AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE
BIOLOGY

H

Higher Tier Paper 1H

Time allowed: 1 hour 45 minutes

Materials

For this paper you must have:
- a ruler
- a scientific calculator.

Instructions
- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
TOTAL	

Information
- The maximum mark for this paper is 100.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

Answer **all** questions in the spaces provided.

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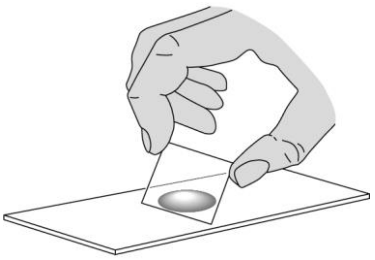
0 1 A student prepared some animal cells to view using a microscope.

Figure 1 shows the student preparing the cells.

Figure 1



0 1 . 1 Name **two** pieces of laboratory equipment the student could have used to **prepare** cells to view using a microscope.

[2 marks]

1 (microscope) slide

2 cover slip

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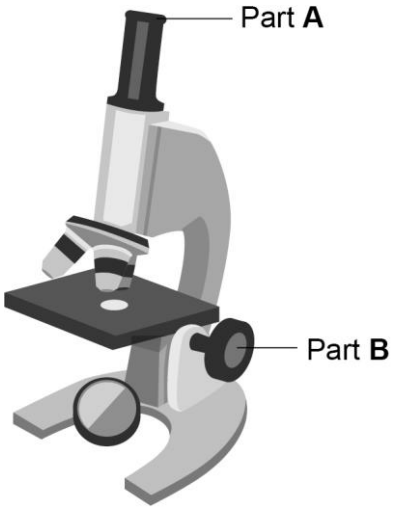
Figure 2 shows the student's light microscope.

Figure 2



0 1 . 2 Name part **A**.

[1 mark]

Eyepiece / lens

0 1 . 3 What is the function of part **B**?

[1 mark]

To focus

0 1 . 4 The student tried to look at the cells using the microscope.

Suggest **one** reason why the student could **not** see any cells when looking through part **A**.

[1 mark]

No cells in the field of view OR slide not in the correct position OR mirror not in correct position

Question 1 continues on the next page

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0 1 . 5 Red blood cells are specialised animal cells.

Compare the structure of a red blood cell with the structure of a plant cell.

[6 marks]

Differences:
- red blood cell has no nucleus or plant cell has a nucleus
- red blood cell has no cell wall or plant cell has a cell wall
- red blood cell is a biconcave disc or there are many different shapes of plant cell
- red blood cell contains haemoglobin or plant cells do not contain haemoglobin
- red blood cells do not contain chlorophyll or plant cells (may) contain chlorophyll
- red blood cell has no chloroplasts or plant cell has chloroplasts
- red blood cell has no (permanent) vacuole or plant cell has (permanent) vacuole
- red blood cells are (much) smaller than plant cells

Similarities:
both have:
- cytoplasm
- cell membrane
- pigments (although they are different)

0 1 . 6 When placed into a beaker of water:

- a red blood cell bursts
- a plant cell does **not** burst.

Explain why the red blood cell bursts but the plant cell does **not** burst.

[2 marks]

Water enters the cells by osmosis / diffusion and plant cell has a cell wall which prevents it from bursting.

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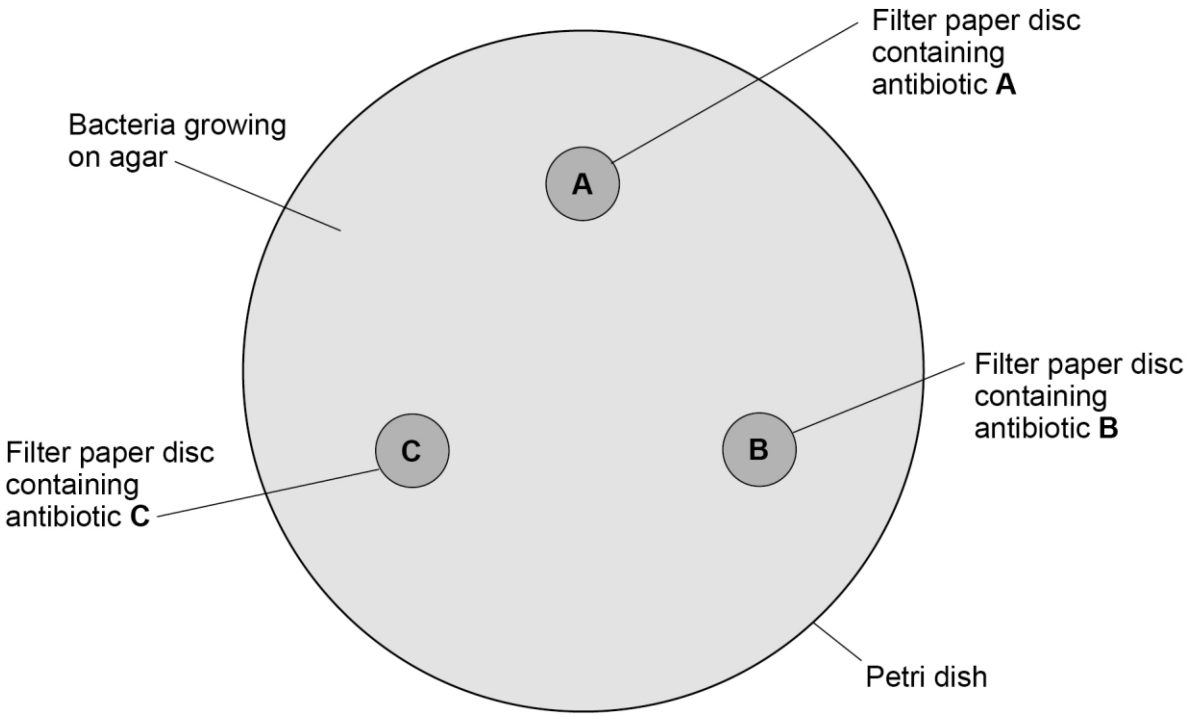
0 2 A student investigated the effectiveness of three different antibiotics.

Figure 3 shows how the student set up an agar plate.

Figure 3



The student used aseptic techniques to make sure that only one type of bacterium was growing on the agar.

0 2 . 1 Describe **two** aseptic techniques the student should have used.

[2 marks]

1 Sterilise equipment / surfaces before use OR (use) sterilised agar

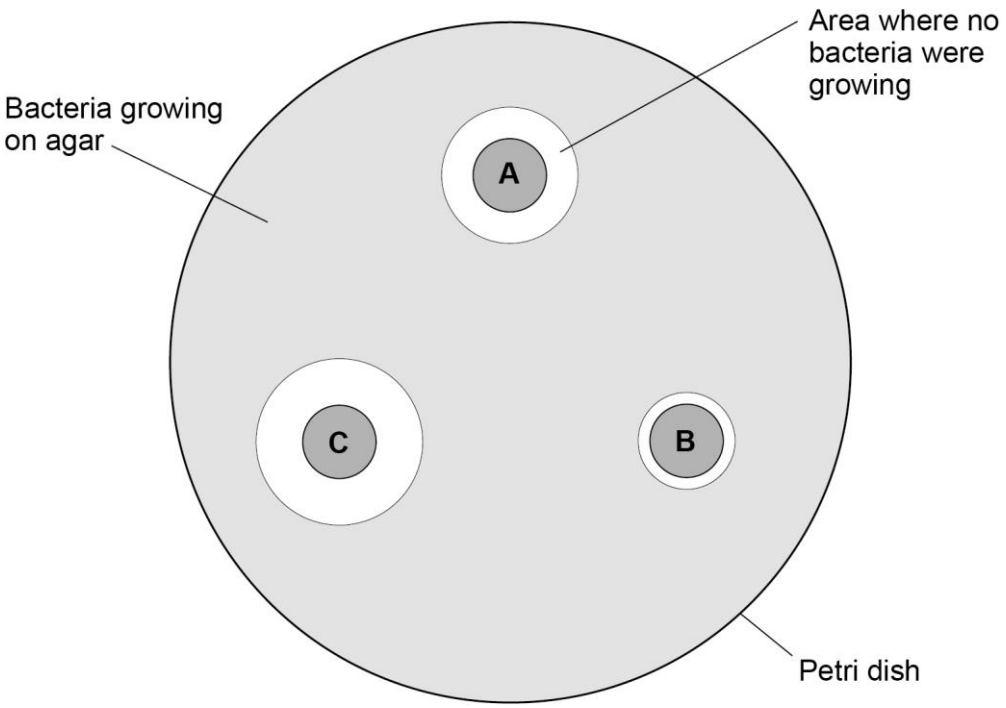
2 Secure lid of the Petri dish with (adhesive) tape ORonly lift lid of Petri dish a little when setting up plate.

Question 2 continues on the next page

The student placed the agar plate in an incubator at 25 °C for 48 hours.

Figure 4 shows the agar plate after 48 hours.

Figure 4



0 2 . 2 Which antibiotic is the **least** effective?

Give a reason for your answer.

[1 mark]

Least effective antibiotic B

Reason It kills the fewest bacteria

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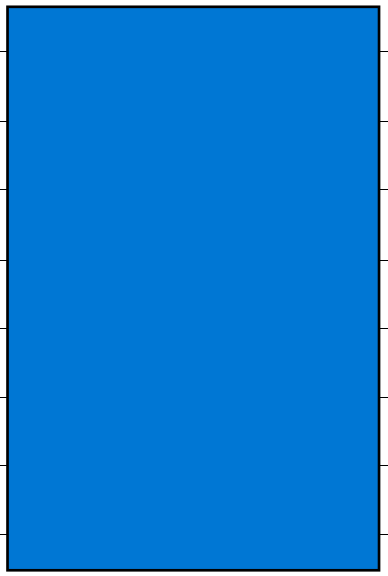
0 2 . 3 Calculate the area where no bacteria were growing for antibiotic **C**.

Use $\pi = 3.14$

Give the unit.

[5 marks]



Area = _____ Unit _____

0 2 . 4 Suggest **one** way the student could improve the investigation.

[1 mark]

Repeat and calculate a mean

9

Turn over for the next question

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0 3 Body Mass Index (BMI) is a way of finding out if a person's body mass falls within a healthy range for their height.

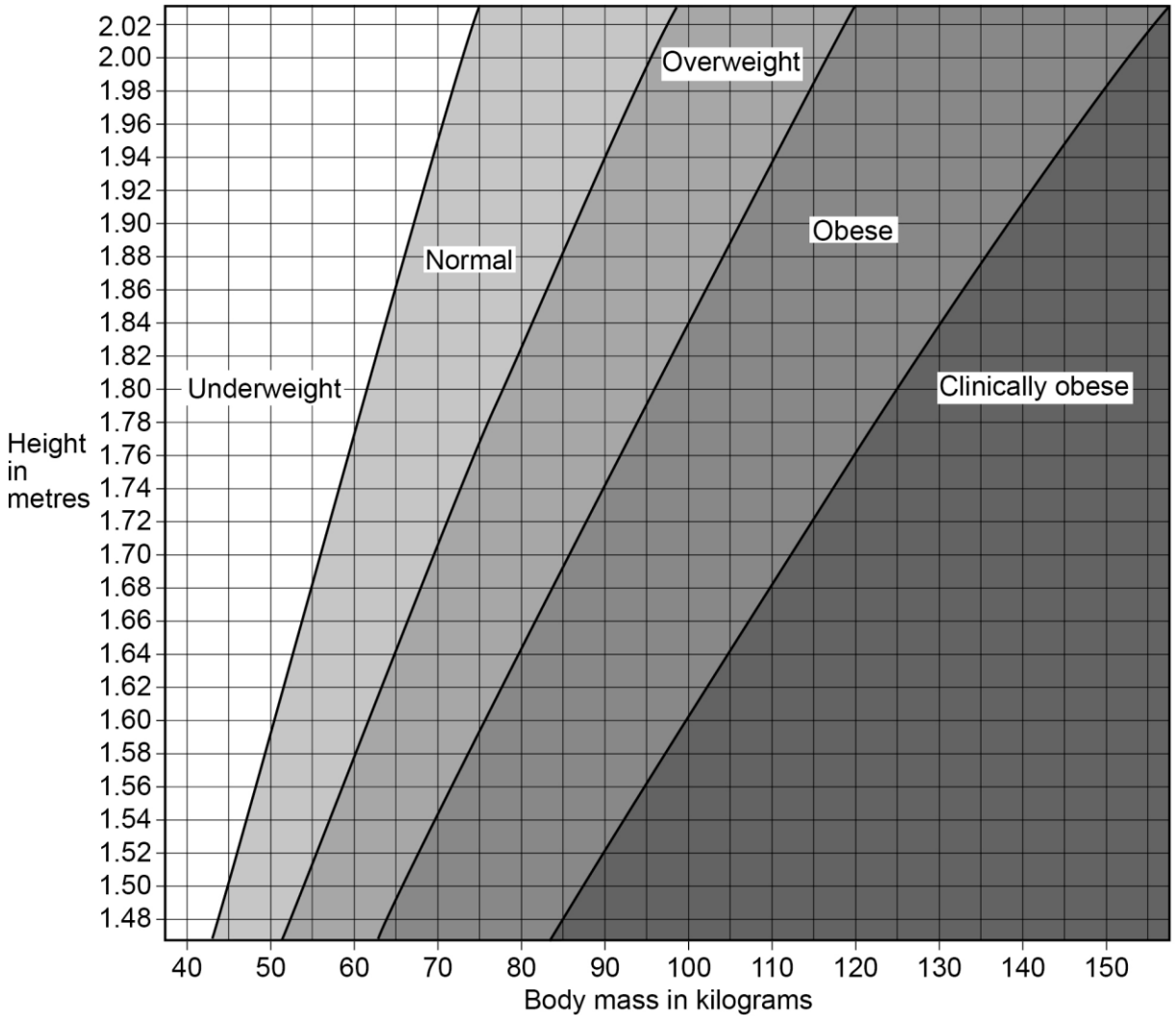
Table 1 shows information about two people.

Table 1

Person	Body mass in kg	Height in m	BMI in kg/m^2
A	63	1.65	23.1
B	92	1.71	**X**

Figure 5 shows five BMI categories for adults.

Figure 5



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0 3 . 1 Which is the BMI category of person **A** in **Table 1**?

[1 mark]

Tick (✓) **one** box.

- Clinically obese ☐
- Normal ☑
- Obese ☐
- Overweight ☐
- Underweight ☐

0 3 . 2 Calculate value **X** in **Table 1**.

Use the equation:

$$\text{BMI} = \frac{\text{body mass}}{\text{height}^2}$$

Give your answer to 3 significant figures.

[3 marks]

92 ÷ 1.712

=31.46…

=31.5

X = 31.5 kg/m^2

Question 3 continues on the next page

Turn over ►

Do not write outside the box

Scientists think there is a link between BMI and life expectancy.

Table 2 shows information about predicted life expectancy of men after the age of 50.

Table 2

BMI Category	Predicted number of years living in good health after the age of 50	Predicted number of years living in bad health after the age of 50
Normal	19.06	4.98
Overweight	18.68	5.32
Obese	16.37	7.08
Clinically obese	13.07	10.10

0 3 . 3 Describe **two** patterns shown in **Table 2** about the effects of BMI category.

[2 marks]

1 The higher the BMI (category) the lower the number of years living in good health

2 The higher the BMI (category) the higher the number of years living in bad health

Do not write outside the box

The number of people who are obese in the UK is increasing.

0 3 . 4 Explain the financial impact on the UK economy of an increasing number of people who are obese.

[2 marks]

Costs the NHS / UK health service / Government / hospitals more money because need to pay for additional surgery / medication / hospital stay to treat stroke /diabetes.

0 3 . 5 A person who is obese is more at risk of arthritis.

Arthritis is a condition that damages joints.

Suggest how arthritis could affect a person's lifestyle.

[1 mark]

movement issues OR Loss of job / income OR disability OR mental health impact of lack of movement or may need surgery

0 3 . 6 A person who eats a diet high in saturated fat might become obese.

Name **two** health conditions that might develop if a person eats a diet high in saturated fat.

Do **not** refer to arthritis in your answer.

[2 marks]

1 type 2 diabetes

2 CVD / CHD

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Turn over for the next question

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0 4 All living organisms respire.

0 4 . 1 What is the chemical equation for aerobic respiration?

[1 mark]

Tick (✓) **one** box.

$6\,O_2 + 6\,CO_2 \rightarrow 6\,H_2O + C_6H_{12}O_6$ ☐

$6\,H_2O + C_6H_{12}O_6 \rightarrow 6\,H_2O + 6\,CO_2$ ✓

$6\,H_2O + 6\,CO_2 \rightarrow 6\,O_2 + C_6H_{12}O_6$ ☐

$6\,O_2 + C_6H_{12}O_6 \rightarrow 6\,H_2O + 6\,CO_2$ ☐

0 4 . 2 Name the sub-cellular structures where aerobic respiration takes place.

[1 mark]

- mitochondria

0 4 . 3 Energy is released in respiration.

Give **two** uses of the energy released in respiration.

[2 marks]

1 movement / muscle contraction OR keeping warm

2 active transport OR building larger molecules

Do not write outside the box

0 4 . 4 Describe **two** differences between aerobic and anaerobic respiration in humans.

Do **not** refer to oxygen in your answer.

[2 marks]

1 Anaerobic produces lactic acid and aerobic does not AND aerobic produces carbon dioxide and anaerobic does not

2 Aerobic produces water and anaerobic does not OR aerobic occurs (mainly) in the mitochondria and anaerobic does not or anaerobic releases less energy than aerobic

0 4 . 5 What are the **two** products of anaerobic respiration in plant cells?

[2 marks]

Tick (✓) **two** boxes.

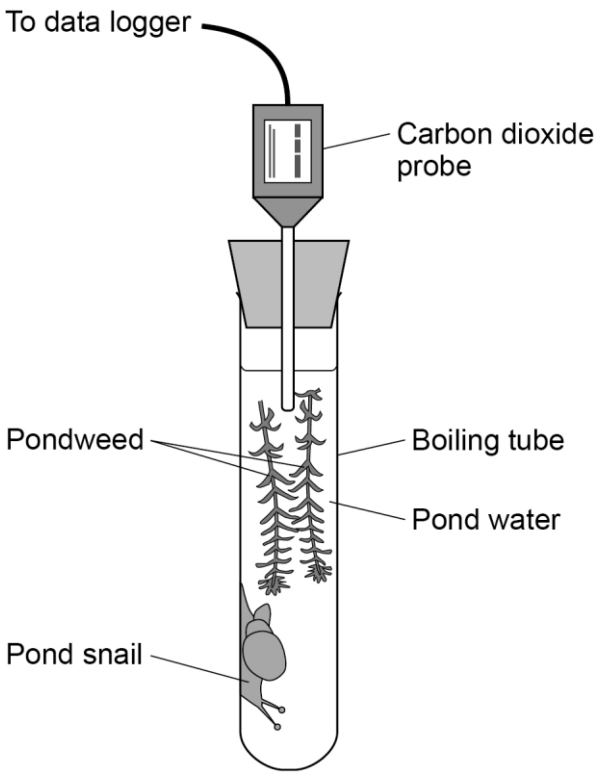
Carbon dioxide	✓
Ethanol	✓
Glucose	
Lactic acid	
Water	

Question 4 continues on the next page

A scientist investigated respiration and photosynthesis using some pondweed and a pond snail.

Figure 6 shows the apparatus used.

Figure 6



The apparatus was left in a well-lit room for 5 days.

The data logger recorded the concentration of carbon dioxide continuously.

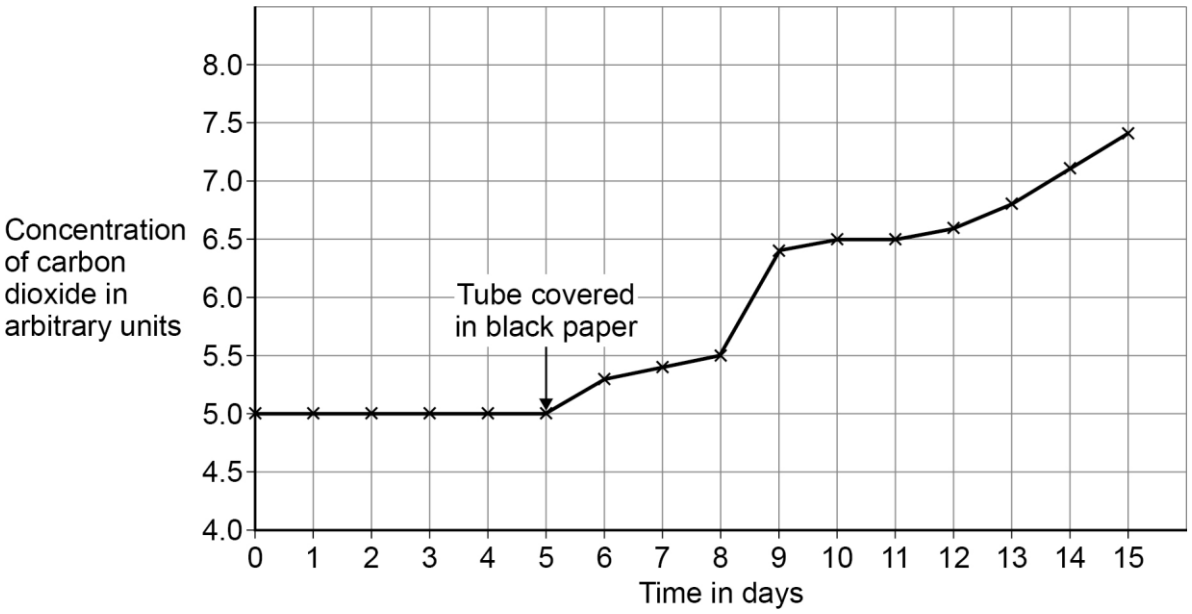
After 5 days, the scientist completely covered the boiling tube with black paper.

The data logger continued to record the concentration of carbon dioxide.

Do not write outside the box

Figure 7 shows the concentration of carbon dioxide inside the boiling tube over 15 days.

Figure 7



0 4 . 6 Explain why the concentration of carbon dioxide in the tube stayed the same between day 0 and day 5.

[2 marks]

Pondweed takes in CO2 for photosynthesis and snail and pondweed are respiring producing CO2.

0 4 . 7 Suggest why the concentration of carbon dioxide increased between day 5 and day 10.

[1 mark]

No light so no photosynthesis or plant is not taking in CO2 and snail and plant are respiring and releasing CO2.

Question 4 continues on the next page

Turn over ►

Do not write outside the box

0 4 . 8 On day 10, the pond snail died.

Explain why the death of the pond snail caused the concentration of carbon dioxide to increase after day 10.

[3 marks]

Snail is being decayed / decomposed / broken down by decomposers / bacteria in pond water / snail therefore respiration of decomposers / bacteria releases CO2.

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Do not write outside the box

0 5 Amylase is an enzyme that breaks down starch.

0 5 . 1 Amylase is a polymer of smaller molecules.

Name the type of smaller molecule.

[1 mark]

Amino acid

0 5 . 2 Name the **three** parts of the human digestive system that produce amylase.

[2 marks]

1 salivary gland

2 pancreas

3 small intestine

0 5 . 3 Explain how amylase breaks down starch.

Answer in terms of the 'lock and key theory'.

[3 marks]

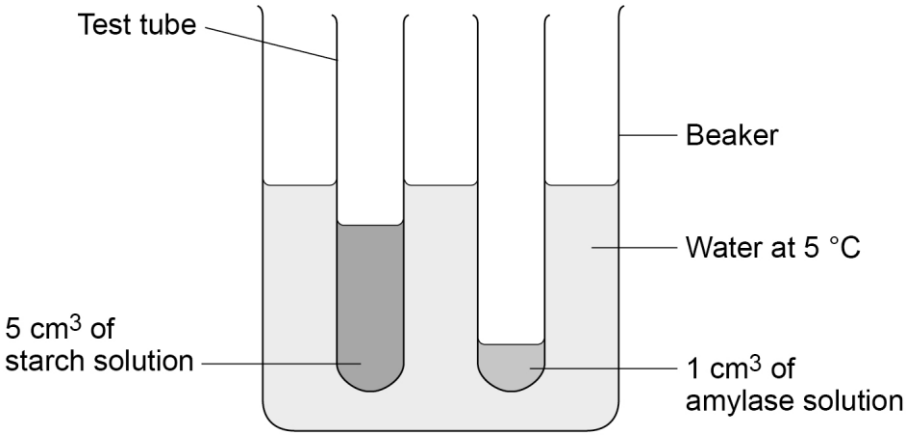
Starch / substrate binds to active site of enzyme because shape of active site and substrate are complementary, chemical reaction occurs to produce smaller molecules.

Question 5 continues on the next page

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

Figure 8 shows the apparatus used.

Figure 8



This is the method used.

1. Set up the apparatus as shown in **Figure 8**.
2. After 5 minutes, pour the starch solution into the amylase solution and mix.
3. Remove one drop of the starch-amylase mixture and place onto a spotting tile.
4. Immediately add two drops of iodine solution to the starch-amylase mixture on the spotting tile.
5. Record the colour of the iodine solution added to the starch-amylase mixture.
6. Repeat steps 3 to 5 every minute until the iodine solution stays yellow-brown.
7. Repeat steps 1 to 6 using water at different temperatures.

Do not write outside the box

0 5 . 4 Name **two** control variables the student used in the investigation.

[2 marks]

1 Time before mixing (starch and amylase) solutions

2 Volume of starch solution OR volume of amylase solution

0 5 . 5 Why did the student leave the starch solution and amylase solution for 5 minutes before mixing them?

[1 mark]

To allow the solutions to reach the same temperature as the water

~~or to allow both solutions to reach 5 °C~~

Question 5 continues on the next page

Do not write outside the box

Table 3 shows the results of the investigation.

Table 3

Temperature in °C	Time taken until iodine solution stays yellow-brown in minutes
5	did not become yellow-brown
20	5
35	2
50	7
65	14
80	did not become yellow-brown

0 5 . 6 What conclusion can be made about the effect of temperature on amylase activity between 20 °C and 65 °C?

[1 mark]

As temperature increases, amylase / enzyme activity increases, to 35 °C after which activity decreases

Do not write outside the box

0 5 . 7 Explain the results at 5 °C and at 80 °C.

Use **Table 3**.

[5 marks]

Iodine is not yellow-brown because starch is still present or starch has not been broken down. At 5 °C amylase / starch / molecules have low kinetic energy therefore there are fewer enzyme-substrate collisions.

At 80 °C the amylase has been denatured so the starch can no longer fit.

0 5 . 8 The student investigated the effect of temperature on amylase activity.

Describe how the student could extend the investigation to determine the effect of a different factor on amylase activity.

[2 marks]

Keep temperature constant but change named factor and test a range of values of factor.

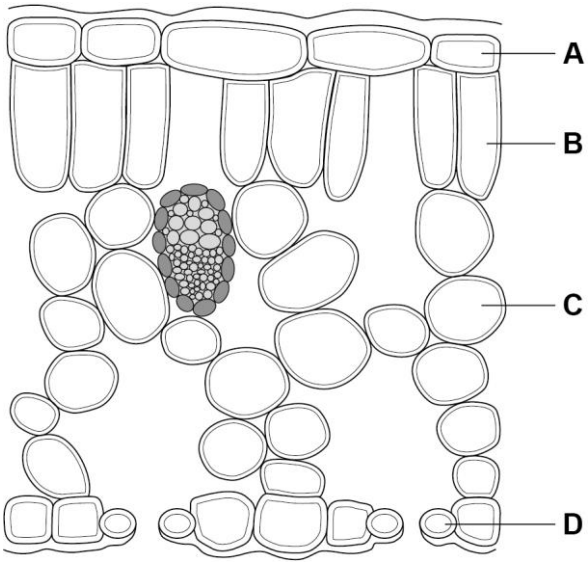
17

Turn over for the next question

Do not write outside the box

0 6 **Figure 9** shows a cross section of a leaf.

Figure 9



0 6 . 1 Which cell is most transparent?

[1 mark]

Tick (✓) **one** box.

A ✓ **B** ☐ **C** ☐ **D** ☐

0 6 . 2 Which cell structure in a leaf mesophyll cell is **not** found in a root hair cell?

[1 mark]

chloroplast

Do not write outside the box

Plants lose water through their leaves.

0 6 . 3 Name the cells in a leaf that control the rate of water loss.

[1 mark]

guard cells

0 6 . 4 Water is taken in by the roots, transported up the plant and lost from the leaves.

Which scientific term describes this movement of water?

[1 mark]

Transpiration stream

0 6 . 5 Which change would decrease the rate of water loss from a plant's leaves?

[1 mark]

Tick (✓) **one** box.

- Increased humidity ☑
- Increased light intensity ☐
- Increased density of stomata ☐
- Increased temperature ☐

Question 6 continues on the next page

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0 6 . 6 Compare the structure and function of xylem tissue and phloem tissue.

[6 marks]

Structure

• xylem is made of dead cells
and
phloem is made of living cells

• phloem cells have pores in their end walls
and
xylem cells do not have pores in their end walls

• xylem is hollow or xylem does not contain cytoplasm
and
phloem contains cytoplasm

• xylem contains lignin
and
phloem does not (contain lignin)

• both made of cells

• both tubular

Function

• xylem transports water / mineral ions
and
phloem transports (dissolved) sugars

• xylem is involved in transpiration
and
phloem is involved in translocation

• xylem transports unidirectionally
and
phloem transports bidirectionally

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Question 6 continues on the next page

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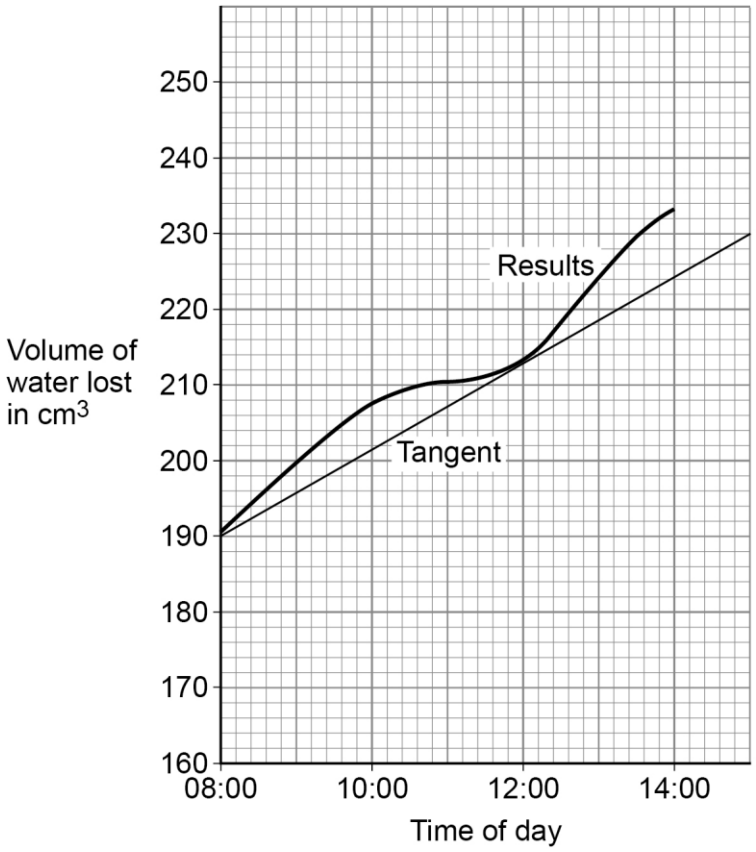
ANSWER IN THE SPACES PROVIDED

Figure 10 shows the total volume of water lost from a plant over 6 hours.

Figure 10



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0 6 . 7 Determine the rate of water loss at 12:00

Use the tangent on **Figure 10**.

Give your answer:

- in cm^3 per minute
- in standard form.

[4 marks]

40 ÷ 7 (in hours)
or
40 ÷ 420 (in minutes)

5.71 (in hours)
or
0.0952…(in minutes)

(answer in standard form in minutes)
9.5(238) x 10-2

Rate of water loss = _____ cm^3 per minute

0 6 . 8 The rate of water loss at midnight was much lower than at 12:00

Explain why.

[2 marks]

Less water loss at night because stomata are (almost completely) closed

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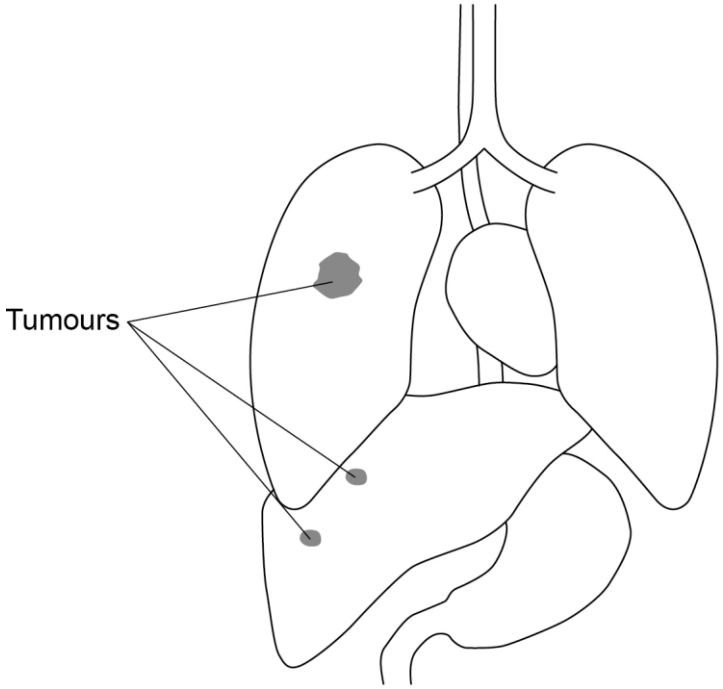
Turn over for the next question

Do not write outside the box

0 7 **Figure 11** shows where three of the same type of tumour were found in a patient.

Figure 11



Malignant tumours are cancers.

0 7 . 1 Describe what happens to cells when a tumour forms.

[1 mark]

Cells grow / divide abnormally / uncontrollably

0 7 . 2 What evidence is there in **Figure 11** to suggest that the tumour in the lung is malignant?

[1 mark]

Tumor has spread to other parts / organs of the body

Do not write outside the box

0 7 . 3 Some types of cancer can cause the numbers of blood components in a person's body to fall to a dangerously low level.

A person with one of these types of cancer may experience symptoms such as:

- tiredness
- frequent infections
- bleeding that will not stop after the skin is cut.

Explain how a very low number of blood components in the body can cause these symptoms.

[6 marks]

Tiredness
- fewer red blood cells
- so less haemoglobin
- so less oxygen transported around the body
- so less (aerobic) respiration can take place
- so more anaerobic respiration takes place
- less energy released for metabolic processes

or less energy released so organs cannot function as well
- lactic acid produced (during anaerobic respiration) causes muscle fatigue

Frequent infections
- fewer white blood cells / phagocytes / lymphocytes
- so fewer antibodies produced or less phagocytosis
- so fewer pathogens / bacteria / viruses killed

Bleeding
- fewer platelets
- so blood does not clot as easily

Question 7 continues on the next page

Some patients with a very low number of blood cells may be given a blood transfusion.

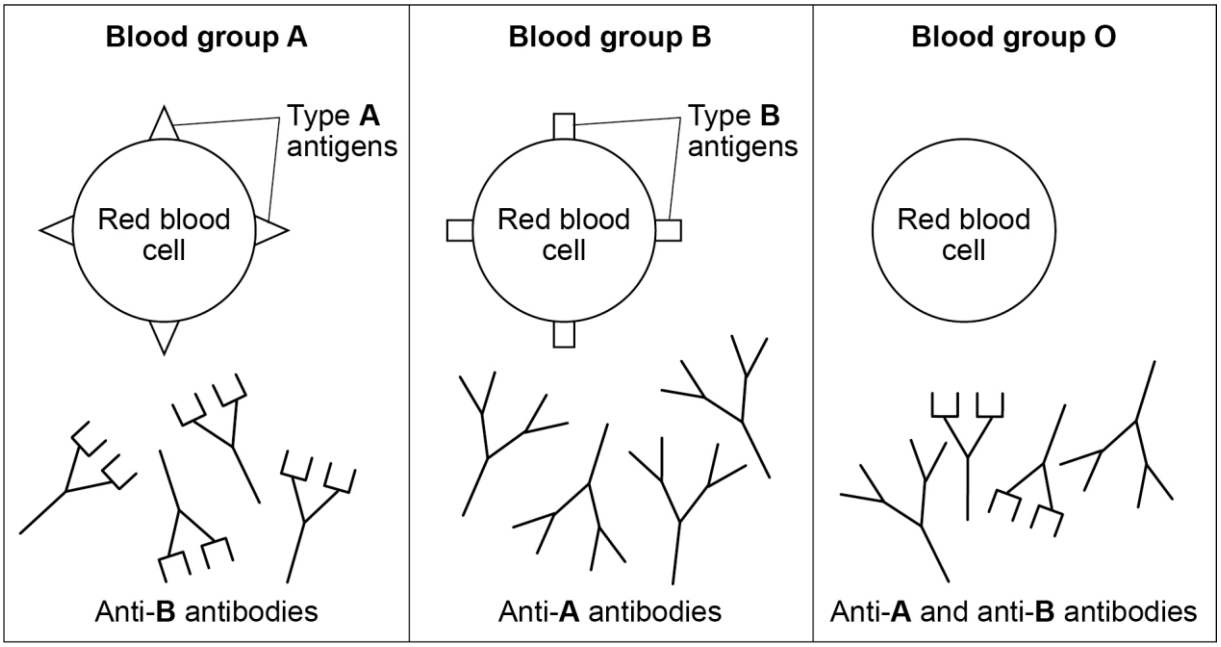
A blood transfusion is where a patient receives blood from a donor.

Different people have different blood groups.

Figure 12 shows:

- the red blood cells found in people with different blood groups
- the antibodies that can be made by people with different blood groups.

Figure 12



Antibodies can bind to antigens that have complementary shapes.

When antibodies bind to the antigens on red blood cells, many red blood cells begin to clump together.

Each red blood cell is about 8 µm in diameter.

Many capillaries have an internal diameter of about 10 µm.

Do not write outside the box

In one type of blood transfusion, **only** red blood cells from a donor are transferred to the patient.

0 7 . 4 It is dangerous for a patient with blood group **A** to receive red blood cells from a donor with blood group **B**.

Explain why.

[3 marks]

anti-B antibodies in patient / receiver / recipient will bind to type B antigens on person's / donor's red blood cells (so) red blood cells clump together and are wider than capillaries or (so) red blood cells clump together and block capillaries (so) cells have reduced supply of oxygen / glucose or (so) cells can't respire

0 7 . 5 Explain why blood group **O** red blood cells can be given to patients with any blood group.

[2 marks]

No antigens (on type O red blood cells) (so) antibodies cannot bind (to the antigens / red blood cells)

Question 7 continues on the next page

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0 7 . 6 **Table 4** shows some of the risks associated with blood transfusions.

Table 4

Risk	Probability of risk occurring
Allergic reaction	0.9 %
Hepatitis B infection	1 in (3×10^5)
Hepatitis C infection	6.7×10^{-7}
Kidney damage	1 in 70 000

Which risk has the **lowest** probability of occurring?

[1 mark]

Tick (✓) **one** box.

Allergic reaction ☐

Hepatitis B infection ☐

Hepatitis C infection ☑

Kidney damage ☐

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0 7 . 7 A person has a tumour blocking the tube leading from the gall bladder to the small intestine.

Explain why this person would have difficulty digesting fat.

[5 marks]

No / less bile reaches the small intestine (so) less / no emulsification of fat (so) smaller surface area for lipase to break down fat. pH of small intestine is not neutralised / alkaline (so) lipase is not at its optimum pH to break down fat.

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END OF QUESTIONS

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