


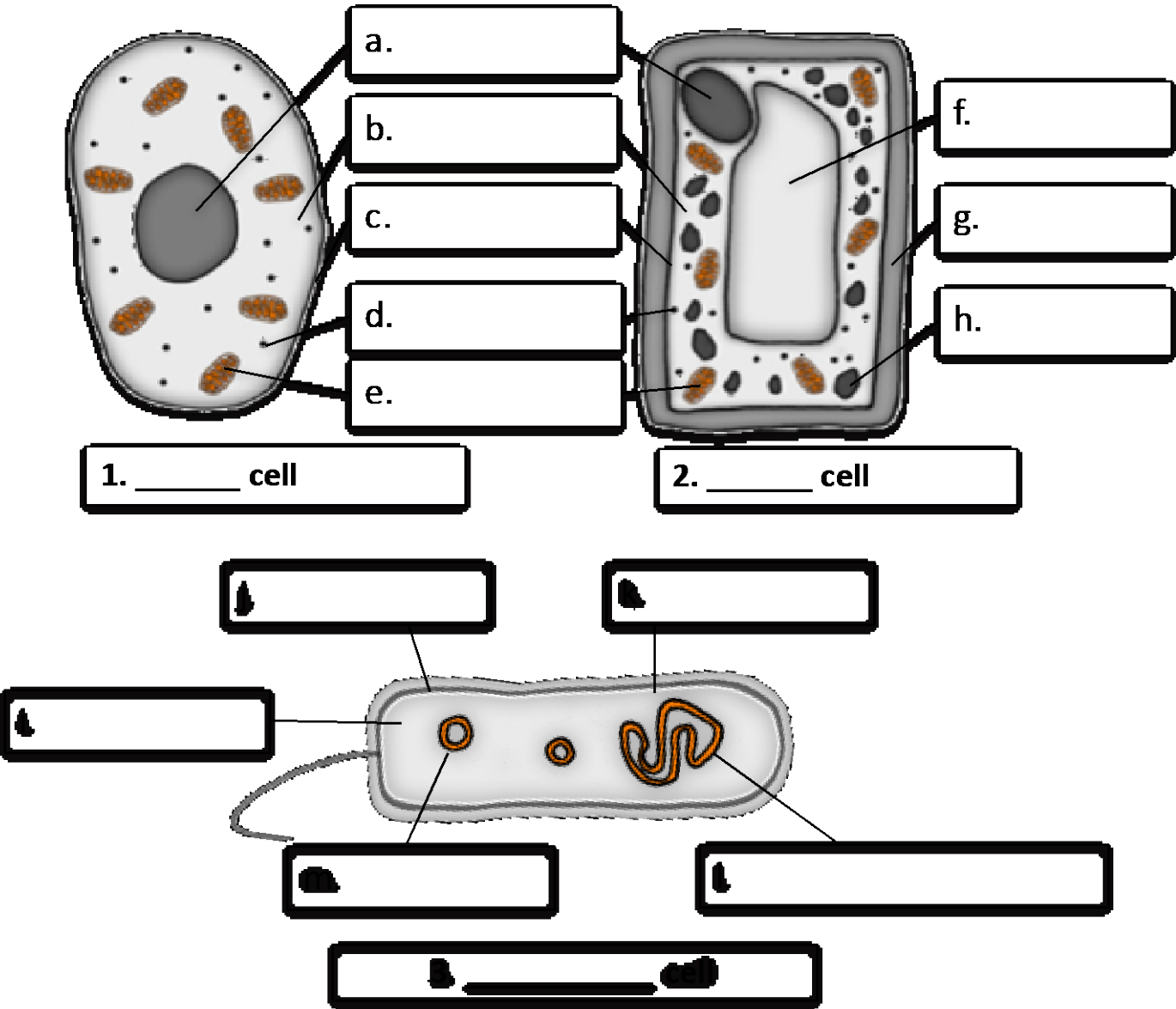


## Review B1 Cell Biology

<i>Can you...?</i>			
<b>B1.1 Cell Structure</b>			
Name the main organelles of plant and animal cells (eukaryotic cells)			
Recall the relative size of bacterial cells (prokaryotic cells)			
Describe the difference in how the genetic material is found within eukaryotic and prokaryotic cells.			
Explain how the main sub-cellular structures, including the nucleus, cell membranes, mitochondria, cell wall and chloroplasts in plant cells and plasmids in bacterial cells are related to their functions			
Explain how the structure of different types of cell relate to their function in a tissue, an organ or organ system, or the whole organism. Including sperm cells, nerve cells and muscle cells in animals and root hair cells, xylem and phloem cells in plants.			
Describe cell differentiation			
Describe the differences in magnification and resolution between electron and light microscopes			
Define binary fission (biology only)			
Explain how to prepare an uncontaminated culture (biology only)			
<b>B1.2 Cell division</b>			
Recall that the nucleus of a cell contains chromosomes made of DNA molecules. Each chromosome carries a large number of genes. In body cells the chromosomes are normally found in pairs			
Give an overview of mitosis			
Understand that Cell division by mitosis is important in the growth and development of multicellular organisms			
Recognise and describe situations where mitosis is occurring.			
Define a stem cell			
Recall that stem cells from human embryos and adult bone marrow can be cloned and made to differentiate into many different types of human cells			
Name some conditions which may be helped by treatment with stem cells			
Discuss the ethical or religious objections and potential risk of stem cell use			
Recall that stem cells from meristems in plants can be used to produce clones of plants quickly and economically and describe possible uses			
<b>B1.3 Transport in cells</b>			
Explain how substances may move into and out of cells across the cell membranes via diffusion			
Describe diffusion			
Recall that some of the substances transported in and out of cells by diffusion are oxygen and carbon dioxide in gas exchange, and of the waste product urea from cells into the blood plasma for excretion in the kidney			
Describe factors that affect the rate of diffusion			
Recall that a single-celled organism has a relatively large surface area to volume ratio to allow sufficient transport of molecules into and out of the cell			
Explain how the small intestine and lungs in mammals, gills in fish, and the roots and leaves in plants, are adapted for exchanging materials			
List factors that increase the effectiveness of an exchange surface			
Describe osmosis			
Recall that active transport moves substances from a more dilute solution to a more concentrated solution (against a concentration gradient). This requires energy from respiration.			
Link the structure of a root hair cell to its function.			
Describe a use for active transport in both plants and animals.			
Explain the difference between diffusion, osmosis and active transport			

Cells

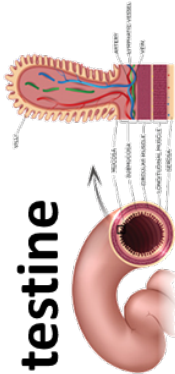
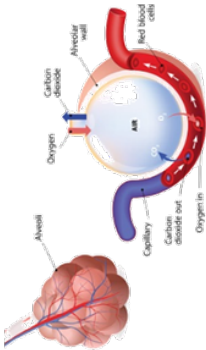

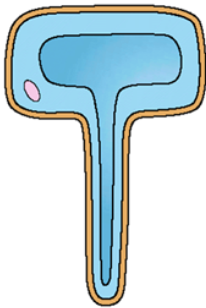
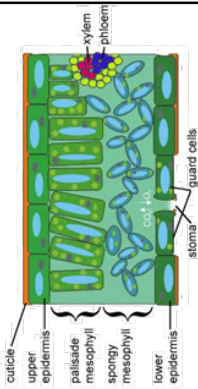
Label the structures inside these cells:



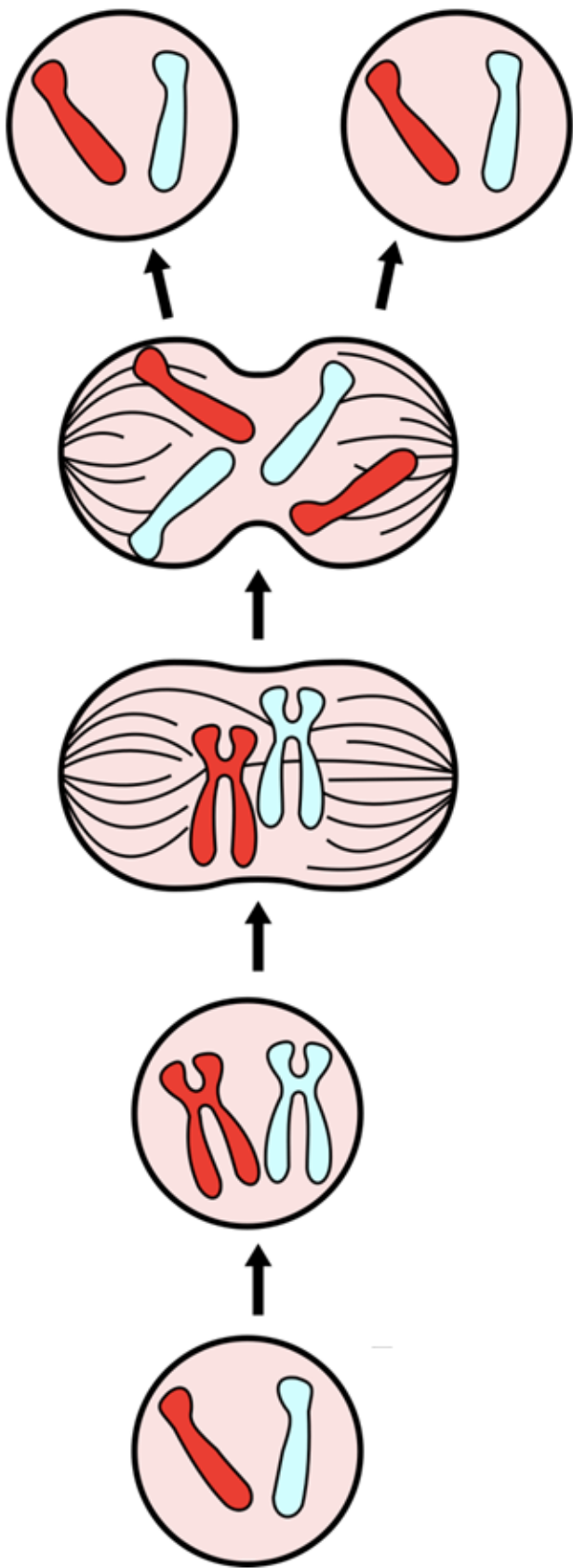
Complete the table to describe the functions of different sub-cellular structures, and to identify the cells in which the structures are found:

Cell part	Function	Animal	Plant	Bacteria
	Contains genetic material, which controls the activities of the cell			
Cytoplasm				
	Controls the movement of substances into and out of the cell			
	Most energy is released by respiration here			
Ribosomes	Protein synthesis happens here			
	Strengthens the cell – made of cellulose			
Chloroplasts				
	Filled with cell sap to help keep the cell turgid			
	Loop of DNA NOT found in a nucleus			
Plasmid (DNA)	Small ring of DNA often used to help bacteria modify ( e.g. bacterial resistance)			

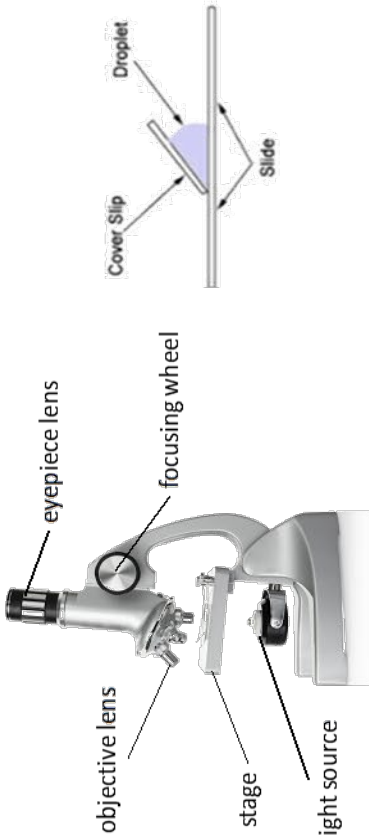
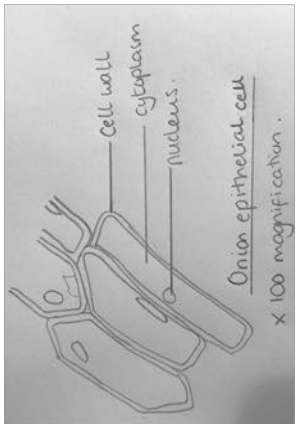
Identify the adaptations of these specialised cells, and explain how their structure allows them to perform specific functions:

Structure	Adaptations for transport
<p><b>Small intestine</b></p> 	
<p><b>Lungs</b></p> 	
<p><b>Gills in fish</b></p> 	
<p><b>Roots of plants</b></p> 	
<p><b>Leaves</b></p> 	

Describe what is happening in each stage of **mitosis**...

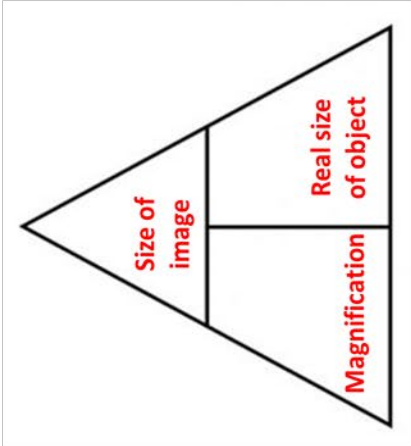
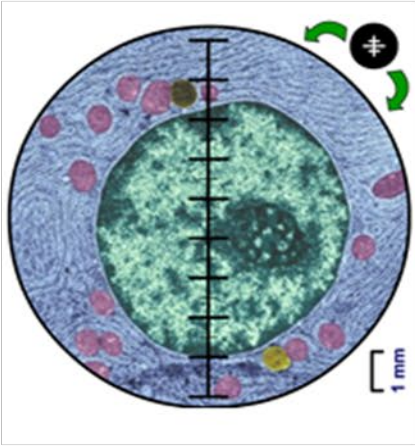
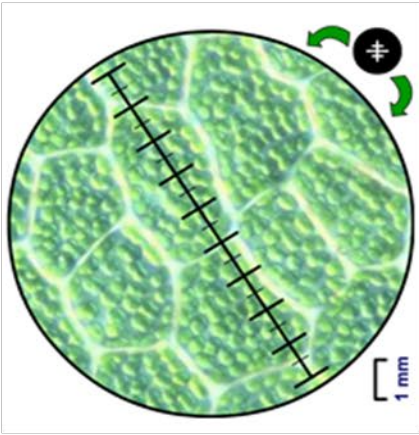
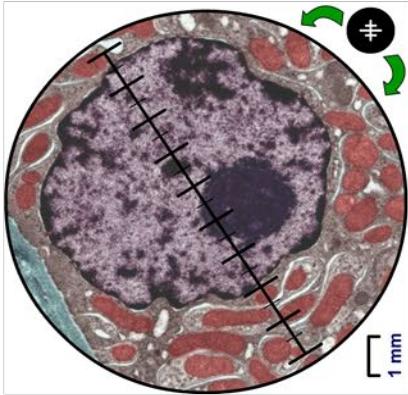
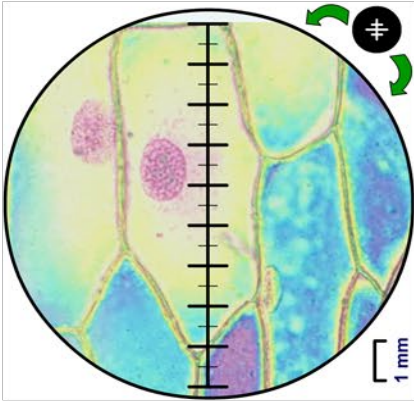
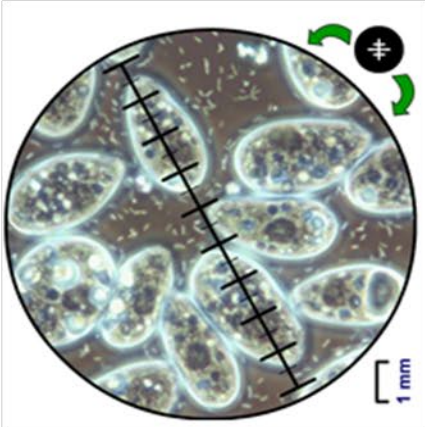


# Required practical: microscopy

<p><b>Method</b></p> <ol style="list-style-type: none"><li>1. Place a _____ section of the _____ onto _____.</li><li>2. Place a drop of _____ in the middle of the slide or _____ the specimen.</li><li>3. Gently lower _____ slip onto the specimen without trapping _____.</li><li>4. Soak up any _____ liquid with a paper towel.</li><li>5. Switch on the _____ source and place your slide on the _____.</li><li>6. Use the lowest _____ lens and turn the focusing wheel to move the lens close to the slide.</li><li>7. Slowly adjust the _____ wheel until you can see a clear image.</li><li>8. Increase the _____ by changing the objective lens and re-focus.</li></ol> <p><b>slide   thin   cover   specimen   stage</b> <b>air bubbles   focusing   magnification</b> <b>water   light   excess   objective   stain</b></p>	<p><b>Diagram</b></p>  <p><b>Drawing</b></p> <p>• • •</p> 
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# Calculating magnification

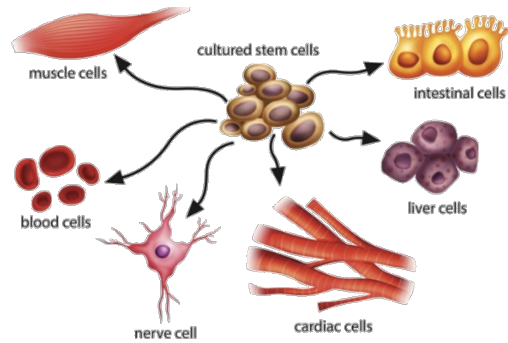
<p><b>magnification <math>M = \frac{\text{size of image I}}{\text{real size of the object A}}</math></b></p> 	<p><b>x 1</b></p> 	<p><b>x 60</b></p> 
<p><b>x 1000</b></p> 	<p><b>x 10</b></p> 	<p><b>x 750</b></p> 

Complete the table to compare different types of transport in cells...

Transport	Definition	Movement of particles	Examples
Diffusion			
Osmosis			
Active transport			



What is a stem cell?



What does differentiation mean?

**Human embryo stem cells:** can be c\_\_\_\_\_ and made to **differentiate** into m\_\_\_\_\_ different types of human cells.

**Human adult stem cells:** can form m\_\_\_\_\_ (but not all) types of cells including blood cells.

**Human stem cells can be used to help treat diseases like d\_\_\_\_\_ and p\_\_\_\_\_.**

Most types of p\_\_\_\_\_ cells can **differentiate throughout their life** cycle. **U**\_\_\_\_\_ stem cells in **plants** are grouped together in **structures called m**\_\_\_\_\_. The undifferentiated cells can then s\_\_\_\_\_, e.g. root hair cell, xylem or phloem cells.

**PLANT     DIABETES     MERISTEMS     MOST     PARALYSIS     MANY**  
**SPECIALISE     CLONED     UNDIFFERENTIATED**

	Advantages	Disadvantages
Human adult stem cells		
Embryonic stem cells		
Plant meristem cells		

# LO: To revise the content of B1: Cell Biology

Living organisms are made of cells.

- (a) Animal and plant cells have several parts. Each part has a different function.

Draw **one** line from each cell part to the correct function of that part.

**Cell part**

**Function**

Cell membrane

Where most energy is released in respiration

Mitochondria

Controls the movement of substances into and out of the cell

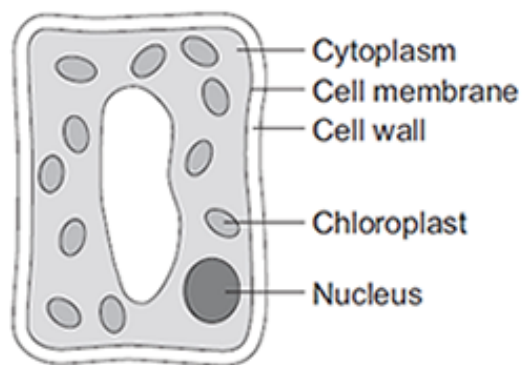
Nucleus

Controls the activities of the cell

Where proteins are made

(3)

- (b) The diagram below shows a cell from a plant leaf.



Which **two** parts in the diagram above are **not** found in an animal cell?

1. \_\_\_\_\_
2. \_\_\_\_\_

(2)

(Total 5 marks)

## LO: To revise the content of B1: Cell Biology

A student carried out an investigation using chicken eggs.

This is the method used.

1. Place 5 eggs in acid for 24 hours to dissolve the egg shell.
2. Measure and record the mass of each egg.
3. Place each egg into a separate beaker containing 200 cm<sup>3</sup> of distilled water.
4. After 20 minutes, remove the eggs from the beakers and dry them gently with a paper towel.
5. Measure and record the mass of each egg.

**Table 1** shows the results.

**Table 1**

Egg	Mass of egg without shell in grams	Mass of egg after 20 minutes in grams
1	73.5	77.0
2	70.3	73.9
3	72.4	75.7
4	71.6	73.1
5	70.5	73.8

- (a) Another student suggested that the result for egg **4** was anomalous.

Do you agree with the student?

Give a reason for your answer.

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(b) Calculate the percentage change in mass of egg 3.

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Percentage change in mass = \_\_\_\_\_

(2)

(c) Explain why the masses of the eggs increased.

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(3)

(d) Explain how the student could modify the investigation to determine the concentration of the solution inside each egg.

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(3)

Chicken egg shells contain calcium. Calcium ions are moved from the shell into the cytoplasm of the egg.

**Table 2** shows information about the concentration of calcium ions.

**Table 2**

Location	Concentration of calcium ions in arbitrary units
Egg shell	0.6
Egg cytoplasm	2.1

(e) Explain how calcium ions are moved from the shell into the cytoplasm of the egg.

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(3)  
(Total 12 marks)

LO: To revise the content of B1: Cell Biology

Cell division is needed for growth and for reproduction.

(a) The table below contains three statements about cell division.

Complete the table.

Tick **one** box for each statement.

Statement	Statement is true for		
	Mitosis only	Meiosis only	Both mitosis and meiosis
All cells produced are genetically identical			
In humans, at the end of cell division each cell contains 23 chromosomes			
Involves DNA replication			

(2)

Bluebell plants grow in woodlands in the UK.

- Bluebells can reproduce sexually by producing seeds.
- Bluebells can also reproduce asexually by making new bulbs.

(b) One advantage of asexual reproduction for bluebells is that only **one** parent is needed.

Suggest **two** other advantages of asexual reproduction for bluebells.

1. \_\_\_\_\_  
\_\_\_\_\_
2. \_\_\_\_\_  
\_\_\_\_\_

(2)

(c) Explain why sexual reproduction is an advantage for bluebells.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

(4)



Stem cells can be used to treat some diseases.

(a) What is a stem cell?

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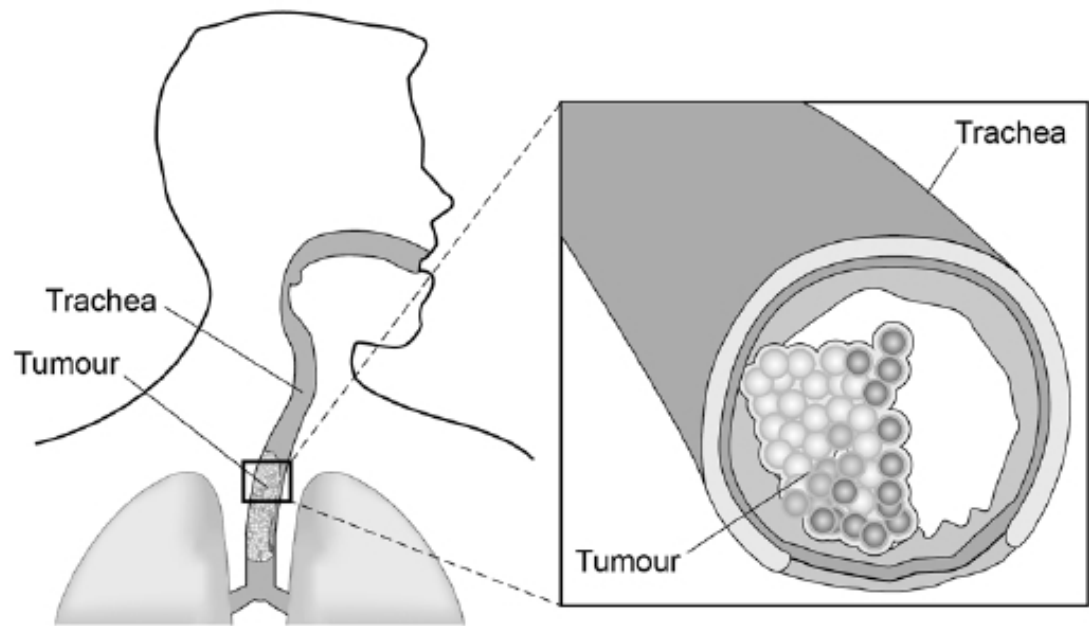
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(2)

Figure 1 shows a malignant tumour in the trachea of a patient.

Figure 1



(b) Give **one** way a malignant tumour differs from a benign tumour.

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(1)

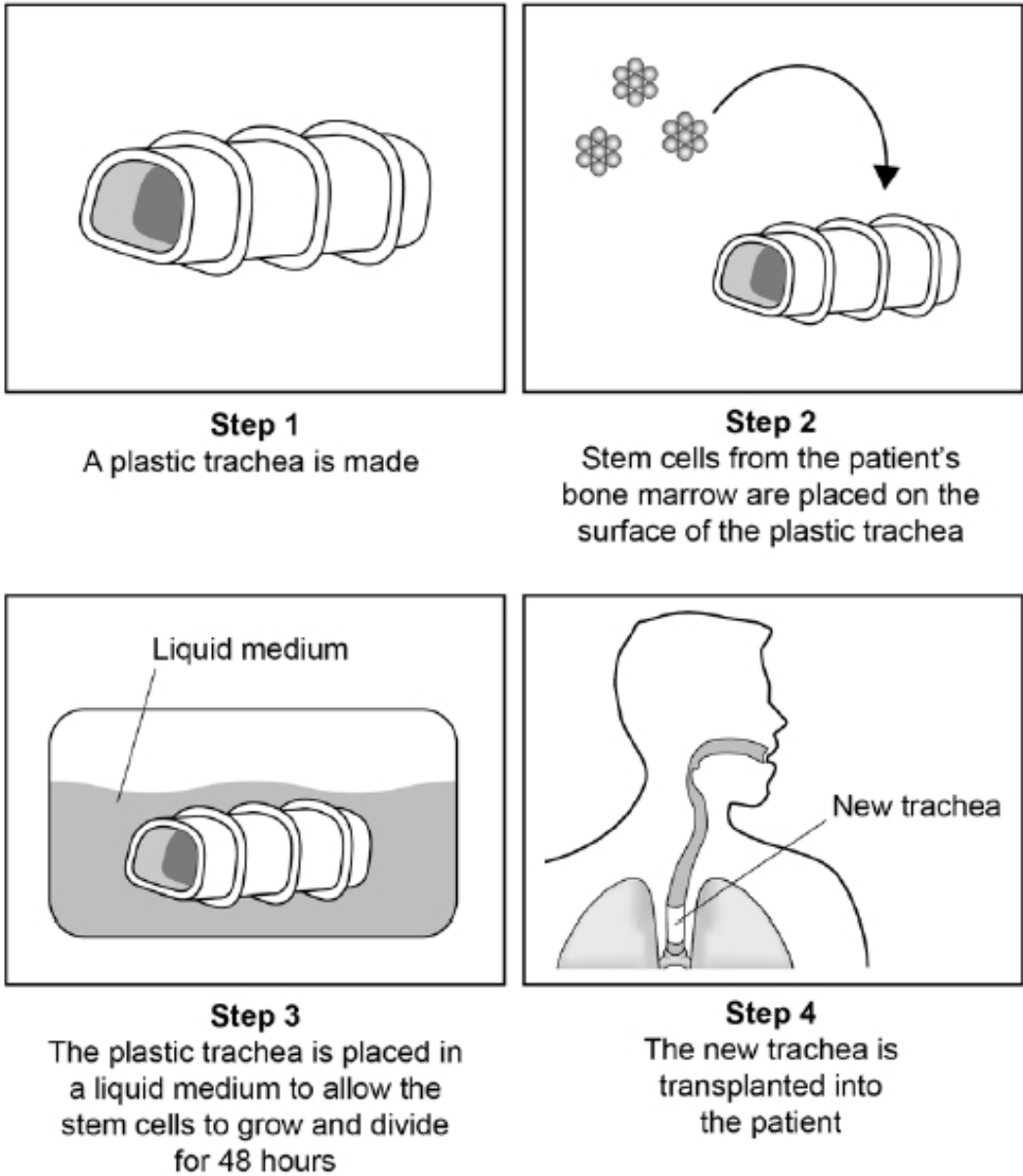
LO: To revise the content of B1: Cell Biology

Scientists can treat the patient's tumour by replacing the trachea with a plastic trachea.

The plastic trachea has a layer of the patient's own stem cells covering it.

**Figure 2** shows the procedure.

**Figure 2**



(c) In **Step 3** the cells are left for 48 hours to divide.

Name the type of cell division in **Step 3**.

- (d) In **Step 3** the cells are given oxygen and water.

Name **two** other substances the cells need so they can grow and divide.

1. \_\_\_\_\_

2. \_\_\_\_\_

(2)

- (e) Give **two** advantages of using the stem cell trachea compared with a trachea from a dead human donor.

1. \_\_\_\_\_

\_\_\_\_\_

2. \_\_\_\_\_

\_\_\_\_\_

(2)

- (f) Sometimes the stem cell trachea is not strong enough.

Doctors can put a stent into the trachea.

Suggest how a stent in the trachea helps to keep the patient alive.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(2)

- (g) Stem cells can also be obtained from human embryos.

Evaluate the use of stem cells from a patient's own bone marrow instead of stem cells from an embryo.

Give a conclusion to your answer.

\_\_\_\_\_

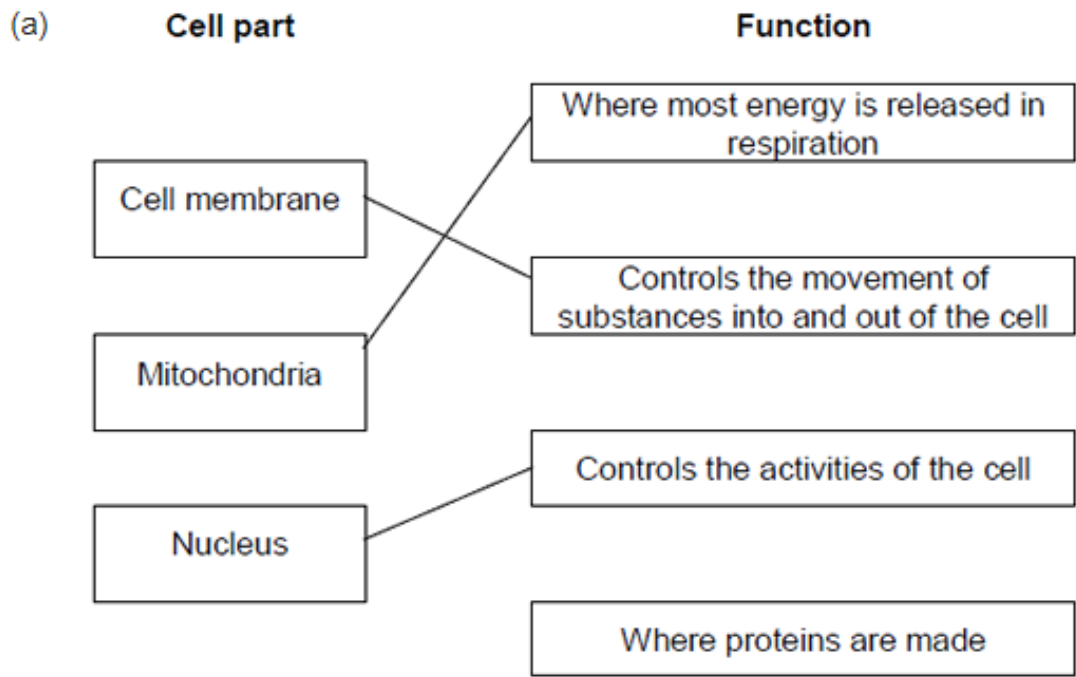
\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(6)





*extra lines cancel*

3

(b) Cell wall  
*in either order*

1

Chloroplast  
*allow (permanent) vacuole*

1

[5]

(a) (yes, because) the mass change (of egg 4) is much lower than the others  
*allow because it / egg 4 has gained (over) 50% less mass than the others*  
*allow it / egg 4 has gained 1.5 g and the others have all gained more than 3 g (unit required)*

1

(b)  $\frac{75.7 - 72.4}{72.4} \times 100$   
*or equivalent*

1

4.6 (%)  
*allow 4.558 / 4.56 (%)*  
*allow any correct rounding of 4.558011049723757*

1

(c)	(mass increased because) water entered by osmosis	1
	from a dilute solution in the beaker to a more concentrated solution in the egg (cell)	
	<i>allow from an area of high water concentration in the beaker to an area of low water concentration in the egg (cell)</i>	
	<i>allow ref to water potential</i>	
	<i>allow ref to 'strong' and 'weak' solutions</i>	
	<i>ignore along / across concentration gradient</i>	
	<i>do <b>not</b> accept 'amount' in place of concentration</i>	
	through a partially permeable membrane	
	<i>allow semi-permeable / selectively permeable membrane</i>	1
(d)	use five (or more) different concentrations of salt / sugar solution (in beakers)	
	<i>allow any number of concentrations provided it is more than four</i>	1
	(by) plotting percentage change (in mass / volume) on / using a graph	1
	determine the concentration where the curve / line crosses the zero percentage change (in mass / volume)	1
(e)	(ions are moved) from an area of low concentration to high concentration	
	<i>allow against the concentration gradient</i>	
	<i>allow in terms of solution</i>	
	<i>do <b>not</b> accept molecules</i>	1
	(by) active transport	1
	(which) requires using energy	
	<i>do <b>not</b> accept idea of energy being created</i>	1



(a)

	statement is true for		
	mitosis only	meiosis only	both mitosis and meiosis
all cells produced are genetically identical	✓		
in humans, at the end of cell division each cell contains 23 chromosomes		✓	
involves DNA replication			✓

3 correct = 2 marks

2 correct = 1 mark

0 or 1 correct = 0 marks

2

(b) any **two** from:*ignore references to one parent only*

- many offspring produced
- takes less time  
*allow asexual is faster*
- (more) energy efficient
- genetically identical offspring  
*allow offspring are clones*
- successful traits propagated / maintained / passed on (due to offspring being genetically identical)
- no transfer of gametes or seed dispersal  
*allow no vulnerable embryo stage*  
*allow no need for animals*
- not wasteful of flowers / pollen / seeds
- colonisation of local area  
*must imply local area*

2

(c) genetic variation (in offspring)

1

(so) better adapted survive

*allow reference to natural selection or survival of the fittest*

1

(and) colonise new areas by seed dispersal

**or**

can escape adverse event in original area (by living in new area)

*must imply new area*

1

many offspring **so** higher probability some will survive

1

*allow bluebell example described (max 3 if not bluebell)*

[8]

(a) an undifferentiated / unspecialised cell

1

that can differentiate / become / change into (many) other cell types

1

(b) (malignant tumours) invade / spread to other tissues via the blood (benign don't)

**or**

(malignant tumours) form secondary tumours in other organs

*ignore cancer unqualified*

*allow converse*

*allow metastasises*

1

(c) mitosis

*correct spelling only*

1

(d) glucose

*answers in any order*

*ignore sugar*

1

protein / amino acids

1

- (e) no need to wait for a donor  
**or**  
can be done immediately

1

- (so) no risk of rejection  
**or**  
no need for immunosuppressant drugs

*if no other marks awarded, allow for 1 mark idea of ethics  
surrounding the use of tissue from another / dead person*

1

- (f) stent opens up the trachea

1

- allowing air to flow through  
**or**  
allowing patient to breathe

1

- (g) **Level 3 (5-6 marks):**

A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

**Level 2 (3-4 marks):**

Some logically linked reasons are given. There may also be a simple judgement.

**Level 1 (1-2 marks):**

Relevant points are made. They are not logically linked.

**Level 0**

No relevant content

**Indicative content**

**embryos advantages**

- can create many embryos in a lab
- painless technique
- can treat many diseases / stem cells are pluripotent / can become any type of cell (whereas bone marrow can treat a limited number)

**embryos disadvantages**

- *harm / death to embryo*
- *embryo rights / embryo cannot consent*
- *unreliable technique / may not work*

**bone marrow advantages**

- no ethical issues / patient can give permission
- can treat **some** diseases
- procedure is (relatively) safe / doesn't kill donor
- tried and tested / reliable technique
- patients recover quickly from procedure

***bone marrow disadvantages***

- *risk of infection from procedure*
- *can only treat a few diseases*
- *procedure can be painful*

**both procedures advantage**

can treat the disease / problem

***both procedures disadvantages***

- *risk of transfer of viral infection*
- *some stem cells can grow out of control / become cancerous*