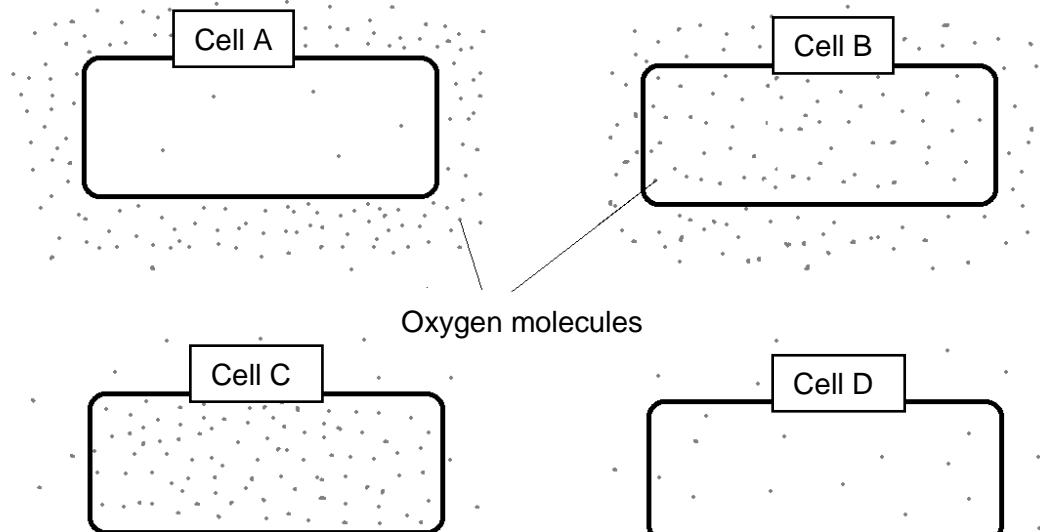


**4-1 Cell biology – Trilogy**

**1.0** **Figure 1** shows cells containing and surrounded by oxygen molecules.

Oxygen can move into cells or out of cells.

**Figure 1**



**1.1** Into which cell, **A**, **B**, **C** or **D**, will oxygen move the fastest?

**[1 mark]**

Tick **one** box.

- A**
- B**
- C**
- D**

1.2 Use words from the box to complete the sentences.

<b>active transport</b>	<b>diffusion</b>	<b>membranes</b>
<b>mitochondria</b>	<b>nuclei</b>	<b>osmosis</b>

**[2 marks]**

Oxygen is taken into cells by the process of \_\_\_\_\_.

The parts of cells that use the most oxygen are \_\_\_\_\_.

1.3 Which process produces oxygen in some cells?

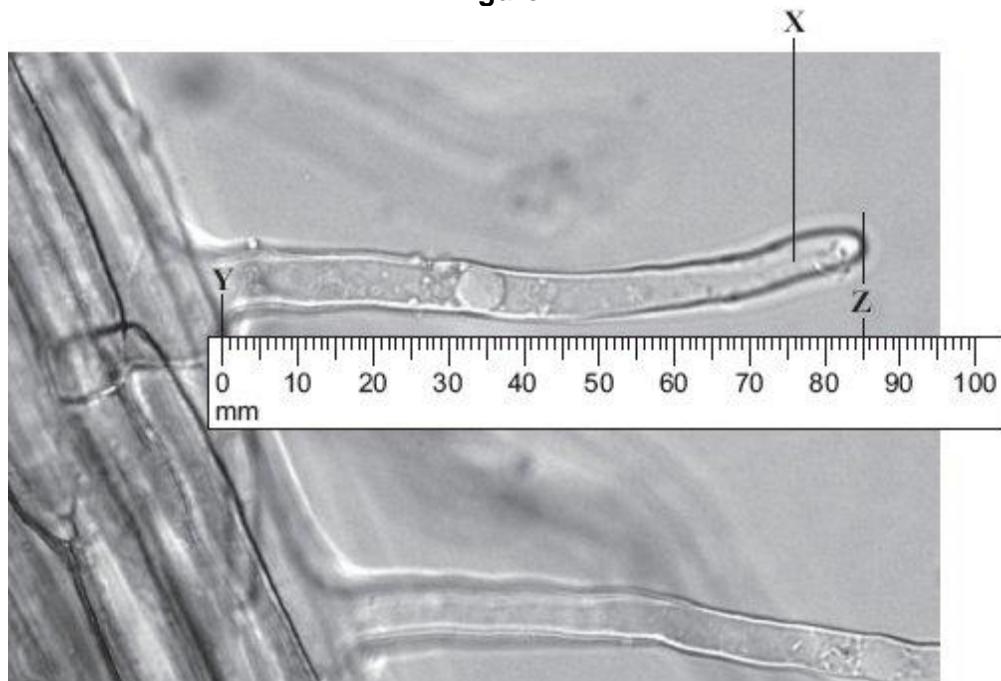
**[1 mark]**

Tick **one** box.

<b>Diffusion</b>	<input type="checkbox"/>
<b>Photosynthesis</b>	<input type="checkbox"/>
<b>Protein synthesis</b>	<input type="checkbox"/>
<b>Respiration</b>	<input type="checkbox"/>

2.0 Figure 2 shows part of the surface of a plant root.

**Figure 2**



2.1 There are hundreds of structure **X** on each root.

What is the name of structure **X**?

[1 mark]

---

2.2 The photograph shows the root magnified 100 times. The distance between **Y** and **Z** in the photograph is the length of structure **X**.

Calculate the actual length of **Y-Z**.

[1 mark]

Actual length **Y-Z** = \_\_\_\_\_ mm

2.3 Structure **X** is very small. There are hundreds of structures like **X** on a plant root.

Explain how this helps the plant.

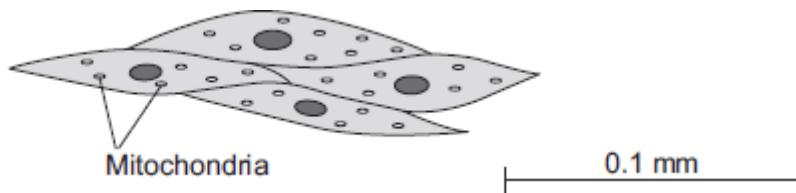
[2 marks]

---

---

3.0 **Figure 3 shows** muscle cells from the wall of the stomach, as seen through a light microscope.

**Figure 3**



3.1 Describe the function of muscle cells in the wall of the stomach.

[2 marks]

---

---

3.2 **Figure 3** is highly magnified.

The scale bar in **Figure 3** represents 0.1 mm.

Calculate the magnification of the cells in **Figure 3**.

[2 marks]

Magnification = \_\_\_\_\_ times

3.3 The muscle cells in **Figure 3** contain many mitochondria.

What is the function of mitochondria?

[1 mark]

---

---

3.4 The muscle cells also contain many ribosomes. The ribosomes cannot be seen in **Figure 3**.

What is the function of a ribosome?

[1 mark]

---

---

3.5 Suggest why the ribosomes **cannot** be seen through a light microscope.

[1 mark]

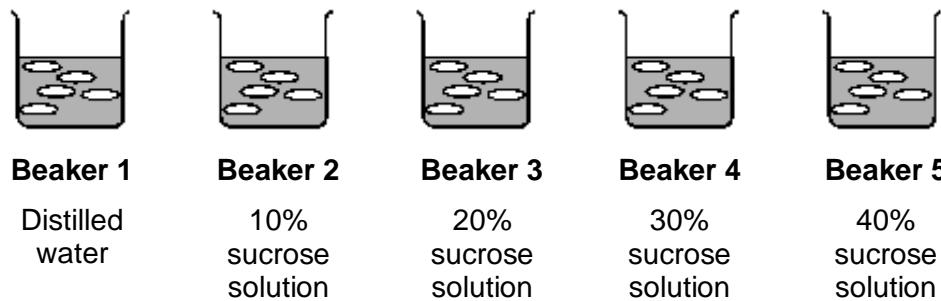
---

---

4.0 Some students set up an experiment to find the concentration of sucrose solution in potato cells.

The students used discs of potato cut to the same size and weighing approximately 10 grams.

The discs were put into each of five beakers.



4.1 After two hours the students carefully dried the potato disks with paper towel before reweighing the discs.

Why did the students dry the potato before weighing it?

[1 mark]

---

4.2 The students calculated the percentage gain or loss in mass of potato.

The students' results are shown in the **Table 1**.

**Table 1**

	Beaker 1	Beaker 2	Beaker 3	Beaker 4	Beaker 5
Final mass in g	13.0	12.2	9.0	7.9	7.3
Initial mass in g	10.0	10.6	10.0	10.1	10.4
Percentage gain or loss in mass	Gain 30%	Gain 15.1%	Loss 10%	Loss 21.8%	

Calculate the percentage loss of mass in beaker 5.

[3 marks]

Percentage loss of mass: \_\_\_\_\_ %

4.3 Predict the concentration of sucrose solution in the potato cells.

Use the results in **Table 1**.

[1 mark]

Concentration of sucrose solution: \_\_\_\_\_ %

5.0 Some scientists investigated the rates of absorption of different sugars by the small intestine.  
In one experiment they used a piece of normal intestine.  
In a second experiment they used a piece of intestine poisoned by cyanide.  
Cyanide is poisonous because it prevents respiration.

**Table 2** shows their results.

**Table 2**

<b>Sugar</b>	<b>Relative rates of absorption</b>	
	<b>Normal intestine</b>	<b>Intestine poisoned by cyanide</b>
Glucose	1.00	0.33
Galactose	1.10	0.53
Xylose	0.30	0.31
Arabinose	0.29	0.29

5.1 Name **two** sugars from **Table 2** which can be absorbed by active transport.

**[2 marks]**

---

---

5.2 Use evidence from **Table 2** to explain why you chose these sugars.

**[4 marks]**

---

---

---

---

---

5.3 All of the sugars named in **Table 2** can be absorbed by diffusion.

Explain how information from **Table 2** provides evidence for this.

**[2 marks]**

---

---

---

**6.0** Bone marrow contains stem cells.

**6.1** Explain why bone marrow can be called a tissue.

**[2 marks]**

---

---

**6.2** Read the information about stem cells.

Stem cells are used to treat some human diseases.

Stem cells can be collected from early embryos. These stem cells have not begun to differentiate, so they could be used to produce any kind of cell, tissue or organ. The use of embryonic stem cells to treat human diseases is new and, for some diseases, trials on patients are happening now.

Stem cells can also be collected from adult bone marrow. The operation is simple but may be painful. Stem cells in bone marrow mainly differentiate to form blood cells. These stem cells have been used successfully for many years to treat some kinds of blood disease. Recently there have been trials of other types of stem cell from bone marrow. These stem cells are used to treat diseases such as heart disease.

Evaluate the use of stem cells from embryos or from adult bone marrow for treating human diseases.

You should give a conclusion to your evaluation.

**[5 marks]**

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

## MARK SCHEME

Qu No.		Extra Information	Marks
1.1	A		1
1.2	diffusion	in this order only	1
	mitochondria		1
1.3	Photosynthesis		1

Qu No.		Extra Information	Marks
2.1	root hair (cell)		1
2.2	0.85 (mm)		1
2.3	(root hair cells) give a larger surface area  (therefore) more water / ions / salts are absorbed	<b>do not allow</b> food	1

Qu No.		Extra Information	Marks
3.1	(they) contract / shorten  to churn / move / mix food	do <b>not</b> allow expand  accept they carry out peristalsis	1 1
3.2	400	accept in range 390 – 410  allow <b>one</b> mark for answer in range 39 to 41 <b>or</b> 3900 to 4100	2
3.3	to transfer energy for use	allow release / give / supply / provide energy allow make ATP do <b>not</b> allow make / produce / create energy	1
3.4	to make protein / enzyme	ignore named protein	1
3.5	any <b>one</b> from, • (ribosomes) are too small or very small • light microscope does not have sufficient magnification / resolution • (ribosomes) are smaller than mitochondria		1

Qu No.		Extra Information	Marks
4.1	so that any change in mass was not due to water on the outside of the potato <b>or</b> so change in mass was due to changes inside the potato		1
4.2	$10.4 - 7.3 = 3.1\text{(g)}$ $3.1\text{(g)} \div 10.4 = 0.29$ <b>or</b> 0.3 $0.29 \times 100 = 29$ (% loss)	allow 29.8% or 30%  correct answer with or without workings gains three marks	1 1 1
4.3	between 10 and 20%		1

Qu No.		Extra Information	Marks
5.1	glucose galactose		1 1
5.2			
<b>Level 2:</b>	A detailed and logical explanation is given which identifies the evidence from the table and links this to the explanation. Logical links are made and scientific terms are used accurately.		3–4
<b>Level 1:</b>	Discrete, relevant statements are made. The logic may be unclear and links may not be made.		1–2
	No relevant content		0
<b>Indicative content</b>			
<b>Evidence</b>			
<ul style="list-style-type: none"> <li>absorption is reduced by cyanide or absorption is higher when there is no cyanide</li> <li>they are absorbed faster (than the other sugars)</li> </ul>			
<b>Explanation</b>			
<ul style="list-style-type: none"> <li>active transport needs energy</li> <li>less or no energy is available / released if cyanide is present</li> <li>less or no energy if less / no respiration</li> </ul>			
5.3	all sugars can be absorbed when the cells / gut are poisoned or when there is no respiration  (because) diffusion does not need an energy supply		1 1

Qu No.		Extra Information	Marks
6.1	<p>group / collection of cells which work together to produce blood cells</p>		<p>1 1</p>
6.2	<p>any <b>four</b> from:</p> <p><u>embryo stem cells</u> – examples of</p> <p>pros</p> <ul style="list-style-type: none"> <li>• can treat a wide variety / lots of diseases / problems</li> <li>• many available / plentiful</li> <li>• using them better than wasting them</li> <li>• painless</li> </ul> <p>cons</p> <ul style="list-style-type: none"> <li>• (possible) harm / death to embryo</li> <li>• (relatively) untested / unreliable / may not work</li> <li>• embryo can't be 'asked' / 'embryo rights' idea</li> </ul> <p><u>adult bone marrow stem cells</u> – examples of</p> <p>pros</p> <ul style="list-style-type: none"> <li>• no ethical issues (in collection) <b>or</b> permission given</li> <li>• quick recovery</li> <li>• (relatively) safe</li> <li>• well tried / tested / know they work</li> </ul> <p>cons</p> <ul style="list-style-type: none"> <li>• operation hazards eg infection</li> <li>• few types of cell / tissue produced <b>or</b> few diseases / problems treated</li> <li>• painful so may deter donors</li> </ul> <p>Conclusion to evaluation: A reasoned conclusion from the evidence</p>	<p>For all 4 marks to be awarded, there must be at least 1 pro and 1 con</p> <p>allow long-term effects not known or may be more risky</p> <p>allow does not kill (donor) / low risk</p>	<p>4 1</p>