



B2 ORGANISATION

Practice questions

Name: _____

Class: _____

Date: _____

Time: **181 minutes**

Marks: **175 marks**

Comments: **HIGHER TIER**

1

Amylase is an enzyme that digests starch.

A student investigated the effect of pH on the activity of amylase.

This is the method used.

1. Mix amylase solution and starch suspension in a boiling tube.
2. Put the boiling tube into a water bath at 25 °C.
3. Remove a drop of the mixture every 30 seconds and test it for the presence of starch.
4. Repeat the investigation at different pH values.

The table below shows the students' results.

pH	Time when no starch was detected in minutes
5.0	7.0
5.5	4.5
6.0	3.0
6.5	2.0
7.0	1.5
7.5	1.5
8.0	2.0

- (a) The student concluded pH 7.25 was the optimum pH for the amylase enzyme.

This is **not** a valid conclusion.

Suggest **two** reasons why.

1. _____

2. _____

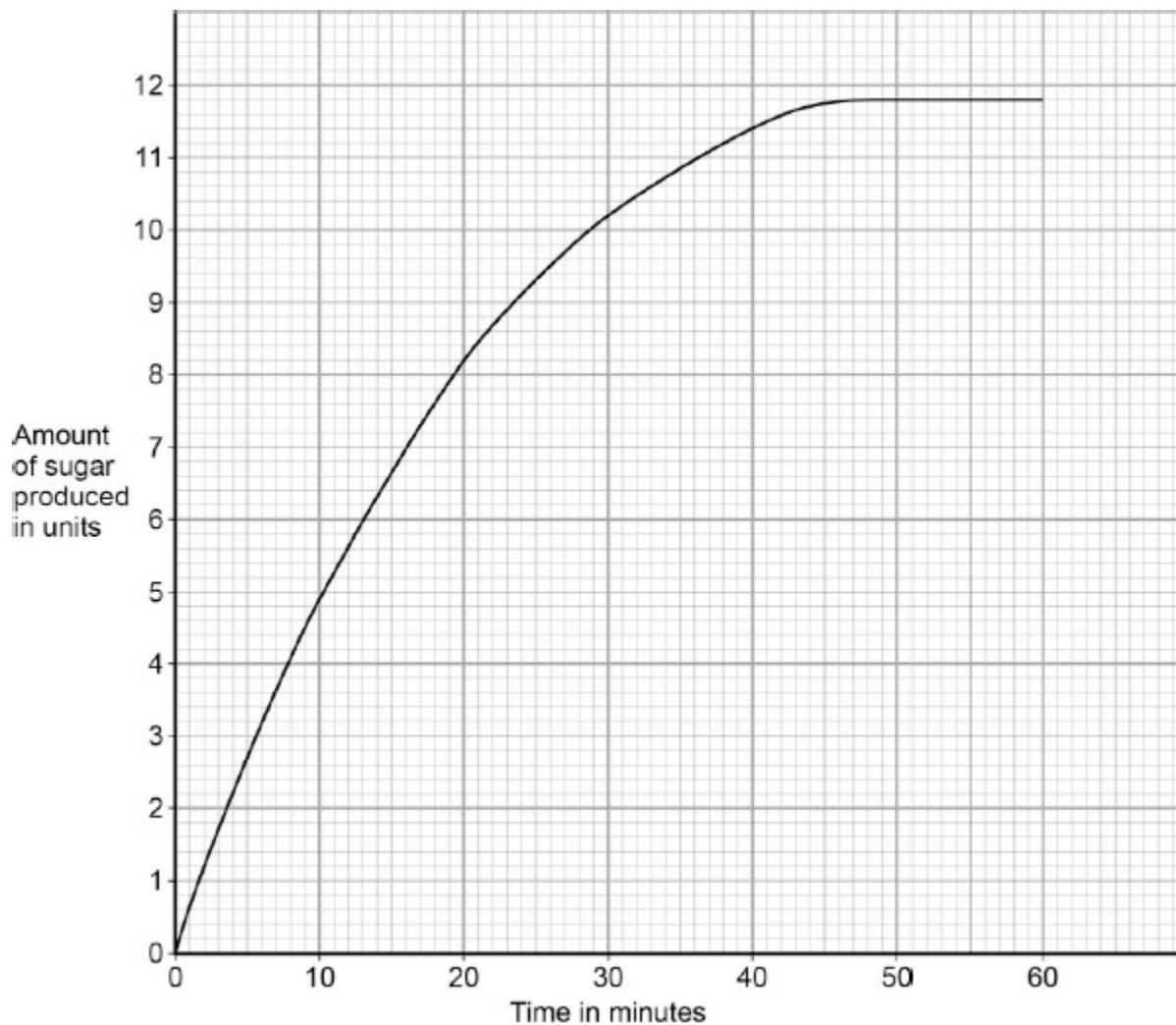
(2)

(b) The student did another investigation.

This is the method used.

1. Put amylase solution and starch suspension into a boiling tube.
2. Make the pH 7.25.
3. Put the boiling tube into a water bath at 25 °C.
4. Measure the amount of sugar produced every 30 seconds.

The results are shown in the figure below.



Calculate the mean rate of sugar produced per minute during the first 5 minutes.

Mean rate = _____ units per minute

(2)

- (c) Iodine solution is added to a sample taken from the boiling tube after 10 minutes and 60 minutes.

Suggest what you would see in these samples.

After 10 minutes _____

.After 60 minutes _____

(2)

- (d) The scientist repeated the investigation at 37 °C.

Draw a line on the figure above to show the predicted results.

(2)

(Total 8 marks)

2

Statins are drugs used to treat coronary heart disease (CHD).

New drugs must be trialled before they can be licensed for use.

Some scientists trialled two different types of statin.

The scientists:

- conducted the trial on 325 patients with a history of CHD in their family
- used a double-blind trial method
- measured the change in blood cholesterol levels over two years
- measured the change in thickness of an artery wall over two years.

- (a) During the trials the statins are tested for side effects.

Give **two** other reasons why the statins are trialled before use.

1. _____

2. _____

(2)

(b) Describe how the double-blind method is used in this trial.

(2)

(c) The results of drug trials are **peer reviewed** before they are published.

Why are peer reviews important in drug trials?

Tick **one** box.

- To calculate the best dose
- To check the drug works
- To make sure the scientist gets credit
- To prevent false claims

(1)

(d) The table below shows the results of the trial.

	Drug A	Drug B
Number of patients who died during the trial	1	2
Number of patients who reported aching muscles	16	17
Number of patients who reported mild abdominal cramps	18	16
Change in blood cholesterol level in percentage	-50.5	-41.2
Change in thickness of artery wall in mm	-0.0033	+0.032

Drug **A** is more effective than Drug **B**.

Give **two** reasons that support this conclusion.

Use information from the table above.

1. _____

2. _____

(2)

(e) A scientist concludes that Drug **A** is a safer drug than Drug **B**.

Give **two** reasons why this is **not** a valid conclusion.

(2)

(Total 9 marks)

3

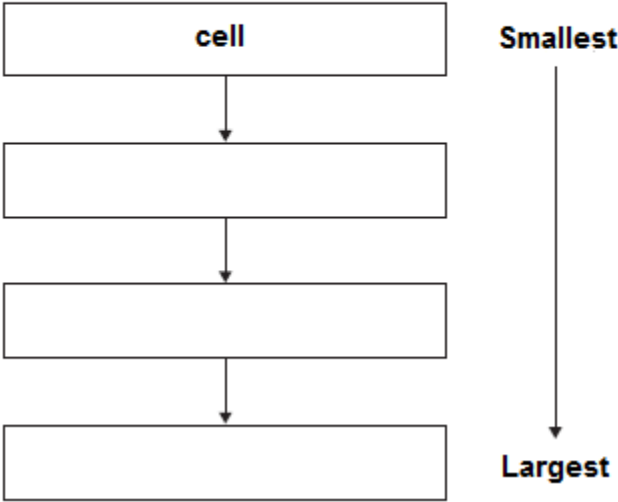
The human body is organised to carry out many different functions.

- (a) Use words from the box to complete **Figure 1** by putting the parts of the body in order of size from smallest to largest.

The smallest one has been done for you.

cell	organ system	organ	tissue
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Figure 1



(2)

- (b) The stomach is made of different types of tissue.

Draw **one** line from each type of stomach tissue to the correct description.

Epithelial tissue	Allows food to be churned around the stomach
Glandular tissue	Covers the outside and the inside of the stomach
Muscular tissue	Produces digestive juices
	Coordinates nerve impulses

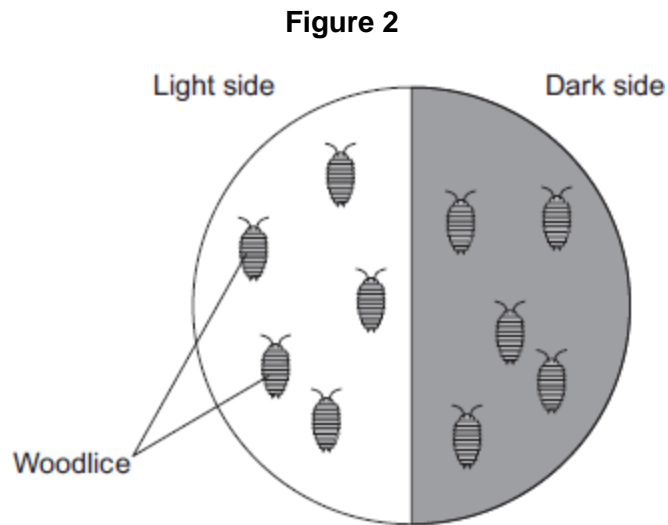
(3)

(c) Animals can react to their surroundings because they have nervous systems.

A student investigated the behaviour of small animals called woodlice.

The student set up the investigation as shown in **Figure 2**.

- The student covered one half of a Petri dish with black paper to make that side of the Petri dish dark.
- The other side had no cover.
- The student put five woodlice into each side of the dish and then put the clear Petri dish lid back on the dish.



After 30 minutes, all the woodlice had moved to the dark side of the Petri dish.

(i) In this investigation, what is the **stimulus** that the woodlice responded to?

(1)

(ii) In this investigation, what is the **response** that the woodlice made?

(1)

(iii) The student concluded that woodlice prefer dark conditions.

Give **two** ways in which the student could improve the investigation to be sure that his conclusion was correct.

1. _____

2. _____

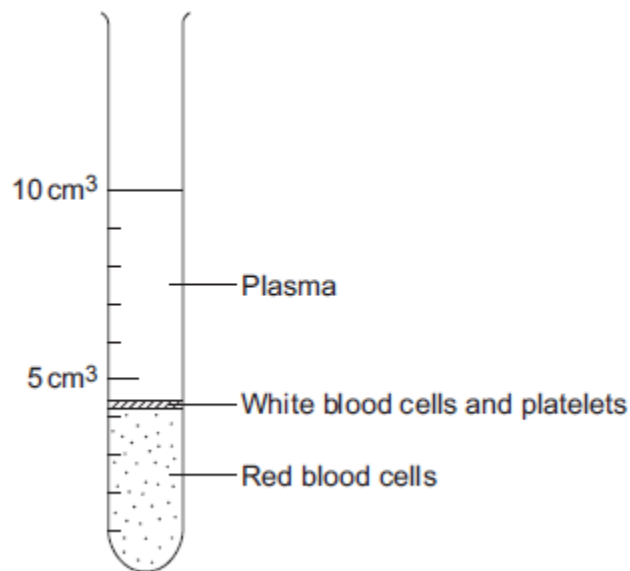
(2)

(Total 9 marks)

4

The parts of the blood can be separated from each other by spinning the blood in a centrifuge.

The image below shows the separated parts of a 10 cm³ blood sample.



(a) Calculate the percentage of the blood that is made up of plasma.

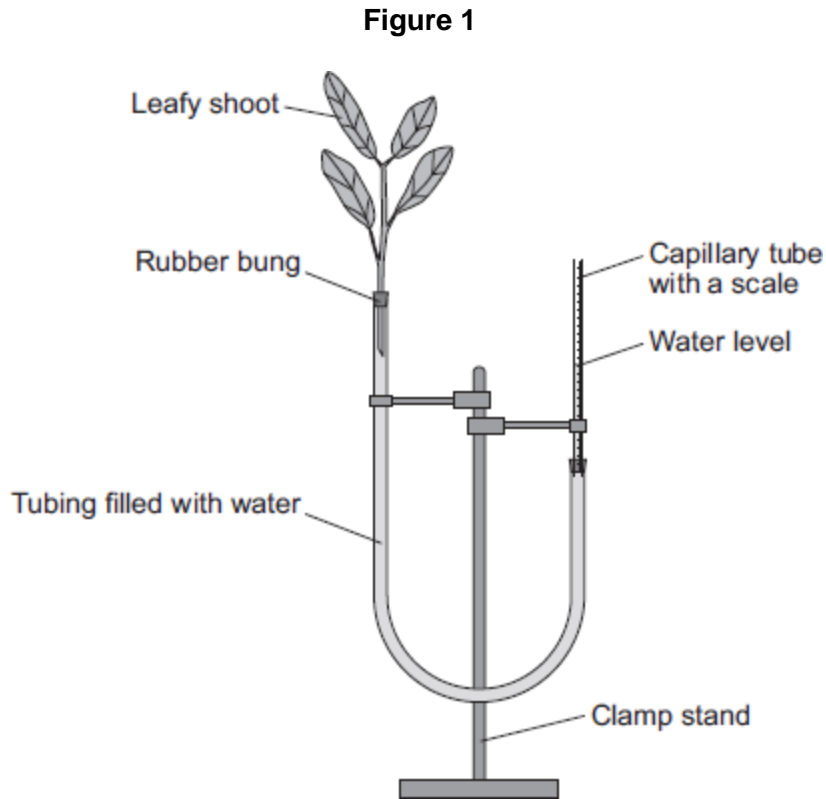
Answer = _____ %

(2)

5

A potometer is a piece of apparatus that can be used to measure water uptake by a leafy shoot.

Figure 1 shows a potometer.



Some students used a potometer like the one shown in **Figure 1**.

- They measured the water taken up by a shoot in normal conditions in a classroom.
- As the water was taken up by the shoot, the level of water in the capillary tube went down.
- The students recorded the level of the water in the capillary tube at 2-minute intervals for 10 minutes.

Table 1 shows the students' results.

Table 1

Time in minutes	0	2	4	6	8	10
Level of water (on scale) in capillary tube in mm	2.5	3.6	4.4	5.4	6.5	7.5

The area of the cross section of the capillary tube was 0.8 mm^2 .

- (a) (i) Complete the following calculation to find the volume of water taken up by the shoot in mm^3 per minute.

Distance water moved along the scale in 10 minutes = _____ mm

Volume of water taken up by the shoot in 10 minutes = _____ mm^3

Therefore, volume of water taken up by the shoot in 1 minute = _____ mm^3

(3)

- (ii) The students repeated the investigation but this time placed the potometer next to a fan blowing air over the leafy shoot.

Suggest how the results would be different. Give a reason for your answer.

(2)

(b) The students repeated the investigation at different temperatures.

The results are shown in **Table 2**.

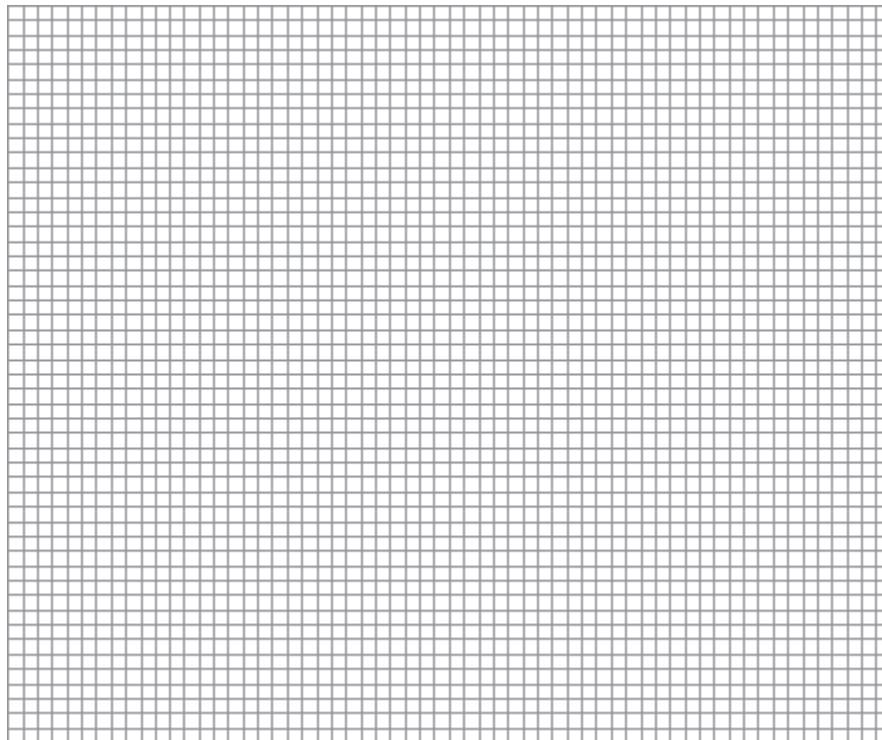
Table 2

Temperature in °C	Rate of water uptake in mm ³ per minute
10	0
15	0.4
20	1.0
25	2.1
30	3.2
35	4.0
40	4.4

Plot the data from **Table 2** on the graph paper in **Figure 2**.

Choose suitable scales, label both axes and draw a line of best fit.

Figure 2



(c) What would happen to the leaves if the potometer was left for a longer time at 40 °C?

Explain your answer.

(3)

(Total 13 marks)

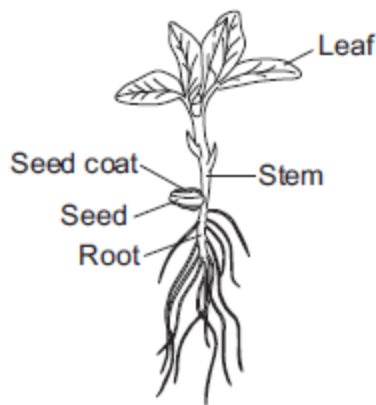
6

Catalase is an enzyme found in many different tissues in plants and animals. It speeds up the rate of the following reaction.



Figure 1 shows a 25-day-old broad bean seedling.

Figure 1



Some students investigated whether different parts of bean seedlings contained different amounts of catalase.

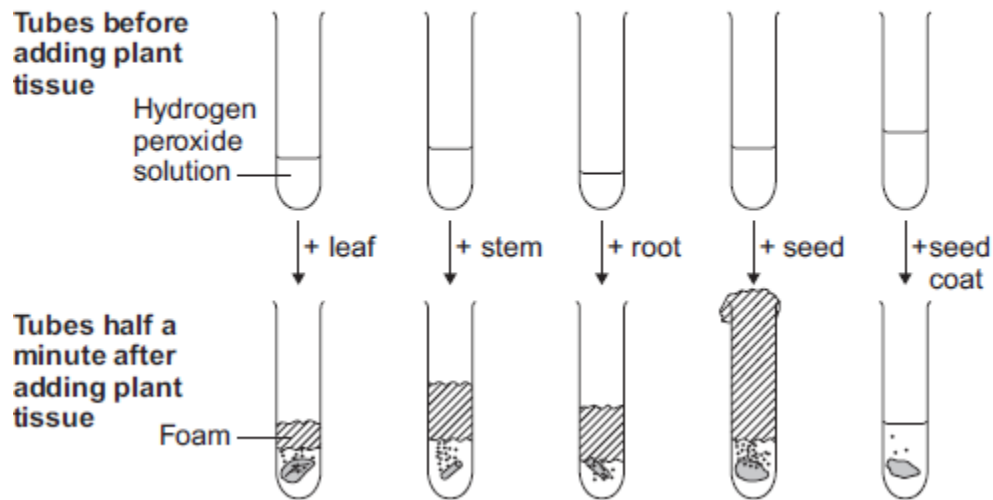
The students:

- put hydrogen peroxide into five test tubes
- added a different part of a bean seedling to each tube
- recorded the results after half a minute.

If there was catalase in part of the seedling, oxygen gas was given off. When oxygen gas is given off, foam is produced in the tubes.

Figure 2 shows the results.

Figure 2



The students made the following conclusions:

- most parts of a bean seedling contain catalase
- the seed contains a lot of catalase
- stems and roots have quite a lot of catalase
- the leaves have a little bit of catalase
- the seed coat has hardly any catalase.

The students' teacher said that the students needed to improve their investigation in order to make valid conclusions.

(a) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Describe how you would carry out an investigation to compare the amounts of catalase in different parts of bean seedlings.

You should include details of how you would make sure your results give a valid comparison of the amounts of catalase.

(6)

(b) Scientists investigated the effect of pH on the activity of the enzyme catalase in a fungus.

The table below shows the scientists' results.

pH	Enzyme activity in arbitrary units					
	Test 1	Test 2	Test 3	Test 4	Test 5	Mean
3.0	0	0	0	0	0	0
4.0	6	5	8	4	7	6
5.0	38	65	41	42	39	
5.5	80	86	82	84	88	84
6.0	100	99	96	103	102	100
6.5	94	92	90	93	91	92
7.0	61	63	61	62	63	62
8.0	22	22	21	24	21	22

(i) Calculate the mean enzyme activity at pH 5.0.

Mean = _____ arbitrary units

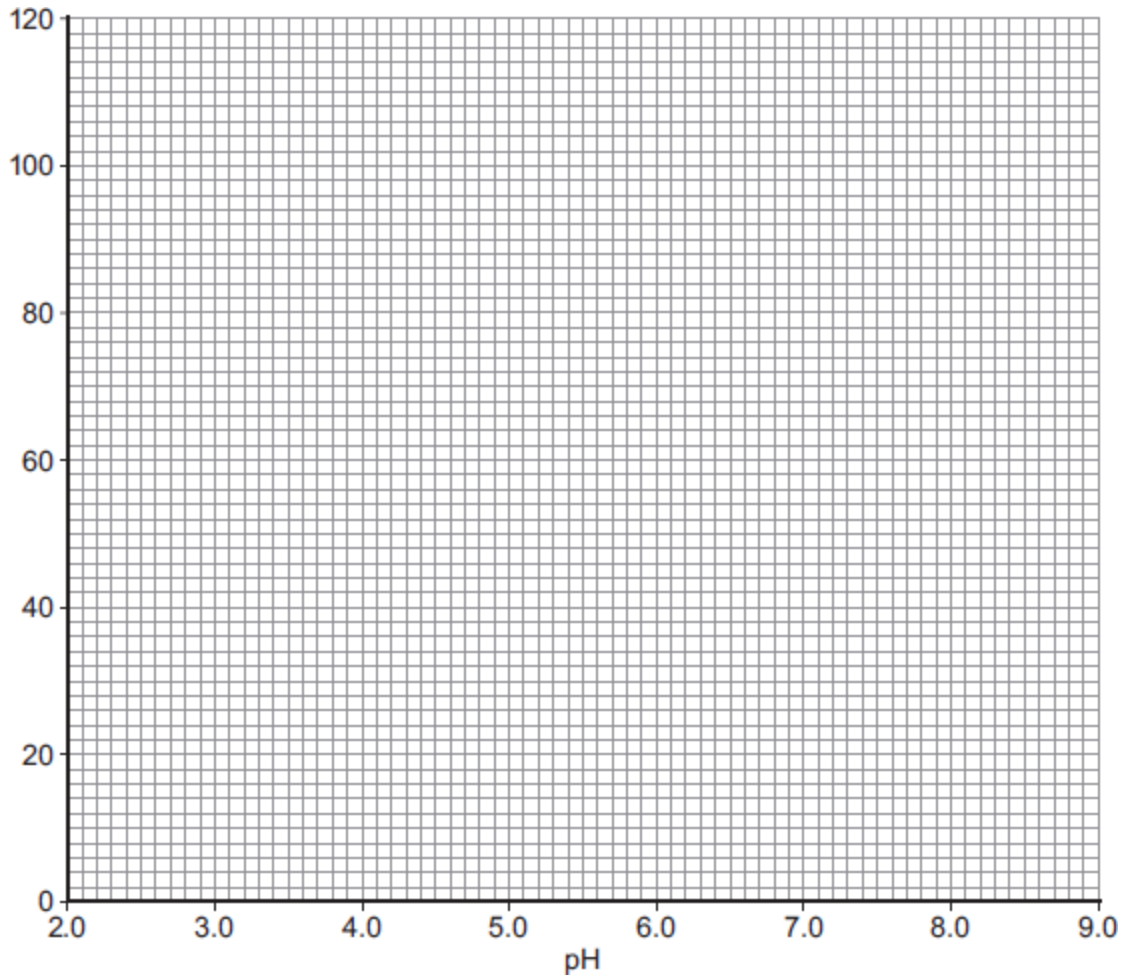
(2)

(ii) On the graph paper in **Figure 3**, draw a graph to show the scientists' results.

Remember to:

- add a label to the vertical axis
- plot the mean values of enzyme activity
- draw a line of best fit.

Figure 3



(4)

(iii) At what pH does the enzyme work best?

(1)

(iv) Predict the activity of the enzyme at pH 9.0.

_____ arbitrary units

(1)

(v) Suggest why the enzyme's activity at pH 3.0 is zero.

(1)

(Total 15 marks)

7

Lipase is an enzyme that digests fat.

(a) (i) Complete the equation to show the digestion of fat.

Use the correct answer from the box.

glucose	glycerol	glycogen
---------	----------	----------

fat $\xrightarrow{\text{lipase}}$ fatty acids + _____

(1)

(ii) Name **one** organ that makes lipase.

(1)

(b) Some students investigated the effect of bile on the digestion of fat by lipase.

The students:

- 1 mixed milk and bile in a beaker
- 2 put the pH sensor of a pH meter into the beaker
- 3 added lipase solution
- 4 recorded the pH at 2-minute intervals
- 5 repeated steps 1 to 4, but used water instead of bile.

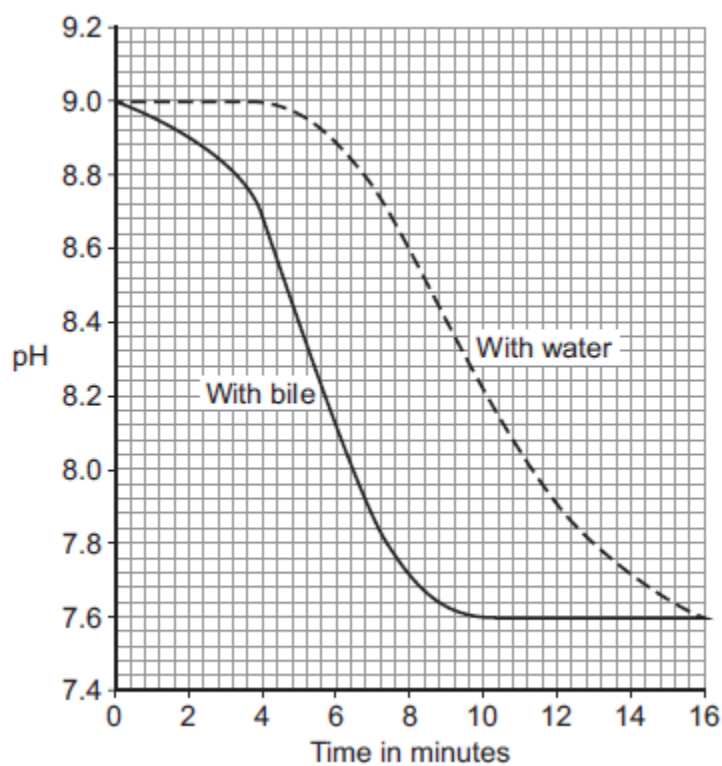
Suggest **two** variables that the students should have controlled in this investigation.

1. _____

2. _____

(2)

(c) The graph shows the students' results.



(i) Why did the pH decrease in both investigations?

(1)

(ii) Bile helps lipase to digest fat.

What evidence is there in the graph to support this conclusion?

(1)

(iii) Suggest **one** reason why the contents of both beakers had the same pH at the end of the investigations.

(1)

(Total 7 marks)

8

The circulatory system transports substances such as glucose and oxygen around the body.

(a) Name **two** other substances that the circulatory system transports around the body.

1. _____

2. _____

(2)

(b) (i) Blood is a tissue. Blood contains red blood cells and white blood cells.

Name **two** other components of blood.

1. _____

2. _____

(2)

(ii) The heart is part of the circulatory system.

What type of tissue is the wall of the heart made of?

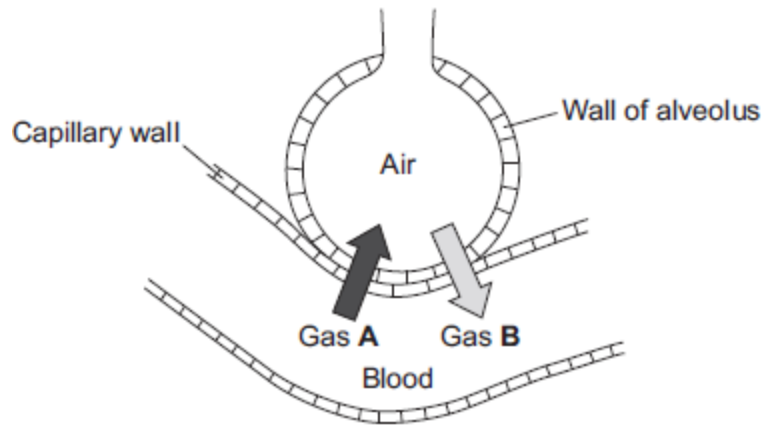
(1)

9

Gas exchange takes place in the lungs.

The diagram shows an alveolus next to a blood capillary in a lung.

The arrows show the movement of two gases, **A** and **B**.



(a) (i) Draw a ring around the correct answer to complete the sentence.

Gases **A** and **B** move by

- diffusion.
- osmosis.
- respiration.

(1)

(ii) Gas **A** moves from the blood to the air in the lungs.

Gas **A** is then breathed out.

Name Gas **A**.

(1)

(iii) Which cells in the blood carry Gas **B**?

Draw a ring around the correct answer.

platelets **red blood cells** **white blood cells**

(1)

(b) The average number of alveoli in each human lung is 280 million.

The average surface area of 1 million alveoli is 0.25 m².

Calculate the total surface area of a human lung.

Answer _____ m²

(2)

- (c) An athlete trains to run a marathon. The surface area of each of the athlete's lungs has increased to 80 m².

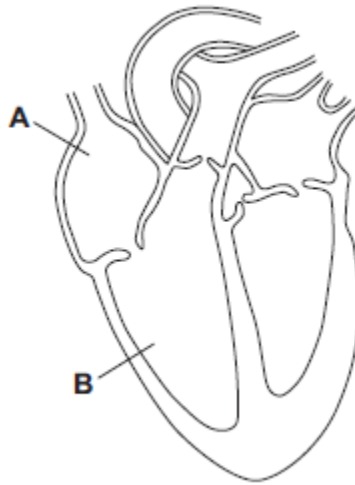
Give **one** way in which this increase will help the athlete.

(1)
(Total 6 marks)

10

Diagram 1 shows a section through the heart.

Diagram 1



- (a) Use words from the box to name the structures labelled **A** and **B** on **Diagram 1**.

arota	atrium	pulmonary artery	ventricle
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A _____

B _____

(2)

(b) The tissue in the wall of the heart contracts.

(i) What type of tissue is this?

Tick (✓) **one** box.

muscular

glandular

epithelial

(1)

(ii) What does the heart do when this tissue contracts?

(1)

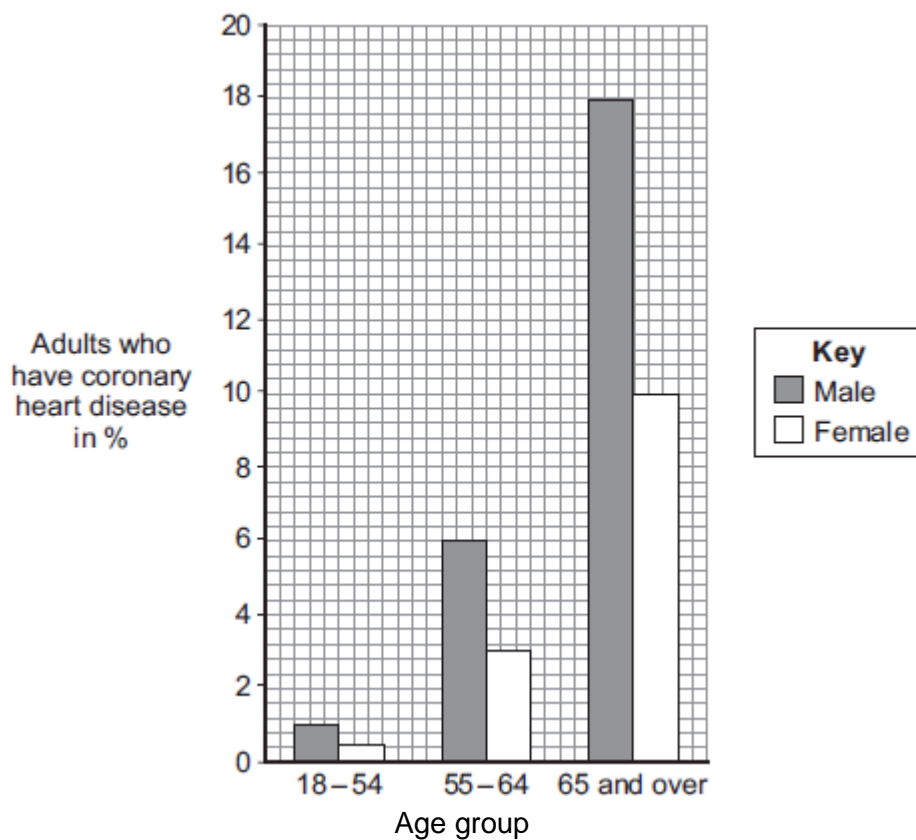
(c) Draw arrows on **Diagram 2** to complete the route taken by deoxygenated blood through the heart.

Diagram 2



(2)

(d) The graph shows the percentage (%) of adults in the UK who have coronary heart disease.



(i) Look at the graph.

Which group of people is **most** at risk of having coronary heart disease in the UK?

(2)

(ii) Explain what happens to the heart in coronary heart disease.

(3)

(Total 11 marks)

11

Malignant tumours are called cancers.

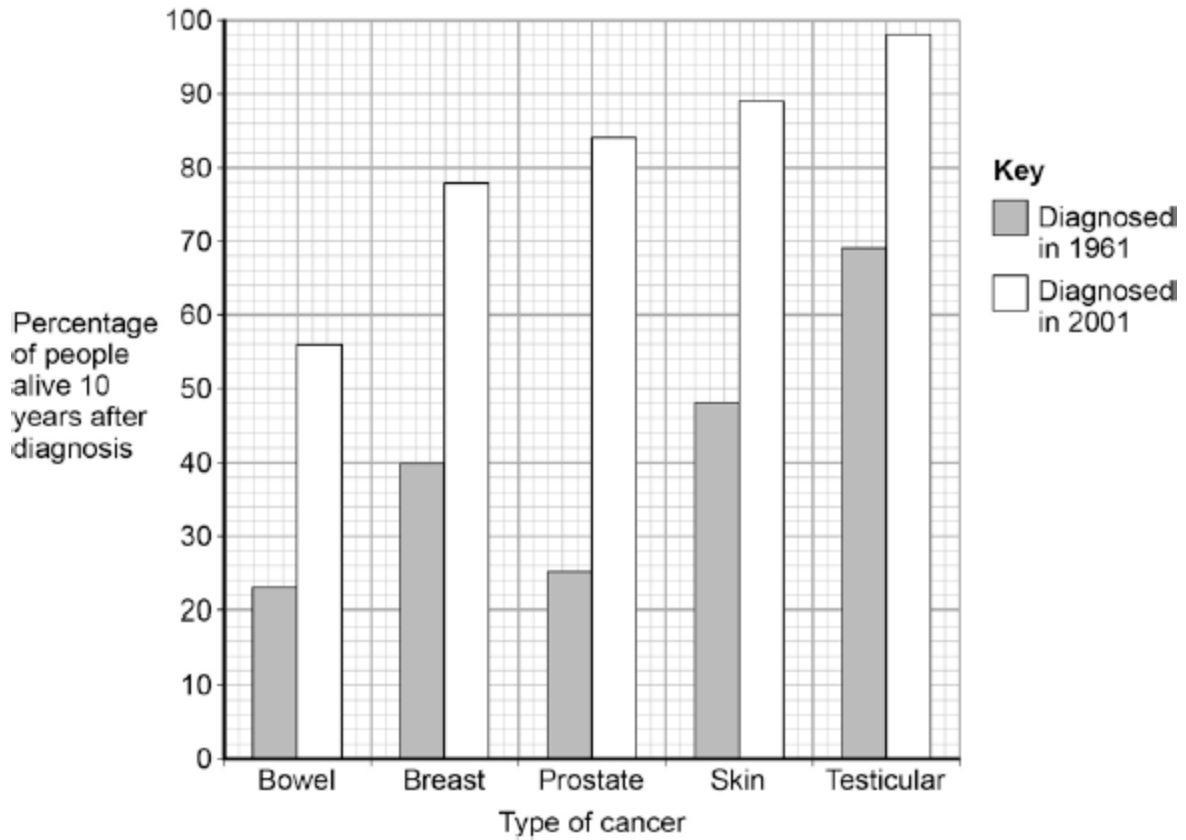
(a) Describe how a tumour can spread to different parts of the body.

(2)

(b) Survival rates for people with cancer have improved a lot.

Some people who are alive 10 years after diagnosis are considered to be cured.

The figure below shows data for people diagnosed with cancer in 1961 and 2001.



Look at the data in the figure above for skin cancer.

Calculate the percentage increase in the survival rate of people diagnosed with skin cancer in 1961 compared to 2001.

Give your answer to **three** significant figures.

Survival rate increase = _____ %

(2)

(c) Look at the data in the figure above for bowel and prostate cancer.

Compare the survival rates for bowel and prostate cancer.

Suggest reasons for the comparisons you have made.

(4)

(Total 8 marks)

12

(a) Blood is made up of four main components.

Red blood cells and white blood cells are two of these components.

Describe the functions of the **two** other components of blood.

(2)

(b) The heart is often described as a **double pump**.

Describe why.

(1)

13

Coronary heart disease (CHD) can be caused by many factors.

The table below shows data related to CHD for five countries.

Country	Number of deaths from CHD per 100 000 population per year	Percentage of the population who smoke tobacco	Percentage of the population who drink alcohol heavily	Amount of fruit and vegetables eaten in kg per person per year
A	285	36	19	180
B	251	63	34	404
C	186	47	36	251
D	149	23	34	218
E	128	27	12	222

(a) Name **one** risk factor for CHD that is **not** shown in the table above.

(1)

(b) A student concludes that the main cause of CHD is not eating enough fruit and vegetables.

Give **three** reasons why the student's conclusion is **not** correct.

Use information from the table above.

(3)

(b) A student is given samples of two fluids.

One fluid is from the phloem of a plant and one from the xylem of a plant.

The student is asked to work out which fluid is from the phloem and which is from the xylem.

She measures the pH and the concentrations of sugar, nitrate ions and potassium ions of each fluid.

The table below shows the student's results.

	Fluid A	Fluid B
pH	7.3	5.6
Sugar in mg / cm ³	118	1.18
Nitrate ions in mg / cm ³	10	600
Potassium ions in µg / cm ³	1.18	2500

Which fluid is from the phloem, and which is from the xylem?

Explain your answer.

Use the information from the table above.

(4)

(c) In fluid **A**, how many times greater is the concentration of sugar than the concentration of potassium ions?

(2)

(d) The concentration of potassium ions in the soil is $3.9 \mu\text{g} / \text{cm}^3$

The concentration of potassium ions in the root tissue is $2500 \mu\text{g} / \text{cm}^3$

Explain why the concentration is so much higher in the roots than in the soil.

(3)

(Total 10 marks)

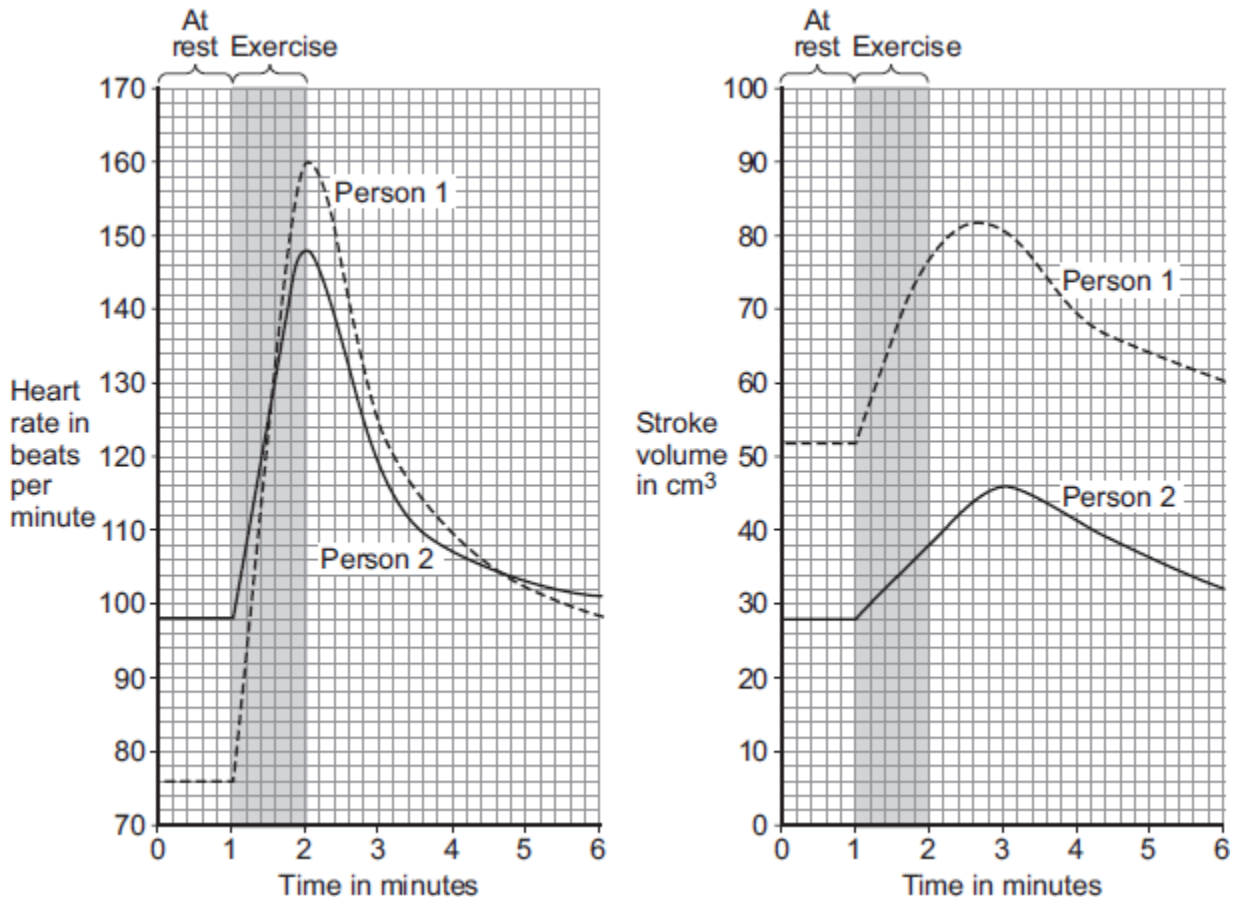
15

During exercise, the heart beats faster and with greater force.

The 'heart rate' is the number of times the heart beats each minute. The volume of blood that travels out of the heart each time the heart beats is called the 'stroke volume'.

In an investigation, **Person 1** and **Person 2** ran as fast as they could for 1 minute. Scientists measured the heart rates and stroke volumes of **Person 1** and **Person 2** at rest, during the exercise and after the exercise.

The graph below shows the scientists' results.



(a) The 'cardiac output' is the volume of blood sent from the heart to the muscles each minute.

$$\text{Cardiac output} = \text{Heart rate} \times \text{Stroke volume}$$

At the end of the exercise, **Person 1's** cardiac output = $160 \times 77 = 12\,320 \text{ cm}^3$ per minute.

Use information from **Figure above** to complete the following calculation of **Person 2's** cardiac output at the end of the exercise.

At the end of the exercise:

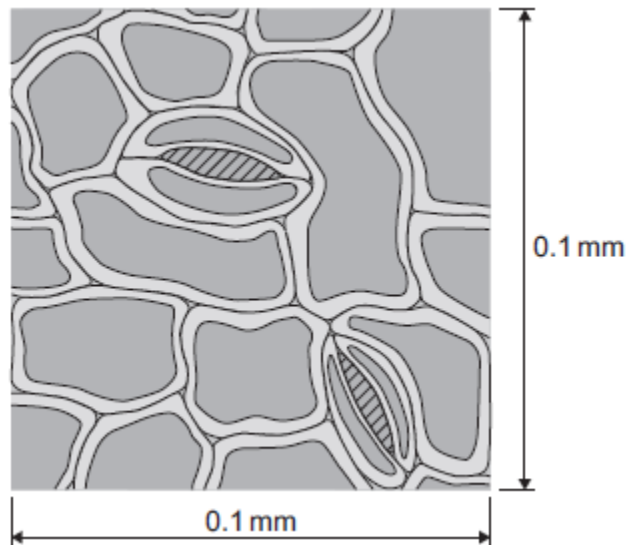
Person 2's heart rate = _____ beats per minute

Person 2's stroke volume = _____ cm^3

Person 2's cardiac output = _____ cm^3 per minute

(3)

(b) The image below shows part of the surface of a leaf.



The length and width of this piece of leaf surface are both 0.1 mm.

(i) Calculate the number of stomata per mm^2 of this leaf surface.

_____ per mm^2

(2)

(ii) A different plant species has 400 stomata per mm^2 of leaf surface.

Having a large number of stomata per mm^2 of leaf surface can be a disadvantage to a plant.

Give **one** disadvantage.

(1)

(c) A student investigated the loss of water from plant leaves.

The student did the following:

- Step 1: took ten leaves from a plant
- Step 2: weighed all ten leaves
- Step 3: hung the leaves up in a classroom for 4 days
- Step 4: weighed all ten leaves again
- Step 5: calculated the mass of water lost by the leaves
- Step 6: repeated steps 1 to 5 with grease spread on the upper surfaces of the leaves
- Step 7: repeated steps 1 to 5 with grease spread on both the upper and lower surfaces of the leaves.

All the leaves were taken from the same type of plant.

The table below shows the student's results.

Treatment of leaves	Mass of water the leaves lost in g
No grease was used on the leaves	0.98
Grease on upper surfaces of the leaves	0.86
Grease on upper and lower surfaces of the leaves	0.01

(i) What mass of water was lost in 4 days through the upper surfaces of the leaves?

Mass = _____ g

(1)

- (ii) Very little water was lost when the lower surfaces of the leaves were covered in grease.

Explain why.

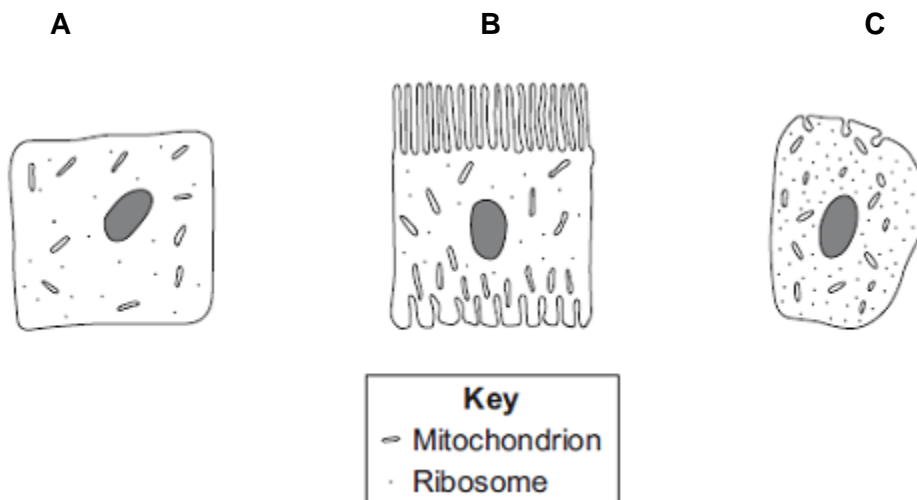
(3)

(Total 9 marks)

(Total 4 marks)

18

Diagrams **A**, **B** and **C** show cells from different parts of the human body, all drawn to the same scale.



(a) Which cell, **A**, **B** or **C**, appears to be best adapted to increase diffusion into or

out of the cell?

Give **one** reason for your choice.

(1)

(b) (i) Cell **C** is found in the salivary glands.

Name the enzyme produced by the salivary glands.

(1)

(ii) Use information from the diagram to explain how cell **C** is adapted for producing this enzyme.

(2)

(Total 4 marks)

19

Fresh milk is a mixture of compounds including lipid, protein and about 5% lactose sugar.

Lactose must be digested by the enzyme lactase, before the products can be absorbed.

Lactase can be added to fresh milk to pre-digest the lactose. This makes 'lactose-free' milk, which is suitable for people who do not produce enough lactase of their own.

A student investigated the effect of changing pH and temperature on the digestion of lactose in milk.

The results are shown in **Tables 1** and **2**.

Table 1
Effect of pH

pH	Time taken to digest lactose in minutes
4.0	20
5.0	18
6.0	13
7.0	7
8.0	5
9.0	6

Table 2
Effect of temperature

Temperature in °C	Time taken to digest lactose in minutes
25	20
30	14
35	11
40	6
45	29
50	No digestion

(a) The label on a carton of lactose-free milk states:

'Lactase is normally produced in the stomach of mammals.'

The results in **Table 1** suggest that this statement is **not** true.

Explain how.

(2)

(b) Explain, as fully as you can, the results shown in **Table 2** .

(3)

(c) Bile is produced in the liver and is released into the small intestine.

Bile helps the digestion of lipid in the milk.

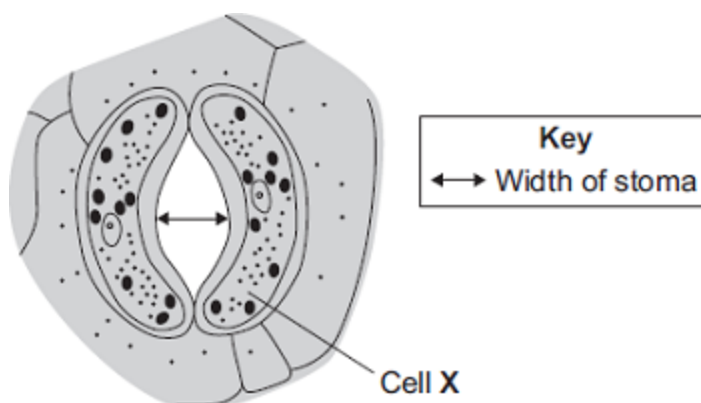
Describe how.

(2)

(Total 7 marks)

20

Plant leaves have many stomata.
The diagram shows a stoma.



(a) Name cell X _____

(1)

(b) The table shows the mean widths of the stomata at different times of the day for two different species of plant.

Species **A** grows in hot, dry deserts.

Species **B** grows in the UK.

	Time of day in hours	Mean width of stomata as a percentage of their maximum width	
		Species A	Species B
Dark	0	95	5
	2	86	5
	4	52	6
Light	6	6	40
	8	4	92
	10	2	98
	12	1	100
	14	0	100
	16	1	96
	18	5	54
Dark	20	86	6
	22	93	5
	24	95	5

The data in the table show that species **A** is better adapted than species **B** to living in hot, dry deserts.

Explain how.

(4)

(Total 5 marks)

Mark schemes

1

(a) any **two** from:

- same result at pH 7 and 7.5
or
could be any pH between 7 and 7.5
or
not tested at pH 7.25
or
need to test at smaller pH intervals (between 7 and 7.5)
- accuracy of result only to nearest 0.5 minutes
- no repeats
- difficult to determine end point (colour)

2

(b) 2.7 / 5

1

0.54 (units per minute)

allow 0.52 with no working shown for 2 marks

1

*allow 1 mark for 0.52 **or** 0.56*

(c) (after 10 minutes) solution goes black

1

(after 60 minutes) solution stays the same

or

does not go black

or

goes slightly orange

1

(d) steeper curve

1

levels off at 11.8 units **and** before 45 minutes

1

[8]

2

(a) any **two** from:

- to work out the correct dose to be given
- to check that the drug is working correctly
- to check for toxic effects.

2

(b) patients are randomly allocated to receive statin or a placebo

1

so neither patient nor doctor knows who has received which

1

answer in terms of only the drug company knows who is taking the statin or the placebo gains 2 marks

(c) To prevent false claims 1

(d) drug **A** reduced the blood cholesterol level more than drug **B** 1

drug **A** reduced the thickness of the artery **or** drug **B** increased the thickness of the artery
allow drug A made the artery thinner or drug B made the artery thicker

ignore side effects

(e) differences in number of patients reporting side effects are very similar 1

we don't know what the patients died of 1

[9]

3 (a) tissue → organ → organ system
one right for 1 mark
three right for 2 marks 2

(b) **Epithelial tissue** → covers the outside and the inside of the stomach
more than one line from a tissue = no mark 1

Glandular tissue → produces digestive juices 1

Muscular tissue → allows food to be churned around the stomach 1

(c) (i) light
ignore dark 1

(ii) moving (to the dark) 1

(iii) any **two** from:

- use more woodlice
- repeat the experiment
- run for a longer time

 2

[9]

4

(a) 55%

2 marks for correct answer alone

accept 54 – 56

5.5 / 10 × 100 alone gains 1 mark

2

(b) any **three** from:

- amino acids
- antibodies
- antitoxins
- carbon dioxide
- cholesterol
- enzymes
- fatty acid
- glucose
- glycerol
- hormones / named hormones
- ions / named ions
- proteins
- urea
- vitamins
- water.

ignore blood cells and platelets

ignore oxygen

max 1 named example of each for ions and hormones

allow minerals

3

(c) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best-fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1 – 2 marks)

There is a description of pathogens with errors or roles confused.

or

the immune response with errors or roles confused.

Level 2 (3 – 4 marks)

There is a description of pathogens **and** the immune response with some errors or confusion

or

a clear description of either pathogens **or** the immune response with few errors or little confusion.

Level 3 (5 – 6 marks)

There is a good description of pathogens **and** the immune response with very few errors or omissions.

Examples of biology points made in the response:

- bacteria and viruses are pathogens
credit any ref to bacteria and viruses
- they reproduce rapidly inside the body
- bacteria may produce poisons / toxins (that make us feel ill)
- viruses live (and reproduce) inside cells (causing damage).

white blood cells help to defend against pathogens by:

- ingesting pathogens / bacteria / (cells containing) viruses
credit engulf / digest / phagocytosis
- to destroy (particular) pathogen / bacteria / viruses
- producing antibodies
- to destroy particular / specific pathogens
- producing antitoxins
- to counteract toxins (released by pathogens)
credit memory cells / correct description
- this leads to immunity from that pathogen.

6
[11]

5	(a) (i) 5.0	1
	(5 × 0.8) or 4	
	<i>allow ecf from distance</i>	1
	0.4	
	<i>allow ecf from 10-min volume</i>	1
	(ii) increased (rate of uptake)	1
	more transpiration / evaporation	1
	(b) correct scales	
	<i>allow reversed axes</i>	1
	correctly labelled axes with units	1
correct points		
<i>one plot error = max 1 mark</i>	2	
curved line of best fit		
<i>allow correct straight line</i>	1	

(c) leaves wilt

1

because plants lose too much water (by evaporation)

1

through the stomata

or

because cells become plasmolysed

or

stomata close

controlled by guard cells

to prevent wilting

1

[13]

6

(a) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking guidance and apply a 'best-fit' approach to the marking.

0 marks

No relevant content.

Level 1 (1–2 marks)

The method described is weak and could not be used to collect valid results, however does show some understanding of the sequence of an investigation.

Level 2 (3–4 marks)

The method described could be followed and would enable some valid results to be collected, but lacks detail.

Level 3 (5–6 marks)

The method described could be easily followed and would enable valid results to be collected.

Examples of the points made in the response:

- bean seedlings of same age
- cut material from same part of each organ (for repeats) e.g. top 1 cm of stem / a whole cotyledon / seed
- equal mass of each organ
accept weight for mass
- grind / homogenise
- in equal amounts of water / buffer
- equal volumes of hydrogen peroxide solution
- equal concentrations of hydrogen peroxide solution
- same temperature
- temperature maintained in water bath
- quantitative measure of gas production eg height of foam in mm / collect gas in graduated syringe in cm³
- for same time period
- repetitions (3+ times)
- calculate mean for each.

6

- (b) (i) correct answer: 40
 1 mark for 45 as the anomalous result has been included in the calculation
 or
 1 mark for $\frac{(38 + 41 + 42 + 39)}{4}$
 or $\frac{160}{4}$ 2
- (ii) vertical axis correctly labelled:
 'Enzyme activity in arbitrary units'
 allow ecf from (b)(i) 1
- points plotted correctly ± 1 mm
 deduct 1 mark for each incorrect plot 2
- suitable line of best fit
 not feathery, not point to point 1
- (iii) 6.0 / 6
 allow ± 0.1
 if 6.0 not given, allow correct for candidate's graph ± 0.1 1
- (iv) in range 0 to 14 units
 allow correct for candidate's graph 1
- (v) enzyme denatured / enzyme (active site) shape changed
 allow substrate no longer fits (active site)
 ignore reference to temperature
 do not allow enzyme dies 1
- [15]**
- 7** (a) (i) glycerol 1
- (ii) pancreas / small intestine
 accept duodenum / ileum
 ignore intestine unqualified 1

(b) any **two** from:

- type of milk
- volume / amount of milk
- vol. bile equals vol. water
- volume of lipase
- concentration of lipase
- temperature

ignore time interval

ignore solution unqualified

*do **not** allow pH*

ignore starting pH

ignore volume / amount of bile / water

ignore concentration of bile

accept amount of lipase if neither volume nor concentration given

2

(c) (i) fatty acid (production)

1

(ii) faster reaction / digestion (with bile)

or

pH decreases faster (with bile)

or

takes less time (with bile)

or

steeper fall / line (with bile)

allow use of data

ignore easier

1

(iii) all fat / milk digested

or

same amount of fatty acids present

or

(lower pH) denatures the enzyme / lipase

allow all reactants used up

ignore reference to neutralisation

allow enzyme won't work at low pH

*do **not** allow enzyme killed*

1

[7]

8

(a) any **two** from:

- carbon dioxide / CO₂
- urea
- protein
- water / H₂O
- hormones / insulin.

ignore food / waste / alcohol / drugs / enzymes

ignore glucose and oxygen

*allow **two** correct hormones for 2 marks*

*allow **two** correct food components for 2 marks*

allow antibodies

allow antitoxins

2

(b) (i) plasma

1

platelets

1

(ii) (cardiac) muscle

allow muscular

1

(c) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the Marking Guidance and apply a 'best-fit' approach to the marking.

0 marks

No relevant content

Level 1 (1–2 marks)

There is a description of at least one advantage of the cow tissue valve

or

a description of at least one disadvantage of the cow tissue valve.

Level 2 (3–4 marks)

There is a description of at least one advantage of the cow tissue valve

and

at least one disadvantage of the cow tissue valve.

Level 3 (5–6 marks)

There is a description of the advantages and disadvantages of the cow tissue valve

or

a description of several advantages of the cow tissue valve and at least one disadvantage.

Examples of the points made in the response

Advantages of cow tissue valve:

- abundant supply of cows
- so shorter waiting time
ignore can take many years to find a suitable human donor
- no need for tissue typing
- quicker operation
- less invasive **or** shorter recovery time
- cheaper operation costs
- less operation / anaesthetic risks.

Disadvantages of cow tissue valve:

- made from cow so possible objections on religious grounds
ignore ethical arguments
- new procedure so could be unknown risks
allow possible transfer of disease from cow
- risks of using a stent eg. blood clots, stent breaking or valve tearing
- not proven as a long term treatment
- may be rejected
ignore information copied directly from the table without value added.

6
[11]

- 9** (a) (i) diffusion 1
- (ii) carbon dioxide
accept CO₂ / CO₂
*do **not** accept CO²* 1
- (iii) red blood cells 1
- (b) 70
if no / incorrect answer then
70 000 000
or
280 x 0.25 gains 1 mark
ignore doubling the answer 2
- (c) allows more gas / oxygen / CO₂
(exchange)
*do **not** accept air* 1

[6]

10

(a) A - atrium

ignore references to right / left

1

B - ventricle

1

(b) (i) muscular

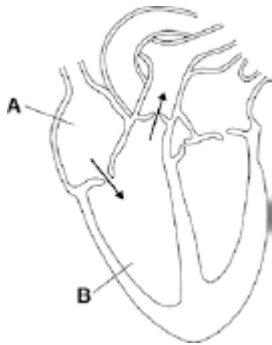
1

(ii) push blood

accept pump / force

1

(c)



arrows approx as indicated

1

arrow(s) showing flow from A to B
from B out / up / to artery

1

(d) (i) male

1

65 and over

1

(ii) fatty deposits / material in (coronary) arteries

allow correct points made about heart attacks

1

narrows / blocks / reduces flow

1

decreases oxygen supply (to heart muscle)

1

[11]

11

(a) cells can break off

allow cells invade other tissues

1

travel in blood

accept travel in lymph (fluid)

1

(b) $\frac{(89 - 48)}{48} \times 100 = 85.416\bar{6}$

1

85.4 (%)

allow 85.4 (%) with no working shown for 2 marks)

1

(c) any **two** from:

- similar survival rates for diagnosis in 1961
- survival rate (for diagnosis in 2011) is 1.5 times greater for prostate cancer compared to bowel cancer
- (survival rates) have improved for both cancers
- (survival rate) for prostate cancer has improved more

*accept survival rate for bowel cancer has increased 2.4 times **but** for prostate cancer 3.4 / 3.36 times*

2

plus **two** from:

- earlier diagnosis
- improved screening programmes
- improved drugs
- difference in level of aggression of cancers
- difference in ease of removing tumours

reason must be correctly linked to comparison

2

[8]

12

(a) plasma transports proteins / dissolved substances / food (molecules) / urea / hormones

or

blood cells are suspended in the plasma

1

platelets are involved in blood clotting

1

(b) the right side of the heart pumps blood to the lungs

and

the left side of the heart pumps blood around (the rest of) the body

1

(c) **Level 3 (5–6 marks):**

A detailed and coherent evaluation is provided which considers a range of relevant points and comes to a conclusion consistent with the reasoning.

Level 2 (3–4 marks):

An attempt to relate relevant points and come to a conclusion. The logic may be inconsistent at times but builds towards a coherent argument.

Level 1 (1–2 marks):

Discrete relevant points made. The logic may be unclear and the conclusion, if present, may not be consistent with the reasoning.

0 marks:

No relevant content

Indicative content

pros of statins:

- decreases blood cholesterol
- slows down build-up of fatty material in arteries
- (so) blood can flow to heart muscle cells

cons of statins:

- drug has to be taken regularly **or** may forget to take drug
- drug will need to be taken long-term
- side-effects of taking the drug
- effects of drug will take time to happen

pros of stents:

- blocked artery is held open
- (so) blood can flow to heart muscle cells
- will remain in place / work for a long time
- rapid recovery time

cons of stents:

- risk of infection from procedure
- risk of surgery eg heart attack
- risk of thrombosis **or** blood clot

a justified conclusion

6

[9]

13

(a) (lack of) exercise

allow description of type or amount of exercise

1

allow other risk factors not mentioned in table, eg high cholesterol levels, blood pressure, levels of obesity, diabetes

- (b) the second highest death rate has the highest fruit and vegetable consumption
the lowest death rates don't have high fruit and vegetable consumption
lowest death rates have a low percentage of the population that smokes.

3

- (c) (it builds up) inside the coronary arteries

1

(causing) them to narrow

1

(this) reduces blood flow

1

so less oxygen gets to the heart muscle

1

- (d) (statins) reduce cholesterol in the blood

1

so there is less build up of fatty material (in coronary arteries)

allow slows the rate of fat deposit

1

[10]

14

- (a) xylem

1

- (b) **A** is phloem, **B** is xylem

1

any **three** from:

- phloem transports sugars
- there are more sugars in fluid A
- xylem transports mineral ions / potassium ions / nitrate ions
- there are more mineral ions in fluid B.

3

- (c) correct conversion of 1.18 μg to mg / cm^3

1

$$\frac{118}{0.00118} = 100\,000$$

allow 1 mark for 100 (ie no conversion to mg)

allow 100 000 with no working shown for 2 marks

1

- (d) potassium ions are transported into the root

1

against a concentration gradient

1

by active transport

1

[10]

15

(a) 5624

allow 2 marks for:

- correct HR = 148 **and** correct SV = 38 plus wrong answer / no answer

or

- only one value correct **and** ecf for answer

allow 1 mark for:

- incorrect values **and** ecf for answer

or

- only one value correct

3

(b) (i) **Person 2** has low(er) stroke volume / SV / described
eg **Person 2** pumps out smaller volume each beat
do **not** allow **Person 2** has lower heart rate

1

(ii) **Person 1** sends more blood (to muscles / body / lungs)

1

(which) supplies (more) oxygen

1

(and) supplies (more) glucose

1

(faster rate of) respiration **or** transfers (more) energy for use

ignore aerobic / anaerobic

allow (more) energy release

allow aerobic respiration transfers / releases more energy (than anaerobic)

do not allow makes (more) energy

1

removes (more) CO₂ / lactic acid / heat

allow less oxygen debt

or less lactic acid made

or (more) muscle contraction / less muscle fatigue

if no other mark awarded,

allow person 1 is fitter (than person 2) for max 1 mark

1

[9]

16

- (a) (i) guard (cells)
allow phonetic spelling 1
- (ii) any **one** from:
ignore reference to cells
- allow carbon dioxide to enter
allow control loss / evaporation of water or control transpiration rate
 - allow oxygen to leave.
allow 'gaseous exchange' 1
- (b) (i) 200
correct answer gains 2 marks with or without working
allow 1 mark for $0.1 \times 0.1 = 0.01$ (mm²) 2
- (ii) more / a lot of / increased water loss
allow plant more likely to wilt (in hot / dry conditions) 1
- (c) (i) 0.12 1
- (ii) the lower surface has most stomata 1
- stomata are now covered / blocked (by grease) 1
- so water cannot escape / evaporate from the stomata
ignore waterproof
to gain credit stomata must be mentioned at least once 1

[9]

17

- A + B most effective (treatment)
ignore descriptions of LDL levels 1
- D is (the most) effective (treatment)
D is the best single (treatment) 1
- neither A nor B (alone) are effective
allow increase risk of heart disease instead of not effective 1

can't tell if C is effective

OR

A + C is not effective

1

[4]

18

(a) **B**

*no mark for "B" alone, the mark is for B **and** the explanation.*

large(r) surface / area **or** large(r) membrane

accept reference to microvilli

ignore villi / hairs / cilia

accept reasonable descriptions of the surface eg folded membrane / surface

*do **not** accept wall / cell wall*

1

(b) (i) any **one** from:

- (salivary) amylase
- carbohydrase

1

(ii) many ribosomes

*do **not** mix routes. If both routes given award marks for the greater.*

1

ribosomes produce protein

accept amylase / enzyme / carbohydrase is made of protein

or

(allow)

many mitochondria (1)

mitochondria provide energy to build / make protein (1)

accept ATP instead of energy

1

[4]

19

(a) stomach is acidic / has low pH

allow any pH below 7

ignore stomach is not alkaline

1

lactase works best / well in alkali / high pH / neutral / non-acidic conditions

allow any pH of 7 and above

accept works slowly in acid conditions

*allow figures from table with a **comparison***

ignore reference to temperature

1

(b) any **three** from:

- (below 40(°C)) increase in temperature increases rate / speed of reaction
- reference to molecules moving faster / colliding faster / harder / more collisions
- enzyme optimum / works best at 40°C
allow value(s) in range 36 – 44
ignore body temperature unless qualified
- high temperatures (above 40°C) / 45°C / 50°C enzyme denatured
*allow synonyms for denaturation, but do **not** allow 'killed'*
*denaturation at high and low temperature does **not** gain this mark*
ignore references to time / pH

3

(c) any **two** from:

- acid neutralised or conditions made neutral / alkali
accept bile is alkaline
- (allow) emulsification / greater surface area (of lipid / fat)
allow description of emulsification eg fat broken down / broken up into droplets
*do **not** accept idea of chemical breakdown*
- lipase / enzymes (in small intestine) work more effectively / better
allow better for enzymes
ignore reference to other named enzymes

2

[7]

20

(a) guard cell

ignore stoma / stomata

1

(b) Species A :

allow converse points for species B

stomata open in dark / at night **or** close in light / in day

1

stomata closed during warm(est) period **or** open when cool(er)

1

heat (energy) /warmth increases evaporation / transpiration
must give explicit link between heat and transpiration

1

reduces water loss / evaporation / transpiration
ignore photosynthesis

1

[5]