Name: _____

Class: _____

Date: _____

Cell Biology part 2 AQA Triple Biology

Time: **77 minutes**

Marks: **69 marks**

Comments:

1. Plants are made of cells, tissues and organs.

(a) Which part of a plant is the largest?

Tick (✓) **one** box.

A guard cell ☐

A leaf ☐

A root hair ☐

(1)

Students investigated the effect of concentration of salt solution on the mass of pieces of potato.

This is the method used.

1. Cut two pieces of potato to the same size.
2. Record the mass of each piece of potato.
3. Place one piece of potato into a beaker containing a dilute salt solution.
4. Place the other piece of potato into a beaker containing a concentrated salt solution.
5. After 20 minutes, remove each piece of potato from its solution.
6. Record the change in mass of each piece of potato.
7. Repeat steps 1 to 6 two more times.

The table below shows the results.

Solution	**Change in mass of piece of potato in grams**			
	Test 1	**Test 2**	**Test 3**	**Mean**
Dilute salt solution	1.1	1.1	1.4	**X**
Concentrated salt solution	–7.2	–6.8	–32.4	–7.0

(b) Calculate mean value **X** in the table above.

_____

_____

_____

_____

X = _____ grams

(2)

There is an anomalous result for the concentrated salt solution in the table.

(c) Draw a ring around the anomalous result in the table above.

(1)

(d) What did the students do with the anomalous result when calculating the mean in the table above?

_____

(1)

(e) What name is given to a variable that is kept the same during an investigation?

Tick ✓ **one** box.

Control variable ☐

Dependent variable ☐

Independent variable ☐

(1)

(f) One variable the students kept the same during the investigation was the size of the pieces of potato.

Which other variable did the students keep the same?

Tick ✓ **one** box.

Change in mass of pieces of potato ☐

Concentration of salt solution ☐

Time in the salt solution ☐

(1)

(g) The pieces of potato in the concentrated salt solution decreased in mass.

Complete the sentence.

Choose the answer from the box.

excretion	**osmosis**	**respiration**

Water moved out of the potato by the process of _____.

(1)

(h) The potato cells have a partially permeable membrane.

Which particles can pass through a partially permeable membrane?

Tick ✓ **one** box.

No particles ☐

Some particles ☐

All particles ☐

(1)

(i) How could the students improve their investigation?

Tick ✓ **one** box.

Boil the pieces of potato at the start. ☐

Leave the skin on some pieces of potato. ☐

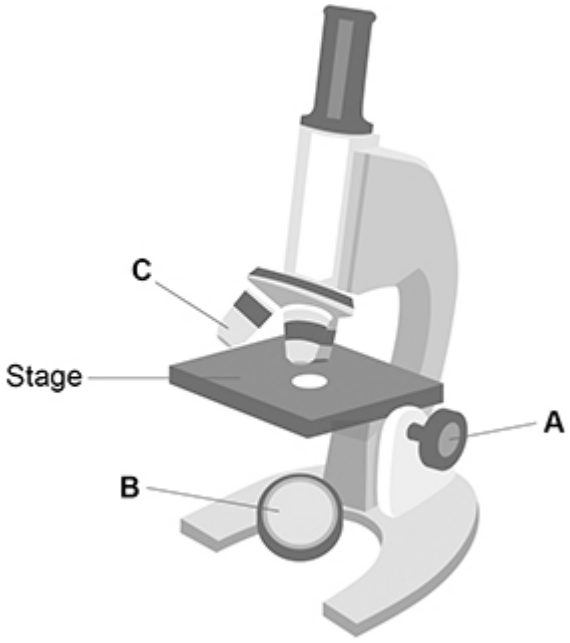
Use more concentrations of salt solution. ☐

(1)

(Total 10 marks)

2. **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.

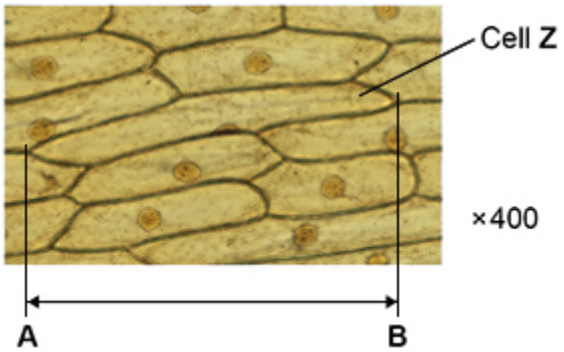
Draw **one** line from each part of the risk assessment to the description of the part.

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

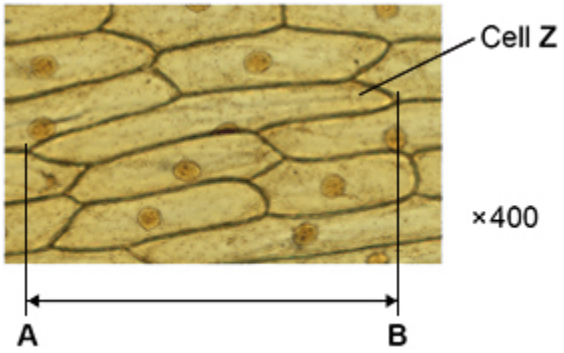
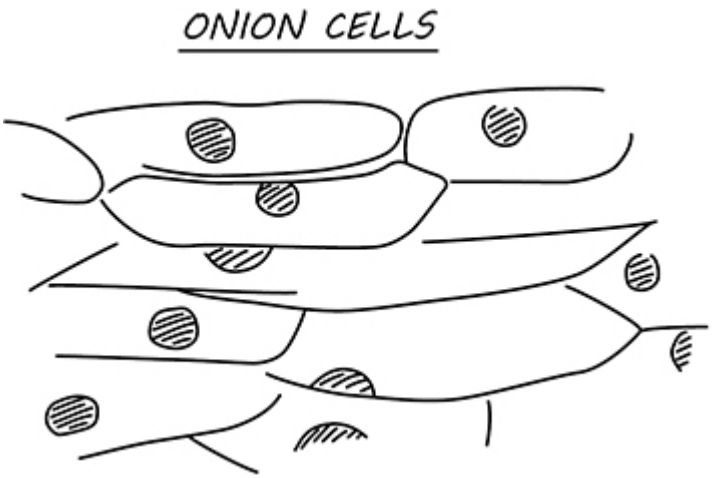


Figure 3 shows the student's drawing of **Figure 2**.

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. ☐

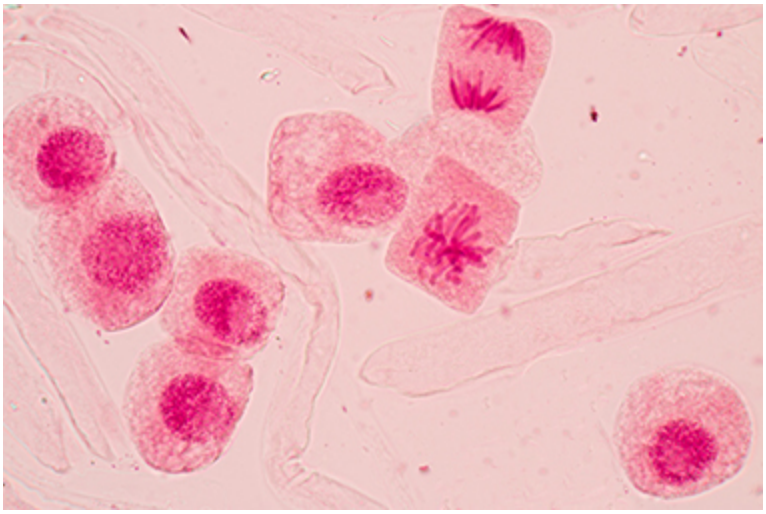
(2)

(Total 15 marks)

3. **Figure 1** shows animal cells.

Some of the cells are dividing by mitosis for growth and repair.

Figure 1



(a) What fraction of the cells in **Figure 1** is dividing by mitosis?

Tick (✓) **one** box.

$\frac{1}{8}$ ☐ $\frac{1}{4}$ ☐ $\frac{1}{2}$ ☐ $\frac{3}{4}$ ☐

(1)

(b) The cells which are **not** dividing in **Figure 1** each contain 10 chromosomes.

One of these cells divides by mitosis to produce two new cells.

How many chromosomes will each new cell contain after mitosis?

Tick (✓) **one** box.

5 ☐ 10 ☐ 15 ☐ 20 ☐

(1)

(c) Cells divide in a series of stages called the cell cycle.

Complete the sentences.

Choose answers from the box.

contracts	**divides**	**grows**
reacts	**relaxes**	**replicates**

Before mitosis occurs, the cell _____.

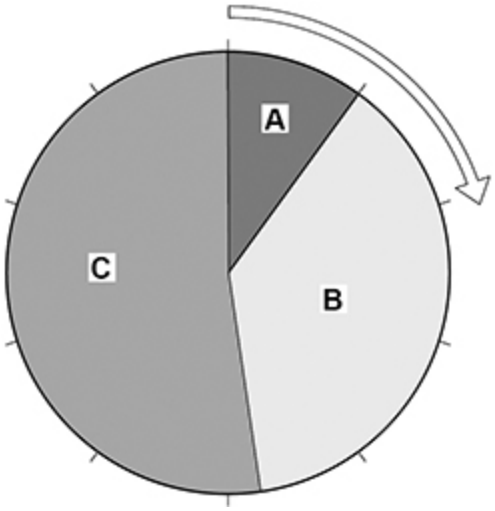
The genetic material in the cell doubles when the DNA _____.

After the chromosomes have been pulled to each end of the cell, the cytoplasm _____.

(3)

Figure 2 shows the time taken to complete different stages of the cell cycle.

Figure 2



(d) Which stage of the cell cycle takes the most time?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐

(1)

(e) What percentage of time in the cell cycle is stage **A**?

Tick (✓) **one** box.

5% ☐ 10% ☐ 15% ☐ 25% ☐

(1)

Stem cells divide by mitosis.

Scientists can use stem cells from an embryo to create heart cells in a laboratory.

(f) Which organ system contains heart cells?

Tick (✓) **one** box.

Circulatory system ☐

Digestive system ☐

Nervous system ☐

Respiratory system ☐

(1)

(g) Name **one** medical condition that could be treated using heart cells created from an embryo.

_____

(1)

(h) Give **one** reason why a patient may **not** want to be treated with heart cells created from an embryo.

_____

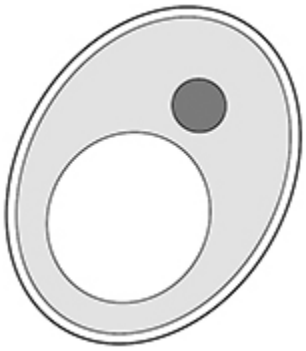
_____

(1)

(Total 10 marks)

4. Plant cells and fungal cells are similar in structure.

The figure below shows a fungal cell.



(a) Name **one** structure in the figure above which is present in both plant cells and fungal cells but **not** in animal cells.

_____

(1)

(b) Which disease is caused by a fungus?

Tick (✓) **one** box.

Gonorrhoea ☐

Malaria ☐

Measles ☐

Rose black spot ☐

(1)

(c) A fungal cell divides once every 90 minutes.

How many times would this fungal cell divide in 24 hours?

_____

_____

_____

_____

Number of times cell divides in 24 hours = _____

(2)

Some types of fungal cell are grown to produce high-protein food.

The high-protein food can be used to make meat-free burgers.

(d) Where is protein digested in the human digestive system?

Tick (✓) **one** box.

- Large intestine ☐
- Liver ☐
- Salivary glands ☐
- Stomach ☐

(1)

(e) Which chemical could be used to test if the burgers contain protein?

Tick (✓) **one** box.

- Benedict's reagent ☐
- Biuret reagent ☐
- Ethanol ☐
- Iodine solution ☐

(1)

(f) The table below shows some information about burgers made from meat and meat-free burgers.

	Mass per 100 g of burger	
	Burgers made from meat	**Meat-free burgers**
Protein in g	14.0	9.0
Fibre in g	0.9	5.5
Fat in g	16.0	5.2
Carbohydrate in g	15.5	15.1
Cholesterol in mg	120.0	0.0

Evaluate the use of burgers made from meat compared with meat-free burgers in providing humans with a healthy, balanced diet.

Use information from the table and your own knowledge.

(6)

(Total 12 marks)

5. This question is about cell division.

(a) Which process makes two identical new body cells for growth and repair?

Tick (✓) **one** box.

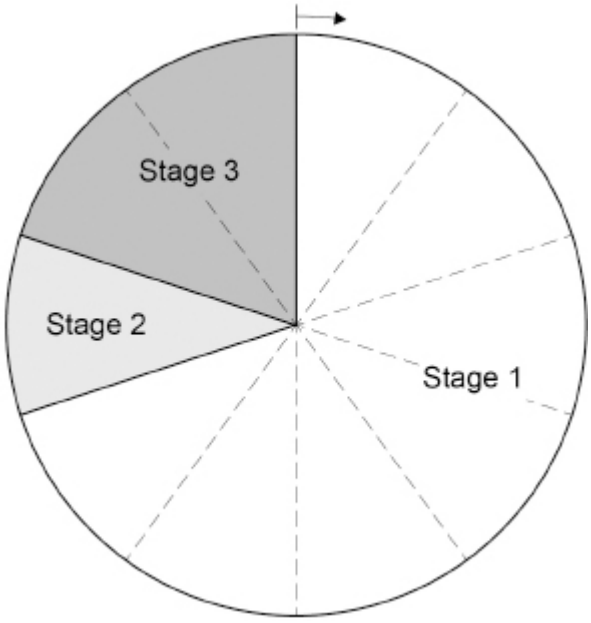
Differentiation ☐

Fertilisation ☐

Mitosis ☐

(1)

The chart shows the three stages of a cell cycle.



(b) Draw **one** line from each stage of the cell cycle to what happens during that stage.

Stage of cell cycle	What happens during that stage
Stage 1	One set of chromosomes is pulled to each end of the cell
Stage 2	The cytoplasm and cell membrane divide to form two new cells
Stage 3	The cell grows and the chromosomes replicate

(2)

(c) What percentage of the total time for the cell cycle is taken by stage 1?

_____

_____

_____

Percentage = _____ %

(2)

(d) A cell divides to form two new cells every 24 hours.

How many days will it take for the original cell to divide into 8 cells?

Tick (✓) **one** box.

1 ☐ 3 ☐ 6 ☐ 8 ☐

(1)

(e) The chromosomes contain the genetic material.

Name the chemical which the genetic material is made from.

_____

(1)

(f) The genetic material is made of many small sections.

Each section codes for a specific protein.

What is one section of genetic material on a chromosome called?

Tick (✓) **one** box.

A gamete ☐

A gene ☐

A nucleus ☐

(1)

(g) Stem cells are cells which have **not** yet been specialised to carry out a particular job.

Bone marrow cells are one example of stem cells.

Explain how a transplant of bone marrow cells can help to treat medical conditions.

_____

_____

_____

_____

(2)

(Total 10 marks)

6. This question is about cells.

(a) **Figure 1** shows a cell.

Figure 1

What type of cell is shown in **Figure 1**?

Tick (✓) **one** box.

Animal ☐

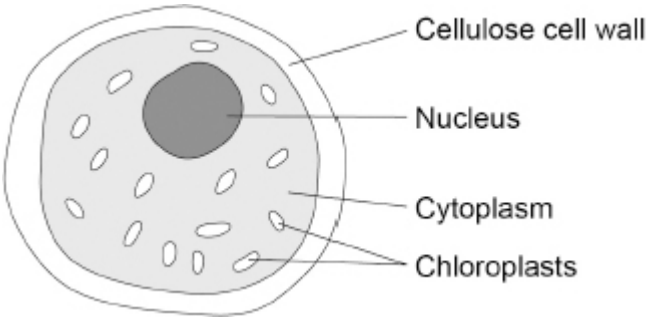
Bacterium ☐

Plant ☐

(1)

Figure 2 shows an algal cell.

Figure 2



(b) What is the function of the cell wall?

Tick (✓) **one** box.

To contain the genetic material ☐

To stop the chloroplasts leaking out ☐

To strengthen the cell ☐

(1)

(c) The algal cell is green.

Which part of the algal cell makes it green in colour?

Tick (✓) **one** box.

Cellulose ☐

Chloroplast ☐

Cytoplasm ☐

Nucleus ☐

(1)

(d) Cells contain sub-cellular structures.

Draw **one** line from each structure to its function.

Structure	Function
	Controls transport of substances into the cell
Cell membrane	Where energy is released
Mitochondria	Where glucose is made
Ribosomes	Where photosynthesis takes place
	Where proteins are made

(3)

A student prepared a microscope slide of cheek cells.

The student looked at one cell using a microscope.

Figure 3 shows the image the student saw.

Figure 3

(e) What should the student do to get a clear image?

Tick (✓) **one** box.

Adjust the focus knob ☐

Make the light dimmer ☐

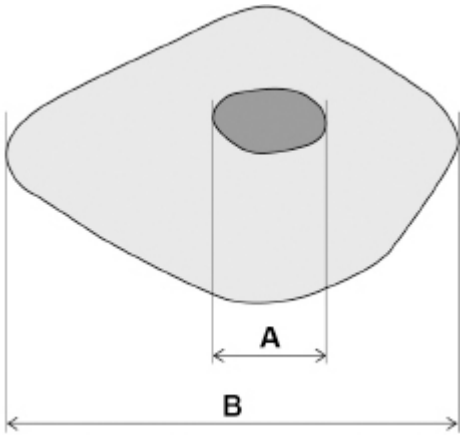
Put water on the slide ☐

(1)

The student then obtained a clear image.

Figure 4 shows the clear image.

Figure 4



(f) Measure the length of the nucleus (**A**) and the length of the cell (**B**) in millimetres (mm).

A = _____ mm

B = _____ mm

(2)

(g) How many times longer is the cell (**B**) than the nucleus (**A**)?

_____

Number of times longer = _____

(1)

(h) The student looked at another cell.

The image width of the cell was 40 mm

The real width of the cell was 0.1 mm

Calculate the magnification of the cell.

Use the equation:

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

Magnification = × _____

(2)

(Total 12 marks)

1. (a) a leaf

1

(b)

$$\frac{1.1 + 1.1 + 1.4}{3}$$

1

or

$$\frac{3.6}{3}$$

1.2 (grams)

if no answer given on answer lines, allow an answer in the table

1

(c) ring around −32.4 (grams)

table takes precedence

allow (−) 32.4 (grams) written by question

1

(d) did not include it

allow ignored it

1

(e) control variable

1

(f) time in the salt solution

1

(g) osmosis

1

(h) some particles

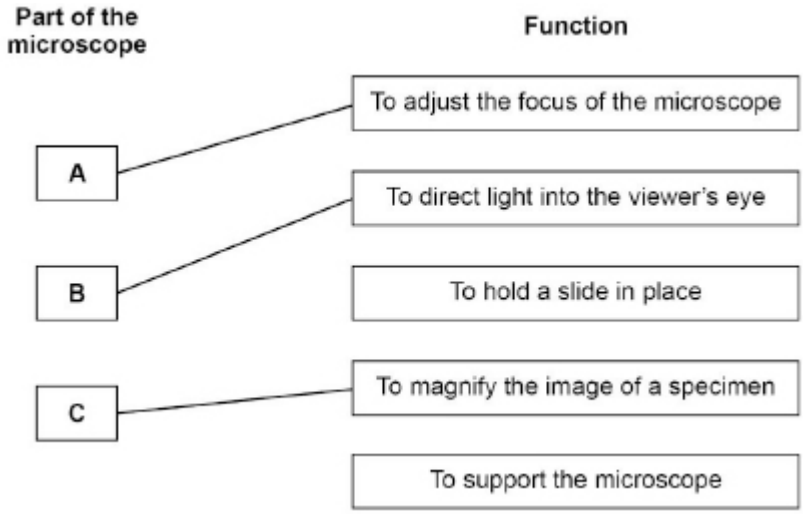
1

(i) use more concentrations of salt solution

1

[10]

2. (a)



*do **not** accept more than one line from a box on the left*

3

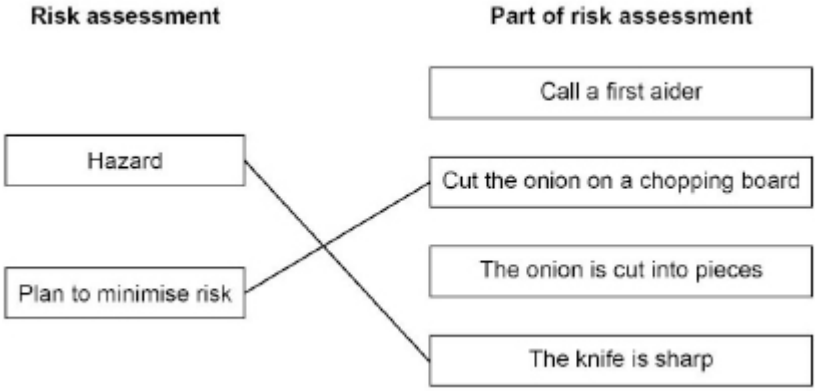
(b) to stain the cells

1

(c) to allow light to pass through the cells

1

(d)



*do **not** accept more than one line from a box on the left*

2

(e) *student's measurement*
49 (mm)

allow in range 48 – 50 (mm)

1

conversion of student's measurement
49 000 (µm)

allow correct conversion using student's measurement

1

substitution

$$\frac{49\,000}{400}$$

allow a correct substitution using incorrectly measured / converted length

1

122.5 (µm)

allow a correct answer from student's division using a magnification of ×400

1

(f) the cells would look larger

1

the cells would show more internal structures

1

(g) complete the cell walls

1

include the magnification

1

[15]

3. (a) $\frac{1}{4}$

1

(b) 10

1

(c) grows

1

replicates

1

divides

1

must be in this order

(d) C

1

(e) 10%

1

(f) circulatory system

1

(g) cardiovascular disease / CVD

allow heart attack

or

(coronary) heart disease / CHD

allow any correctly named heart condition e.g. arrhythmia, hole in the heart

1

(h) any **one** from:

- unethical

  allow examples of unethical such as destroying a (potential) life
- (against) religious / cultural / personal beliefs

  allow against God's will

  ignore religion unqualified
- the method is not (fully) tested

  allow the method might not work

  allow may cause side effects
- risk of infection
- (heart cells) may be rejected

1

[10]

4. (a) (cell) wall

or

(large / permanent) vacuole

ignore cellulose

1

(b) rose black spot

1

(c) $\frac{24 \times 60}{90}$

or

$\frac{24}{1.5}$

allow $\frac{1440}{90}$

1

16

*do **not** accept if a unit is given*

1

(d) stomach

1

(e) biuret reagent

1

(f) **Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.

5–6

Level 2: Some logically linked reasons are given. There may also be a simple judgement.

3–4

Level 1: Relevant points are made. They are not logically linked.

1–2

No relevant content

0

Indicative content

- meat-free burgers contain more fibre
  - aids digestion **or** prevents constipation
- meat burgers contain more protein
  - for growth
- meat burgers contain more fat
  - can cause CHD **or** heart attack **or** narrowing of arteries
  - may lead to needing a stent
  - may lead to obesity
  - obesity is a risk factor for (type 2) diabetes
- meat burgers contain more cholesterol
  - can cause narrowing of arteries **or** CHD **or** heart attack
  - may lead to needing a stent
  - may need to take statins

- both burgers have similar amounts of carbohydrate
  - good for providing energy
- no information on vitamins / minerals provided for either burger
- meat burgers require animals to be farmed
  - increase in methane in atmosphere
  - (methane) contributes to global warming
- meat burgers require animals to be slaughtered
  - ethical issues
- some people won't eat meat-free burgers
  - (because) some people don't like the idea of eating fungus
  - (because) some people prefer the taste of meat

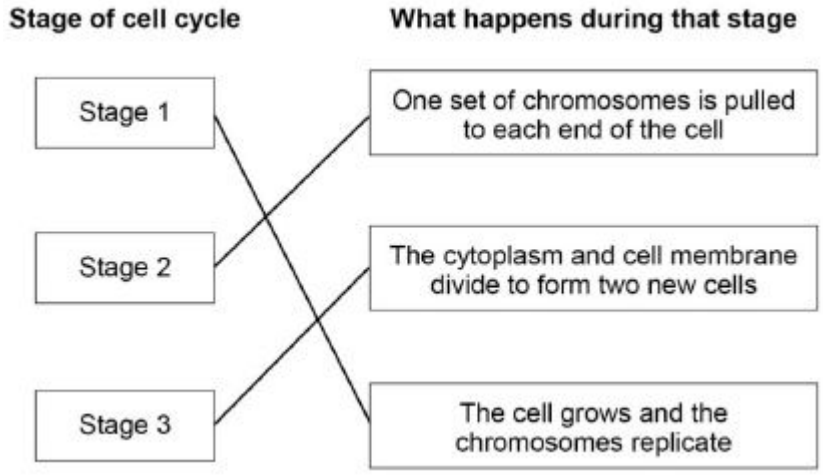
For **Level 2**, comparisons and linked reasons using own knowledge are required.

[12]

5. (a) mitosis

1

(b) all lines correct = **2** marks
1 or 2 lines correct = **1** mark



additional line from a box on the left negates the credit for that box

2

(c) $\frac{7}{10} \times 100$

allow $\frac{252}{300} \times 100$

1

70(%)

allow answer calculated from angle in range 250° to 254°

*if no other mark awarded, allow 0.7 for **1***

1

(d) 3

1

(e) DNA

allow deoxyribonucleic acid for 1

1

(f) a gene

1

(g) (bone marrow) cells differentiate into many / other types of (named) cell

allow (bone marrow) cells can become many / other types of (named) cell

1

(so) will cure diseases where new cells are needed
or will cure diseases where cells are damaged

*allow (so) will cure anaemia / leukaemia **or** blood cancer **or** blood disorders*
allow (so) will cure paralysis / diabetes

1

[10]

6. (a) bacterium

1

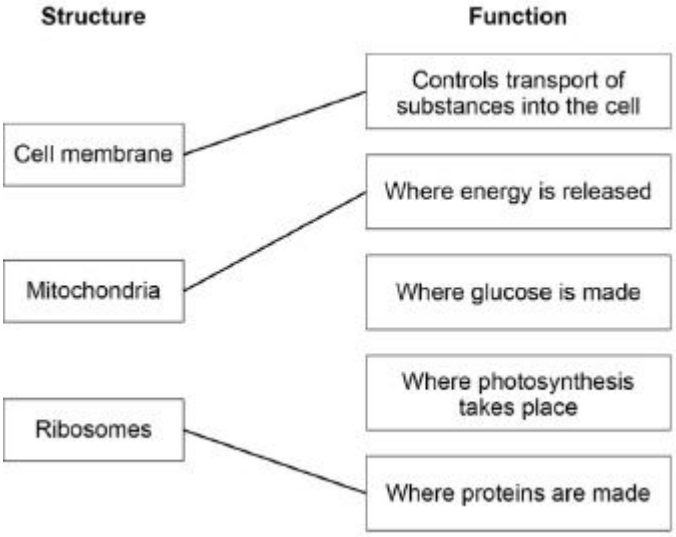
(b) to strengthen the cell

1

(c) chloroplast

1

(d)



additional line from a box on the left negates the mark for that box

3

(e) adjust the focus knob

1

(f) (A =) 15 (mm)

allow a tolerance of ± 1mm

1

(B =) 60 (mm)

1

(g)

$$\frac{60}{15} = 4(.0)$$

*allow ecf from question **(f)***

1

(h)

$$\frac{40}{0.1}$$

1

400

*do **not** accept if a unit is given*

1

[12]