

## Organisation part 15

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

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

Time: **85 minutes**

Marks: **77 marks**

Comments:

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**Q1.**

A patient has a disease. The disease damages his pancreas.

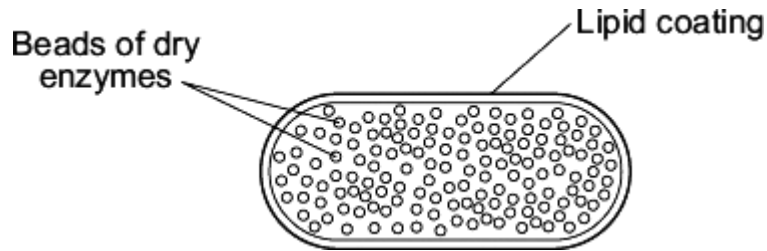
A doctor prescribes a course of treatment for the patient:

*'Take one capsule with each meal.'*

Each capsule contains hundreds of small, dry beads.

The beads are made of enzymes. The pancreas normally produces these enzymes.

The outer coating of the capsule is made of lipid.



- (a) One enzyme in the beads is lipase.

In a healthy person, lipase is made in the pancreas.

Name **two** other enzymes made in the pancreas of a healthy person.

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

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

(2)

- (b) The lipid coating on the capsule makes sure that the enzymes are not released until the capsule reaches the small intestine.

Explain how.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(2)

- (c) The lipase in the beads does **not** digest the lipid coating around the capsule.

Suggest why.

\_\_\_\_\_

\_\_\_\_\_

(1)

(Total 5 marks)

**Q2.**

The table shows the mass of carbon dioxide passed into the atmosphere in one year.

	<b>Mass of carbon dioxide passed into the atmosphere in billions of tonnes per year</b>
Animals	45
Plants	15
Microorganisms	60
Human activity	9

- (a) (i) Calculate the total mass of carbon dioxide passed into the atmosphere in one year.

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Answer = \_\_\_\_\_ billion tonnes

(1)

- (ii) Plants take 120 billion tonnes of carbon dioxide out of the atmosphere per year.

Use your answer to part (a)(i) to calculate the change in the mass of carbon dioxide in the atmosphere in one year.

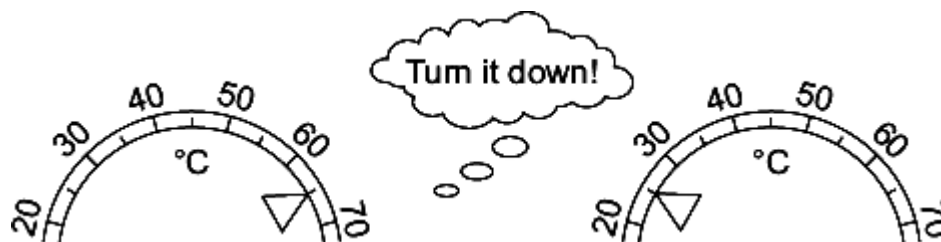
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Answer = \_\_\_\_\_ billion tonnes

(1)

- (b) The drawing shows part of a campaign to encourage householders to reduce the temperature of the water used to wash clothes.



Give **two** advantages to the environment of reducing the temperature of the water used to wash clothes.

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

(2)

- (c) A householder reduces the temperature of the water he uses to wash clothes. He finds that some stains are not removed at the new temperature. He decides to use a biological washing powder. Biological washing powders contain enzymes.

- (i) Draw a line from each enzyme in **List 1** to the type of stain the enzyme will remove, in **List 2**.

**List 1**  
**Enzyme**

Protease

Lipase

**List 2**  
**Type of Stain**

Starch

Fat

Protein

(2)

- (ii) The biological washing powder would **not** have removed the stains from clothes if the water had been at 65 °C.

Use **one** word from the box to complete the sentence.

<b>killed</b>	<b>denatured</b>	<b>diffused</b>
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At 65 °C the enzymes would be \_\_\_\_\_

(1)

(Total 7 marks)

**Q3.**

- (a) **List A** gives four structures in the human body.

**List B** gives the functions of some structures in the body.

Draw a straight line from each structure in **List A** to the correct function in **List B**.

**List A – Structure**

**List B – Function**

Alveoli

Surround and protect the lungs

Veins

Filter the blood

Villi

Carry blood towards the heart

Ribs

Absorb digested food

Allow oxygen to enter the blood

(4)

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

In the lungs, oxygen enters the blood from the air by

- diffusion.
- filtration.
- respiration.

(1)  
(Total 5 marks)

**Q4.**

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

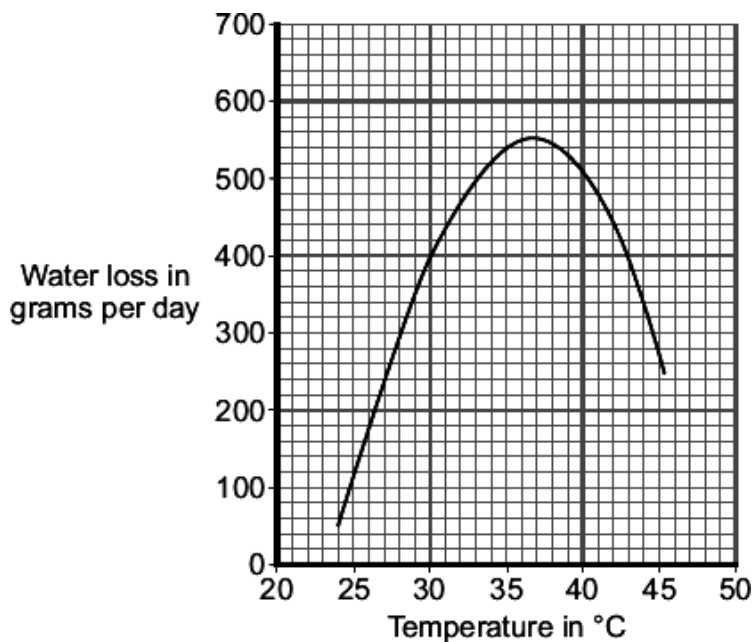
A plant loses water from its leaves by a process called

- distillation.
- respiration.
- transpiration.

(1)

(b) Some scientists investigated the effect of temperature on water loss from a plant.

The graph shows the results.



Describe the effect of increasing the temperature on water loss from the plant.

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(2)

(c) Under different conditions, plants open or close their stomata.

(i) How does closing its stomata help a plant?

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(1)

(ii) In the investigation described in part (b), which temperature range would cause most of the stomata to close?

Draw a ring around **one** answer.

**25 - 30 °C**

**30 - 35 °C**

**40 - 45 °C**

(1)

(Total 5 marks)

**Q5.**

Scientists estimate that about one third of cancers in the UK may be linked to obesity.

Name **two** diseases linked to obesity.

Do **not** give cancer as one of your answers.

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

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

(Total 2 marks)

**Q6.**

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

**Traditional stone washing**

- 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 denim 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 the treatment the enzymes have to be removed from the denim.

(a) Use **only** the information above to answer this question.

(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)

**Q7.**

There are enzymes in biological washing powders. Biological washing powder has to be used at temperatures below 45 °C.

- (a) The enzymes in biological washing powders do **not** work on the stains on clothes at temperatures above 45 °C.

Explain why.

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(2)

- (b) Some bacteria, called thermophilic bacteria live in hot springs at temperatures of 80 °C.

Scientists have extracted enzymes from these thermophilic bacteria. These enzymes are being trialled in industrial laundries.

The laundries expect to increase the amount of clothes they can clean by using enzymes from thermophilic bacteria instead of using the biological washing powders the laundries use now.

- (i) The laundries expect to be able to increase the amount of clothes that they can clean each day.

Suggest why.

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(2)

- (ii) Using washing powders with enzymes from thermophilic bacteria may be more harmful to the environment than using the biological washing powders that laundries use now.

Suggest why.

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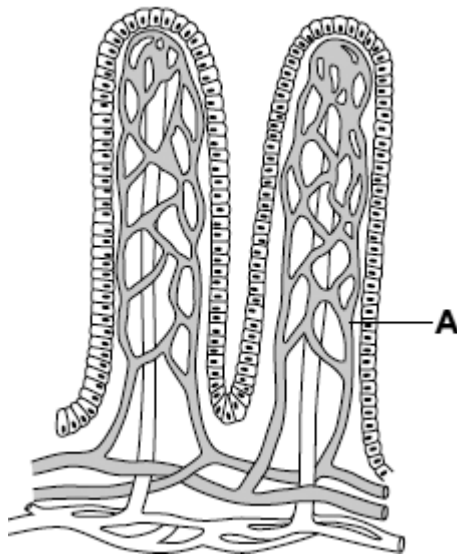
(2)  
(Total 6 marks)

**Q8.**

Villi are found in some parts of the digestive system.

**Diagram 1** shows two villi.

**Diagram 1**



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

- (i) Structure **A** is a

muscle.
nerve.
capillary.

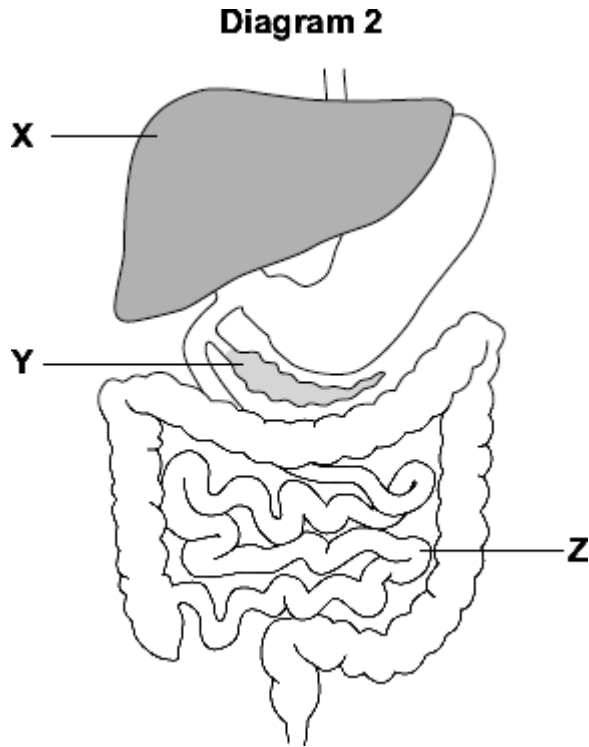
(1)

(ii) The villi absorb the products of digestion by

- dialysis.
- diffusion.
- osmosis.

(1)

(b) **Diagram 2** shows the digestive system.



(i) In which part of the digestive system, **X**, **Y** or **Z**, are most villi found?

(1)

(ii) There are about 2000 villi in each  $\text{cm}^2$  of this part of the digestive system.

Why is it helpful to have lots of villi?

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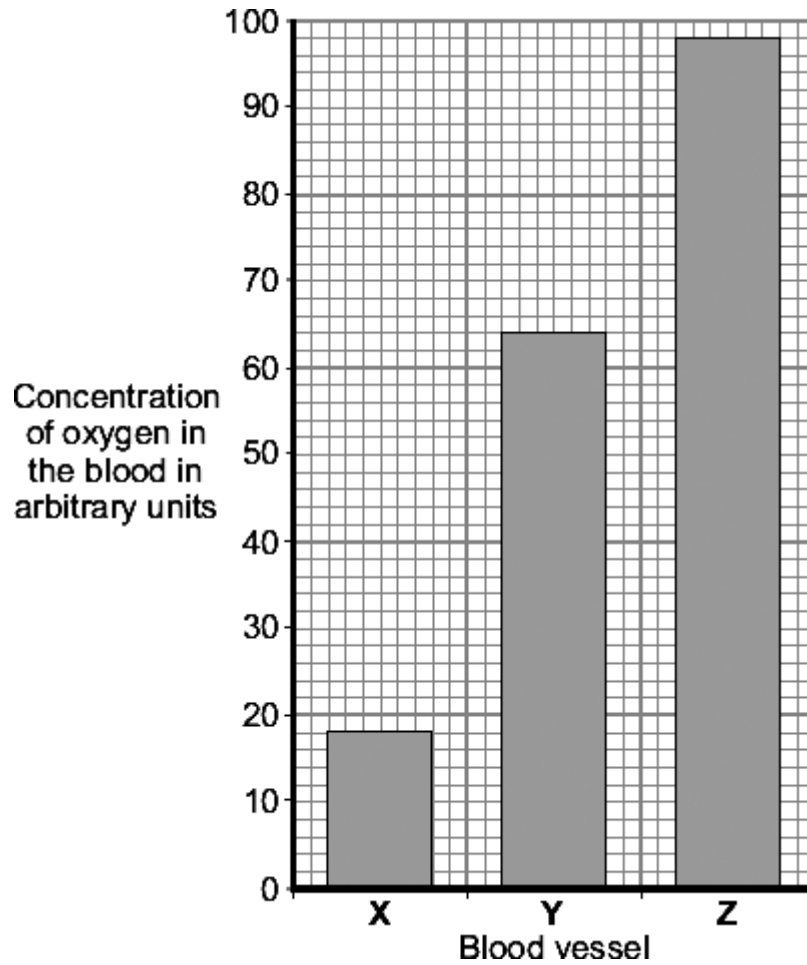
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(1)

**(Total 4 marks)**

**Q9.**

The bar chart shows the concentration of oxygen in the blood in three different blood vessels, **X**, **Y** and **Z**.



(a) (i) What is the concentration of oxygen in blood vessel **X**?

Answer \_\_\_\_\_ arbitrary units.

(1)

(ii) Which blood vessel, **X**, **Y** or **Z**, carries blood from the lungs to the heart?

(1)

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

(i) Most of the oxygen in the blood is carried by the

- plasma.
- red blood cells.
- white blood cells.

(1)

- (ii) Oxygen combines with a coloured pigment in the blood.

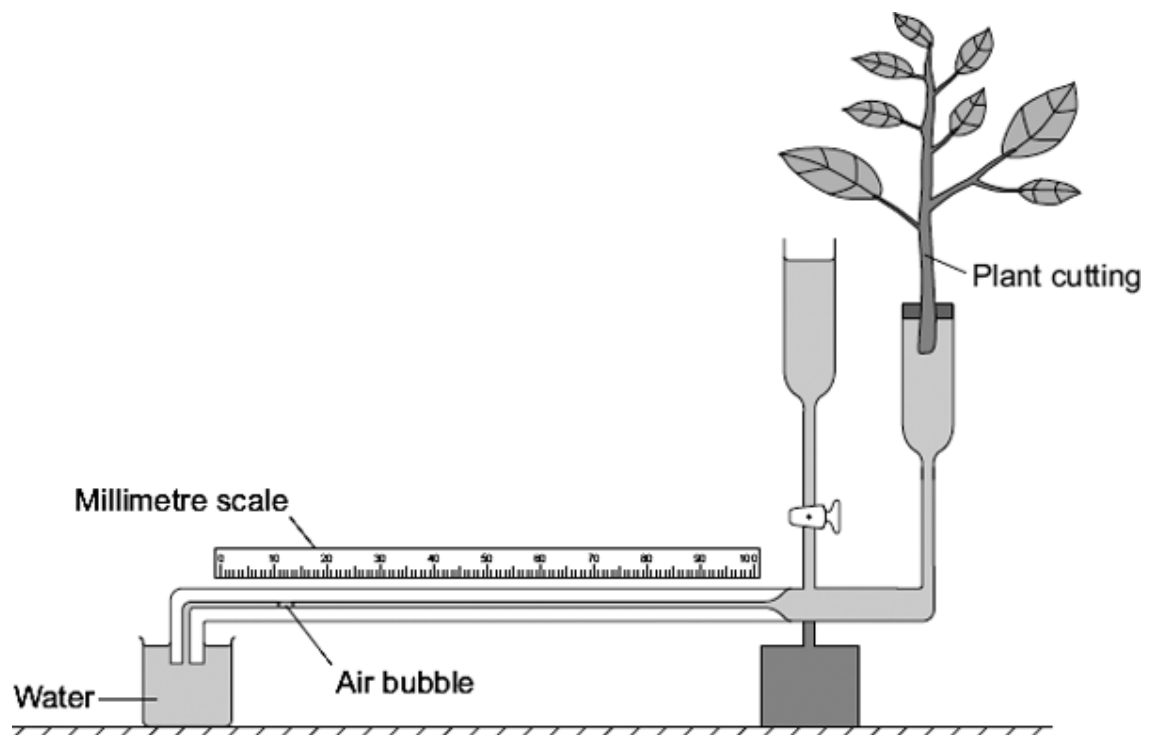
This coloured pigment is called

alveoli.  
haemoglobin.  
lactic acid.

(1)  
(Total 4 marks)

### Q10.

Some students used the apparatus shown in the diagram to measure the rate of water uptake by a plant cutting.



The students set up the apparatus in three different conditions:

- no wind at 15 °C
- no wind at 25 °C
- wind at 25 °C

For each experiment, the students recorded the movement of the air bubble along the scale.

- (a) (i) Name the **two** variables that the students chose to change in these experiments.

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

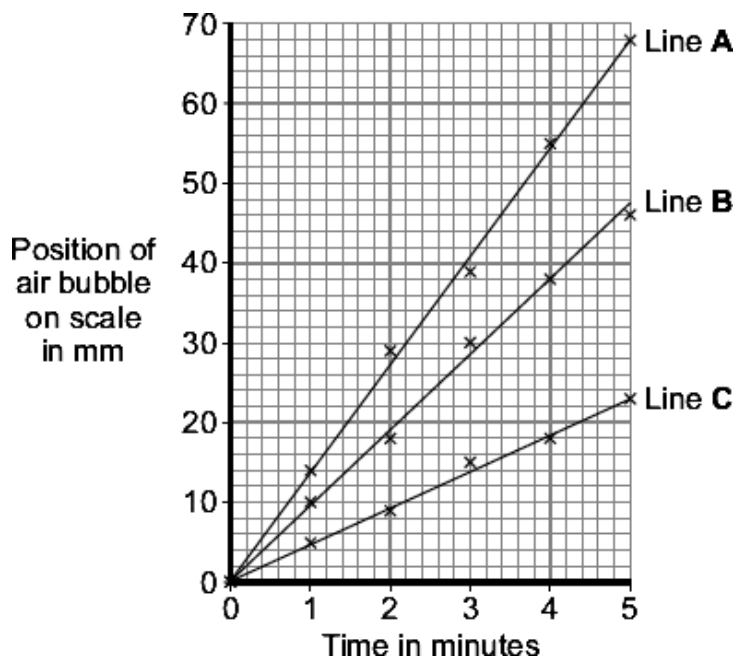
(2)

- (ii) It was important to use the same plant cutting each time to make these experiments fair.

Explain why.

(1)

- (b) The graph shows the students' results.



Which line on the graph, **A**, **B** or **C**, shows the results for each of the three different experiments?

Write each of the letters **A**, **B** or **C** in the correct boxes in the table.

Condition	Letter
No wind at 15 °C	
No wind at 25 °C	
Wind at 25 °C	

(2)

- (c) Water is lost from the leaves of the plant cutting.

Name this process.

Draw a ring around **one** answer.

**distillation**

**respiration**

**transpiration**

(1)

(Total 6 marks)

**Q11.**

The table shows the volume of blood flowing through different organs at three levels of exercise.

Organ(s)	Volume of blood flowing through organ(s) in cm <sup>3</sup> per minute		
	Light exercise	Moderate exercise	Heavy exercise
Gut	1 100	600	300
Kidneys	900	600	250
Brain	750	750	750
Heart muscles	350	750	1 000
Skeletal muscles	4 500	12 500	22 000
Skin	1 500	1 900	600
Other	400	500	100
<b>Total</b>	<b>9 500</b>	<b>17 600</b>	<b>25 000</b>

- (a) (i) Which organ has a constant flow of blood through it?

\_\_\_\_\_

(1)

- (ii) Which organ has the greatest reduction in the volume of blood supplied during heavy exercise compared with light exercise?

\_\_\_\_\_

(1)

- (iii) What proportion of the blood flows through the heart muscle during heavy exercise?

\_\_\_\_\_

(1)

- (b) The volume of blood flowing through the skeletal muscles increases greatly during exercise.

Give **two** ways in which the body brings about this increase.

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

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

(2)

(c) During exercise, the concentration of carbon dioxide in the blood increases.

Explain what causes this increase.

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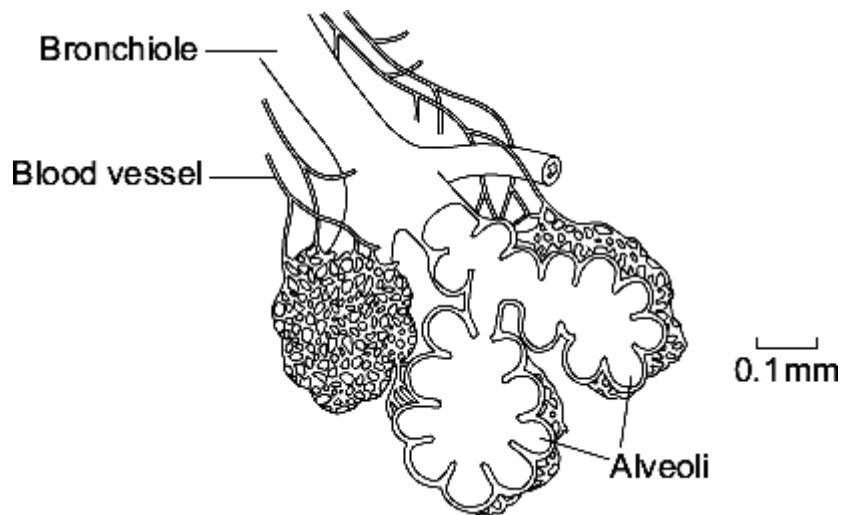
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(3)  
(Total 8 marks)

**Q12.**

The human lung has about 80 million alveoli.  
The diagram shows some alveoli in a human lung.



(a) Give **three** features of the alveoli that allow large amounts of oxygen to enter the blood.

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

\_\_\_\_\_

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

\_\_\_\_\_

3. \_\_\_\_\_

\_\_\_\_\_

(3)

(b) (i) Name the process by which oxygen passes from the air into the blood.

\_\_\_\_\_ (1)

(ii) Breathing allows large amounts of oxygen to enter the blood.

Explain how breathing does this.

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_ (2)

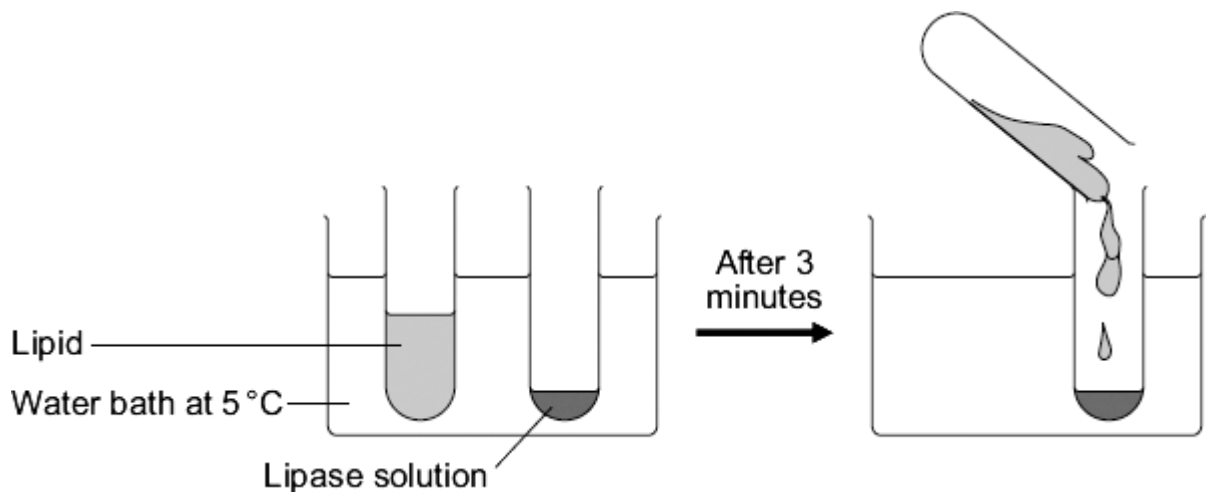
(Total 6 marks)

**Q13.**

A group of students investigated the effect of temperature on the action of the enzyme lipase.

The students:

- put 1 cm<sup>3</sup> of lipase solution into a test tube
- put 5 cm<sup>3</sup> of lipid into a different test tube
- put both tubes in a water bath at 5 °C for 3 minutes
- mixed the lipid with the lipase solution.



Every five minutes the students tested a sample of the mixture for lipid, until no lipid remained.

The students repeated the experiment at different temperatures.

(a) To make their investigation fair the students needed to control some variables.

Give **one** variable the students controlled in their investigation.

\_\_\_\_\_ (1)

- (b) The tubes of lipase solution and lipid were kept separately in the water bath for 3 minutes before mixing. Why?

Tick ( ✓ ) **one** box.

So that the lipase broke down the lipid quickly

So that the lipase and the lipid reached the right temperature

To give enough time for the lipase to break down the lipid

To give enough time for the water bath to heat up

(1)

The table shows the students' results.

Temperature in C	Time taken until no lipid remained in minutes
5	40
20	15
35	5
50	30
95	lipid still there after 120 minutes

- (c) Describe the effect on the breakdown of the lipid of increasing the temperature from 5 °C to 50 °C.

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(2)

(d) Suggest **two** ways in which the students could have improved their investigation.

Use information from the students' method and the results table to help you.

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

\_\_\_\_\_

\_\_\_\_\_

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

\_\_\_\_\_

\_\_\_\_\_

(2)

(e) (i) The lipase did **not** break down the lipid at 95 °C.

Why?

\_\_\_\_\_

\_\_\_\_\_

(1)

(ii) At 35 °C the lipase broke down the lipid after 5 minutes.

What new substances will be in the tube?

Draw a ring around **one** answer.

**amino acids**

**fatty acids and glycerol**

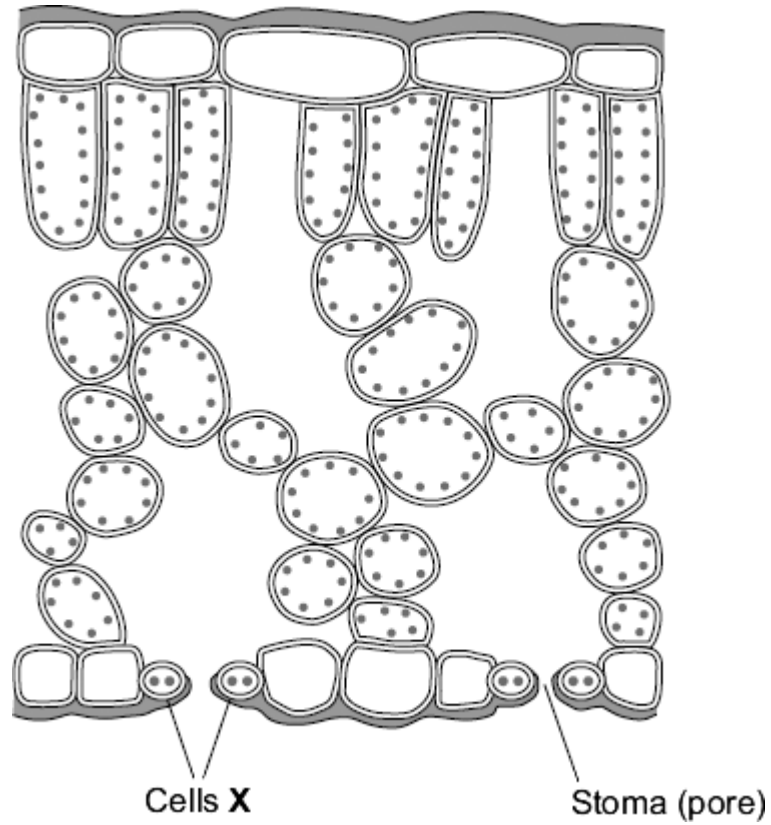
**sugars**

(1)

(Total 8 marks)

**Q14.**

The diagram shows a section through a plant leaf.



- (a) The cells labelled **X** surround a stoma (pore).

Draw a ring around the correct answer to complete the sentence.

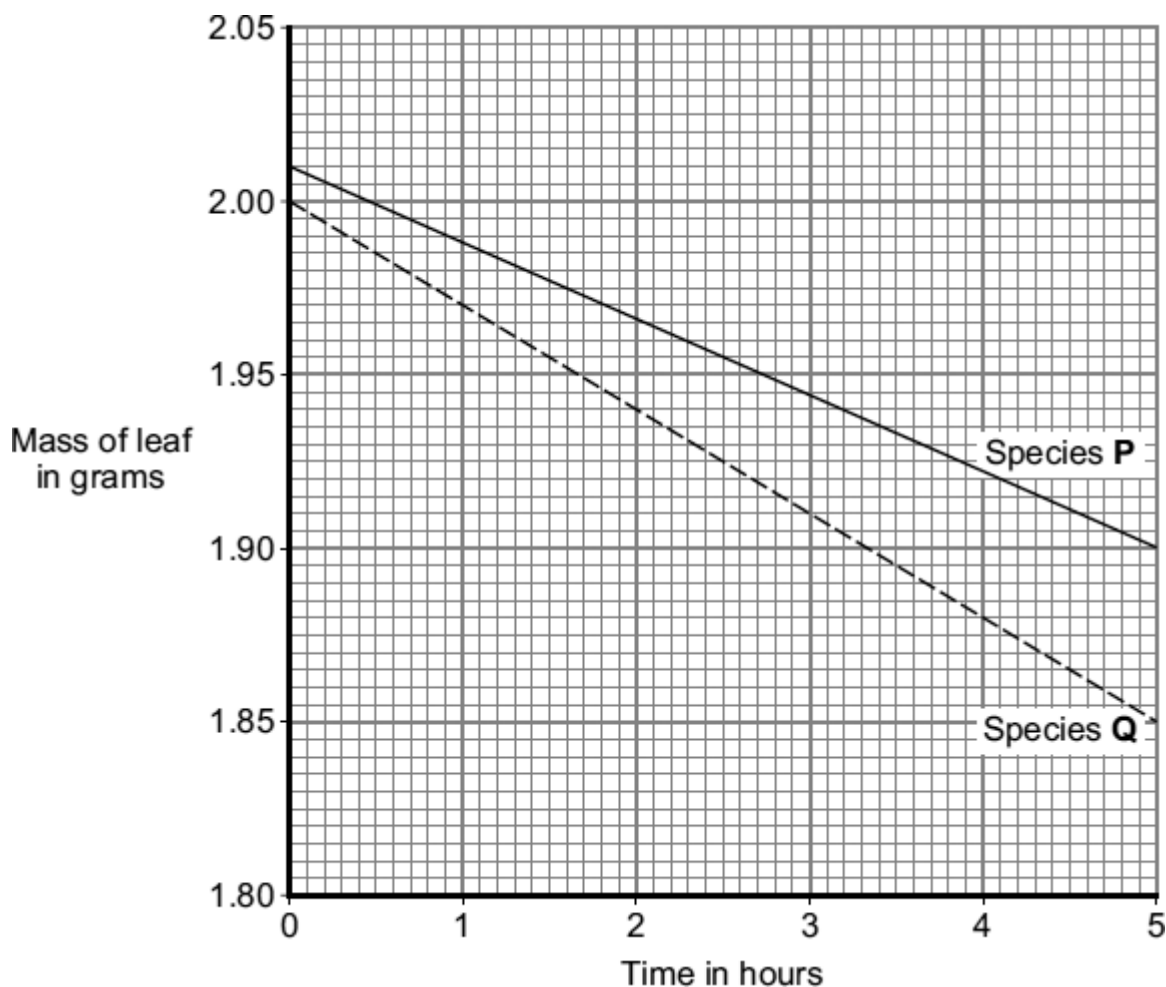
Cells **X** are called

- |              |
|--------------|
| alveoli.     |
| guard cells. |
| villi.       |

(1)

(b) Water vapour is lost from leaves. Water loss causes a leaf to lose mass.

The graph shows how the masses of leaves from two plant species, **P** and **Q**, changed over several hours. Both leaves were kept in the same conditions.



(i) What was the mass of the leaf of species **Q** at 0 hours?

\_\_\_\_\_ grams

(1)

(ii) What was the difference between the mass of the leaf of species **P** and the mass of the leaf of species **Q** after 5 hours?

\_\_\_\_\_ grams

(1)

(iii) The leaf of species **Q** lost water at a faster rate than the leaf of species **P**.

Suggest **one** reason why.

\_\_\_\_\_  
\_\_\_\_\_

(1)

- (iv) Which weather conditions would cause the greatest rate of loss of mass for both species **P** and species **Q**?

Tick (✓) **one** box in the table.

Weather conditions		Tick (✓)
Still air or wind	Temperature in °C	
Wind	30	
Still air	30	
Wind	20	

(1)

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

In very hot, dry conditions, the stomata close.

This is to prevent

anaerobic respiration. breathing. wilting.
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(1)

(Total 6 marks)

## Mark schemes

### Q1.

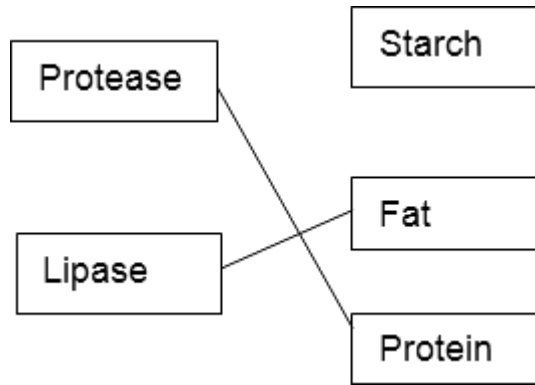
- (a) protease  
*allow trypsin / peptidase*  
*do not allow pepsin* 1
- carbohydrase / amylase  
*do not allow sucrase / maltase / lactase* 1
- (b) no lipase produced / found 1
- in stomach / mouth / before small intestine  
**OR**  
accept lipase only produced / found (1)  
in small intestine / pancreas (1)  
*if no other mark is awarded lipid is not broken down in the stomach or lipid is digested in small intestine gains 1 mark* 1
- (c) enzymes only work in solution / when dissolved  
**or**  
because enzyme / lipase / it is dry  
*allow enzymes only work in presence of water or enzymes do not work when dry*  
*ignore other physical conditions* 1

[5]

### Q2.

- (a) (i) 129 1
- (ii) 9  
*accept calculated difference between answer to (a)(i) and 120* 1
- (b) less energy / power used  
*allow less fuel / named fuel used*  
*ignore cost* 1
- less pollution / carbon dioxide  
**or** less hot water / less heat released  
*allow less global warming / carbon emissions or reduced carbon footprints*  
*do not accept secondary effects alone, eg less melting of ice caps* 1

(c) (i)



1 mark for each correct line  
do **not** accept two lines from an enzyme

2

(ii) denatured

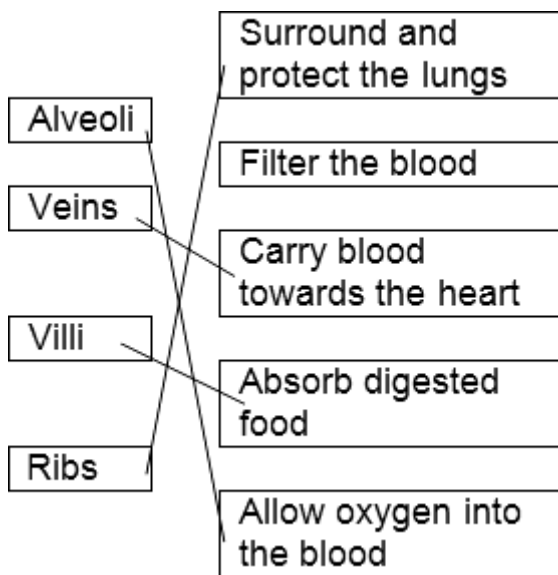
if no answer on the line accept a clear indication of correct answer in the box

1

[7]

### Q3.

(a)



4 correct = 4 marks  
3 correct = 3 marks  
2 correct = 2 marks  
1 correct = 1 mark  
extra line from a structure cancels the mark

4

(b) diffusion

1

[5]

### Q4.

- (a) transpiration 1
- (b) increase then decrease 1
- maximum rate at 36 - 38 (°C ) / 540 - 560 (grams per day)  
*any figure in these ranges* 1
- (c) (i) reduce water loss / prevent wilting  
*allow stops water loss* 1
- (ii) 40 - 45 °C 1

[5]

**Q5.**

any **two** from:

- arthritis  
*ignore descriptions*
- diabetes
- high blood pressure
- heart / blood vessel disease  
*ignore cholesterol*

[2]

**Q6.**

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

- fibres not damaged
- machines last longer / machines not damaged by stones
- shorter time **or** quicker
- lower temperature  
*allow cheaper / uses less energy as an alternative to shorter time / lower temperature, if these not given*

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 2  
1 [5]

**Q7.**

- (a) shape changed / destroyed (above 45 °C)  
*accept denatured*  
*accept active site changed*  
*do not accept enzyme killed* 1

(shape) doesn't fit (other molecules / stain) 1

- (b) (i) any **two** from:  
  - can wash the clothes at higher temperature
  - so wash / enzyme action will be quicker  
*do not accept idea of bacteria working faster*
  - enzyme not destroyed at high temperature / 80 °C  
*accept denaturation or description*
2

(ii) high(er) temperature / 80 °C uses more energy / fuel 1

more pollution / named (eg carbon dioxide / global warming) (from electricity production)

**or**

increased release of hot water (into the environment) 1

[6]

**Q8.**

(a) (i) capillary 1

(ii) diffusion 1

(b) (i) Z  
*ignore any names* 1

(ii) large / increased surface / area / **or** to absorb more food **or** improved diffusion  
*allow all food absorbed* 1

[4]

**Q9.**

- (a) (i) 18 1
- (ii) Z 1
- (b) (i) red blood cells 1
- (ii) haemoglobin 1

[4]

**Q10.**

- (a) (i) wind 1
- temperature  
*answers in either order*  
*ignore weather* 1
- (ii) different plants have different sizes / different numbers of leaves / different sizes of leaves / different plants take up different amounts of water  
*ignore reference to validity*  
*allow different plants need different amounts of water* 1
- (b) in table, in sequence:  
C  
*all 3 correct = 2 marks*  
B  
A  
*all 3 correct = 2 marks*  
*2 correct = 1 mark*  
*0 or 1 correct = 0 mark* 2
- (c) transpiration 1

[6]

**Q11.**

- (a) (i) brain 1
- (ii) skin 1

(iii) 1/25 **or** 4% **or** 0.04 **or** 1 in 25 **or** 1:25 **or** 1 out of 25

$$\text{allow } \frac{1000}{25000}$$

1

(b) any **two** from:

- increased / high heart rate / pulse rate  
*do not allow pumps more blood unqualified*
- dilation / widening of arteries / arterioles (to skeletal muscles)  
*accept vasodilation unqualified*  
*do not accept reference to veins / capillaries*

**or**

less blood flow to other organs

- increased stroke volume / described

2

(c) *ignore references to breathing*

more respiration / description

**or**

more energy required **or** to provide more energy

1

respiration / process described → CO<sub>2</sub>

*do not accept anaerobic respiration*

1

CO<sub>2</sub> diffuses into blood

1

[8]

## Q12.

(a) large surface / large area

1

thin / short distance (from air to blood) / one cell thick / two cells thick

1

good blood supply / many capillaries / capillary network / many blood vessels

*ignore moist surface*

1

(b) (i) diffusion

*ignore gaseous exchange*

1

(ii) brings (more) oxygen / air into the lungs / alveoli

1

keeps O<sub>2</sub> level high in alveoli

or

maintains concentration difference (between alveoli and blood) / keeps O<sub>2</sub> concentration in alveoli > O<sub>2</sub> concentration in blood gains **2** marks

1

[6]

**Q13.**

(a) any **one** from:

*ignore reference to recording results every 5 minutes or concentrations of lipid / lipase*

- (same) volume / amount / 1 cm<sup>3</sup> lipase  
*allow amount of solution*
- (same) volume / amount / 5 cm<sup>3</sup> lipid  
*allow keep same volumes in the test tubes*
- mixed after 3 minutes / same time before mixing  
*do not accept temperature*

1

(b) so that the lipase and the lipid reached the right temperature

1

(c) any **two** from

*ignore explanations*

- decrease in time **or** faster (breakdown)
- then increase in time **or** then slower (breakdown)
- fastest / least time / optimum at 35°C

2

(d) any **two** from:

*ignore 'test at more temperatures' unqualified*

- test more regularly eg test every minute  
*any interval < 5min*
- test at smaller temperature intervals  
*any value < 15°C*  
*allow test more temperatures in the range*
- test between 50 (°C) and 95 (°C)  
*any value in range, eg test at 70*
- repeat at same temperatures  
**or** repeat the investigation  
**or** compare results with others  
*allow do it again*

2

(e) (i) (lipase / it) denatured / destroyed / changed shape

*allow damaged / deformed*  
*do not accept killed*  
*ignore broken (down)*

(ii) fatty acids and glycerol

1

1

[8]

**Q14.**

(a) guard cells

1

(b) (i) 2.00 / 2.0 / 2

1

(ii) 0.05 or 1/20

1

(iii) (Q has)  
*it = Q*

large(r) surface area / more stomata / thinner cuticle / larger leaves  
*accept other sensible answers*

1

(iv) wind 30  
*extra box ticked cancels the mark*

1

(c) wilting  
*extra ring drawn cancels the mark*

1

[6]