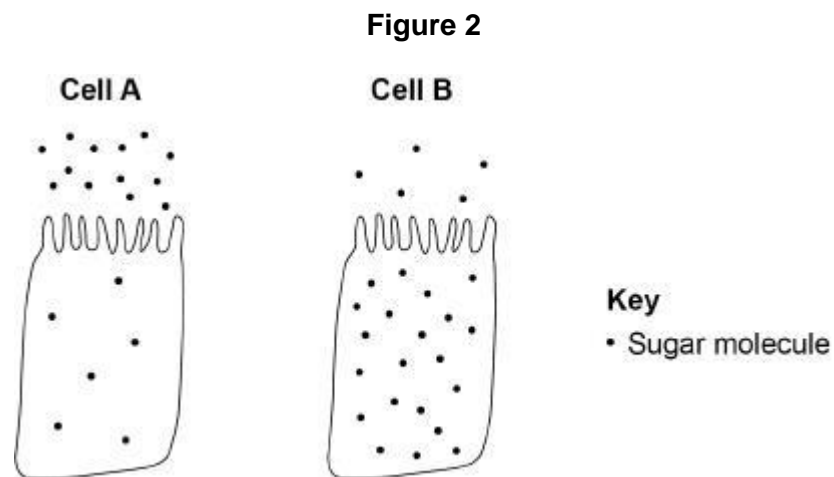
$$\text{magnification} = \frac{\text{size of image}}{\text{size of real object}}$$

Image length = _____ mm

(3)

Figure 2 shows two cells from the surface of a villus.

There are sugar molecules inside and next to each cell.



(f) Name the process by which sugar moves into cell **A**.

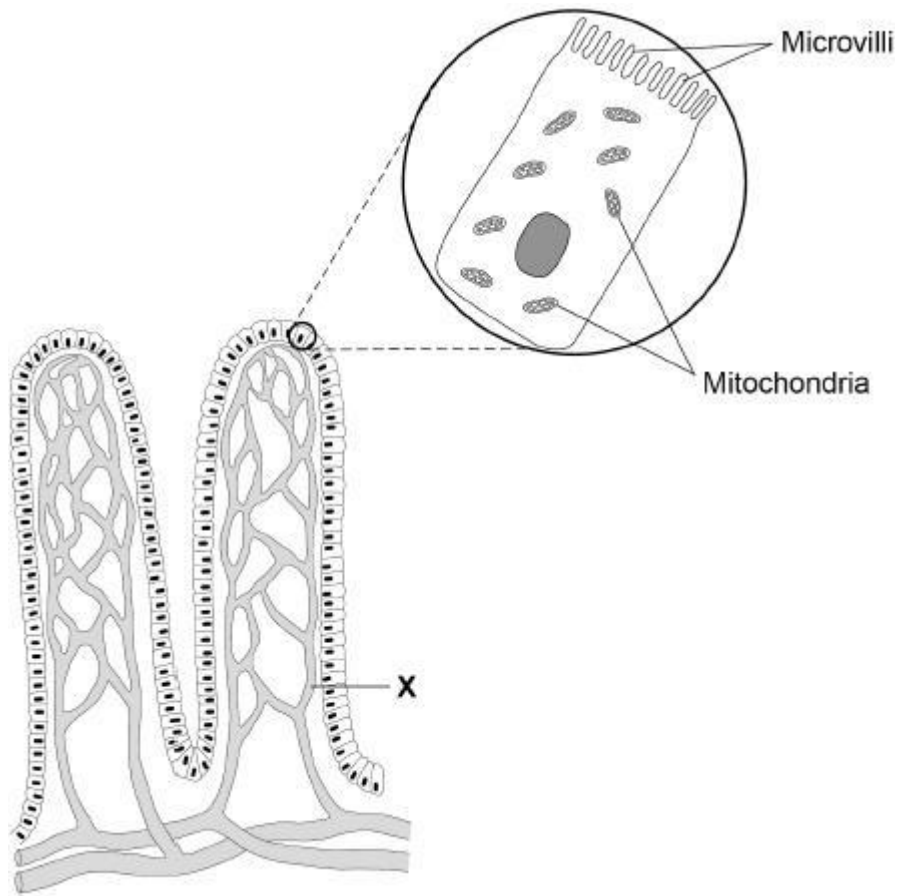
(1)

(g) Name the process by which sugar moves into cell **B**.

(1)

(i) **Figure 1** is repeated below.

Figure 1

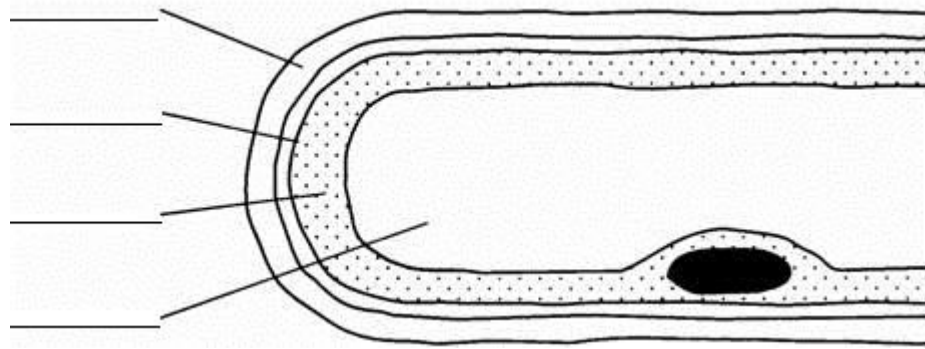


Explain how villi are adapted for efficient absorption of sugar molecules.

(4)
(Total 10 marks)

Q2.

The drawing shows part of a root hair cell.

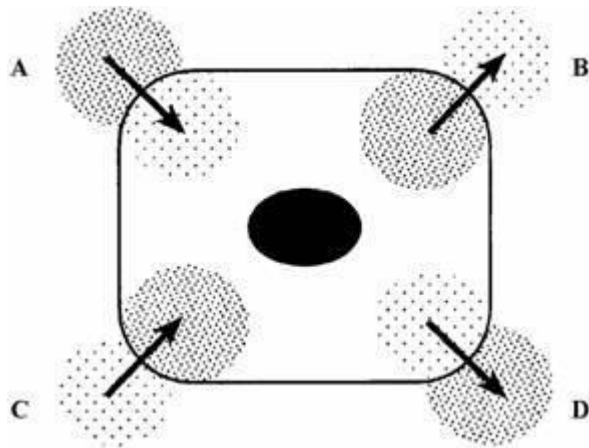


(a) Use words from the list to label the parts of the root hair cell.

cell membrane cell wall cytoplasm nucleus vacuole

(4)

(b) The diagram shows four ways in which molecules may move into and out of a cell. The dots show the concentration of molecules.



The cell is respiring aerobically.
Which arrow, **A**, **B**, **C** or **D** represents:

(i) movement of oxygen molecules; _____

(ii) movement of carbon dioxide molecules? _____

(2)

(c) Name the process by which these gases move into and out of the cell.

(1)

(Total 7 marks)

Q3.

Cells contain a solution of salts and sugars.

A student is investigating how cells change when they are put into water.

(a) The student:

- looks at a plant cell using a microscope
- adds water to the cell.

The plant cell swells up.

Explain why, as fully as you can.

(3)

(b) When **animal** cells are put in water, they swell up, and then burst.
When **plant** cells are put in water, they swell up, but do **not** burst.

How does the structure of plant cells prevent them from bursting?

(1)

(Total 4 marks)

Combined higher question:

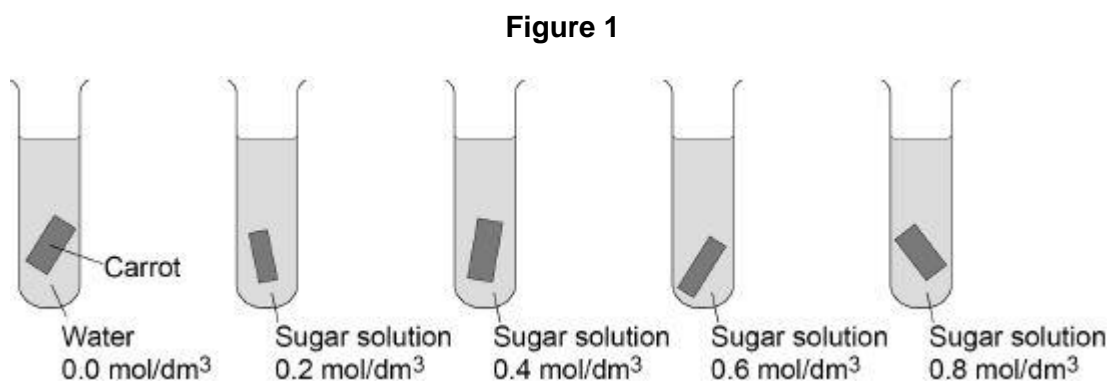
Q1.

A student investigated the effect of different concentrations of sugar solution on pieces of carrot.

This is the method used.

1. Weigh five pieces of carrot.
2. Place each piece into a different tube.
3. Into each tube add 20 cm³ of water or one of the sugar solutions as shown in **Figure 1**
4. Leave the apparatus for 2 hours.
5. Remove the carrot and dry each piece on paper towel.
6. Reweigh each piece.
7. Calculate the percentage (%) change in mass of each piece.

Figure 1 shows how the investigation was set up.



The table below shows the results.

Concentration of sugar solution in mol/dm ³	Percentage (%) change in mass
0.0	+24
0.2	+12
0.4	+1
0.6	-8
0.8	-15

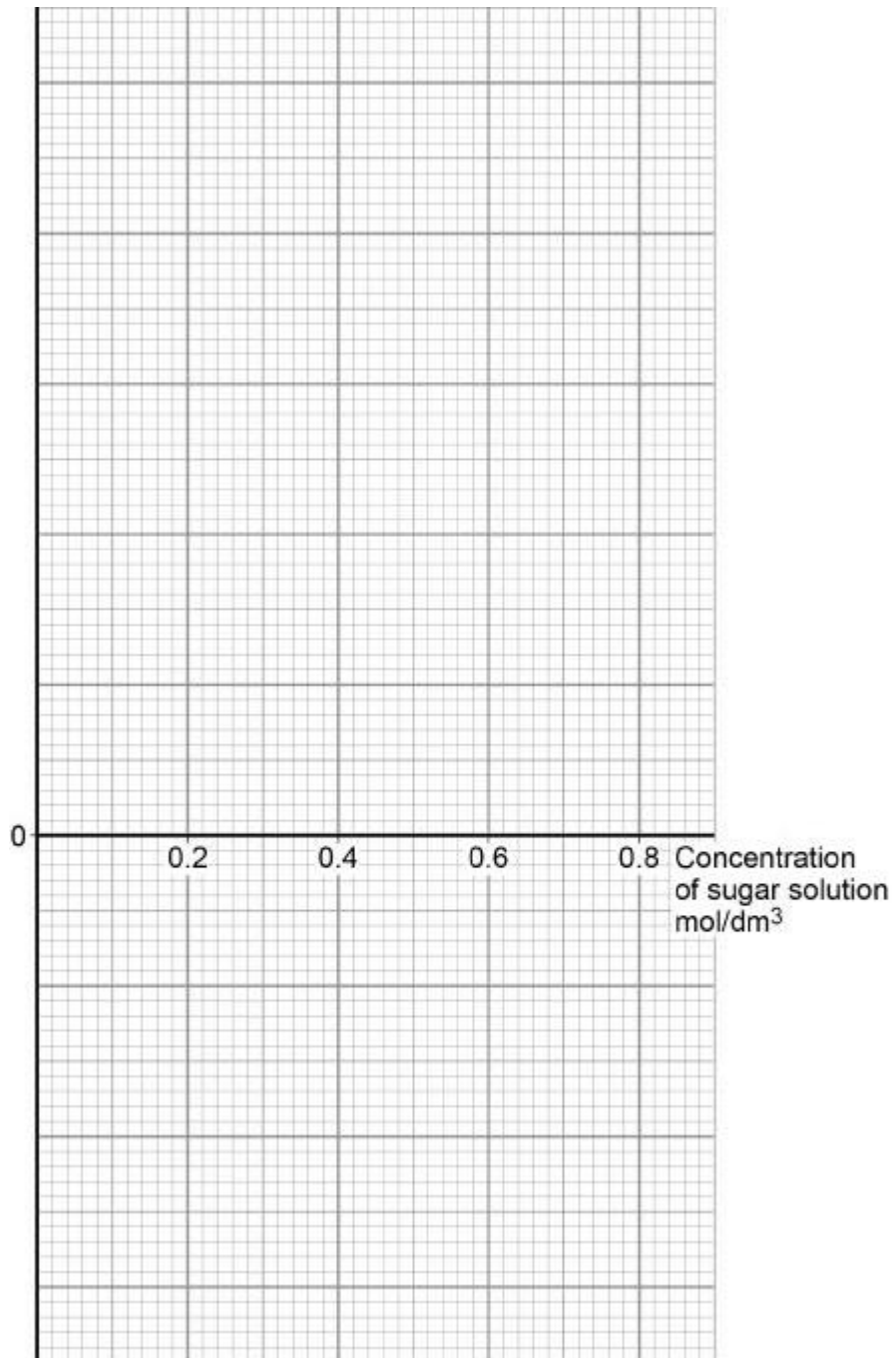
- (a) Suggest why the student calculated the percentage (%) change in mass of each piece of carrot.

(1)

(b) Complete **Figure 2** using the results in the table above

- Choose a suitable scale and label for the y-axis.
- Plot the results.
- Draw a line of best fit.

Figure 2



(4)

(c) Estimate the concentration of sugar solution inside the carrot cells.

Use your completed graph on **Figure 2**

Concentration = _____ mol/dm³

(1)

(d) Explain why the mass of the carrot in the 0.6 mol/dm^3 sugar solution changed.

(4)

(e) The student repeated the investigation using boiled pieces of carrot.

The pieces of carrot did **not** change in mass.

Suggest why.

(1)

(Total 11 marks)

Mark schemes

Q1.

- (c) any **one** from:
- greater magnification
 - higher resolving power
- allow can see (smaller) sub-cellular structures / parts*
- allow can see more detail (inside cells)*
- allow reference to 3-D images*

1

(e)

$$20 = \frac{\text{image length}}{0.8}$$

1

$$\text{image length} = 0.8 \times 20$$

1

$$\text{image length} = 16 \text{ (mm)}$$

1

(f) diffusion

1

(g) active transport

allow active uptake

1

(i) **Level 2:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.

3-4

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1-2

No relevant content

0

Indicative content

- have (many) microvilli
- (to) increase surface area
- wall of villus only one cell thick **or** is thin
- capillaries are close to surface
- (so) short pathway
- good blood supply
- (to) transport food molecules away **or** to the body
- (and) maintain a diffusion gradient

- cells have many mitochondria
- (where) respiration takes place
- (where) energy is transferred
- (as) active transport requires energy
- energy is needed to absorb sugar / food / molecules

For Level 2 must make links between structure and it's function

[14]

Q2.

- (a) (cell) wall
(cell) membrane
cytoplasm
vacuole

for 1 mark each

4

- (b) (i) A
(ii) B

for 1 mark each

2

- (c) diffusion (reject osmosis)
for 1 mark

1

[7]

Q3.

- (a) because water enters (the cell / it / named cell)
*do **not** accept salt / sugar / solution entering*

1

by osmosis / diffusion

if osmosis / diffusion not given accept concentration inside cell greater than outside cell

assume concentration refers to solute concentration unless answer indicates otherwise

allow water goes up the concentration gradient

allow water goes down its concentration gradient

*do **not** accept if diffusion of salt / sugar*

1

through a partially permeable membrane

*allow semi / selectively permeable membrane **or** description*

1

- (b) (plant cells) have (cell) wall

accept animal cells have no (cell) wall

ignore reference to cell membrane

*do **not** accept reference to other organelles **or** any*

implication that animal cells have a cell wall eg plant cells

have a thicker cell wall

Combined Higher mark scheme

Q1.

- (a) to control for the starting mass (of the pieces of carrot)
allow because the pieces of carrot were not all the same mass at the start
*do **not** accept were not all the same size*
*do **not** accept as a control variable*

1

- (b) suitable scale **and** label for y-axis
allow 5 or 6 per 2 cm
*do **not** accept 5 per 1 cm*

1

all points plotted correctly
allow $\pm \frac{1}{2}$ a square
*allow **1** mark for 4 correct points*

2

line of best fit

conc. ...	percentage (%) change...
0.0	+24
0.2	+12
0.4	+1
0.6	-8
0.8	-15

1

- (c) value from student's line of best fit
allow $\pm \frac{1}{2}$ a square

1

- (d) mass decreased

1

(due to) **loss of water** by **osmosis**
ignore diffusion

1

through a partially / selectively / semi permeable membrane

1

a clear reference to concentration of water or concentration of sugar is required for the fourth

mark

(as) concentration of sugar solution is greater than concentration of sugar (solution) inside cells / carrot

allow (as) concentration of sugar solution inside cells / carrot is lower than the concentration of sugar solution (in the tube or around the carrot)

or

(as) the concentration of water is less outside the cells / carrot than the concentration inside the cells / carrot

allow answers in terms of dilute and concentrated solutions

1

(e) the (partially permeable / cell) membrane was damaged

allow idea that cell membrane is no longer intact

***or** is **more** permeable / leaky*

allow the membrane is denatured

ignore cells are dead

1

[11]