DRAFT SPECIMEN MATERIAL

GCSE
BIOLOGY

H

Higher Tier Paper 1H

Specimen 2018 Time allowed: 1 hour 45 minutes

Materials
For this paper you must have:
- a ruler
- a calculator.

Instructions
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- There are 100 marks available on this paper.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Advice
In all calculations, show clearly how you work out your answer.

Please write clearly, in block capitals, to allow character computer recognition.

Centre number ☐☐☐☐☐ Candidate number ☐☐☐☐

Surname

Forename(s)

Candidate signature _____

There are no questions printed on this page

0 1 Plants transport water and mineral ions from the roots to the leaves.

0 1 . 1 Plants move mineral ions:

- from a low concentration in the soil
- to a high concentration in the root cells.

What process do plants use to move these minerals into root cells?

[1 mark]

Tick **one** box.

Active transport	☐
Diffusion	☐
Evaporation	☐
Osmosis	☐

0 1 . 2 Name the plant tissue that transports water and mineral ions from the roots to the leaves.

[1 mark]

Question 1 continues on the next page

Plants lose water through the stomata in the leaves.

The epidermis can be peeled from a leaf.

The stomata can be seen using a light microscope.

Table 1 shows the data a student collected from five areas on one leaf.

Table 1

Leaf area	Number of stomata	
	Upper surface	Lower surface
1	3	44
2	0	41
3	1	40
4	5	42
5	1	39
Mean	**2**	**X**

0 1 . 3 Describe how the student might have collected the data in **Table 1**.

[3 marks]

0 1 . 4 What is the median number of stomata on the upper surface of the leaf?

[1 mark]

0 1 . 5 Calculate value of **X** in **Table 1**.

Give your answer to 2 significant figures.

[2 marks]

Mean number of stomata = _____

0 1 . 6 The plant used in this investigation has very few stomata on the upper surface of the leaf.

Explain why this is an **advantage** to the plant.

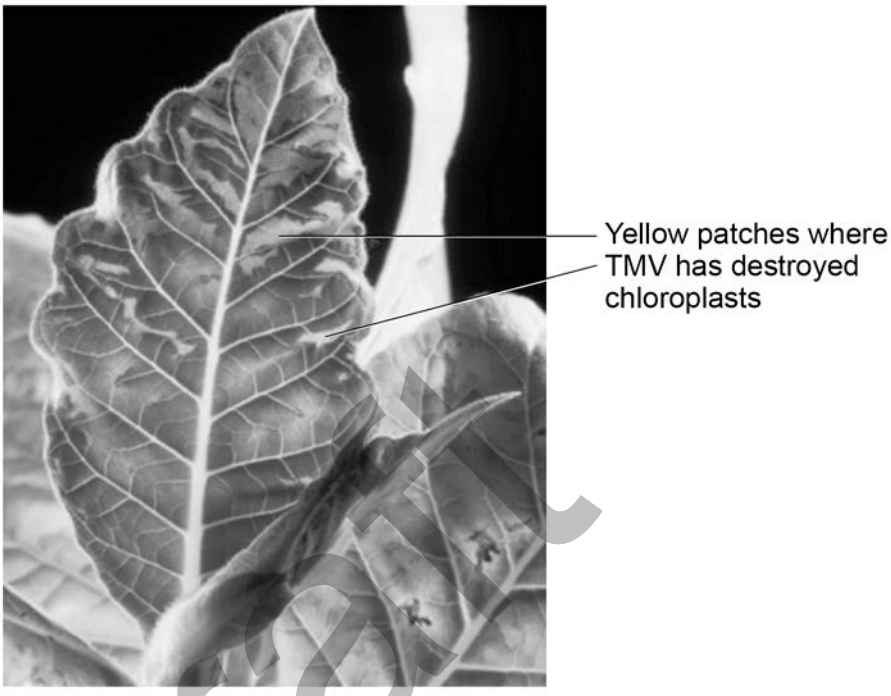
[2 marks]

Turn over for the next question

0 2 Tobacco mosaic virus (TMV) is a disease affecting plants.

Figure 1 shows a leaf infected with TMV.

Figure 1



TMV can cause plants to produce less chlorophyll.

This causes leaf discoloration.

0 2 . 1 How would **less** chlorophyll in leaves affect the rate of photosynthesis?

[1 mark]

0 2 . 2 Complete the **word** equation for photosynthesis.

[2 marks]

carbon dioxide + _____ ⟶ _____ + oxygen

0 2 . 3 Explain why plants with TMV have stunted growth.

[3 marks]

0 2 . 4 All tools should be washed in disinfectant after using them on plants infected with TMV.

Suggest why.

[1 mark]

0 2 . 5 Scientists produced a single plant that contains a TMV-resistant gene.

Suggest how scientists can use this plant to produce **many** plants with the TMV-resistant gene.

[1 mark]

Turn over for the next question

0 3 Microorganisms cause infections.

Infections kill many people each year.

The human body has many ways of defending itself against microorganisms.

0 3 . 1 Name the substance in the stomach that kills microorganisms swallowed in food.

[1 mark]

0 3 . 2 Give **two** ways white blood cells help defend against microorganisms.

[2 marks]

1 _____

2 _____

0 3 . 3 In 2014 the Ebola virus killed almost 8000 people in Africa.

Drug companies have developed a new drug to treat Ebola.

Describe what testing must be done before the drug can be used to treat people.

[6 marks]

Turn over for the next question

0 4 All living cells respire.

0 4 . 1 Which part of the cell transfers most energy from respiration?

[1 mark]

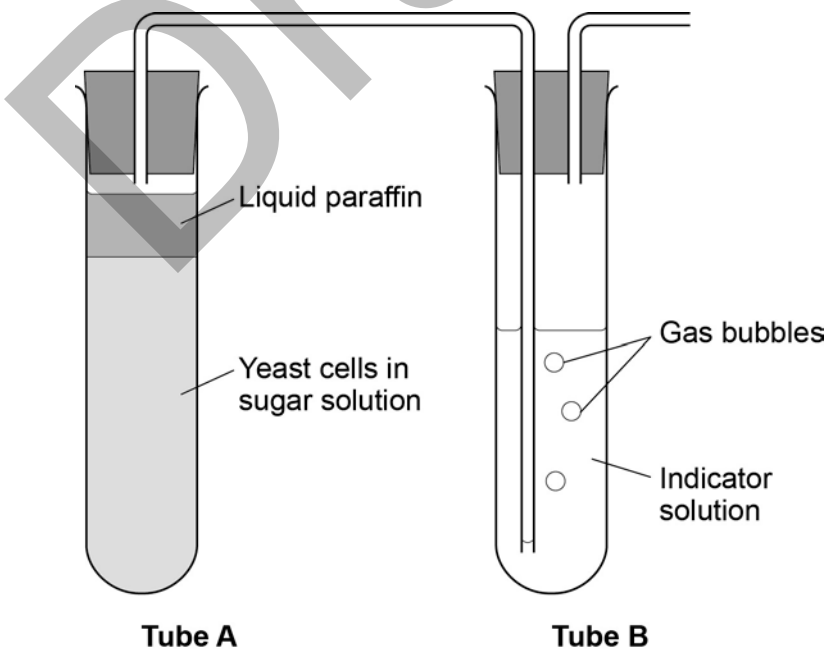
0 4 . 2 Complete a balanced symbol equation for **aerobic** respiration.

[2 marks]

$6O_2$ + _____ ⟶ _____ + $6CO_2$

Figure 2 shows an experiment to investigate **anaerobic** respiration in yeast cells.

Figure 2



0 4 . 3 What is the purpose of the liquid paraffin in tube **A**?

[1 mark]

Tick **one** box.

- To prevent evaporation ☐
- To stop air getting in ☐
- To stop the temperature going up ☐
- To stop water getting in ☐

The indicator solution in tube **B** shows changes in the concentration of carbon dioxide (CO_2).

The indicator is:

- **blue** when the concentration of CO_2 is very low
- **green** when the concentration of CO_2 is low
- **yellow** when the concentration of CO_2 is high.

0 4 . 4 What colour would you expect the indicator to be in tube **B** during maximum rate of anaerobic respiration?

[1 mark]

Tick **one** box.

- Blue ☐
- Green ☐
- Yellow ☐

0 4 . 5 Suggest how the experiment could be changed to give a reliable way to measure the rate of the reaction.

Include any apparatus you would use.

[2 marks]

Question 4 continues on the next page

0 4 . 6 Compare anaerobic respiration in a yeast cell with anaerobic respiration in a muscle cell.

Include the products made and energy transfered.

[3 marks]

Turn over for the next question

0 5 A student investigates the effect of different sugar solutions on potato tissue.

This is the method used.

1. Add 30 cm^3 of 0.8 mol dm^{-3} sugar solution to a boiling tube.
2. Repeat step **1** with equal volumes of 0.6, 0.4 and 0.2 mol dm^{-3} sugar solutions.
3. Use water to give a concentration of 0.0 mol dm^{-3}.
4. Cut five cylinders of potato of equal size using a cork borer.
5. Weigh each potato cylinder and place one in each tube.
6. Remove the potato cylinders from the solutions after 24 hours.
7. Dry each potato cylinder with a paper towel.
8. Reweigh the potato cylinders.

Table 2 shows the results.

Table 2

Concentration of sugar solution in mol dm^{-3}	Starting mass in g	Final mass in g	Change of mass in g	Percentage (%) change
0.0	1.30	1.51	0.21	16.2
0.2	1.35	1.50	0.15	**X**
0.4	1.30	1.35	0.05	3.8
0.6	1.34	1.28	–0.06	–4.5
0.8	1.22	1.11	–0.11	–9.0

0 5 . 1 Calculate the value of **X** in **Table 2**.

[2 marks]

Change in mass = _____ %

0 5 . 2 Why did the student calculate the percentage change in mass as well as the change in grams?

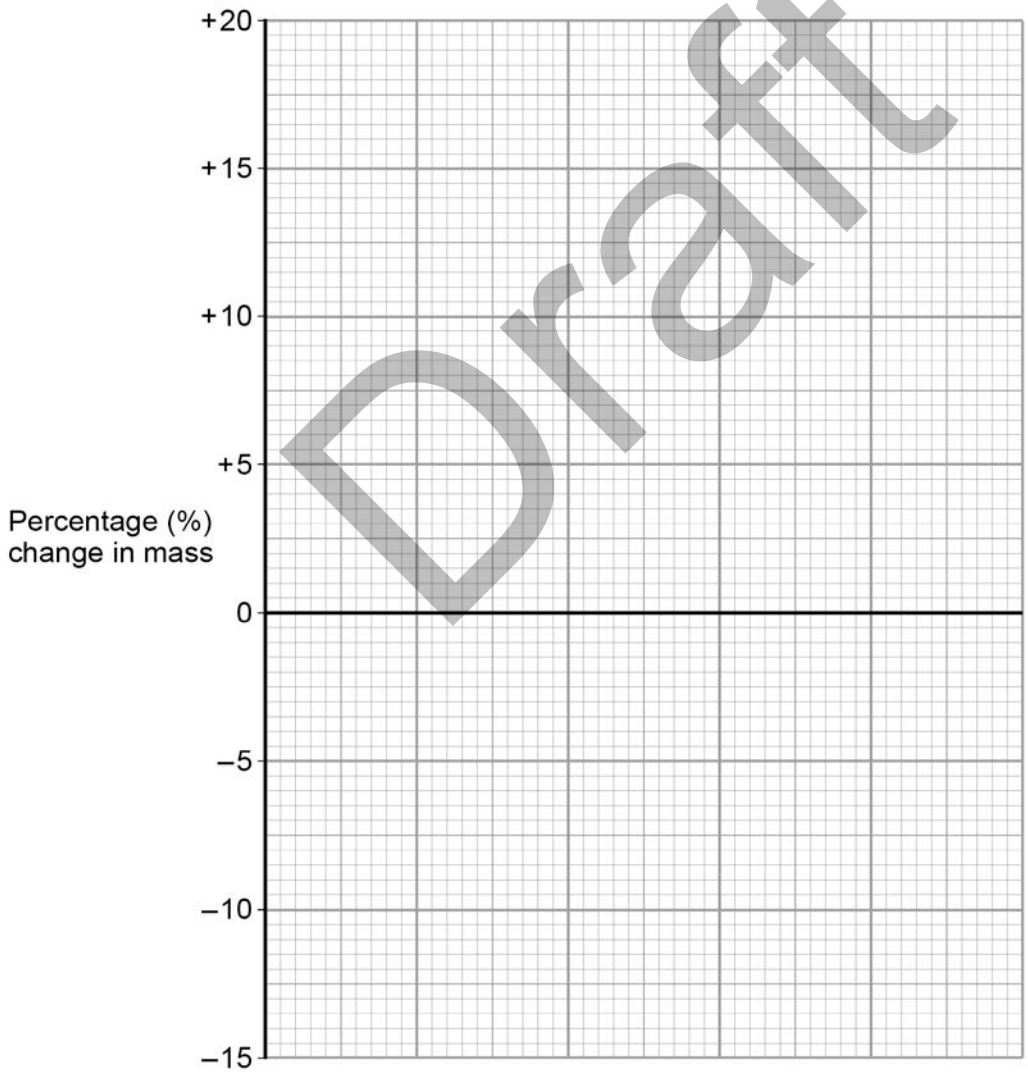
[1 mark]

0 5 . 3 Complete **Figure 3** using data from **Table 2**.

- Choose a suitable scale and label for the *x*-axis.
- Plot the percentage (%) change in mass.
- Draw a line of best fit.

[4 marks]

Figure 3



Question 5 continues on the next page

0 5 . 4 Use your graph in **Figure 3** to estimate the concentration of the solution inside the potato cells.

[1 mark]

Concentration = _____ mol dm^{-3}

0 5 . 5 The results in **Table 2** show the percentage change in mass of the potato cylinders.

Explain why some percentage change results are positive and some are negative.

[3 marks]

0 5 . 6 Suggest **two** possible sources of error in the method given on **page 14**.

[2 marks]

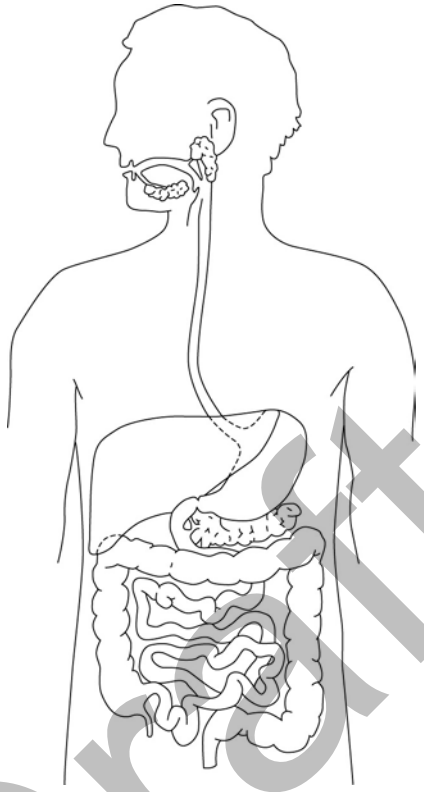
1 _____

2 _____

Turn over for the next question

0 6 **Figure 4** shows the human digestive system.

Figure 4



0 6 . 1 Label the stomach on **Figure 4**.

[1 mark]

Many people suffer from stomach ulcers caused by a species of bacteria called *Helicobacter pylori.*

These are acid-tolerant bacteria which can damage the mucus lining of the digestive system.

0 6 . 2 Suggest how an infection with *Helicobacter pylori* causes stomach ulcers.

[2 marks]

0 6 . 3 Explain how food molecules are absorbed in the small intestine.

[3 marks]

0 6 . 4 Coeliac disease is a disease of the digestive system.

It damages the lining of the small intestine when foods that contain gluten are eaten.

Gluten is a form of protein found in some grains.

When people with coeliac disease eat foods that contain gluten:

1. their immune system forms antibodies to gluten
2. these antibodies attack the lining of the small intestine
3. this causes inflammation in the intestines and damages the villi.

Symptoms of coeliac disease include poor growth.

Suggest why a person with coeliac disease might have this symptom.

[4 marks]

0 7 A gardener is looking at the plants in his greenhouse.

0 7 . 1 Some of the plants have a disease.

Give **two** ways the gardener could identify the pathogen infecting the plants.

[2 marks]

1 _____

_____

2 _____

_____

0 7 . 2 Plants can become unhealthy if they do not have essential mineral ions.

Describe the appearance of plants with:

- **nitrate** deficiency
- **magnesium** deficiency.

[2 marks]

Nitrate deficiency _____

_____

Magnesium deficiency _____

_____

0 7 . 3 Plants need other minerals.

- Potassium is needed for healthy root growth.
- Phosphate ions are needed for healthy flowers and fruits.

The gardener makes his own garden compost.

The percentage (%) of minerals in his compost was compared with two fertilisers he could buy.

Look at **Table 3**.

Table 3

	Percentage (%) mineral content			
	Nitrate ions	**Phosphate ions**	**Potassium ions**	**Cost in £/kg**
Garden compost	0.5	0.3	0.8	0.00
Fertiliser S	5.0	1.3	6.6	4.99
Fertiliser T	3.0	12.0	6.0	9.99

The gardener buys Fertiliser **S**.

Suggest why he chose Fertiliser **S**.

[3 marks]

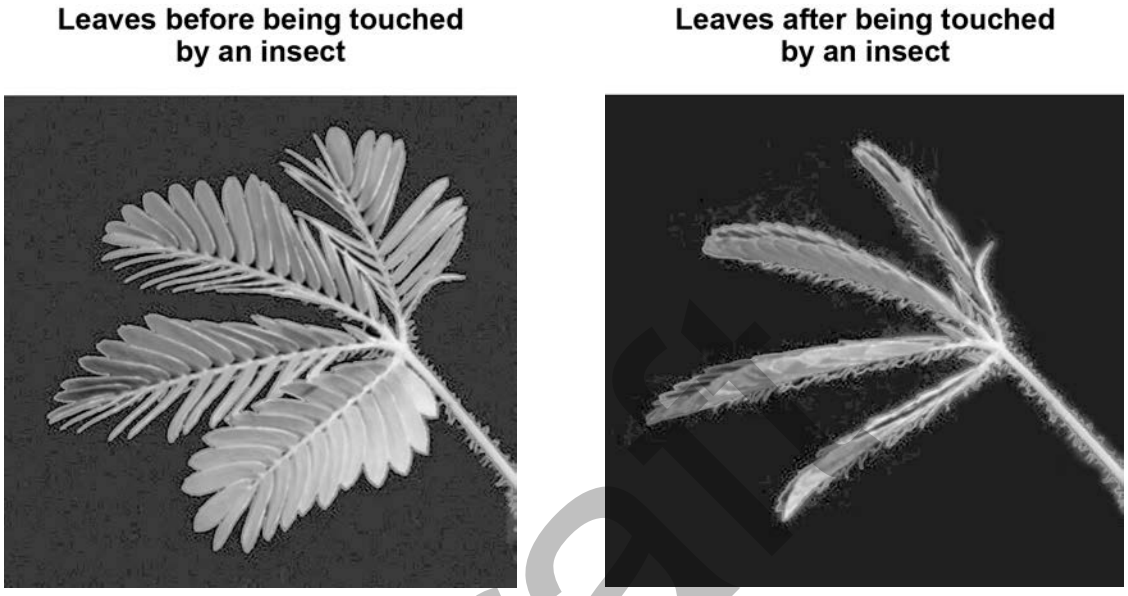
Question 7 continues on the next page

0 7 . 4 Some organisms can harm plants.

Plants have developed defence mechanisms to reduce this risk.

Figure 5 shows a defence mechanism.

Figure 5



The leaves fold after being touched by an insect.

Suggest how folding leaves may help protect the plant.

[2 marks]

Turn over for the next question

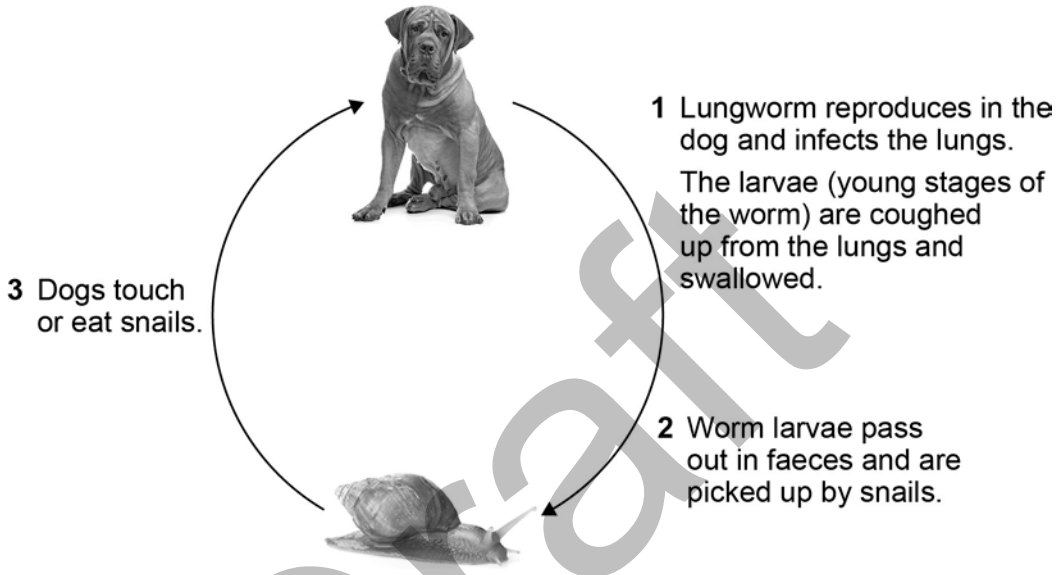
0 8 Lungworm is an infection.

Lungworm can kill dogs.

It is caused by a small worm.

Figure 6 shows the lifecycle of the lungworm.

Figure 6



0 8 . 1 What type of organism is represented by the snail in the lifecycle of the lungworm?

[1 mark]

Tick **one** box.

- Fungus ☐
- Parasite ☐
- Protist ☐
- Vector ☐

0 8 . 2 Suggest how the spread of the lungworm disease can be prevented.

[3 marks]

0 8 . 3 Malaria is a disease spread by mosquitoes.

Describe **two** ways to control the spread of malaria.

[2 marks]

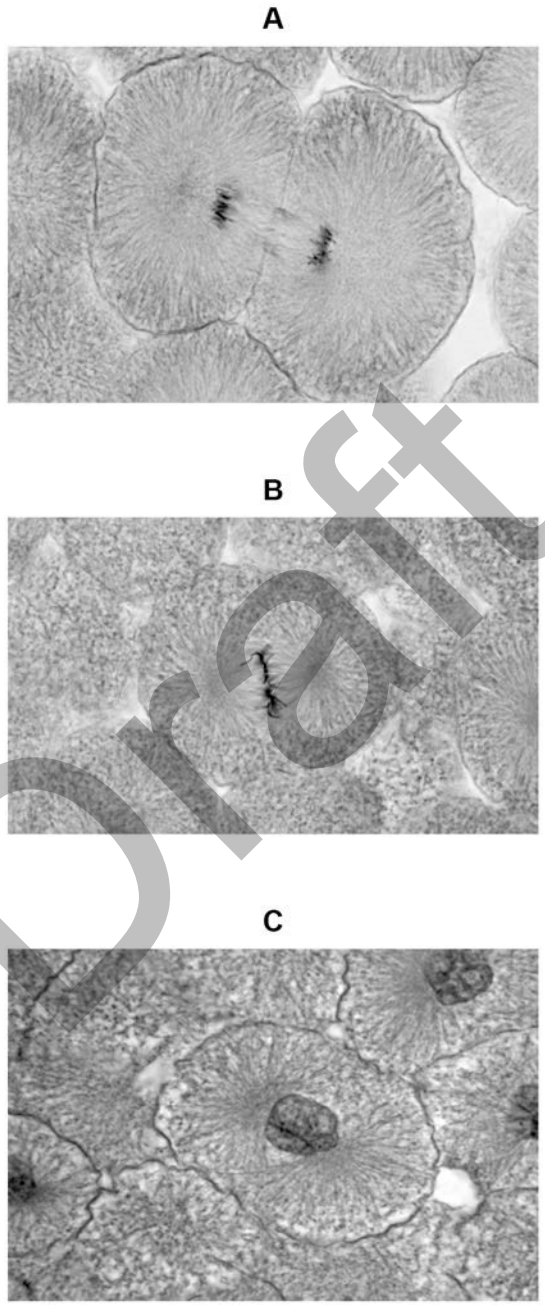
1

2

Turn over for the next question

0 9 **Figure 7** shows photographs of some animal cells at different stages during the cell cycle.

Figure 7



0 9 . 1 Which photograph in **Figure 7** shows a cell that is **not** going through mitosis?

[1 mark]

Tick **one** box.

A ☐ **B** ☐ **C** ☐

0 9 . 2 Describe what is happening to the cells in photograph **A**.

[2 marks]

Question 9 continues on the next page

A student wanted to find out more about the cell cycle.

The student made a slide of an onion root tip.

She counted the number of cells in each stage of the cell cycle in one field of view.

Table 4 shows the results.

Table 4

		Stage of mitosis				
	Non-dividing cells	**Stage 1**	**Stage 2**	**Stage 3**	**Stage 4**	**Total**
Number of cells	20	10	3	2	1	36

0 9 . 3 What type of plant tissue is found at a root tip?

[1 mark]

0 9 . 4 Each stage of the cell cycle takes a different amount of time.

Which stage in **Table 4** is the fastest in the cell cycle?

Give a reason for your answer.

[2 marks]

Stage _____

Reason _____

0 9 . 5 The cell cycle in an onion root tip cell takes 16 hours.

How long does **Stage 2** last in a typical cell?

Calculate the length of time.

[2 marks]

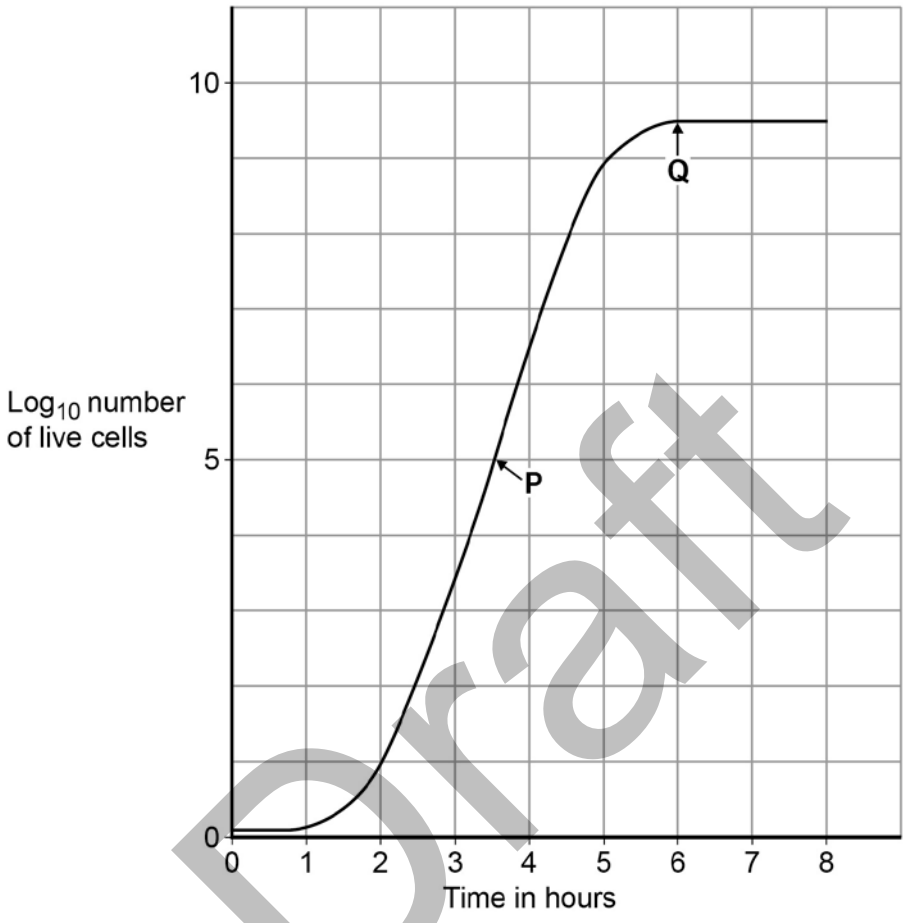
Time in **Stage 2** = _____ minutes

Question 9 continues on the next page

Bacteria such as *Escherichia coli* undergo cell division similar to mitosis.

Figure 8 shows a growth curve for *E. coli* grown in a nutrient broth.

Figure 8



0 9 . 6 What type of cell division causes the change in number of *E. coli* cells at **P**?

[1 mark]

0 9 . 7 Suggest why the number of cells levels out at **Q**.

[2 marks]

Turn over for the next question

1 0 Describe how the human circulatory system works to:

- supply oxygen to the tissues
- remove waste products from tissues.

Include details of the blood vessels and cells involved.

[6 marks]

Turn over for the next question

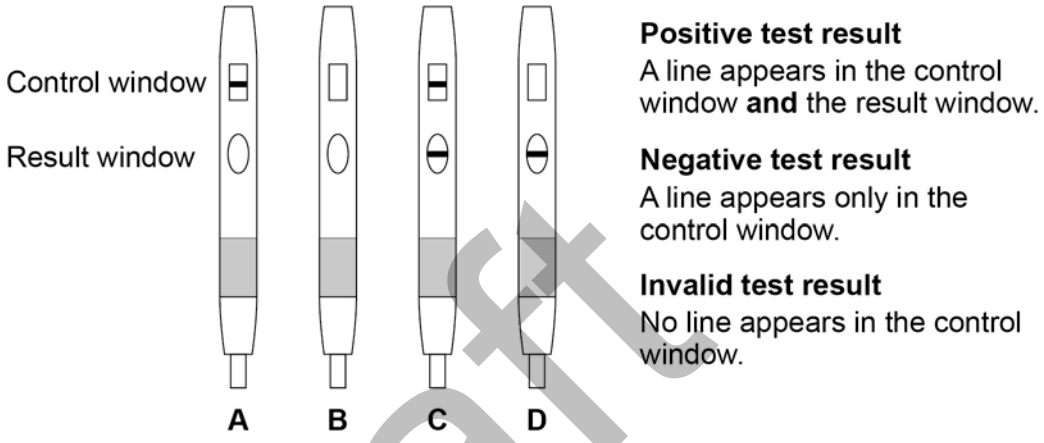
1 1 Monoclonal antibodies are used to measure the levels of hormones in the blood.

Pregnant women produce the hormone HCG.

HCG is excreted in urine.

Figure 9 shows four pregnancy test strips.

Figure 9



1 1 . 1 Which test strip shows a negative test result?

[1 mark]

Tick **one** box.

A		B		C		D	

1 1 . 2 Which test strip shows a positive test result?

[1 mark]

Tick **one** box.

A		B		C		D	

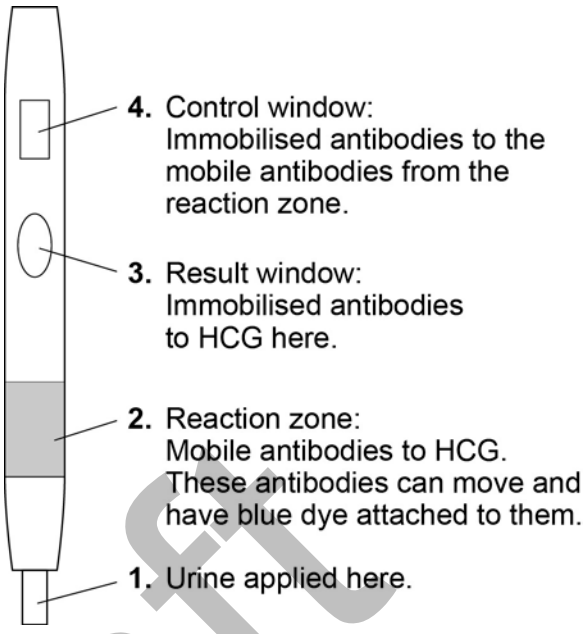
1 1 . 3 Monoclonal antibodies are used for pregnancy testing.

Give **one other** use of monoclonal antibodies.

[1 mark]

1 1 . 4 **Figure 10** shows the parts of a pregnancy test strip.

Figure 10



The pregnancy test strip shows a positive test result when a woman is pregnant.

Explain how the pregnancy test strip shows this.

[5 marks]

END OF QUESTIONS

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