

Organisation part 12

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Time: **72 minutes**

Marks: **72 marks**

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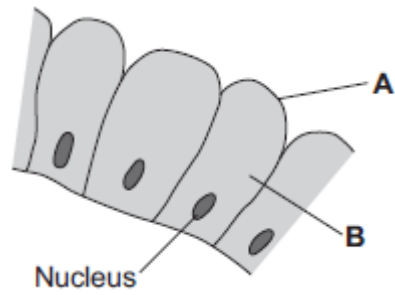
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Q1.

The image below shows some cells in the lining of the stomach.



- (a) (i) Use words from the box to name structures **A** and **B**.

cell membrane	chloroplast	cytoplasm	vacuole
---------------	-------------	-----------	---------

A _____

B _____

(2)

- (ii) What is the function of the nucleus?

Tick (✓) **one** box.

To control the activities of the cell

To control movement of substances into and out of the cell

To release energy in respiration

(1)

(b) Draw **one** line from each part of the human body to its correct scientific name.

Part of human body	Scientific name
Layer of cells lining the stomach	An organ
Stomach	An organism
Mouth, stomach, intestines, liver and pancreas	An organ system
	A tissue

(3)
(Total 6 marks)

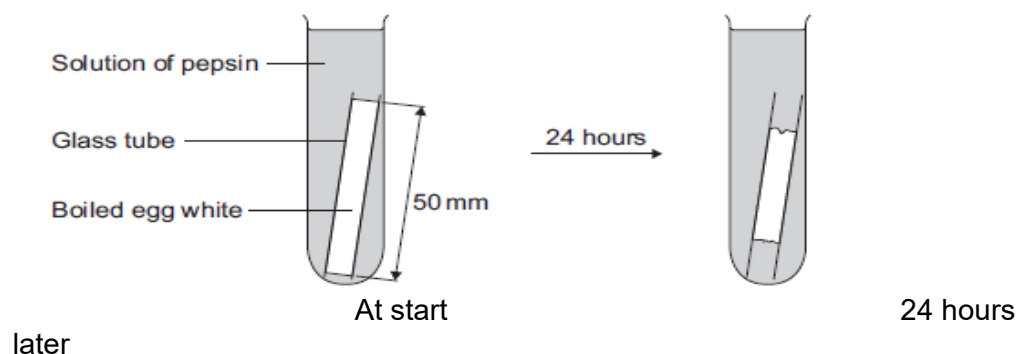
Q2.

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?

(2)

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

Explain why.

(2)

(c) Pepsin is made by the stomach.

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

(1)

(Total 8 marks)

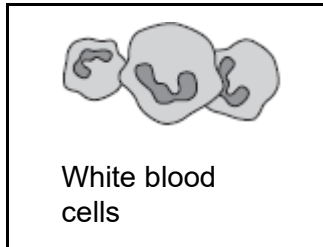
Q3.

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

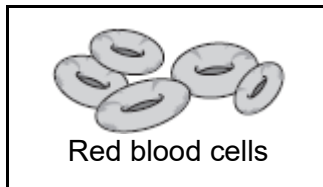
Draw **one** line from each part of the blood to its correct function.

Part of the blood

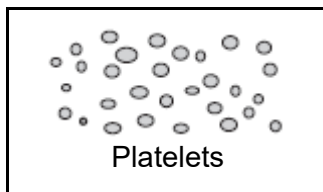
Function



carry glucose around the body



carry oxygen around the body



help the blood to clot

destroy microorganisms

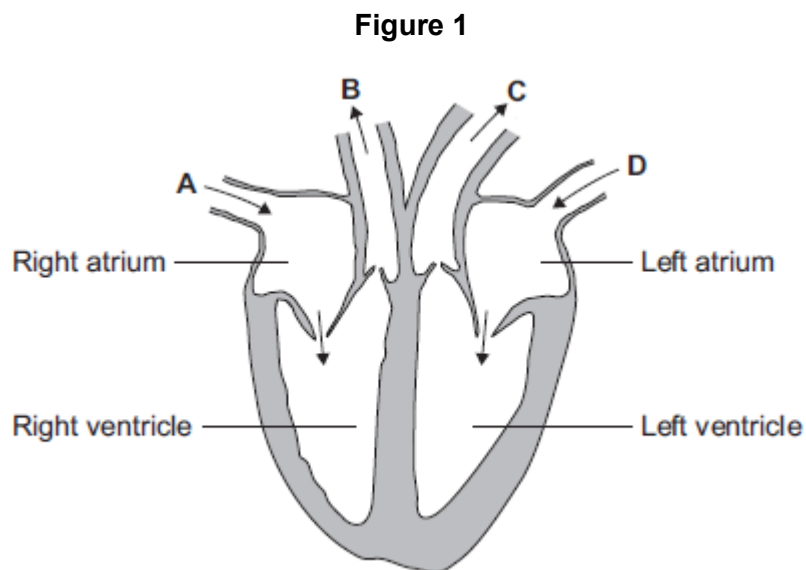
(3)

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

(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.

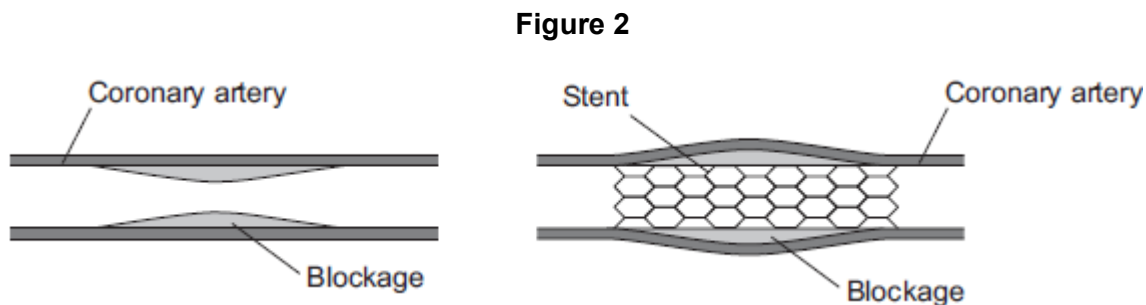
(1)

(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.

(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)

Q4.

Substances are transported through plants.

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

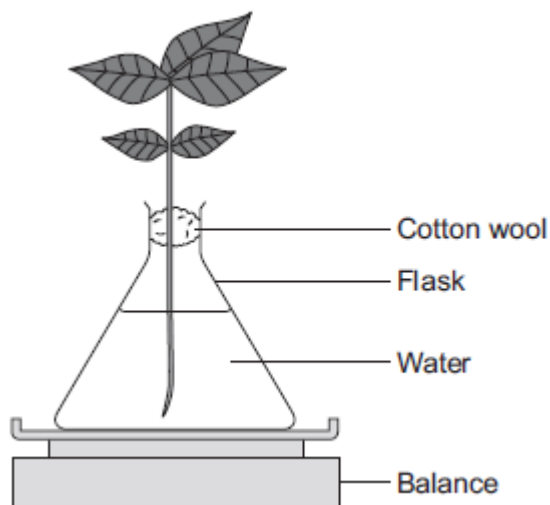
capillary	guard cells	phloem
stomata	transpiration	xylem

- (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
A	20	No Fan
B	20	Fan
C	35	No Fan
D	35	Fan

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

(1)

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

Explain why.

(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**?

_____ grams

(1)

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

(1)

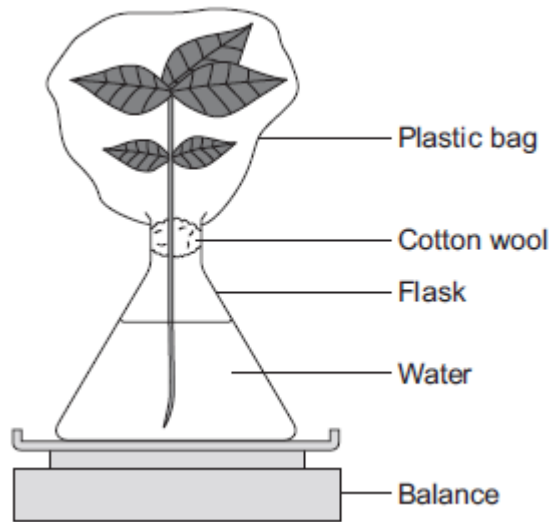
- (v) Suggest what conclusion can be made about the effect of the fan on water loss from the plant shoot.

(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).

(1)

(Total 12 marks)

Q5.

The leaves of most plants have stomata.

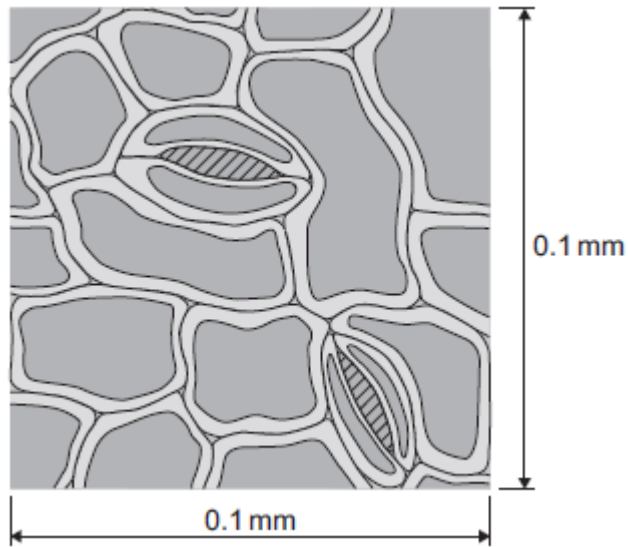
- (a) (i) Name the cells which control the size of the stomata.

_____ (1)

- (ii) Give **one** function of stomata.

_____ (1)

- (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 mm² of this leaf surface.

_____ per mm² (2)

- (ii) A different plant species has 400 stomata per mm² of leaf surface.

Having a large number of stomata per mm² 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)

Q6.

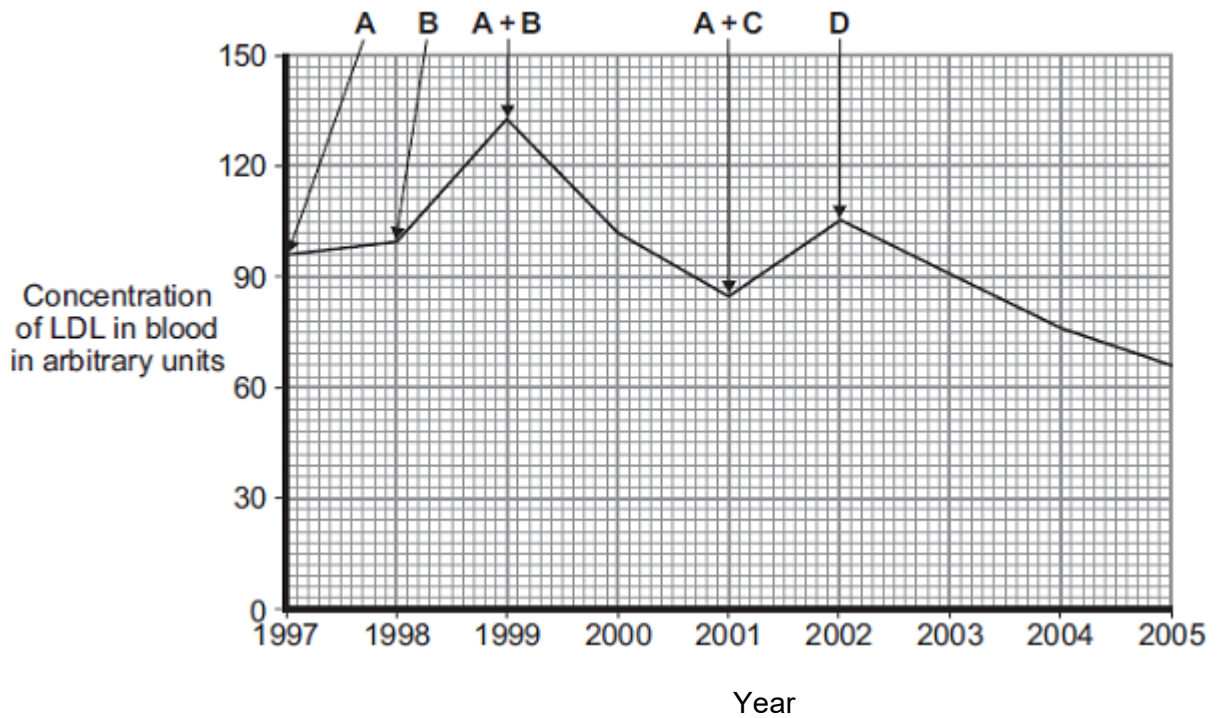
LDL is one form of cholesterol found in the blood.

People with a high concentration of LDL in their blood may be treated with drugs called statins.

A high concentration of LDL cholesterol in the blood may result in an increased risk of heart and circulatory diseases.

The graph shows the effects of the treatment of one person with four different statins, **A**, **B**, **C** and **D**, over a period of 8 years. The arrows show when each new treatment was started.

Each treatment was continued until the next treatment was started.



Compare the effectiveness of the five treatments in reducing the risk of heart and circulatory diseases for this person.

(Total 4 marks)

Q7.

Scientists investigated how exercise affects blood flow to different organs in the body.

The scientists made measurements of blood flow to different organs of:

- a person resting in a room at 20°C
- the same person, in the same room, doing vigorous exercise at constant speed on an exercise cycle.

The table shows the scientists' results.

Organ	Blood flow in cm ³ per minute whilst ...	
	resting	doing vigorous exercise
Brain	750	750
Heart	250	1000
Muscles	1200	22 000
Skin	500	600
Other	3100	650

- (a) In this investigation, it was better to do the exercise indoors on an exercise cycle than to go cycling outdoors on the road.

Suggest **two** reasons why.

Do **not** include safety reasons.

1. _____

2. _____

(2)

- (b) Blood flow to **one** organ did **not** change between resting and vigorous exercise.

Which organ? _____

(1)

- (c) (i) How much more blood flowed to the muscles during vigorous exercise than when resting?

Answer = _____ cm³ per minute

(2)

- (ii) Name **two** substances needed in larger amounts by the muscles during vigorous exercise than when resting.

1. _____

2. _____

(2)

- (iii) Tick (✓) **one** box to complete the sentence.

The substances you named in part (c)(ii) helped the muscles to

make more lactic acid.

respire aerobically.

make more glycogen.

(1)

- (iv) The higher rate of blood flow to the muscles during exercise removed larger amounts of waste products made by the muscles.

Which **two** substances need to be removed from the muscles in larger amounts during vigorous exercise?

Tick (✓) **two** boxes.

Amino acids

Carbon dioxide

Glycogen

Lactic acid

(2)

- (d) The total blood flow was much higher during exercise than when resting.

One way to increase the total blood flow is for the heart to pump out a larger volume of blood each beat.

Give **one** other way to increase the blood flow.

(1)
(Total 11 marks)

Q8.

Denim jeans can be coloured with blue dye. The dye joins onto the fibres of the material. Some people like their denim jeans to look faded. The faded look is called 'stonewashed'. There are two different ways to make denim material look faded.

Traditional stonewashing

- Denim material is put in a slowly spinning container with large stones.
- Very hot water is added.
- Washing takes up to five hours.
- Washing breaks some of the fibres and lets the dye come out from the fibres.
- Washing will work with any dye.

Bio-stonewashing

- Denim material is washed with enzymes in warm water.
- Washing takes half an hour.
- The enzymes let the dye come out from the fibres.
- Different enzymes are needed for different dyes.
- The enzymes are expensive.
- After treatment the enzymes have to be removed from the denim.

- (a) Use **only** the information above to answer these questions.

- (i) Suggest **two** advantages of using the bio-stonewashing method instead of the traditional stonewashing method.

1. _____

2. _____

(2)

- (ii) Suggest **two** disadvantages of using the bio-stonewashing method instead of the traditional stonewashing method.

1. _____

2. _____

(2)

- (b) Some blue dyes are made of protein.

What type of enzyme would be used to remove these blue dyes from denim?

Draw a ring around **one** answer.

carbohydrase

lipase

protease

(1)

(Total 5 marks)

Q9.

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)

Mark schemes

Q1.

(a) (i) A = (cell) membrane

1

B = cytoplasm

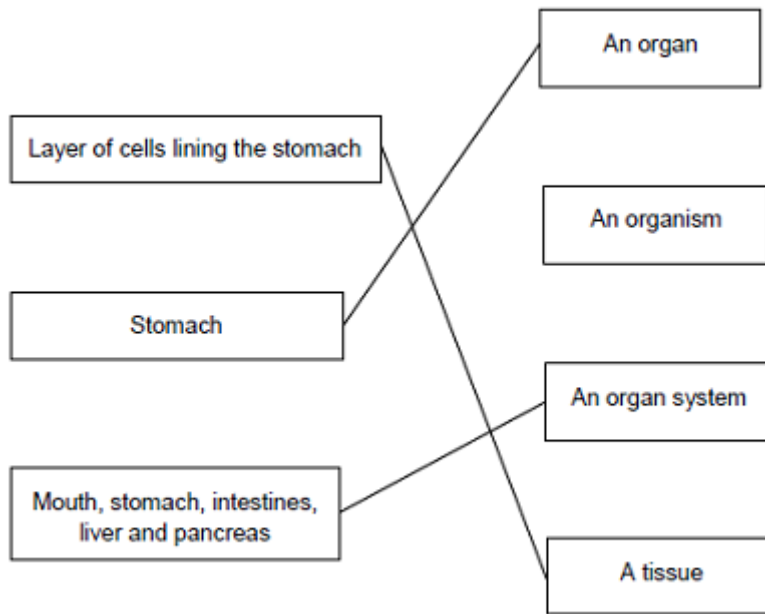
do not accept cytoplasm

1

(ii) To control the activities of the cell

1

(b)



extra lines cancel

3

[6]

Q2.

(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

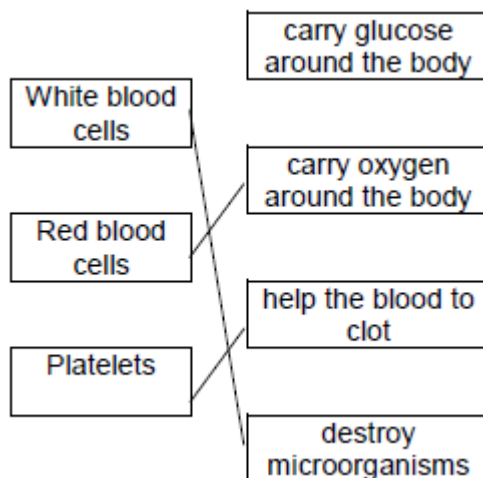
do **not** allow incorrect formula –e.g. H₂Cl / HCl₂

1

[8]

Q3.

(a) (i)



one mark for each line

extra line negates a mark

3

(ii) any **one** from:

• carbon dioxide / CO₂

• 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: 1
- 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
- (ii) any **two** from: 2
- bleeding
allow blood clots
 - infection
 - damaging blood vessels
 - damaging the heart
 - risk from anaesthetic

[10]

Q4.

- (a) (i) xylem 1
- (ii) phloem 1
- (iii) transpiration 1
- (iv) stomata 1
- (b) (i) any **one** from: 1
- reduce / prevent evaporation of water from flask
 - holds plant shoot in place
 - prevent damage to the plant
- (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

		<i>allow from which water escapes</i>	1
(iii)	4.5	<i>look for answer written in table</i>	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 <i>allow plastic bag stops water (vapour) leaving</i> <i>allow air (in plastic bag) becomes saturated (with water)</i>	1
			[12]
Q5.			
(a)	(i)	guard (cells) <i>allow phonetic spelling</i>	1
	(ii)	any one from: <i>ignore reference to cells</i> <ul style="list-style-type: none"> • allow carbon dioxide to enter <i>allow control loss / evaporation of water or control transpiration rate</i> • allow oxygen to leave. <i>allow 'gaseous exchange'</i> 	1
(b)	(i)	200 <i>correct answer gains 2 marks with or without working</i> <i>allow 1 mark for $0.1 \times 0.1 = 0.01$ (mm²)</i>	2
	(ii)	more / a lot of / increased water loss <i>allow plant more likely to wilt (in hot / dry conditions)</i>	1
(c)	(i)	0.12	1
	(ii)	the lower surface has most stomata 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]

Q6.

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]

Q7.

(a) any **two** from:
or allow converse for outdoors

- constant speed
 - *variable speed*
- constant effort
 - *variable terrain*
- constant temperature
 - *traffic conditions*
 - *variable temperature*
 - *wind (resistance)*
 - *rain / snow*
 - allow weather*

allow pollution only if qualified by effect on body function but
ignore pollution unqualified
if no other marks obtained allow variable conditions outdoors

2

(b) Brain

1

(c) (i) 20 800

correct answer with or without working gains 2 marks
if answer incorrect, allow 1 mark for use of 1200 and 22 000
only

2

- (ii) oxygen
apply list principle

1

do **not** accept other named substances eg CO₂ water

glucose / sugar
allow glycogen
ignore food / carbohydrate

1

- (iii) respire aerobically

1

- (iv) carbon dioxide

1

lactic acid

1

- (d) increased heart rate

ignore adrenaline / drugs

accept heart beats more but not heart pumps more

1

[11]

Q8.

- (a) (i) any **two** from:

- fibres not damaged
- machines last longer / machines not damaged by stones

Only **one** from:

- shorterer time or quickerer
- lowerer temperature
uses less energy or cheaper for energy as an alternative to
shorter time / lower temperature, if neither of these given
no mark for cheaper unqualified

2

- (ii) any **two** from:

- different enzymes (for different dyes)
- enzymes expensive
no mark for expensive alone
- enzymes have to be removed (from denim material) (after
washing / treatment)

- (b) protease
apply list principle

1

[5]

Q9.

- (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

