



**Topic Test: OxfordAQA**  
**International GCSE Biology 9201**  
Bioenergetics

Name: \_\_\_\_\_

Class: \_\_\_\_\_

Date: \_\_\_\_\_

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Time: **73 minutes**

Marks: **73 marks**

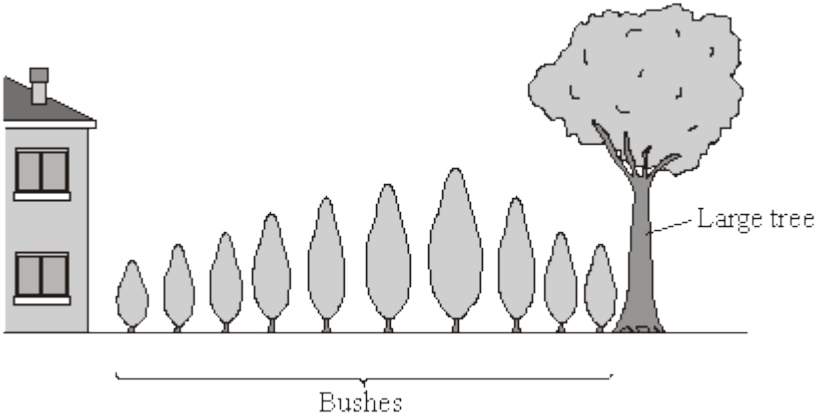
Comments:

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1

The diagram shows bushes in a hedge growing near to a house.

The bushes were the same species and the same age.



- (a) (i) The student said, "I have noticed that the short bushes grow next to the house. I think that the more light the bushes get, the faster they will grow."

Draw lines to match each of the student's statements to the correct term.

Draw only two lines.

Statement	Term
The short bushes grow next to the house.	A conclusion
Plants will grow faster if they get more light.	A prediction
	An observation

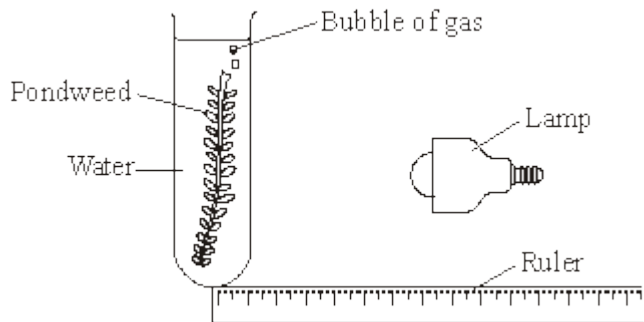
(2)

- (ii) Complete the word equation for photosynthesis.

\_\_\_\_\_ + water (+ light energy) ® \_\_\_\_\_ + oxygen

(2)

- (b) The student decided to investigate the effect of light intensity on the rate of photosynthesis. She used the apparatus shown in the diagram.



She measured the rate of photosynthesis by counting the number of gas bubbles given off each minute.

- (i) Suggest how the student varied the intensity of the light received by the pondweed.

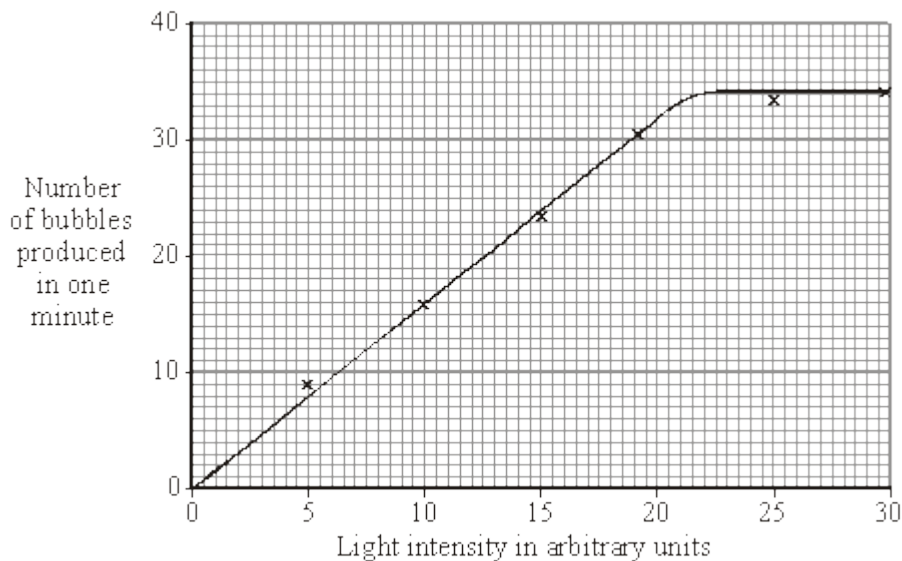
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(1)

- (ii) The student's results are shown on the graph.



Describe the pattern shown on the graph.

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(2)

(iii) This is what the student wrote for her conclusion.

“Increasing the light intensity increases the rate of photosynthesis of the pondweed.”

Why was her conclusion incomplete?

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(1)

(Total 8 marks)

2

Substances are transported through plants.

(a) Use the correct answer from the box to complete each sentence.

<b>capillary</b>	<b>guard cells</b>	<b>phloem</b>
<b>stomata</b>	<b>transpiration</b>	<b>xylem</b>

(i) Water is transported from the roots to the stem of a plant

in the \_\_\_\_\_ .

(1)

(ii) Dissolved sugars are transported through the plant

in the \_\_\_\_\_ .

(1)

(iii) Movement of water through the plant is called the

\_\_\_\_\_ stream.

(1)

(iv) Water vapour moves out of the plant through pores

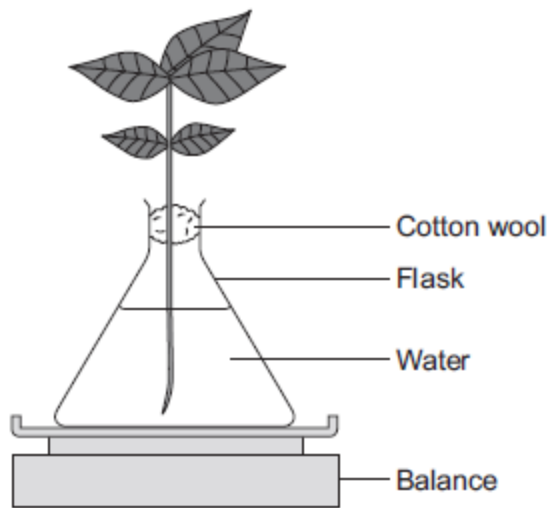
called \_\_\_\_\_ .

(1)

(b) Students investigated the effect of different conditions on water loss from leaves.

The apparatus is shown in **Figure 1**.

**Figure 1**



The students set up four flasks, **A**, **B**, **C** and **D**.

The students:

- used the same size plant shoot in each flask
- recorded the mass of the flask and plant shoot at the start of each experiment
- left each flask and plant shoot in different conditions
- recorded the mass of each flask and plant shoot after 2 hours.

**Table 1** shows the conditions that flasks **A**, **B**, **C** and **D** were left in for 2 hours.

**Table 1**

Flask	Temperature in °C	Fan or no fan
<b>A</b>	20	No Fan
<b>B</b>	20	Fan
<b>C</b>	35	No Fan
<b>D</b>	35	Fan

(i) Suggest why the students used cotton wool in each flask.

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(1)

- (ii) The use of the same size of plant shoot made the investigation a fair test.

Explain why.

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(2)

- (iii) **Table 2** shows the students' results.

**Table 2**

Flask	Conditions		Mass at the start in grams	Mass after 2 hours in grams	Mass of water lost in 2 hours in grams
	Temperature in °C	Fan or no fan			
A	20	No Fan	150.0	148.1	1.9
B	20	Fan	152.0	148.5	3.5
C	35	No Fan	149.0	145.9	3.1
D	35	Fan	150.0	145.5	

What mass of water was lost by the plant shoot in flask **D**?

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\_\_\_\_\_ grams

(1)

- (iv) Suggest what conclusion can be made about the effect of temperature on water loss from the plant shoot.

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(1)

- (v) Suggest what conclusion can be made about the effect of the fan on water loss from the plant shoot.

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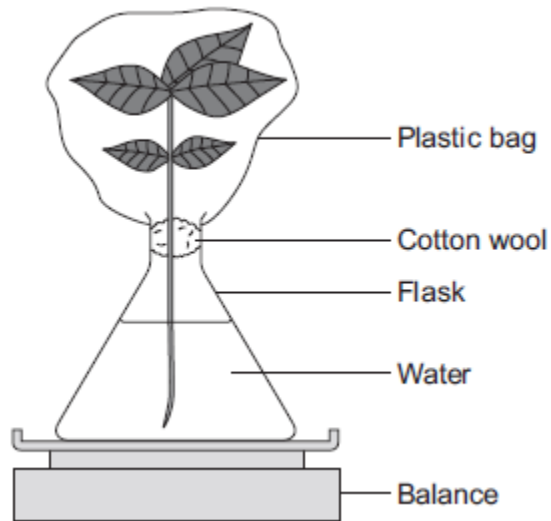
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(1)

- (c) The students carried out another experiment at 20 °C, with no fan.

The students used the apparatus in **Figure 2**.

**Figure 2**



In this experiment, the students:

- recorded the mass of the flask and plant shoot before tying the plastic bag around the plant shoot
- removed the bag after 2 hours and recorded the mass again.

- (i) What mass of water would be lost from the plant shoot in 2 hours?

Draw a ring around the correct answer.

**0.3 g**

**1.9 g**

**3.9 g**

(1)

(ii) Give a reason for your answer to part (c)(i).

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(1)  
(Total 12 marks)

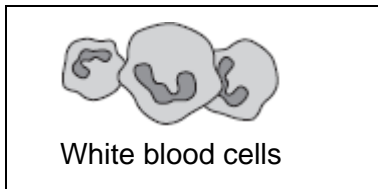
3

(a) (i) Blood is part of the circulatory system.

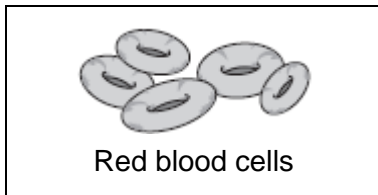
Draw **one** line from each part of the blood to its correct function.

**Part of the blood**

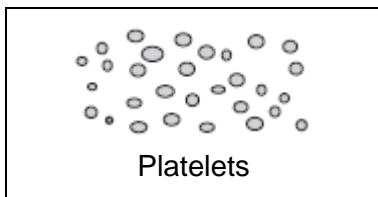
**Function**



carry glucose around the body



carry oxygen around the body



help the blood to clot

destroy microorganisms

(3)

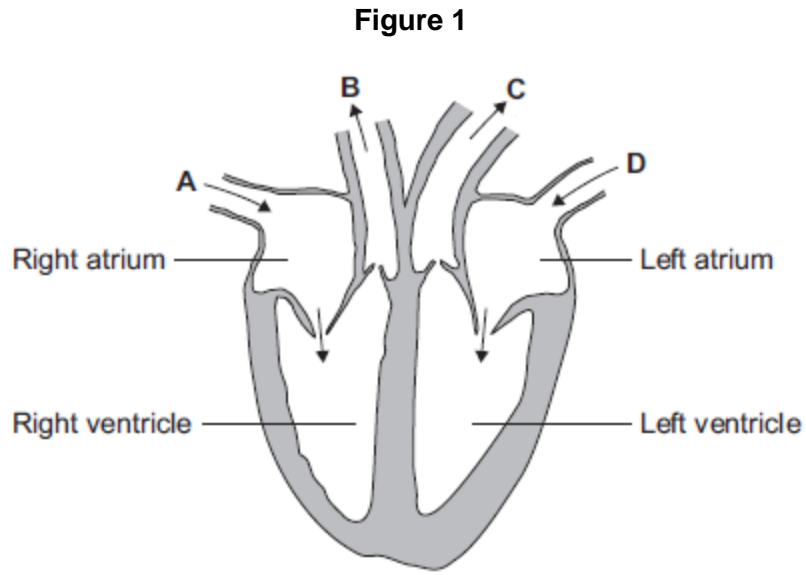
(ii) Name **one** waste product that is transported by the blood plasma.

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(1)

(b) The heart is also part of the circulatory system.

**Figure 1** shows a section through the human heart.



(i) Which arrow, **A**, **B**, **C** or **D**, shows blood leaving the heart in the pulmonary artery to

go to the lungs?

(1)

(ii) Which arrow, **A**, **B**, **C** or **D**, shows blood from the lungs entering the heart in the

pulmonary vein?

(1)

(iii) Valves in the circulatory system make sure blood only travels in one direction.

Name the type of blood vessel that has valves.

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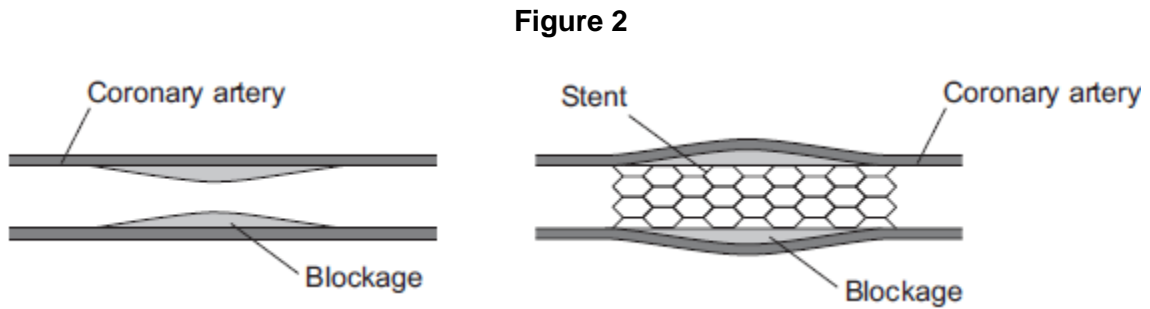
(1)

(c) A person's coronary artery has become narrower.

The person has a heart attack.

A doctor puts a stent into the person's coronary artery.

**Figure 2** shows a stent inside a coronary artery.



(i) How does the stent help to prevent another heart attack?

Give **one** way.

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(1)

(ii) **Figure 3** shows a surgeon putting a stent into a patient.

**Figure 3**



© Science Photo Library

The surgeon puts the stent into an artery in the leg. He moves the stent through the artery to the coronary artery.

Suggest **two** possible risks of this operation.

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

\_\_\_\_\_

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

\_\_\_\_\_

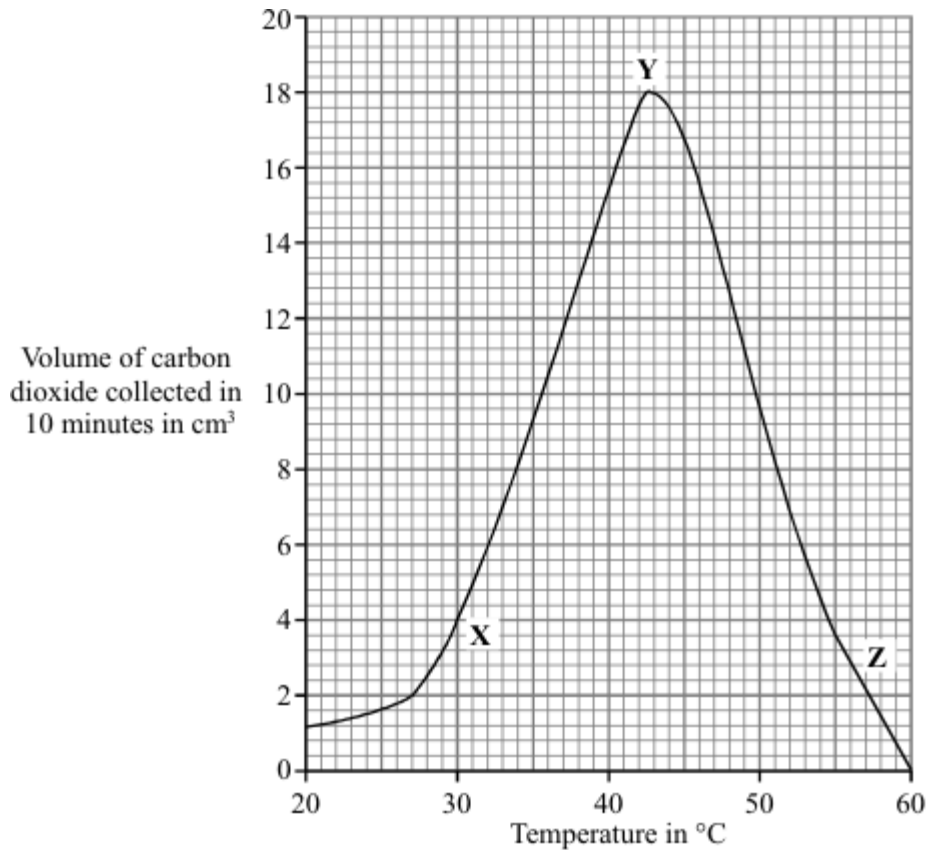
(2)

(Total 10 marks)

4

Fermentation of sugar by yeast produces carbon dioxide.

The graph shows the effect of temperature on the production of carbon dioxide by fermentation.



(a) By how much did the volume of carbon dioxide collected change when the temperature was raised from 30°C to 40°C?

\_\_\_\_\_ cm<sup>3</sup>

(1)

(b) Complete the sentences to explain the shape of the curve between X and Y.

Raising the temperature \_\_\_\_\_ the speed of the reacting particles.

These particles collide more \_\_\_\_\_ and more \_\_\_\_\_.

(3)

(Total 4 marks)

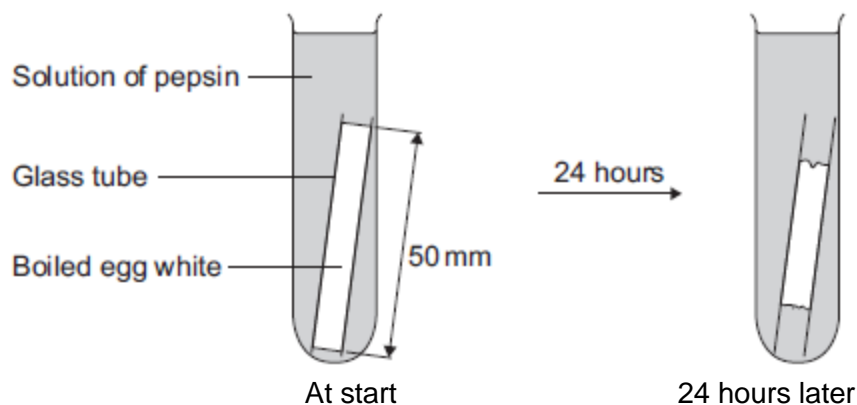
5

Some students investigated the effect of pH on the digestion of boiled egg white by an enzyme called pepsin. Egg white contains protein.

The students:

- put a glass tube containing boiled egg white into a test tube
- added a solution containing pepsin at pH 7
- set up six more tubes with solutions of pepsin at different pH values
- left the test tubes for 24 hours at room temperature.

The image below shows one of the test tubes, at the start and at the end of the 24 hours.



(a) (i) Name the product of protein digestion.

\_\_\_\_\_

(1)

(ii) What type of enzyme digests protein?

Tick (✓) **one** box.

amylase

lipase

protease

(1)

(b) The egg white in each tube was 50 mm long at the start of the investigation. The table below shows the students' results.

pH	Length in mm of boiled egg white after 24 hours
1	38
2	20
3	34
4	45
5	50
6	50
7	50

(i) At which pH did the pepsin work best?

pH \_\_\_\_\_

(1)

- (ii) The answer you gave in part **(b)(i)** may not be the exact pH at which pepsin works best.

What could the students do to find a more accurate value for this pH?

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**(2)**

- (iii) There was no change in the length of the egg white from pH 5 to pH 7.

Explain why.

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**(2)**

- (c) Pepsin is made by the stomach.

Name the acid made by the stomach which allows pepsin to work well.

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**(1)**

**(Total 8 marks)**

**6**

**Figure 1** shows an athlete running on a treadmill.

**Figure 1**



© Starush/istock/Thinkstock

After running for several minutes, the athlete's leg muscles began to ache. This ache was caused by a high concentration of lactic acid in the muscles.

(a) The equation shows how lactic acid is made.



Name the process that makes lactic acid in the athlete's muscles.

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(1)

(b) Scientists investigated the production of lactic acid by an athlete running at different speeds.

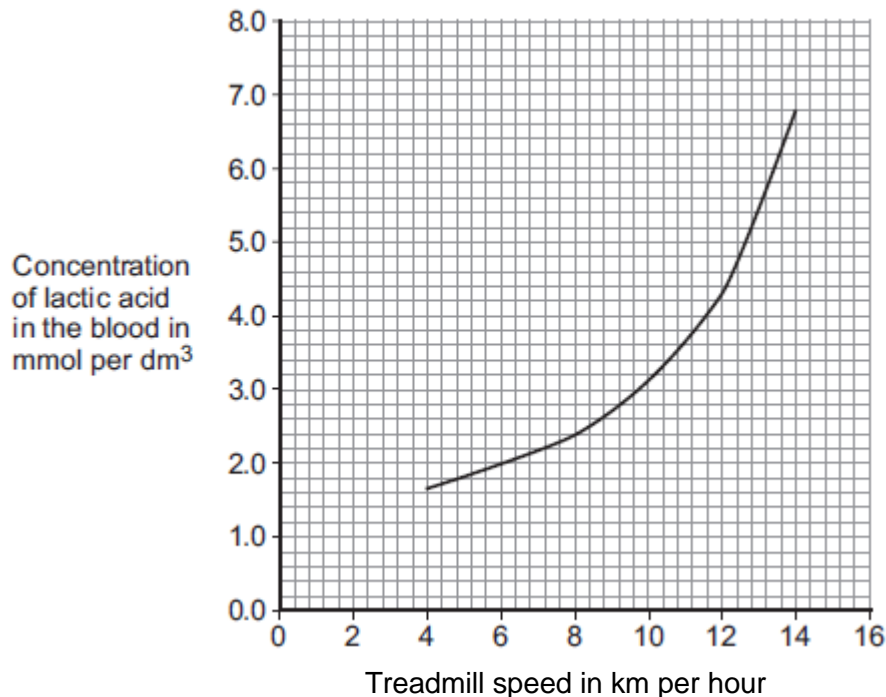
In the investigation:

- the athlete ran on the treadmill at 4 km per hour
- the scientists measured the concentration of lactic acid in the athlete's blood after 2 minutes of running.

The investigation was repeated for different running speeds.

**Figure 2** shows the scientists' results.

**Figure 2**



- (i) How much more lactic acid was there in the athlete's blood when he ran at 14 km per hour than when he ran at 8 km per hour?

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Answer = \_\_\_\_\_ mmol per dm<sup>3</sup>

(2)

- (ii) Why is more lactic acid made in the muscles when running at 14 km per hour than when running at 8 km per hour?

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(3)

(Total 6 marks)

7

- (a) During breathing, oxygen moves from the air into the blood in the lungs.

Explain how oxygen moves from the air into the blood.

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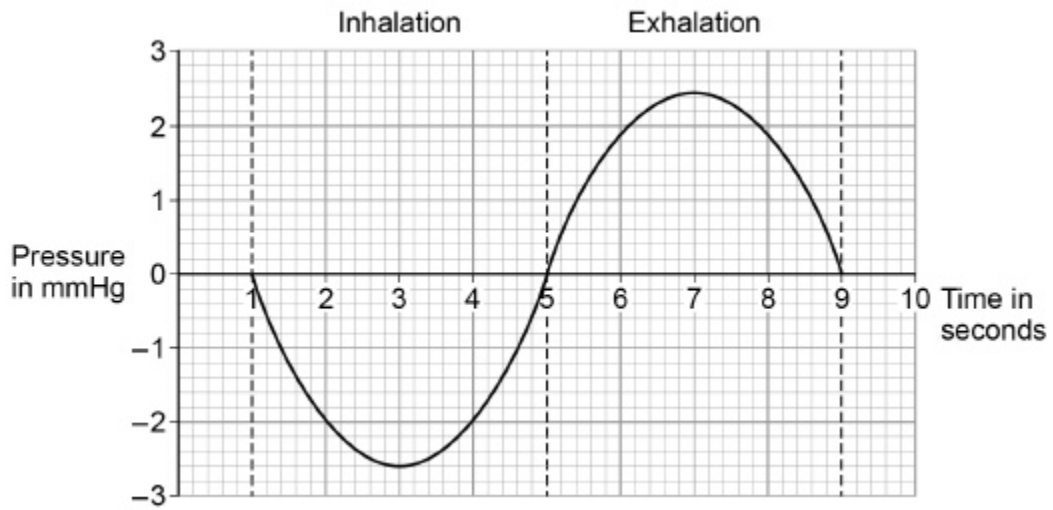
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(2)

The graph below shows how pressure changes in the lungs during breathing.



- (b) Calculate the percentage increase in pressure between maximum inhalation and maximum exhalation.

Give your answer to three significant figures.

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Percentage increase = \_\_\_\_\_ %

(3)



8

(a) Blood contains several components.

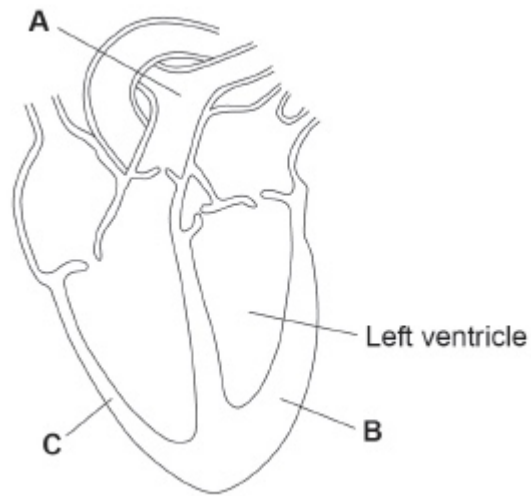
Draw one line from each component to its function.

Component	Function
Plasma	carries oxygen
Platelet	helps to destroy pathogens
White blood cell	contains water and proteins
	helps the blood to clot

(3)

Figure 1 shows a section through a human heart.

Figure 1



(b) Name the blood vessel A.

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(1)

(c) Explain why the wall of the heart is thicker at **B** than at **C**.

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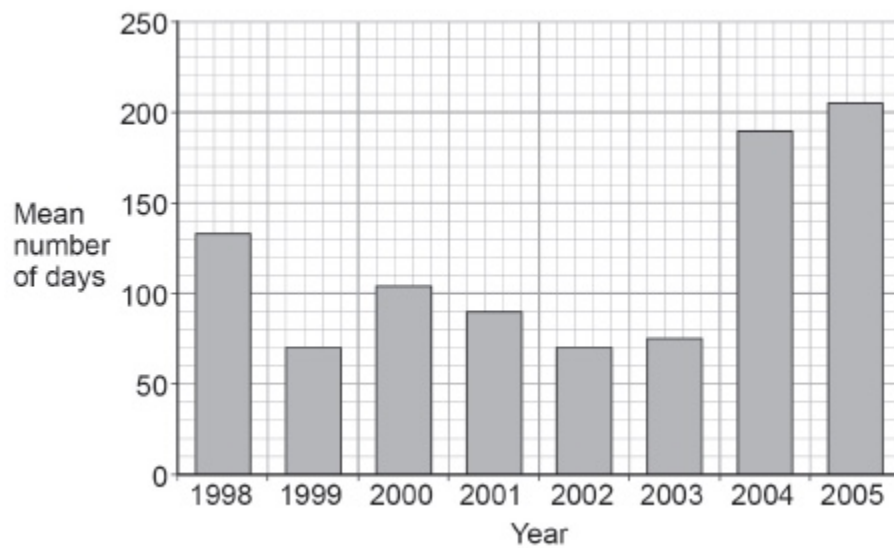
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(3)

(d) People with heart disease may receive a heart transplant.

**Figure 2** shows the mean number of days people with heart disease waited for a heart transplant in one country between 1998 and 2005.

**Figure 2**



Calculate the difference between the mean number of days people waited for a heart transplant in 2005 compared with 2002.

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Difference = \_\_\_\_\_ days

(1)

- (e) Read the following newspaper article.

Heart transplants can treat a number of heart conditions. After a successful operation the transplant can last for 20 years. Some patients can wait more than 6 months for a heart transplant and many die before a suitable transplant becomes available.

In recent years doctors have started to use mechanical heart devices instead of heart transplants. These devices can also be used to prolong life before a heart transplant.

One of these devices is readily available and is called the Jarvik Heart. It is inserted into the left ventricle and can last for 2–5 years. It can treat patients with problems associated with the left ventricle but there is an increased risk of clots and strokes.

Evaluate the use of the Jarvik Heart compared with living heart transplants.

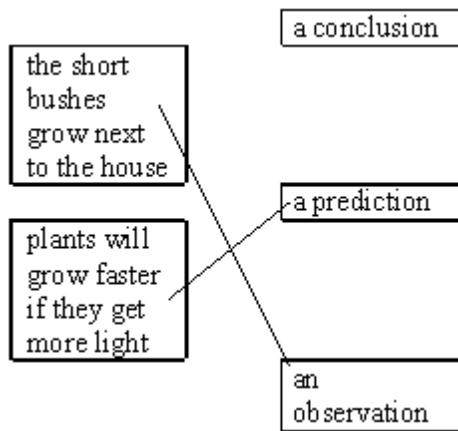
**(6)**

**(Total 14 marks)**

## Mark schemes

1

(a) (i)



*both correct = 2 marks*

*one correct = 1 mark*

*extra line from a statement cancels the mark*

2

(ii) 1<sup>st</sup> space: carbon dioxide

*allow CO<sub>2</sub> (ignore superscript)*

*do **not** allow CO alone*

1

2<sup>nd</sup> space: glucose / sugar / starch / carbohydrate

1

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

- move lamp or change distance between lamp and plant  
*ignore measure the distance*
- change wattage / power of (light) bulb  
*do **not** accept just "change bulb"*
- change voltage / power supply to the (light) bulb
- change the number of lamps
- put translucent material between lamp and plant  
*accept examples, eg tracing paper / filters*  
*do **not** accept coloured filters*

1

- (ii) rises 1
- levels off  
*ignore numbers* 1
- (iii) idea that it levels off
- or**
- does not increase at all light intensities
- or**
- it only increases to a certain amount  
*answers should relate to photosynthesis and **not** to bubbling* 1

[8]

- 2** (a) (i) xylem 1
- (ii) phloem 1
- (iii) transpiration 1
- (iv) stomata 1
- (b) (i) any **one** from:
- reduce / prevent evaporation of water from flask
  - holds plant shoot in place
  - prevent damage to the plant
- 1
- (ii) same surface area **or** number of leaves  
*(because if they used larger / smaller size shoots) there would be a larger / smaller surface area **or** a larger/ smaller number of leaves allow same number of stomata* 1
- from which (the same amount of) water evaporates  
*(and therefore) more / less water would escape allow from which water escapes* 1

(iii) 4.5

*look for answer written in table*

1

(iv) increasing temperature / heat increases (rate of) water loss / evaporation

1

(v) having moving air / a fan increases (rate of) water loss / evaporation

1

(c) (i) 0.3 g

1

(ii) plastic bag reduces air flow across leaves

**or**

air is humid around the leaves

*allow plastic bag stops water (vapour) leaving*

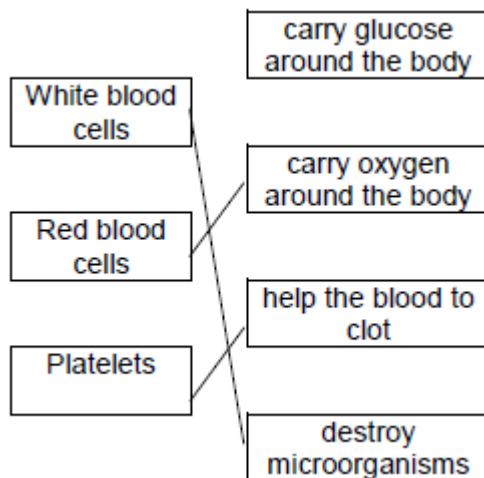
*allow air (in plastic bag) becomes saturated (with water)*

1

[12]

3

(a) (i)



*one mark for each line*

*extra line negates a mark*

3

(ii) any **one** from:

- carbon dioxide / CO<sub>2</sub>
- urea

*do **not** allow urine*

*ignore water*

*ignore ions*

1

(b) (i) B

1

(ii) D

1

(iii) vein

*accept correct named  
examples*

1

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

- keeps artery / blood vessel open **or** widens artery / blood vessel
- allows (more) blood to heart / cardiac muscle
- (allows) blood to flow more easily
- allows (more) oxygen to heart / cardiac muscle

1

(ii) any **two** from:

- bleeding  
*allow blood clots*
- infection
- damaging blood vessels
- damaging the heart
- risk from anaesthetic

2

[10]

4

(a) 11

*accept 10.5 – 11.5*

1

(b) ideas of

increase / rises

1

frequently / often

1

energetically / violently

1

[4]

5

(a) (i) amino acid(s)

*accept peptide(s)*

*do **not** allow polypeptide(s)*

1

(ii) protease

1

(b) (i) 2

1

(ii) repeat

*do not allow other enzyme / substrate*

1

using smaller pH intervals between pH1 and pH3  
*allow smaller intervals on both sides of / around pH2*  
*allow smaller intervals on both sides of / around answer to (b)(i)*

1

(iii) enzyme / pepsin denatured / shape changed

*do not allow enzyme killed*

*allow enzyme 'destroyed'*

1

enzyme / pepsin no longer fits (substrate)

*allow enzyme / pepsin does not work*

1

(c) hydrochloric (acid)

*allow phonetic spelling*

*accept HCl*

*allow HCL*

*ignore hcl*

*do not allow incorrect formula –e.g. H<sub>2</sub>Cl / HCl<sub>2</sub>*

1

[8]

6

(a) anaerobic respiration

*allow phonetic spelling*

1

(b) (i) 4.4

*4.2, 4.3, 4.5 or 4.6 with figures in tolerance (6.7 to 6.9 and 2.3 to 2.5) and correct working gains 2 marks*

*4.2, 4.3, 4.5 or 4.6 with no working shown or correct working with one reading out of tolerance gains 1 mark*

*correct readings from graph in the ranges of 6.7 to 6.9 **and** 2.3 to 2.5 but no answer / wrong answer gains 1 mark*

2

(ii) more energy is needed / used / released

*do not allow energy production*

(at 14 km per hour)

*ignore work*

1

not enough oxygen (can be taken in / can be supplied to muscles)

*allow reference to oxygen debt*

*do not allow less / no oxygen*

1

so more anaerobic respiration (to supply the extra energy) **or** more glucose changed to lactic acid

*allow not enough aerobic respiration*

1

**[6]**

**7**

(a) diffusion

1

from high concentration to low concentration

1

(b)

$$\frac{2.45 - (-2.6)}{-2.60} \times 100$$

*Usual allowance of  $\pm$  half a small square means a reading of +2.4 or +2.5 is acceptable instead of +2.4*

1

1

194.231

1

*an answer of 194 scores 2 marks*

194 (%)

(c) diaphragm contracts

**or**

flattens

1

**or**

intercostal muscle contracts (to raise ribs)

which causes the volume (of the thorax) to increase

*must be in the correct order*

1

causing pressure (in thorax) to decrease

1

below zero

*allow below atmospheric pressure*

1

- (d) many filaments (gives large surface area)  
*allow ref to large surface area alone.*  
**or**  
*allow water flowing over gills (maintains concentration gradient)*  
**or**  
*good blood supply (maintains concentration gradient)*

1

filaments thin

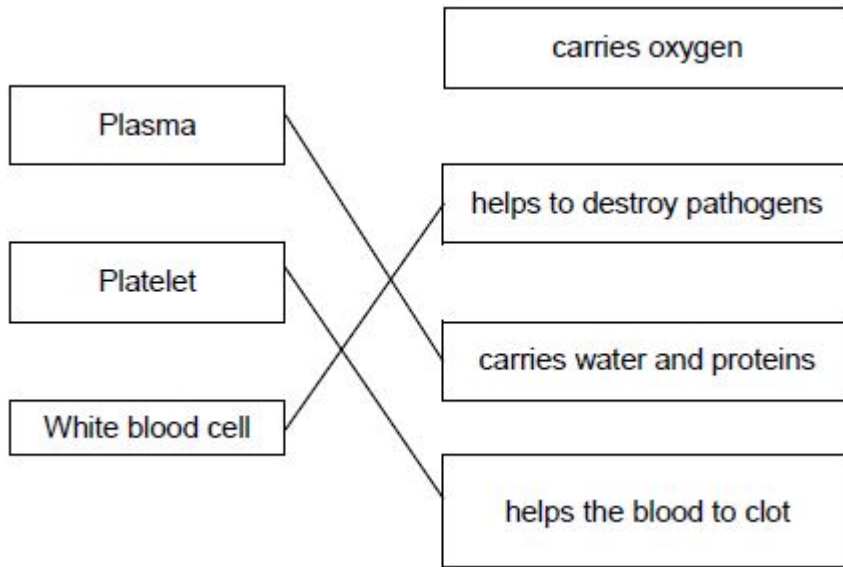
**or**

short diffusion pathway

1

[11]

**8** (a)



If more than one line is drawn from a component then no mark.

3

(b) **Pulmonary** artery

1

(c) Stronger / more (muscle) contraction

1

(to create) higher (blood) least once pressure

*comparative must be given at comparative must be given at least once*

1

(to) pump blood all around the body

1

(d) 135

1

- (e) **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**

*allow converse arguments*

#### **Advantages of Jarvik Heart**

- no need to wait for the transplant
- surgery less drastic

#### **Disadvantages of Jarvik Heart**

- more chance of blood clots and strokes
- only lasts up to 5 years
- the mechanical motor can fail
- only treats one heart condition

#### **Comparisons**

- mechanical only lasts 5 years but a heart transplant last much longer, 20 years
- mechanical heart only treats one heart problem but heart transplants treat many
- mechanical heart readily available but a heart for transplant may not be

#### **Additional detailed knowledge**

- no chance of being rejected by the body [for mechanical heart]
- do not need to take anti-rejection drugs [for mechanical heart]
- may cause an immune response, ref to foreign antigens [for heart transplant]

[14]