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.

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.

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

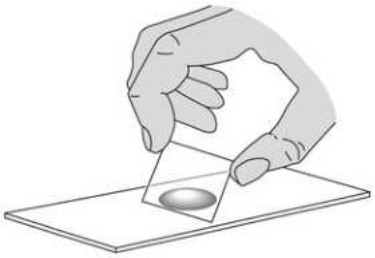
Do not write outside the box

Answer all questions in the spaces provided.

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 cells prepare to view using a microscope.

[2 marks]

1 microscope slide dye/stain mounted needle

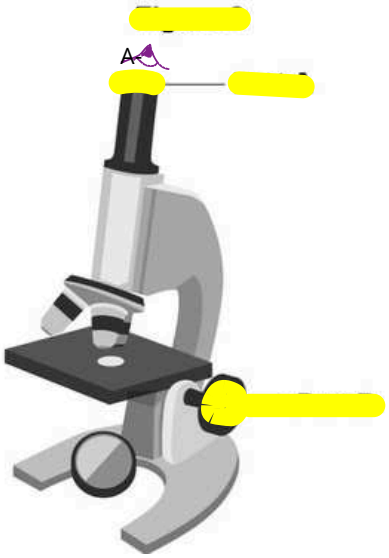
2 cover slip pipette scalpel forceps // tweezers

Do not write outside the box

Figure 2shows the student's light microscope.

If Figure 2

shows the student's light microscope.



0 1.2 Name part A.

[1 mark]

eyepiece // lenss

0 1.3 What is the function of part B?

[1 mark]

to focus the image

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

Slide not in correct position

Mirror not in correct position

Objective lens dirty // not clicked into place

student is looking at an air bubble

Microscope not focussed

loQuoestkion j1 ncongtinueas o→n the nTexptl apcTae

Turn over ►

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0 1.5 Red blood cells are specialised animal cells.

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

[6 marks]

Differences: (RBC) has no nucleus whereas plant cell (PC) does.

RBC has no nucleus, whereas plant cell (PC) does. RBC has no cell wall whereas PC does. RBC has biconcave disc shape, whereas plant cells have many shapes. There RBCs do not contain chloroplasts which PCs do have. RBCs much smaller than PCs

Both have cytoplasm. Both have cell membrane. Both contain pigments (RBC are different).

- Have a balanced argument won't get full marks for six differences

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]

movement of water across partially permeable membrane from dilute to concentrated solution

Water enters the cells by osmosis

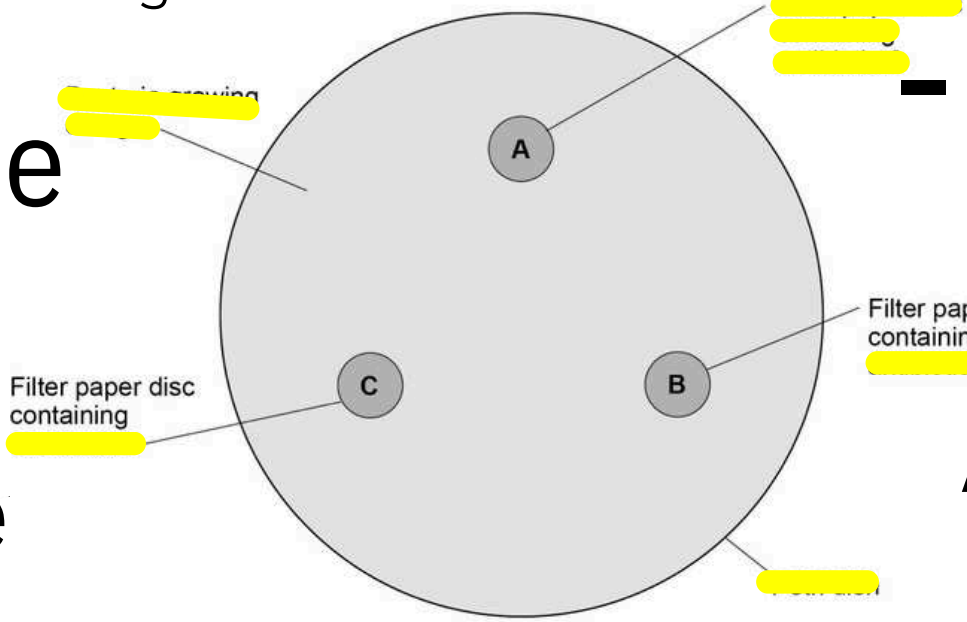
Plant cell has cell wall which prevents diffusion it from bursting

13

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

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

fFi-gure 3



Be

tee

A

ff@@fffff

ensures microorganisms being investigated don't escape

✓orbecomecontaminated

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

ensures microorganisms being investigated don't escape or become contaminated

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

[2 marks]

1 sterilising equipment / surfaces before use

secure lid of petri dish with tape

only lift lid of petri dish a little

2 use sterilised agar

SQueEstion 2 TcontinuTes on thEe next Epage

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

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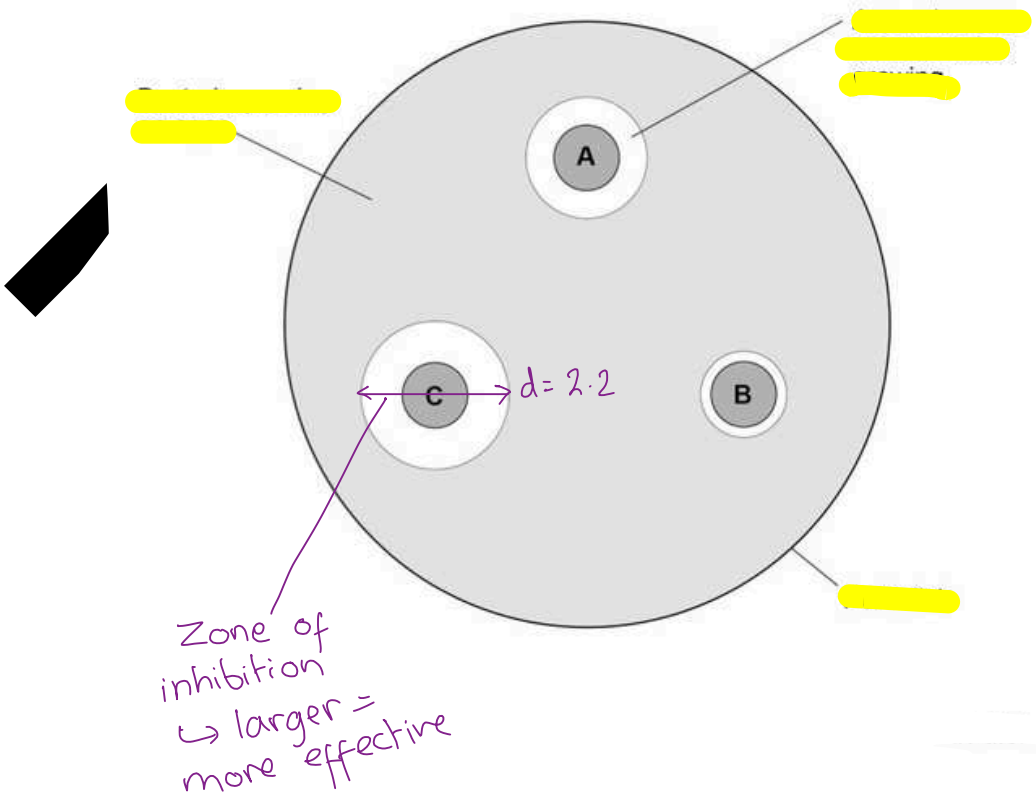
Figure 4 shows the agar plate after 48 hours.

Figure 4



0

smallest Z of I

B

Kills fewest bacteria / [illegible] smaller area where [illegible] bacteria growing

Do not write outside the box

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

Use • Measure diameter (cross section)

$\pi\pi$= 3.14 ◦ Measurediameter Grosssection) •Use

Give the (5) ~A=Iunit. [5 marks]

hit ↳ d = 2.2 cm

$\frac{2.2}{2} = r$ Area = 3.14 × $(\frac{2.2}{2})^2$ ↳ 1.1

Area = 3.3.799...

3.80 cm^2

Area = 3.80 Unit cm^2

0 2 . 4 Suggest one way the student could improve the investigation. [1 mark]

Repeat and calculate the mean Use a control disc

Repeat and eliminate anomalies Use different types of bacteria

ffTuTrn ovTer fofr thTe nehxt qTuest-ion

9

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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.

BM = %%;;÷

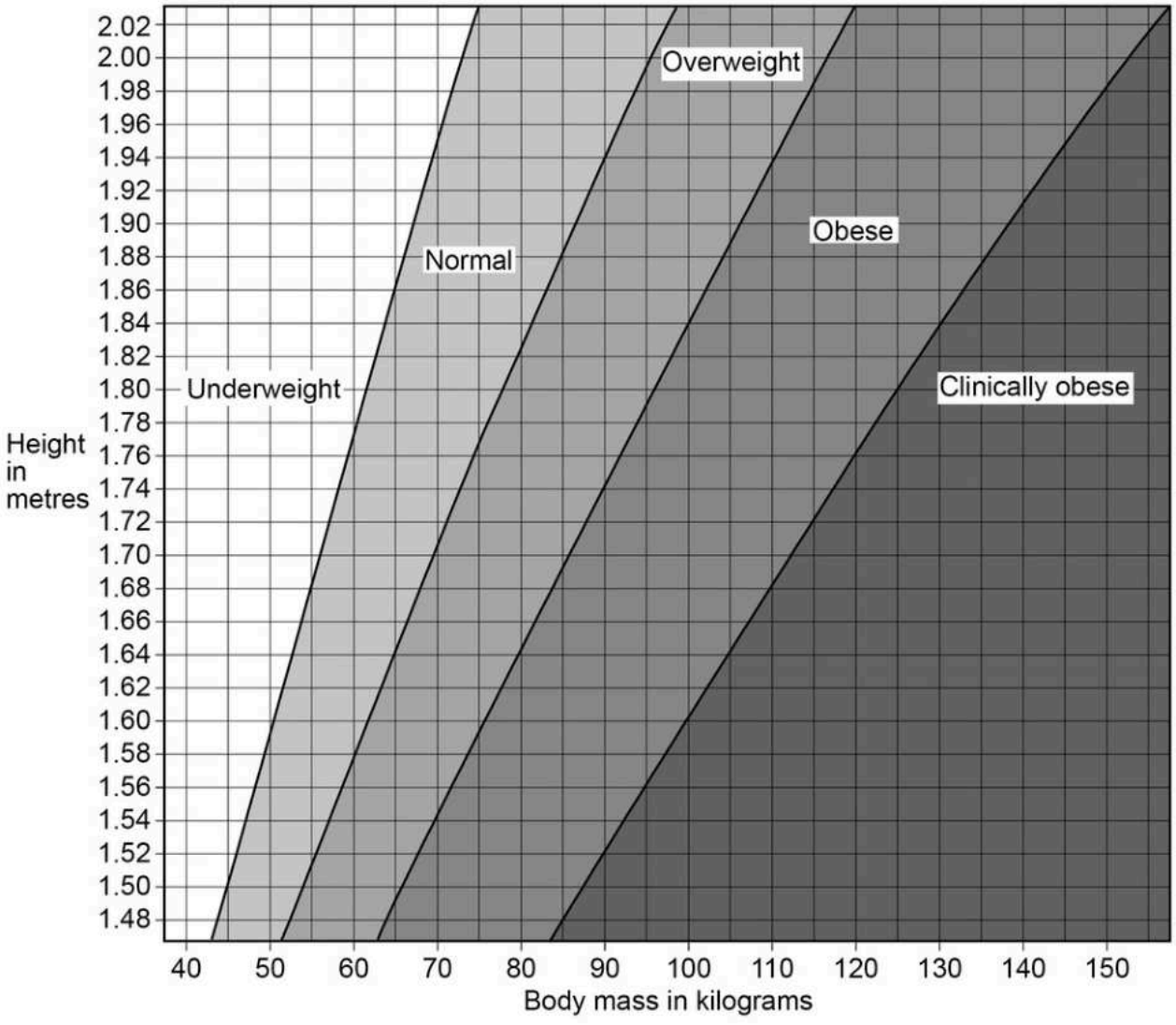
BMI = body mass / (height)²

Table 1

Person	Body mass in kg	Height in m	BMI in kg/m2
A	63	1.65	23.1
B	92	1.71	X

Figure 5 shows five BMI categories for adults.

EFAigureT 5



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]

$\frac{92}{1.712^2} = 31.446\ldots$

31.5

X = 31.5 kg/m2

Question 3 continues on the next page

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

shown in about the .

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

[2 marks]

1 The higher the BMI, the lower the number of years living higher the BMI the lower the total life expectancy

The higher the BMI, the lower the total life expectancy

2 The higher the BMI, 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 NHS / health service / Government / hospitals more money because they have to pay for additional surgery/medication / hospital stay to treat stroke / diabetes

More time off work (if unwell) so employer/Government have to give financial support

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 loss of job/income

mental health impact from lack of movement / from pain

Need to visit doctor/take medication regularly

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]

cardiovascular disease, coronary heart disease

1 CVD // CHD (heart disease/attack, stroke)

2 Type 2 diabetes

(allows cancer, liver disease, high blood pressure / cholesterol)

Turn over for the next question

11

Do not write outside the box

0 4 All living organisms respire.

→

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

[1 mark]

Tick (✓) one box.

- 6 O2 + 6 CO2 → 6 H2O + C6H12O6 ✗
- 6 H2O + C6H12O6 → 6 H2O + 6 CO2 ✗
- 6 H2O + 6 CO2 → 6 O2 + C6H12O6 ✗
- 6 O2 + C6H12O6 → 6 H2O + 6 CO2 ✓

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

2 keeping warm

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 whereas aerobic does not produces

Aerobic produces water and anaerobic does not

2 Aerobic produces carbon dioxide whereas anaerobic does not produces

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 (animal cells) ☐
- Water ☐

Fermentation

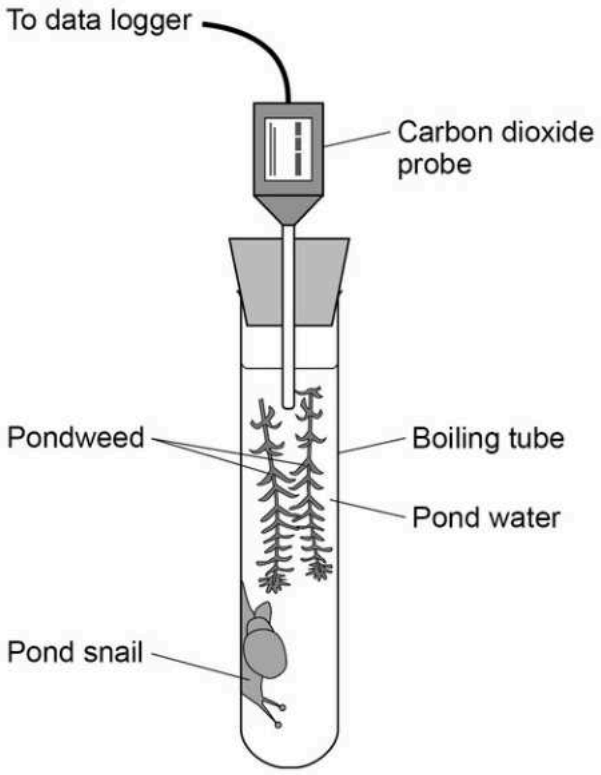
no O2 consumed

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. SEES

Figure 6



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

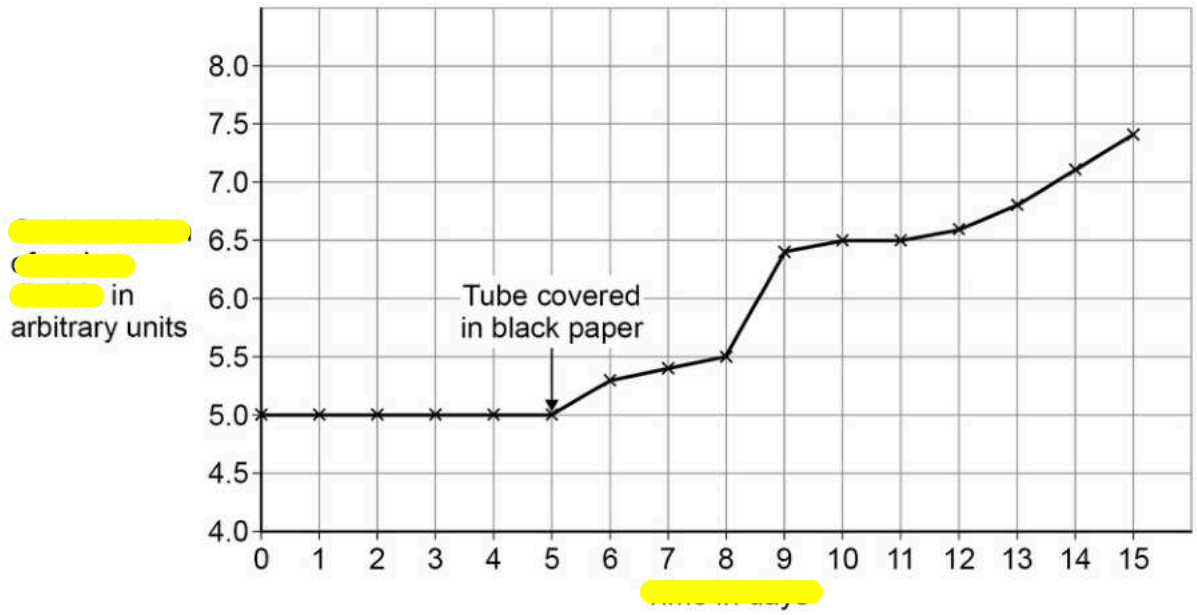
The data logger recorded the concentration of carbon dioxide continuously.

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

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

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 CO_2 for photosynthesis
Snail and pondweed respiring, producing CO_2

1

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

[1 mark]

No light (so no photosynthesis) plant not taking in CO_2
Snail and plant respiring, releasing CO_2

Question 4 continues on the next page

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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 decomposed by decomposers / bacteria

Decomposers respire releasing CO_2

14

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 acids

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

[2 marks]

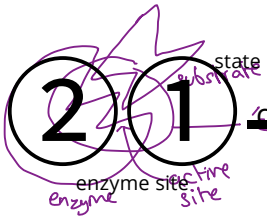
1 salivary gland

2 pancreas

3 small intestine

0 5 . 3 Explain how amylase breaks down starch.

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



-'active

[3 marks]

starch / substrate binds to active site of enzyme

Shape of enzyme active site and substrate are complementary

A chemical reaction occurs to produce smaller molecules

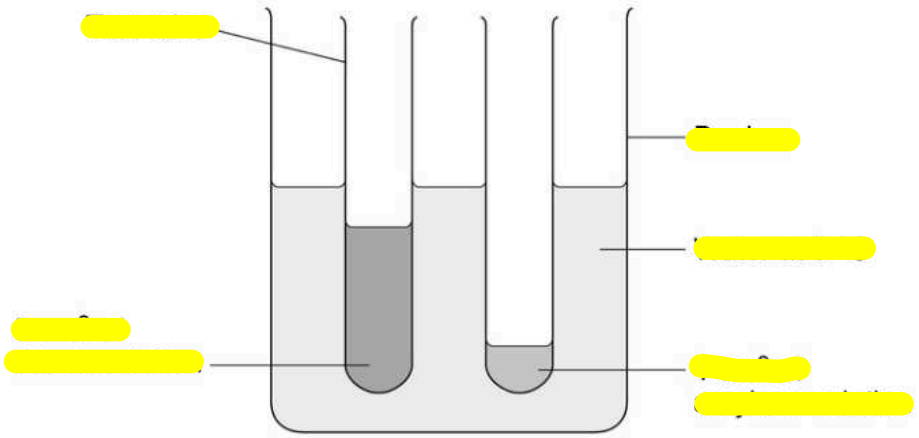
(or) bonds between starch molecules are broken to produce smaller molecules

SQuestionT 5 continAues on the Gnext 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.

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

[2 marks]

1 equilibration
time before mixing solutions

2 volume of starch solution / amylase solution / mixture added to spotting the iodine added

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 / allow both solutions to reach 5°C

SQuestion 5 tcontinuaes on the nfext pafge

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, enzyme activity increases until 35°C reached, after which activity decreases

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

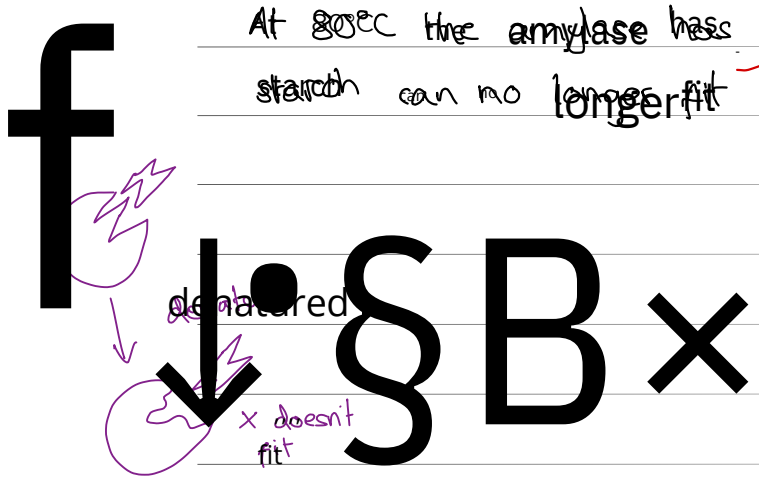
Use Table 3.

[5 marks]

Iodine not yellow-brown because starch still present? has not been broken down

At 5ec amylase/starch molecules have low kinetic energy. There are fewer enzyme-substrate collisions?

At 80ec the amylase has been denatured 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 enzyme concentration // substrate concentration

17

ETuSrn oveTr for tAhe nexTt quesEtion

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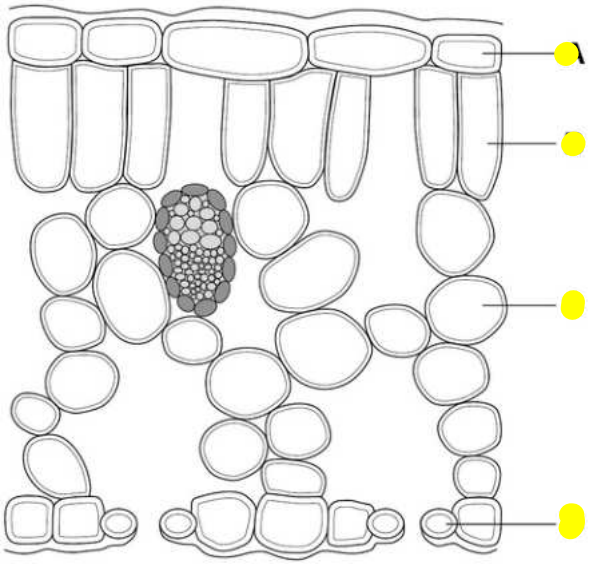
0 6 Figure 9 shows a cross section of a leaf.

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?

underground ~~absorb~~ light

[1 mark]

~~chloroplasts~~ mitochondria

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

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

[1 mark]

Tick (✓) one box. ↳

evaporationin
↳ difference
humidity
Increased humidity ✓temperature
air flow
increasewater ✗
Increased light intensity ✗ increase water loss

Increased density of stomata ✗ increase (more holes)

Increased temperature ✗ increase water loss

evaporation → difference in humidity, temperature, air flow

FQueRstion 6E contEinues Son theA next pTage

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

Structure's

Xylem is made from dead cells, while phloem is made of living cells

Phloem cells have pores in their end walls, while xylem DON'T have end pores in end walls

Xylem is hollow, while phloem contains cytoplasm. Xylem contains lignin but phloem does not contain lignin. Both are tubular. Both made of cells.

Function:

Xylem transports mineral ions/water, while phloem transports dissolved sugars

Xylem is involved in transpiration, while phloem is involved in translocation

Xylem transports unidirectionally, phloem transports bidirectionally

Both transport liquids/substances through stem/leaves/roots/plant

- Identify scientifically relevant features
- State how they are similar/different
- Magnitude of similarity/difference

- Reference structure, function, similarity and difference

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Question 6 continues on the next page

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ANSWER IN THE SPACES PROVIDED

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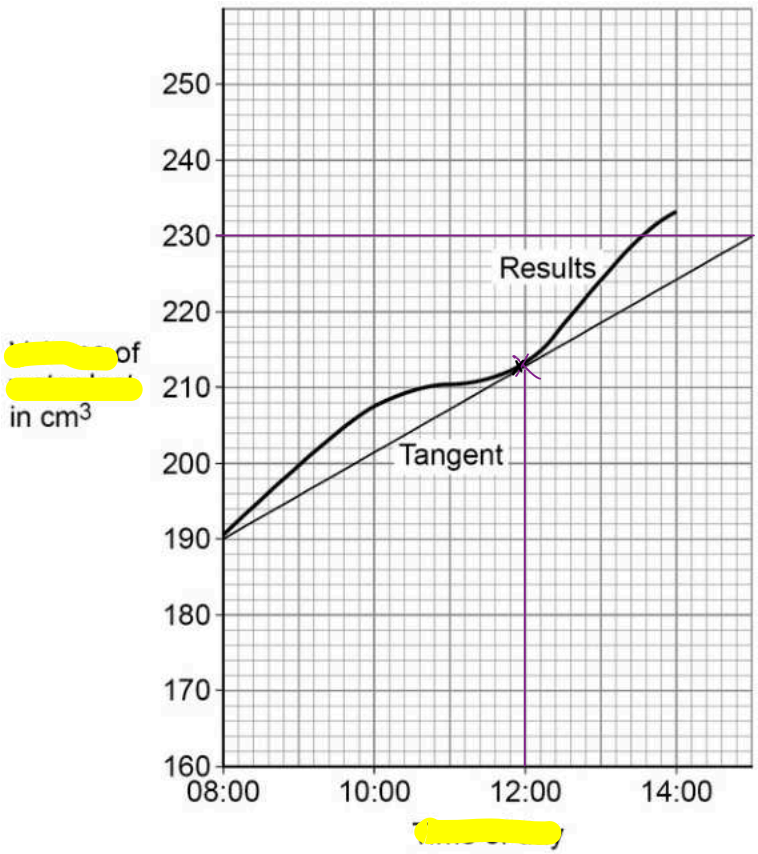
Figure 10 shows the total volume of water lost from a plant over 6 hours.

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 cm3 per minute
- in s=tandard form.

[4 marks]

Rate of water loss = 915×10^-2 cm3 per minute

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

Explain why.

[2 marks]

Stomata almost completely closed because it is cooler// because there is less light

17

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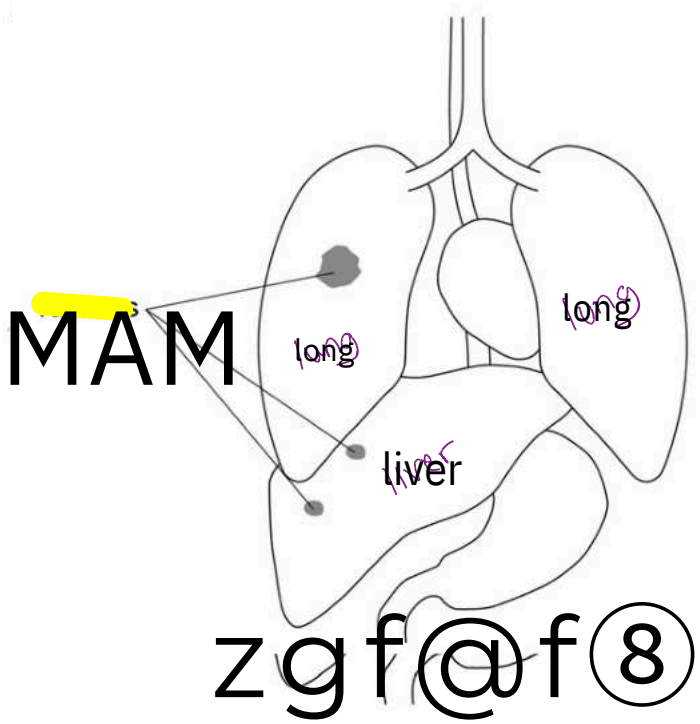
0 7 Figure 11 shows where three of the same type of tumour were found in a patient.

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]

Has spread to other parts / organs of the body

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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

nt infections •• frequeRelevantpoints

Detail

• bleeding that will not stop after the skin is cut. •
Logically linked

- Relevant points identified
- Detail
- Logically linked

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

[6 marks]

Tiredness:

fewer red blood cells (RBE)so less haemoglobin so less O2 transported around body. Less aerobic respiration? so less energy released. Lactic acid produced causes muscle fatigue

Infections:

fewer white blood cells (WBC) so fewer antibodies produced/ less phagocytosis fewer pathogens therefore killed.

← phagocytes / lymphocytes

Bleeding:

fewer platelets so blood does not clot as easily

cell fragments → 'sticky'

fragments

Must refer to all three symptoms for full marks

refer to symptoms for full

oQuesftion f7 constinuse on the tnexts page

Turn over ►

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

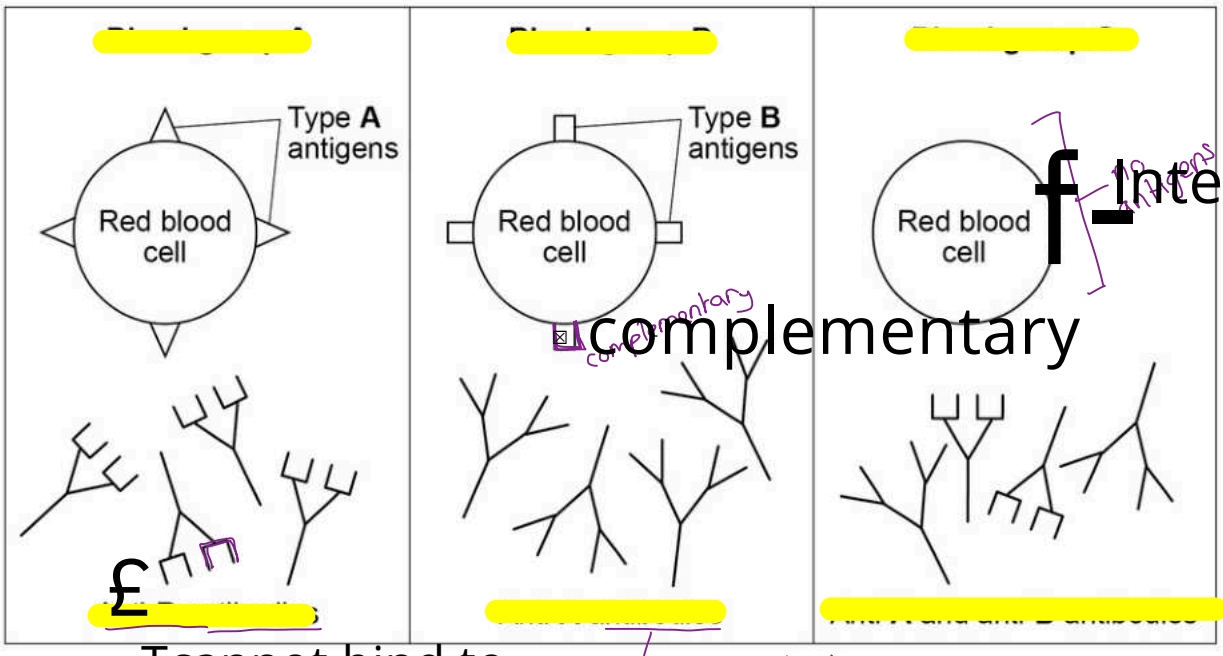
A blood transfusion is where a patient receives blood from a donor.

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



Tcannot bind to
0RBC

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.

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 will bind to type B antigens on donor's red blood cells.

So red blood cells clump together and are wider than capillaries / block capillaries

Cells therefore have reduced amount of oxygen / glucose

(or cells cannot 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 RBC, so antibodies cannot bind to the antigens / RBCs.

TALAAT

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 × 105)
Hepatitis C infection	6.7 × 1–7
Kidney damage	1 in 70000

$\frac{1}{3 \times 10^5} \times 100 = 3.33 \times 10^{-4}$ %

$6.7 \times 10^{-7} \times 100 = 6.7 \times 10^{-5}$ smallest

$\frac{1}{70000} \times 100 = 1.428... \times 10^{-3}$

Which risk has the lowest probability of occurring?

Tick (✓) one box.

[1 mark]

Allergic reaction ☐

Hepatitis B infection ☐

Hepatitis C infection ☑

Kidney damage ☐

Do not write outside the box

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 emulsification of fat ✓

So smaller surface area for lipase (enzyme) to break down fat ✓

pH of small intestine is not neutralised // is alkaline ✓

So lipase is not at its optimum pH to break down fat ✓

19

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