Organisation part 7

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Name: _____

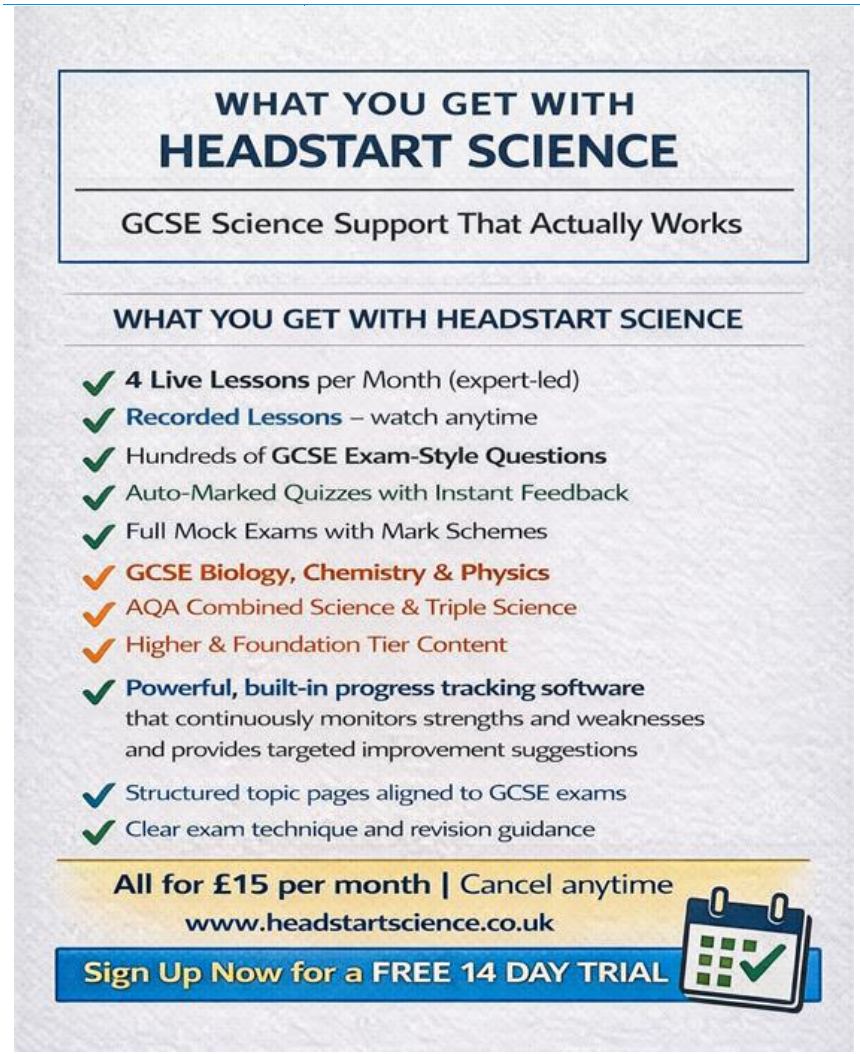
Class: _____

Date: _____

Time: **79 minutes**

Marks: **73 marks**

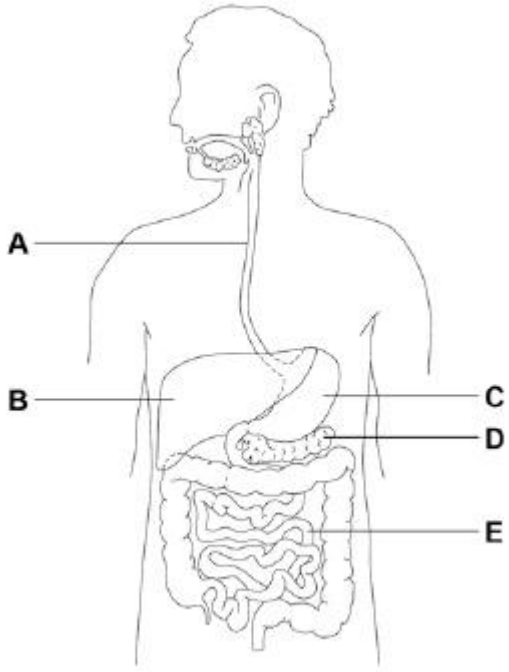
Comments:



Q1.

Figure 1 shows the human digestive system.

Figure 1



(a) Which organ in **Figure 1** produces acid?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(b) Which organ in **Figure 1** produces bile?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(c) Where in **Figure 1** are digested foods absorbed into the blood?

Tick **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐

(1)

(d) Food molecules such as proteins **cannot** be absorbed unless they are digested.

Give **one** reason why.

_____

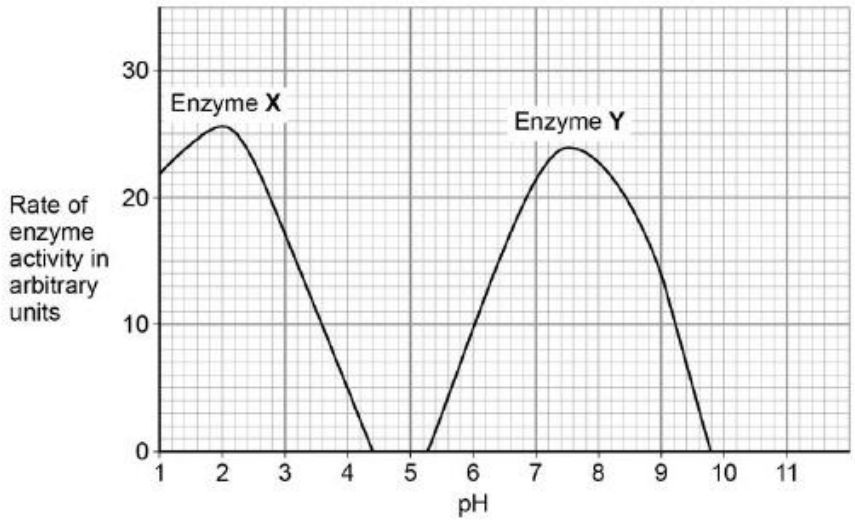
_____

(1)

A scientist investigated the effect of pH on the activity of two protease enzymes.

Figure 2 shows the results.

Figure 2



(e) What is the optimum pH for enzyme **Y**?

pH _____

(1)

(f) Where in the digestive system might the two protease enzymes be produced?

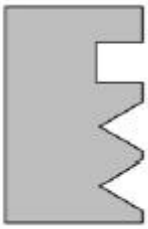
Tick **one** box.

Enzyme X	Enzyme Y	
Mouth	Stomach	☐
Pancreas	Mouth	☐
Small intestine	Pancreas	☐
Stomach	Small intestine	☐

(1)

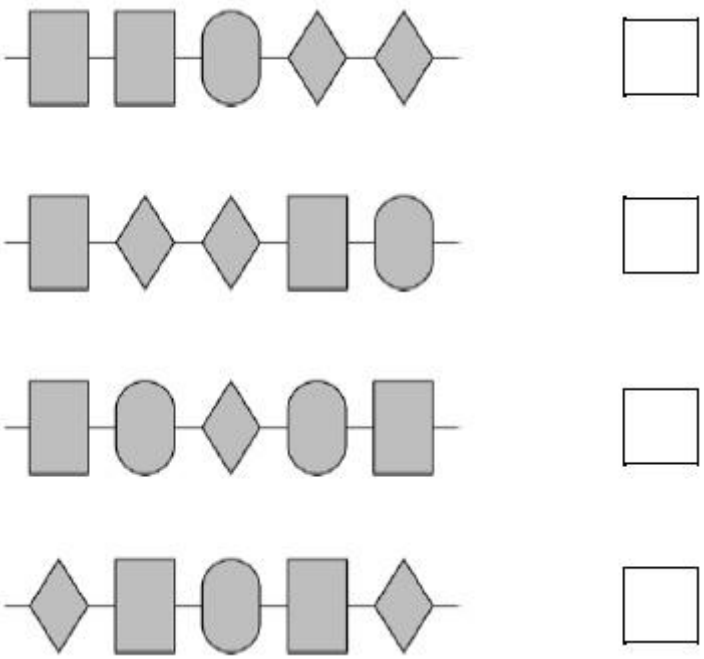
Figure 3 shows a model of an enzyme molecule.

Figure 3



(g) Which substrate fits the enzyme molecule in **Figure 3**?

Tick **one** box.



(1)

(h) The enzyme and substrate diagrams are used as a model for a theory of enzyme action.

What is the name of this theory?

Tick **one** box.

- Evolution ☐
- Lock and key ☐
- Natural selection ☐
- Protein synthesis ☐

(1)

(i) Explain why pH affects enzyme activity.

_____

_____

_____

_____

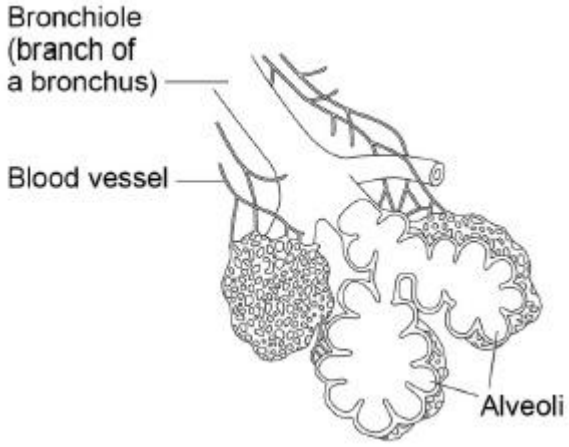
(2)

(Total 10 marks)

Q2.

Figure 1 shows part of the lungs.

Figure 1



(a) Give **two** ways the lungs are adapted for efficient exchange of gases.

Describe how each adaptation helps to maintain efficient gas exchange.

Adaptation 1 _____

_____

Description _____

_____

Adaptation 2 _____

_____

Description _____

_____

(4)

(b) There are 5.4 million people with asthma in the UK.

What type of disease is asthma?

Tick **one** box.

An allergy ☐

A bacterial infection ☐

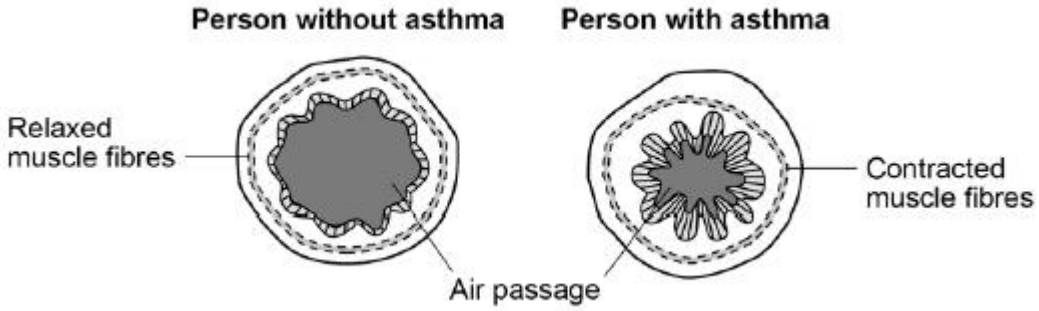
A cancer ☐

A viral infection ☐

(1)

(c) **Figure 2** shows cross-sections of bronchioles of two people.

Figure 2



Suggest why people with asthma often find it difficult to breathe.

_____

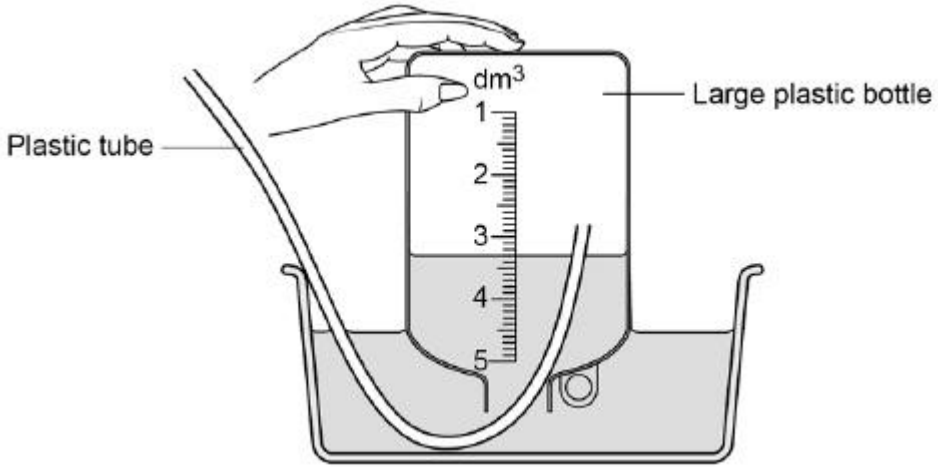
_____

(1)

(d) People with asthma often have a reduced lung volume.

Figure 3 shows the apparatus a student used to measure his lung volume.

Figure 3



This is the method used.

1 Fill the bottle with water.

2 Breathe out through the tube.

The volume of water pushed out of the bottle is equal to his lung volume.

What is the student's lung volume?

Volume = _____ dm^3

(1)

Scientists tested a new drug to treat asthma.

The scientists measured the lung volume of:
- volunteers without asthma
- some volunteers during a mild asthma attack
- other volunteers during a severe asthma attack.

Half the people in each group were given a placebo.

The other half of the people in each group were given the new drug.

The tests were carried out as a double blind trial.

(e) What is a placebo?

_____

_____

(1)

(f) Who knows which volunteers in a double blind trial are given the drug and which volunteers are given the placebo?

Tick **one** box.

The scientists but not the volunteers	☐
The scientists and the volunteers	☐
The volunteers but not the scientists	☐
Neither the volunteers nor the scientists	☐

(1)

(g) Suggest why it is a good idea that double blind trials should be used in drug testing?

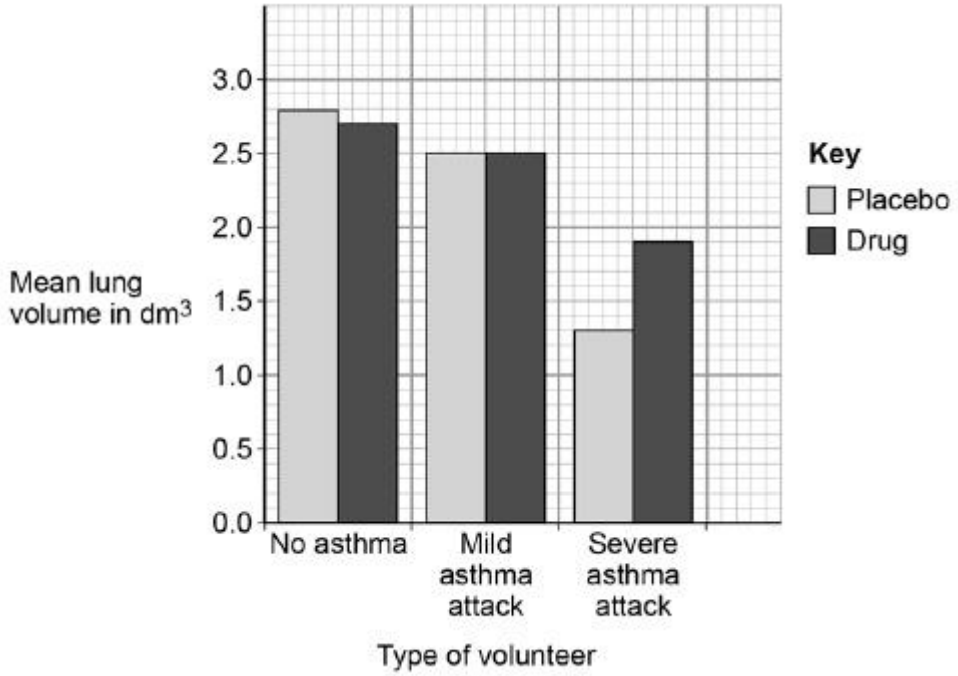
_____

_____

(1)

(h) **Figure 4** shows the results of the drug tests.

Figure 4



Give **two** conclusions that can be made about the usefulness of the drug.

1. _____

_____

2. _____

_____

(2)

(Total 12 marks)

Q3.

Plants make glucose by photosynthesis.

(a) Complete the word equation for photosynthesis.

_____ + _____ → glucose + _____

(1)

(b) What is the name of the chemical that makes a leaf look green?

Tick **one** box.

Cellulose ☐

Chlorophyll ☐

Chloroplast ☐

Chromosome ☐

(1)

(c) A test for starch is used to show that a plant has photosynthesised.

How does the presence of starch show that photosynthesis has taken place?

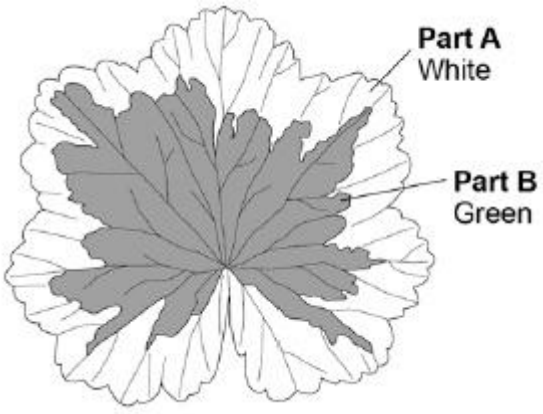
_____

_____

(1)

A student investigated where starch was made in a leaf.

She used a leaf that was part green and part white as shown in the diagram.



This is the method used.

1. Put the leaf in boiling water for 1 minute.
Reason: stops all chemical reactions in the leaf.

2. Transfer the leaf to boiling ethanol for 5 minutes.
Reason: removes the green colour.

3. Dip the leaf in hot water.
Reason: softens the leaf.

4. Spread the leaf on a white tile and test with iodine solution.
Reason: stains any starch.

(d) If the chemical reactions in the leaf were not stopped, the amount of starch in the leaf would decrease.

Give the reason why.

_____

_____

(1)

(e) Suggest why it is important to remove the green colour from the leaf before adding iodine solution.

_____

_____

(1)

(f) Ethanol is flammable.

The student wore safety goggles when testing the leaf for starch.

Give one other safety precaution the student should have taken.

_____

_____

(1)

(g) Look at the leaf in the diagram.

What colour would part **A** and part **B** stain with iodine solution after the starch test?

A _____

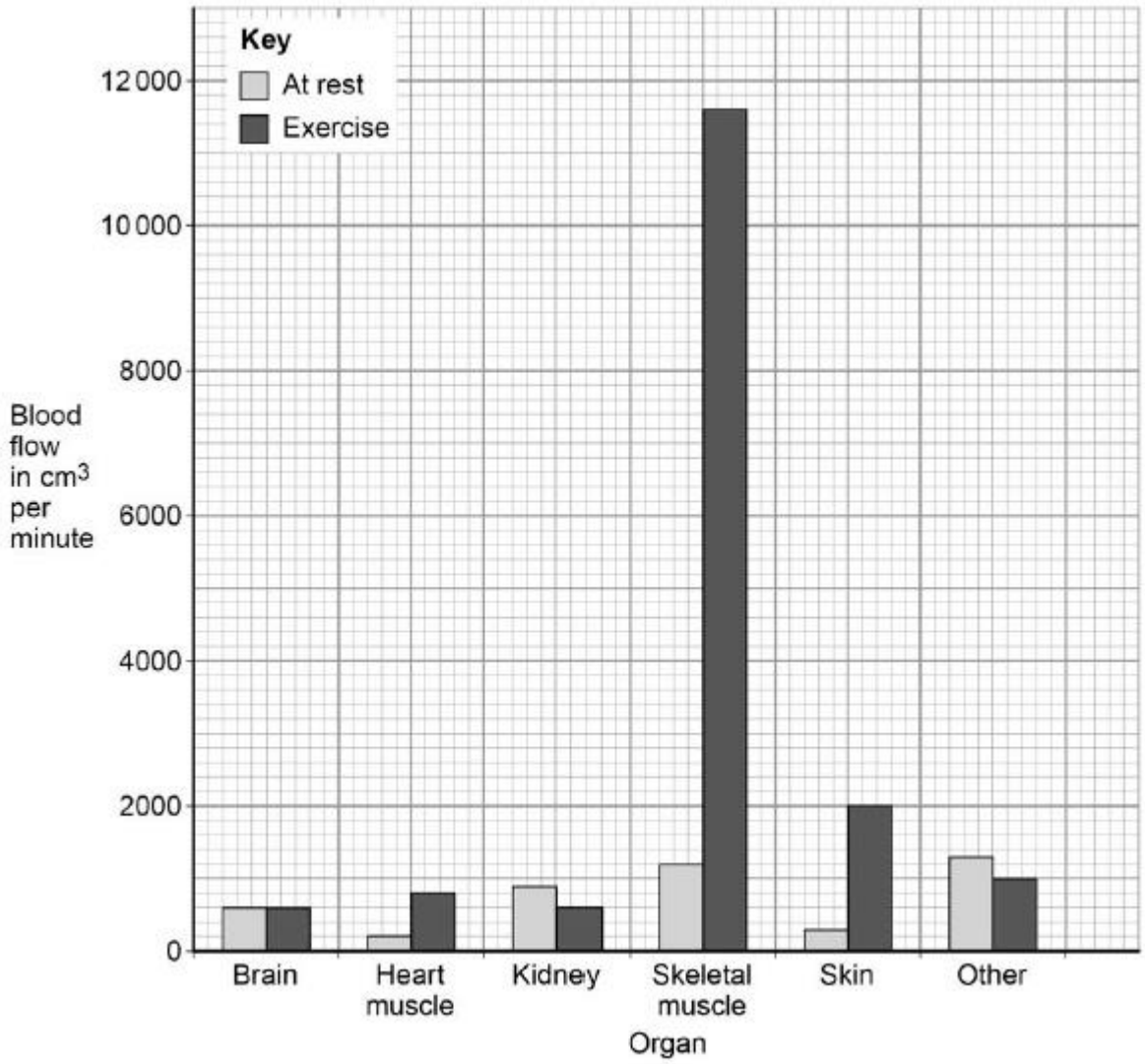
B _____

(2)

(Total 8 marks)

Q4.

The graph shows the rate of blood flow through different organs at rest and during exercise.



(a) Determine the total volume of blood that flows through the brain in 1 hour.

_____

Volume = _____ cm^3

(1)

(b) Look at the blood flow through the skeletal muscle.

Calculate how many times the blood flow increases by during exercise compared to at rest.

_____

_____

Answer = _____

(2)

(c) Explain why the blood flow to the skeletal muscles increases during exercise.

(3)

(d) Arteries and veins have different structures and different functions.

Explain how the different structure of arteries and veins relates to their different functions.

(6)

(Total 12 marks)

Q5.

Proteins are broken down by protease enzymes.

(a) Which organs in the digestive system produce protease enzymes?

Tick **one** box.

Mouth and liver ☐

Mouth and stomach ☐

Pancreas and liver ☐

Stomach and pancreas ☐

(1)

A student used a colorimeter to investigate the rate of protein digestion of an insoluble protein.

A colorimeter measures the percentage of light that passes through a liquid.

The student measured the percentage of light passing through different concentrations of protein suspension.

The student used the results to produce a concentration curve.

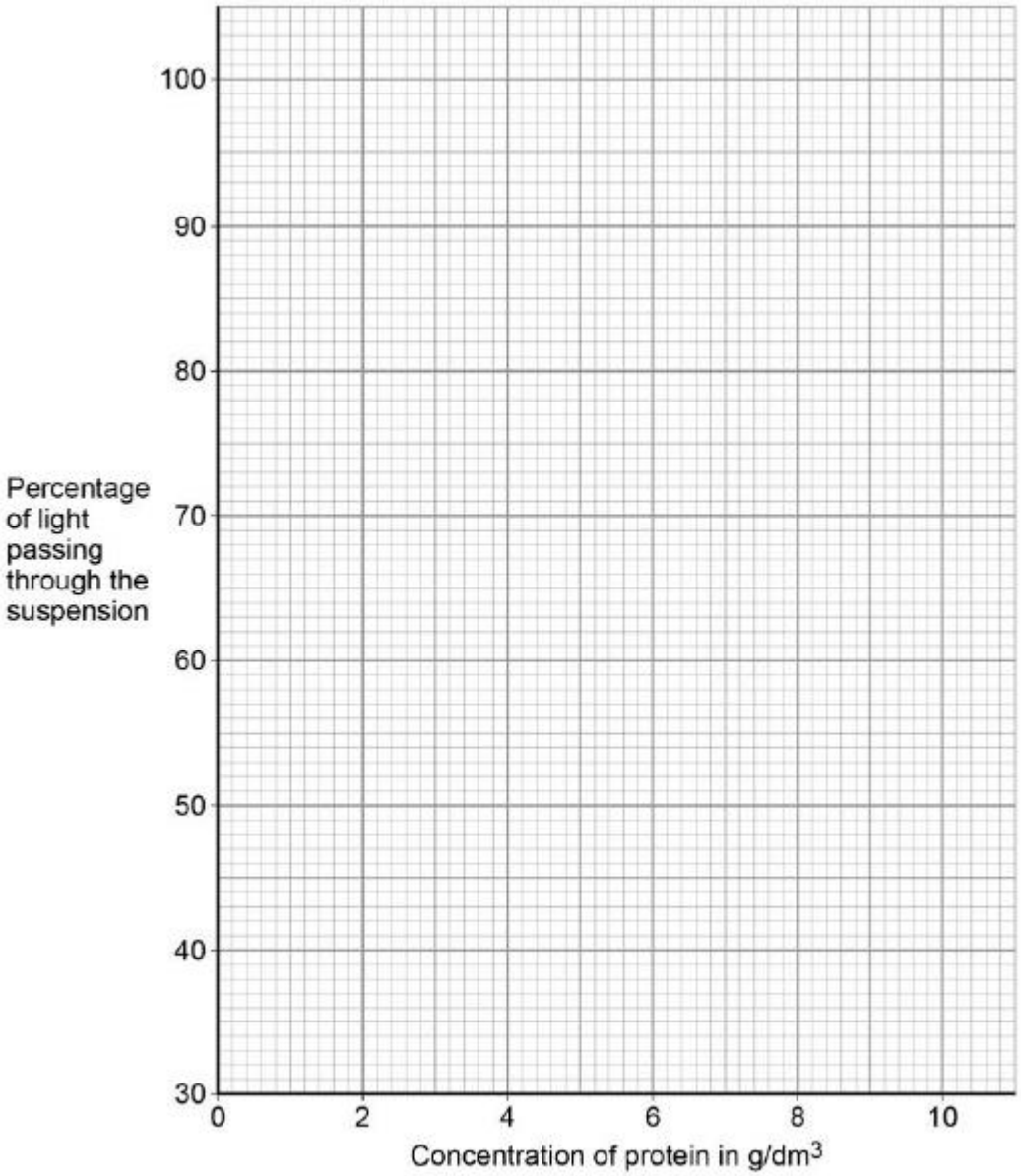
The table shows the results.

Concentration of protein in g/dm^3	**Percentage of light passing through the suspension**
0.0	100
0.5	93
2.0	75
10.0	38

(b) Plot the data from the table on **Figure 1**.

Draw a line of best fit.

Figure 1



(3)

(c) Explain the change in the percentage of light passing through the suspension.

_____

_____

_____

_____

(2)

(d) Suggest how the student could improve their investigation to draw a more accurate concentration curve.

_____

_____

(1)

The student then investigated the rate of protein digestion with protease obtained from two different organs.

This is the method used.

1. Put 5 cm^3 of protease from each organ into separate test tubes.

2. Put 10 cm^3 of protein suspension into two other test tubes.

3. Put all four tubes into a water bath at 37 °C for 10 minutes.

4. Mix each 5 cm^3 of protease into a tube of protein suspension.

5. Take a sample of each mixture every 2 minutes.

6. Measure the percentage of light passing through each sample using a colorimeter.

(e) Suggest why the protease and the protein suspension were put into a water bath before being mixed.

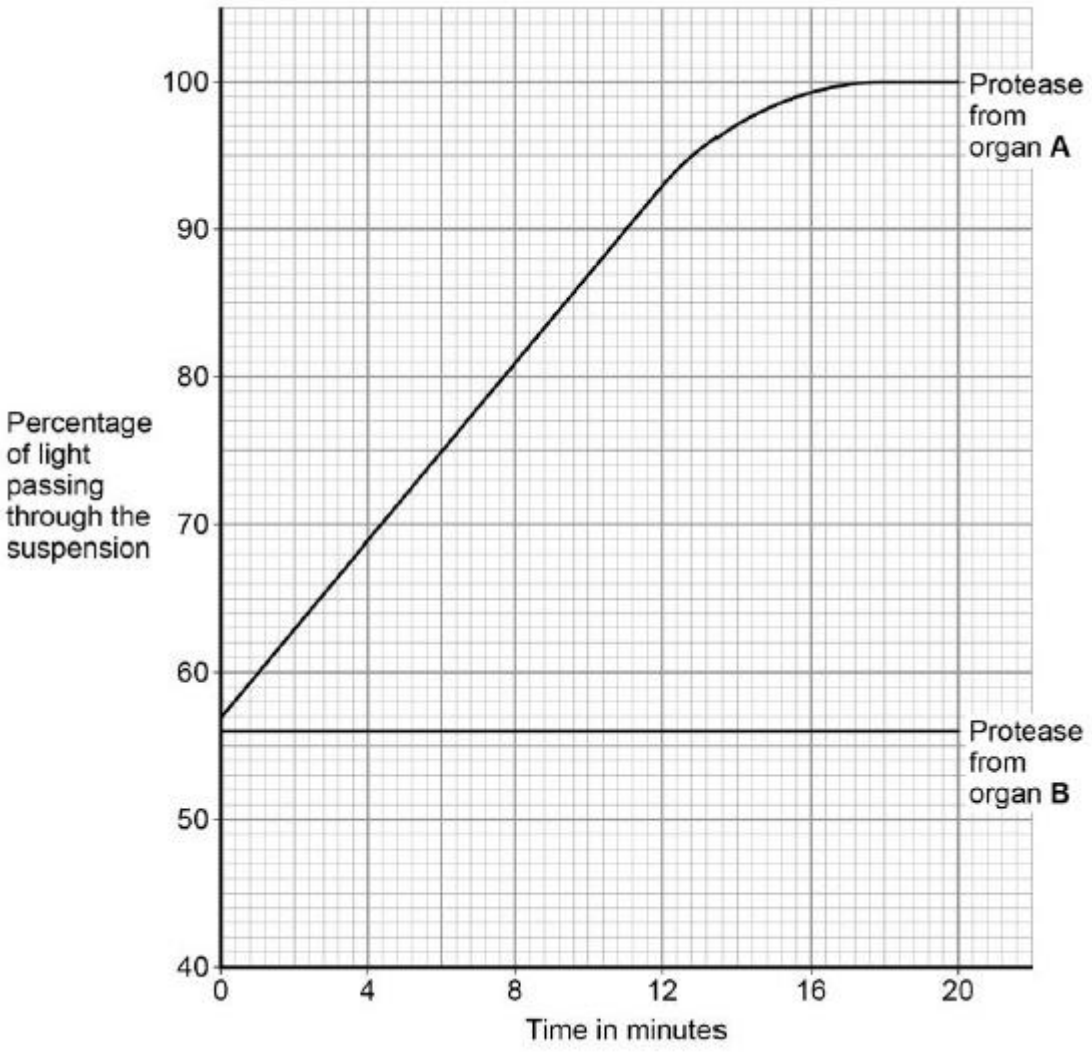
_____

_____

(1)

Figure 2 shows the student's results.

Figure 2



(f) Determine the concentration of protein at the start of the reaction with protease from organ **A**.

Use **Figure 2** and your graph in **Figure 1**.

_____

_____

Concentration = _____ g/dm^3

(1)

(g) Calculate the rate of protein digestion with protease from organ **A** over the first 12 minutes.

Use **Figure 2** and your graph in **Figure 1**.

_____

_____

_____

_____

Rate = _____ g/dm^3 per minute

(1)

(h) Describe how the activity of protease from organ **B** is different from the activity of protease from organ **A**.

Suggest **one** reason for the difference.

_____

_____

_____

_____

(2)

(Total 13 marks)

Q6.

Plants have tissues that are specialised for the transport of food and water molecules.

(a) Which is a description of the role of the xylem?

Tick **one** box.

Transports dissolved sugars using translocation	☐
Transports starch in the transpiration stream	☐
Transports water in the transpiration stream	☐
Transports water using translocation	☐

(1)

(b) Which is a description of the role of the pholem?

Tick **one** box.

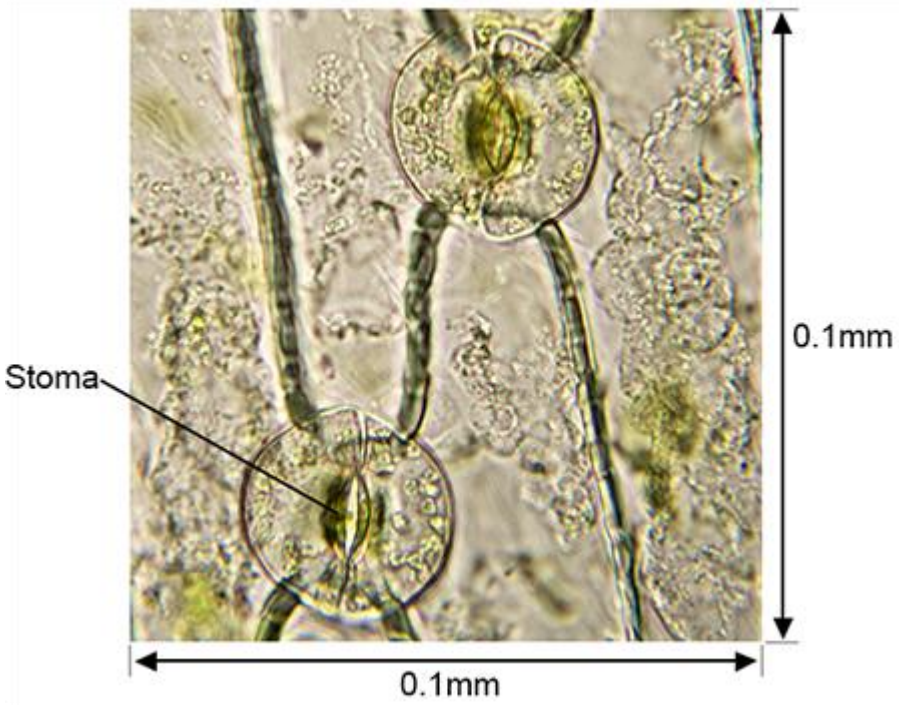
Transports dissolved sugars in the transpiration stream	☐
Transports dissolved sugars using translocation	☐
Transports starch using translocation	☐
Transports water in the transpiration stream	☐

(1)

In plants water is lost through stomata.

Figure 1 shows stomata on the lower surface of a leaf.

Figure 1



(c) Calculate the number of stomata per mm^2 for the leaf shown in **Figure 1**.

_____

_____

_____

_____

Number of stomata = _____

(2)

(d) Most plants have more stomata on the lower surface of a leaf than on the upper surface.

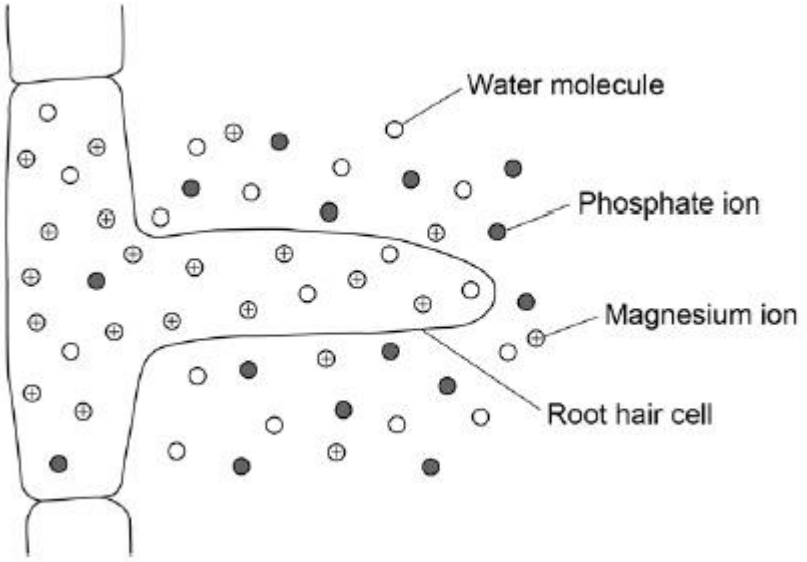
Explain why there are more stomata on the lower surface of a leaf.

(3)

(e) Particles can move into and out of cells by different processes.

Figure 2 shows different particles inside and outside a root hair cell.

Figure 2



Explain the processes by which the different particles would enter the root hair cell.

_____

_____

_____

_____

_____

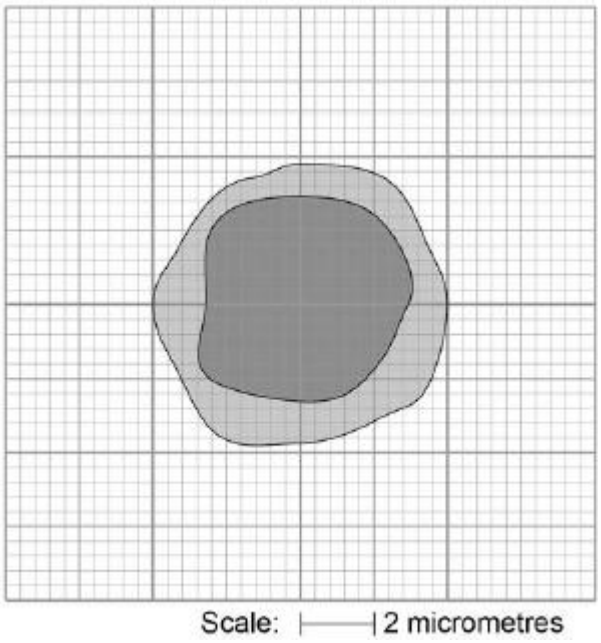
_____

(6)

(Total 13 marks)

Q7.

The figure below shows a scale drawing of one type of cell in blood.



(a) Use the scale to determine the width of the cell.

Give your answer to the nearest micrometre.

_____

_____

Width of cell = _____ micrometres

(1)

(b) Complete the table below.

Part of the blood	Function
	Carries oxygen around the body
	Protects the body against infection
Plasma	

(3)

(c) Platelets are fragments of cells.

Platelets help the blood to clot.

Suggest what might happen if the blood did **not** clot.

_____

_____

(1)

(Total 5 marks)

Q1.

(a) **C**

1

(b) **B**

1

(c) **E**

1

(d) any **one** from:

- they are too big
- they are insoluble

1

(e) (pH) 7.5

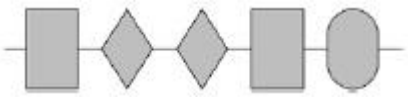
allow answers in range 7.4 to 7.6

1

(f) (enzyme **X**) stomach

(enzyme **Y**) small intestine

1

(g) 

1

(h) lock and key

1

(i) (some pH values):

change the shape of the active site

allow some pH values denature enzymes

1

(so) so substrate will no longer fit / bind to the active site

1

[10]

Q2.

(a) any **two** adaptations with linked descriptions from:

- many alveoli to provide a large surface area
- good blood supply to maintain steep diffusion / concentration gradient
- thin walls so gases do not have far to diffuse / travel
- well ventilated to maintain steep diffusion / concentration gradient

1 mark for adaptation and 1 mark for linked description
*allow to collect oxygen **or** to bring carbon dioxide to lungs*

4

(b) an allergy

1

(c) any **one** from:

- narrow(er) / small(er) (air) passages / bronchioles
- less air / oxygen can pass through

1

(d) 3.3 (dm^3)

1

(e) any **one** from:

- fake drug
- inactive form of drug

1

(f) neither the volunteers nor the scientists

1

(g) to avoid / reduce bias

1

(h) any **two** from:

- drug only works for severe asthma attacks
  or
  drug only increased lung capacity in severe asthma attacks
- drug had little effect **or** slight reduction in healthy people
- drug had no effect in mild asthma attacks
- drug does not alleviate the problem entirely

2

[12]

Q3.

(a) carbon dioxide + water → (glucose) + oxygen
allow reactants in either order
allow correct formulae, balancing not required

1

(b) chlorophyll

1

(c) glucose (produced in photosynthesis) is converted into starch

1

(d) starch could be broken down (into sugar)

1

(e) so the colour of the iodine solution / result can be seen

1

(f) any **one** from:

- turn off Bunsen / flame before collecting ethanol
- use a water bath to heat the ethanol
  allow idea that there are no naked flames near the ethanol

1

(g) **A** orange / brown

1

B black / blue-black

1

[8]

Q4.

(a) 36 000 (cm^3)

1

(b) 11600 / 1200

1

9.66666r

allow any number of decimals

1

(c) muscles need more energy (for contraction)

1

(so) more oxygen / glucose needed

need at least one reference to 'more' for full marks

allow so more carbon dioxide / thermal energy needs to be removed

1

(for) increased respiration

1

(d)

Level 3: Relevant points (differences / functions) are identified, given in detail and linked logically to form a clear account.	5-6
Level 2: Relevant points (differences / functions) are identified and there are attempts at logical linking. The resulting account is not fully clear.	3-4
Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1-2
No relevant content	0

Indicative content • artery has a thicker wall • (because) artery has to withstand higher pressure • artery has thicker layer of elastic tissue / fibres • (so) it can stretch • (so) artery returns to original size / shape • artery has thicker layer of muscle • to maintain a force on the blood • vein has valves • (valves) prevent backflow of blood • artery carries blood away from the heart • vein carries blood towards the heart ignore references to oxygenated / deoxygenated blood	

6

[12]

Q5.

(a) stomach and pancreas

1

(b) all points plotted correctly

*allow **1** mark for 3 points correctly plotted*

2

smooth curve drawn through all the points

1

(c) as concentration of protein increases the percentage of light passing through decreases

1

(because) mixture more cloudy

allow idea of more particles in suspension

1

(d) use protein concentrations between 2 and 10 g/dm^3

1

(e) any one from:

- to allow them to reach 37 °C

  to allow them to reach body temperature

- so they would be at the optimum temperature

allow so they would be at the same temperature

- so reaction temperature controlled
  allow temperature affects enzyme activity

1

(f) correctly read concentration at 57% from their graph

1

(g) their value given in part (f) – 0.5
allow use of different values over straight line portion of graph

1

answer for their value given in

$$\frac{\mathbf{03.6} - 0.5}{12}$$

1

(h) (protease from organ **B**) is inactive **or** rate of digestion is zero **and** protease from organ **A** is active
*allow only protease from organ **B** is inactive*

1

any **one** from:

- enzyme denatured by pH
- at the wrong pH
- enzyme not specific for this protein
  allow active site damaged / changed by pH

1

[13]

Q6.

(a) transports water in the transpiration stream

1

(b) transports dissolved sugars using translocation

1

(c) 2/(0.1 × 0.1)
or
2/ 0.01

1

200
*an answer of 200 scores **2** marks*

1

(d) cooler around lower surface

1

more humid around lower surface
allow converse argument for upper surface of leaf if qualified

1

(so) less water evaporated

allow less breeze around lower surface

1

(e)

Level 3: Relevant points (correct processes / explanations) are identified, given in detail and linked logically to form a clear account.	5-6
Level 2: Relevant points (correct processes / explanations) are identified and there are attempts at logical thinking. The resulting account is not fully clear.	3-4
Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical thinking.	1-2
No relevant content	0
Indicative content • water is absorbed by osmosis • osmosis is a passive process, or described • water in soil is at a higher concentration than inside cell • water moves down concentration gradient • through a partially permeable membrane • phosphate ions absorbed by diffusion • diffusion is a passive process, or described • phosphate ions are in a higher concentration in soil than inside cells • magnesium ions are absorbed by active transport • magnesium ions are in lower concentration in soil than inside cells • magnesium ions move from an area of lower concentration to an area of higher concentration inside the cells • magnesium ions move up the concentration gradient • process requires energy • energy from respiration	

6

[13]

Q7.

(a) 8 (micrometres)

1

(b) red blood cell(s)

1

white blood cell(s)

accept named cell

eg phagocyte / lymphocyte

1

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

1

(c) any **one** from:

- you could lose a lot of blood
- bleed internally

allow bleeding would not stop

allow could bleed to death

1

[5]