

Organisation part 2 AQA Triple Biology

Name:

Class:

Date:

Time: **85 minutes**

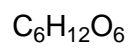
Marks: **80 marks**

Comments:

1. Carbohydrates are needed as part of a balanced diet.

(a) Which formula shows glucose?

Tick (✓) **one** box.



(1)

(b) Which type of enzyme breaks down starch?

Tick (✓) **one** box.

Carbohydrase

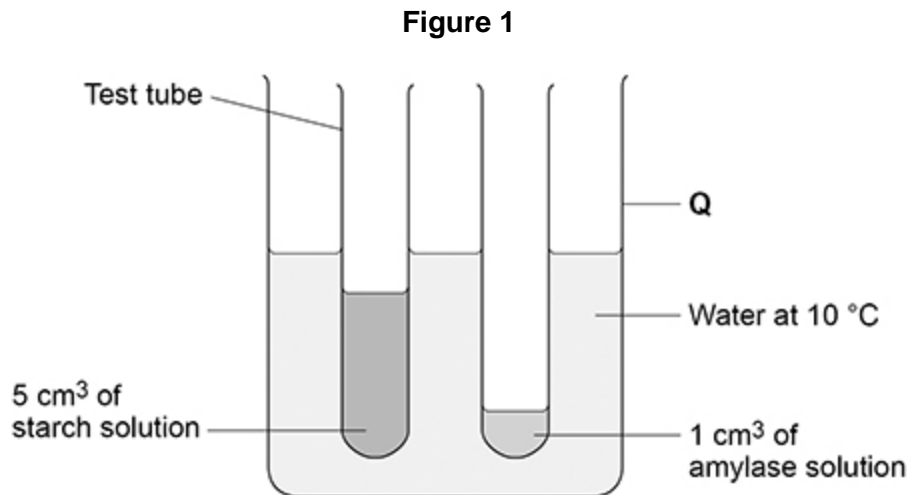
Lipase

Protease

(1)

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

Figure 1 shows the apparatus used.



This is the method used.

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

(c) Name apparatus **Q** in **Figure 1**.

(1)

- (d) Why were the starch solution and the amylase solution left for five minutes before mixing them together?

Tick (✓) **one** box.

So that both solutions could reach 10 °C

So that the student could calculate a mean

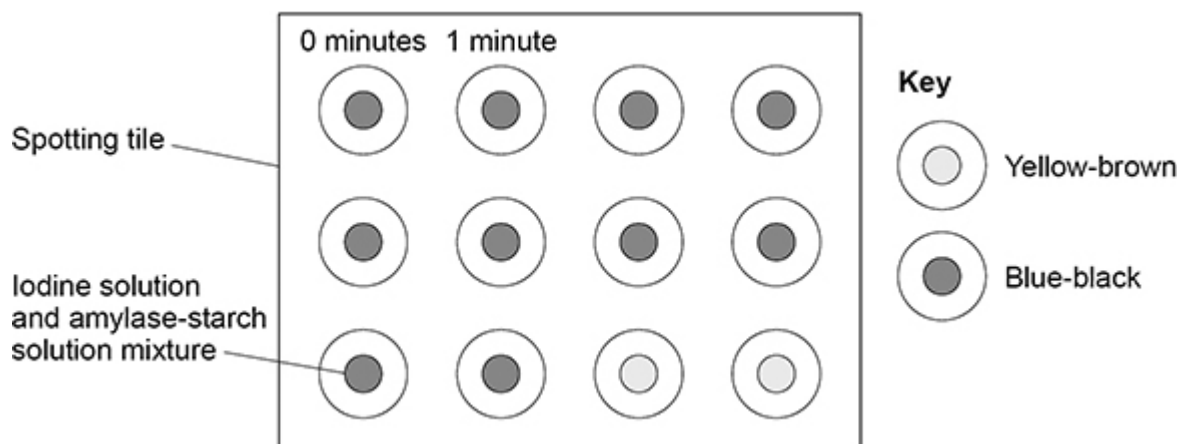
So that the student could repeat the investigation

So that the student had time to draw a table of results

(1)

Figure 2 shows the results.

Figure 2



- (e) How many minutes did it take until the iodine solution and amylase-starch solution mixture was yellow-brown?

Use **Figure 2**.

_____ minutes

(1)

(f) How could a more accurate time be obtained?

Tick (✓) **one** box.

Add more iodine solution to the spotting tile.

Test the mixture with iodine solution every 30 seconds.

Test the mixture with iodine solution for more time.

Use two drops of amylase-starch solution mixture in each test.

(1)

The student repeated the investigation at five different temperatures.

The table below shows the results.

Temperature in °C	Time taken until iodine solution and mixture was yellow-brown in minutes
20	5
35	2
50	7
65	12
80	Remained blue-black

(g) Which temperature did the enzyme work quickest at?

Tick (✓) **one** box.

20 °C	<input type="checkbox"/>
35 °C	<input type="checkbox"/>
50 °C	<input type="checkbox"/>
65 °C	<input type="checkbox"/>

(1)

(h) Explain why the iodine solution remained blue-black in the investigation at 80 °C.

(2)

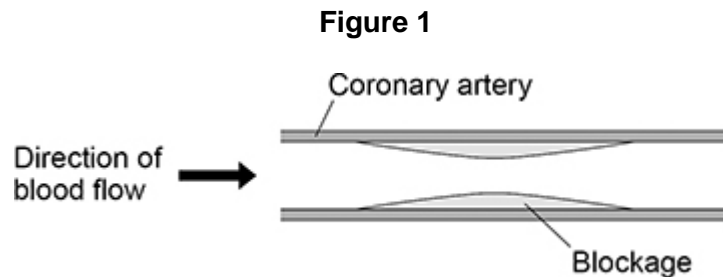
(Total 9 marks)

2.

A high cholesterol concentration in the blood can lead to blockages inside arteries.

The coronary arteries supply blood to the heart muscle.

Figure 1 shows a coronary artery with a blockage.



(a) Why could the blockage in **Figure 1** cause cells in the heart to die?

(2)

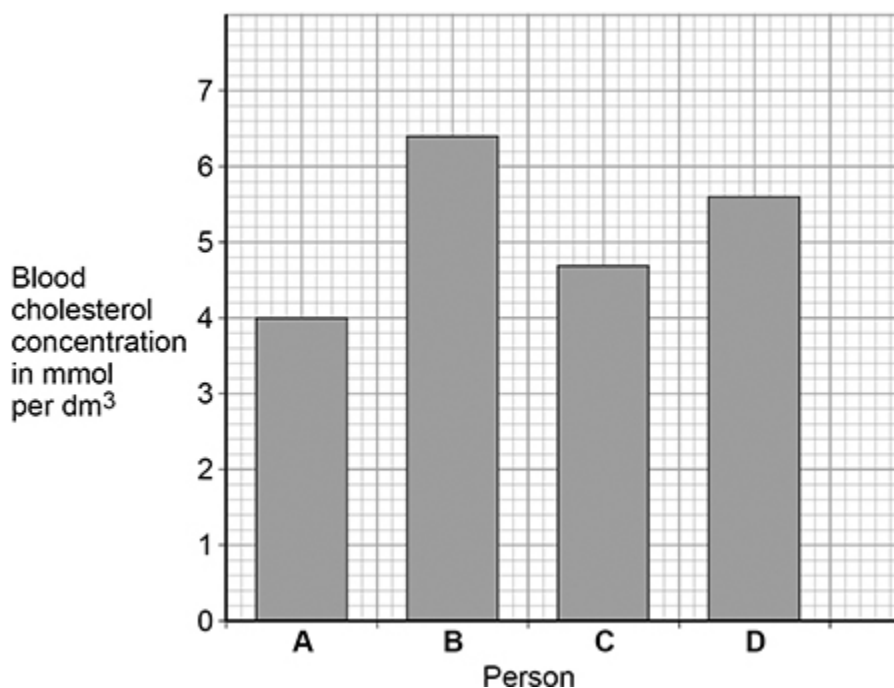
Doctors can measure the concentration of cholesterol in the blood.

The table below shows four different blood cholesterol categories.

Blood cholesterol concentration in mmol per dm ³	Cholesterol category
<4.6	Low
4.6–5.0	Normal
5.1–6.1	Medium
6.2 and above	High

Figure 2 shows the blood cholesterol concentration of four people.

Figure 2



(b) Which person is in the medium cholesterol category?

Tick (✓) **one** box.

A

B

C

D

(1)

(c) Which person is most at risk of having a heart attack?

Tick (✓) **one** box.

A

B

C

D

(1)

(d) Give a reason for your answer to part (c).

(1)

- (e) The blood cholesterol concentration of person **D** is greater than the blood cholesterol concentration of person **A**.

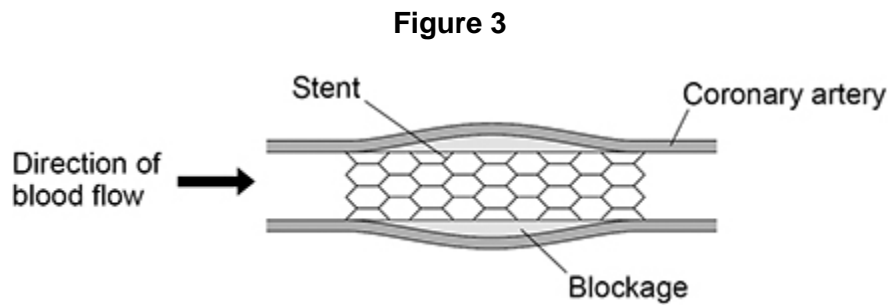
Calculate how many times greater.

Use **Figure 2**.

Number of times greater = _____

(2)

Figure 3 shows how a stent can be used to treat a person with a blockage in a coronary artery.



- (f) Explain how a stent works as a treatment for a person with a blockage in a coronary artery.

(2)

Patients are given anti-clotting drugs after they have a stent fitted.

The drugs help to prevent clots forming in the blood.

(g) Which part of the blood starts the blood clotting process?

Tick (✓) **one** box.

Antibodies

Plasma

Platelets

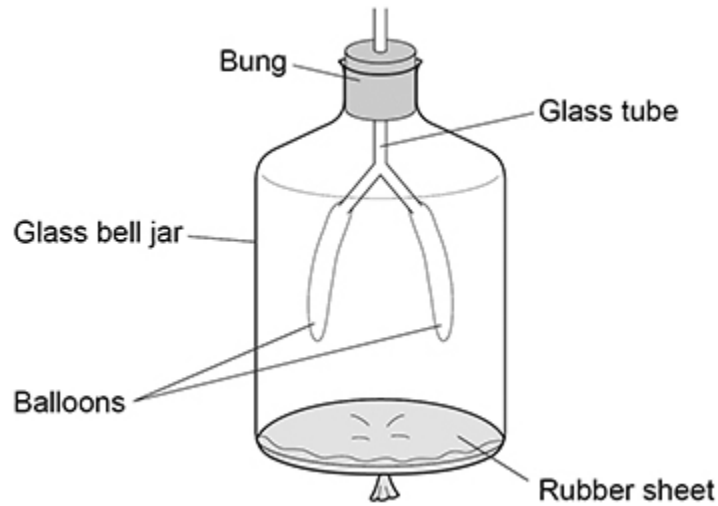
Red blood cells

(1)

3.

Figure 1 shows a model used to demonstrate human breathing.

Figure 1



(a) Which part of the breathing system is represented by the glass tube?

Tick (✓) **one** box.

- | | |
|-------------|--------------------------|
| Alveoli | <input type="checkbox"/> |
| Capillaries | <input type="checkbox"/> |
| Lung | <input type="checkbox"/> |
| Trachea | <input type="checkbox"/> |

(1)

The model in **Figure 1** represents the human breathing system.

A teacher said:

“The model does **not** represent the human breathing system very well.”

(b) Give **two** reasons why the teacher is correct.

1 _____

2 _____

(2)

A scientist investigated the effect of exercise on breathing rate.

This is the method used.

1. Record the breathing rates of 10 male non-smokers at rest.
2. Tell each man to run on a treadmill at the same speed for 8 minutes.
3. Record the breathing rate of each man every 2 minutes.
4. Continue to record the breathing rate of each man for 4 minutes after he stops running.

(c) Give **two** variables the scientist controlled in the investigation.

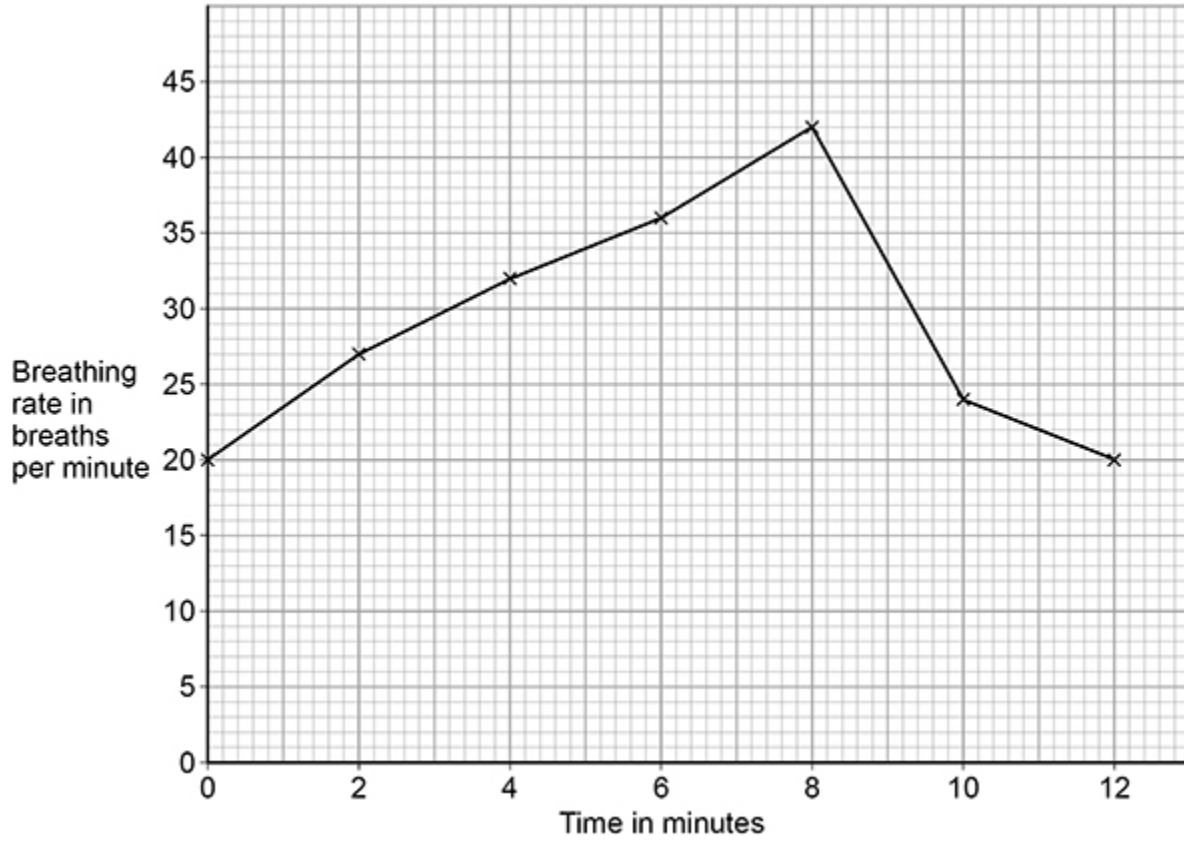
1 _____

2 _____

(2)

Figure 2 shows the data collected from **one** of the men.

Figure 2



- (d) Calculate the percentage increase in the man's breathing rate between 0 minutes and 8 minutes.

Use the equation:

$$\text{percentage increase} = \frac{(\text{breathing rate at 8 minutes} - \text{breathing rate at 0 minutes})}{\text{breathing rate at 0 minutes}} \times 100$$

Percentage increase = _____ %

(3)

- (e) Explain why the man's breathing rate increased when he was running.

(2)

- (f) Give **one** measurement that could be taken to show a different effect of exercise on the body.

Do **not** refer to breathing rate in your answer.

(1)

- (g) The men in the investigation were all non-smokers.

Give **one** effect that smoking can have on the body.

(1)

(Total 12 marks)

4.

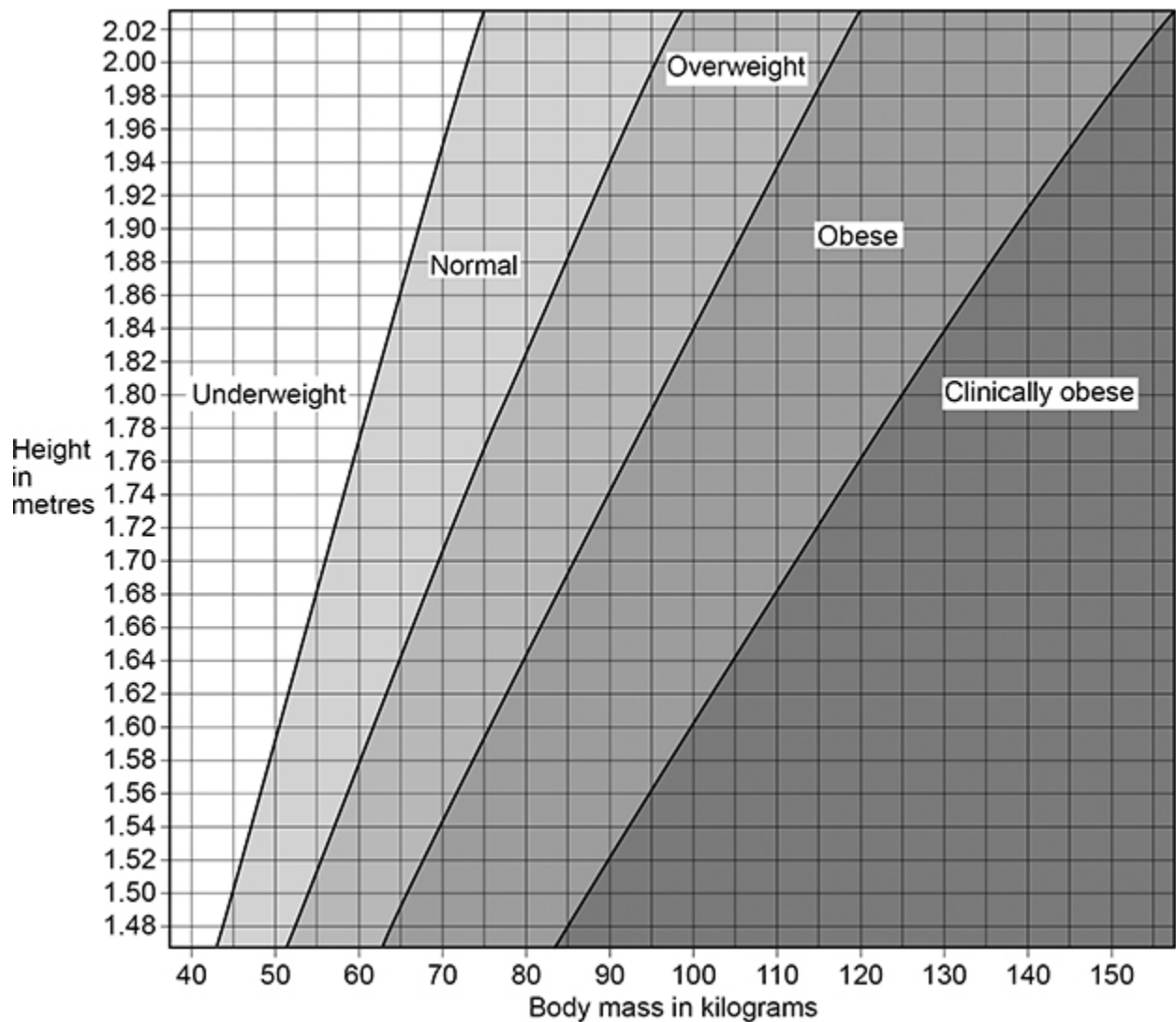
Body Mass Index (BMI) is a way of finding out if a person's body mass falls within a healthy range for their height.

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

The graph below shows five BMI categories for adults.



(a) Which is the BMI category of person **A** in **Table 1**?

Tick (✓) **one** box.

Clinically obese

Normal

Obese

Overweight

Underweight

(1)

(b) 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.

X = _____ kg/m²

(3)

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

(c) Describe **two** patterns shown in **Table 2** about the effects of BMI category.

1 _____

2 _____

(2)

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

(d) Explain the financial impact on the UK economy of an increasing number of people who are obese.

(2)

(e) 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)

(f) 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.

1 _____

2 _____

(2)

(Total 11 marks)

5.

Amylase is an enzyme that breaks down starch.

(a) Amylase is a polymer of smaller molecules.

Name the type of smaller molecule.

(1)

(b) Name the **three** parts of the human digestive system that produce amylase.

1 _____

2 _____

3 _____

(2)

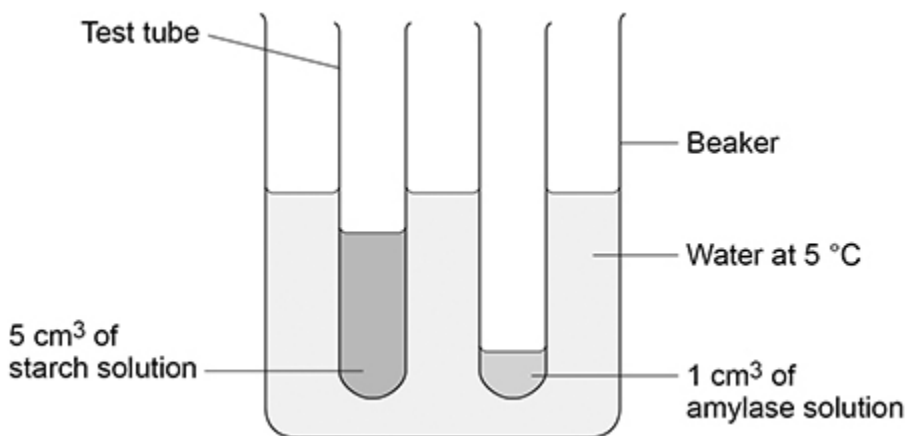
(c) Explain how amylase breaks down starch.

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

(3)

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

The figure below shows the apparatus used.



This is the method used.

1. Set up the apparatus as shown in the figure above.
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.

(d) Name **two** control variables the student used in the investigation.

1 _____

2 _____

(2)

- (e) Why did the student leave the starch solution and amylase solution for 5 minutes before mixing them?

(1)

The table below shows the results of the investigation.

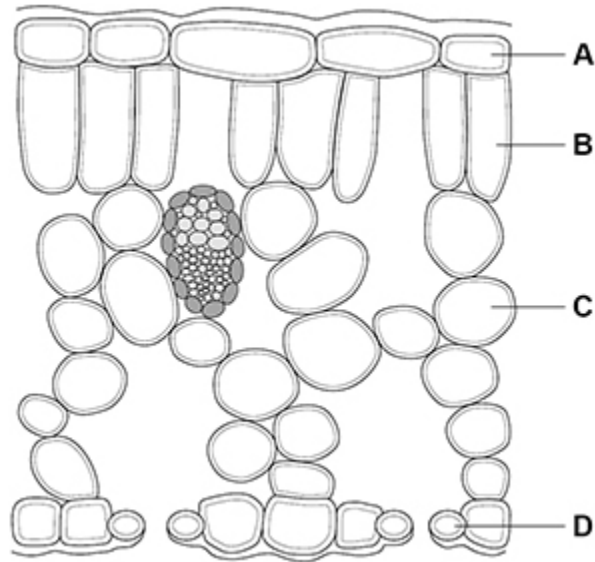
Temperature in °C	Time taken until iodine solution stays yellow-brown in minutes
5	did not become yellow-brown
20	5
35	2
50	7
65	14
80	did not become yellow-brown

- (f) What conclusion can be made about the effect of temperature on amylase activity between 20 °C and 65 °C?

(1)

6. Figure 1 shows a cross section of a leaf.

Figure 1



(a) Which cell is most transparent?

Tick (✓) **one** box.

A

B

C

D

(1)

(b) Which cell structure in a leaf mesophyll cell is **not** found in a root hair cell?

(1)

Plants lose water through their leaves.

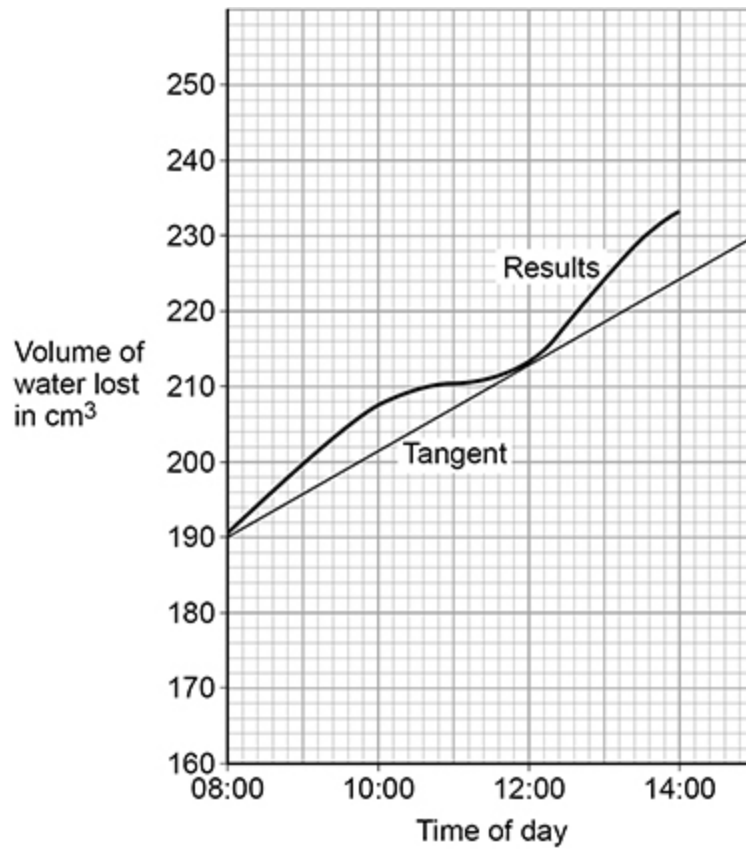
(c) Name the cells in a leaf that control the rate of water loss.

(1)

(d) 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)



(g) Determine the rate of water loss at 12:00

Use the tangent on the graph above.

Give your answer:

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

Rate of water loss = _____ cm^3 per minute

(4)

(h) The rate of water loss at midnight was much lower than at 12:00

Explain why.

(2)

(Total 17 marks)

Mark schemes

- 1.** (a) $C_6H_{12}O_6$ 1
- (b) carbohydrase 1
- (c) beaker
allow water bath 1
- (d) so that both solutions could reach 10 °C 1
- (e) 10 / ten (minutes) 1
- (f) test the mixture with iodine solution every 30 seconds 1
- (g) 35 °C 1
- (h) enzyme / amylase is denatured
or
enzyme / amylase stops working
allow active site / enzyme has changed shape
*do **not** accept enzyme / amylase has died* 1
- (so) starch is not broken down
or
starch is still present 1
- [9]**
- 2.** (a) less blood flows through **or** less blood flows to the heart (muscle / cells / tissue) 1
- less oxygen (reaches the heart muscle)
allow less respiration
allow less energy released
*do **not** accept less energy produced / made / created* 1
- (b) D 1
- (c) B 1

(d) is more likely to get a blockage (with high cholesterol)
or
blockage could be biggest
ignore has the highest blood cholesterol concentration 1

(e) 4 **and** 5.6 1

$$\left(\frac{5.6}{4}\right) = 1.4$$

*allow correct division using
either 5.3 or 5.8 (for person D)* 1

(f) opens / widens (artery)
allow pushes blockage to the side 1

so (more) blood can flow through
allow (more) oxygen(ated blood) can flow through 1

(g) platelets 1

(h) **Level 2:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given. 3-4

Level 1: Relevant points are made. They are not logically linked. 1-2

No relevant content 0

Indicative content:

Advantages:

- **only** have to take the tablet once a day
- **only** a tablet so easy to take **or only** a tablet so not painful to take
- (drugs are effective so) less likely to get a blood clot
- drugs are cheap so less cost to NHS **or** drugs are cheap so (more) people can afford them
- drugs have been used for a long time so must be safe / trusted

Disadvantages:

- patients have to make sure they always have a supply of drugs
- patients could forget to take the drugs (every day)
- patients could still get a blood clot in the first week
- restrictions on lifestyle because patients have to have a blood test every few weeks
- restrictions on lifestyle because patient can't eat certain foods
- patients may get a blood clot if they eat the wrong food
- risks associated with puncturing skin / infection
- patient may have a fear of needles
- higher risk of bleeding / bruising

For **Level 2** students must evaluate, including consideration of, the advantage and disadvantage of anti-clotting drugs.

[14]

3.

(a) trachea

1

(b) any **two** from:

- only one air space (per balloon)
 - **or**
alveoli not represented
 - blood vessels / capillaries not represented
 - bronchioles not represented
- do not accept bronchi not represented*
- glass tube not flexible (like trachea / bronchi)
 - bell jar does not move during breathing (like ribs)
 - ribs have gaps between them
 - rib cage contains muscles
 - pleural cavity not represented

2

(c) any **two** from:

- speed (of treadmill)
 - type of exercise **or** all were running
 - (biological) sex **or** all male
 - all were non-smokers
 - time spent running
- allow ran for 8 minutes*
- ignore reference to time interval for counting breaths*

2

(d) 0 minutes = 20

8 minutes = 42

allow value for 8 minutes in the range 41.5 to 42.5

1

$$(42 - 20) \div 20 \times 100$$

or

$$22 \div 20 \times 100$$

*allow correct substitution from incorrect graph readings
(i.e. ± 1 small square) at 0 minutes and / or 8 minutes*

1

110 (%)

*allow correct calculation from incorrect graph readings
from previous step*

1

(e) to get more oxygen (into the blood)
allow using more oxygen (in muscles) 1

for use in respiration **or** for releasing energy (for muscle contraction)

or

to remove more carbon dioxide (1)

produced in respiration (1)

allow to reduce anaerobic respiration

*do **not** accept produces / makes / creates energy*

1

(f) any **one** from:

- heart / pulse rate

allow heart beat per minute

- depth / volume of breathing

allow amount of sweat

- volume of sweat

- body temperature

allow body mass / measurement

1

(g) any **one** from:

- (lung) cancer

- increased blood pressure

- lung disease

allow named example of lung disease e.g. asthma

- low birth weight in babies of mothers who smoke

- increased risk of heart / cardiovascular disease

allow persistent cough ignore cough unqualified

1

[12]

4.

(a) normal

1

(b) $92 \div 1.71^2$

1

31.46(...)

allow correctly calculated value using $92 \div 1.71$

1

31.5

1

(c) any **two** from:

allow 'more overweight' or 'more obese' for higher BMI category throughout

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

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

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

allow the lower the BMI (category) the lower the number of years living in bad health

- the higher the BMI (category), the lower total life expectancy

allow the lower the BMI (category), the higher total life expectancy

if no other marks awarded, allow for 1 mark idea that as BMI increases, quality of life decreases

2

(d) costs the NHS / UK health service / Government / hospitals more money

(because need to pay for) additional surgery / medication / hospital stay to treat stroke / diabetes

allow other correct named conditions e.g. heart attack / immobility / disability / arthritis

1

or

more time off work (if in hospital / unwell) (1)

allow more people unable to work

(so) employer / Government have to give financial support (1)

allow (so) decreased productivity (in workplace)

1

(e) allow any **one** from:

- movement issues

allow example of movement issue

- loss of job / income
- disability
- mental health impact of lack of movement

or

mental health impact of pain

- need to visit the doctor / take medication regularly
- may need surgery

1

(f) type 2 diabetes
allow atherosclerosis

1

CVD / CHD

or

heart attack / disease

or

stroke

*allow **two** named vascular conditions for **2** marks from heart attack **or** stroke **or** high blood pressure **or** high (blood) cholesterol*

allow cancer

allow liver disease

1

[11]

5.

(a) amino acid(s)
ignore monomers

1

(b) salivary gland
in any order
ignore mouth

pancreas

small intestine

*allow duodenum / ileum do **not** accept large intestine*

ignore intestine unqualified

*all three correct for **2** marks two correct for **1** mark*

2

(c) starch / substrate binds to active site (of enzyme)
ignore starch / substrate fits active site (of enzyme)

1

(because) shape of active site and substrate are complementary

allow shape of starch / substrate and active site allow them to fit together

1

a chemical reaction occurs to produce smaller molecules

or

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

allow maltose / sugars for smaller molecules

1

- (d) any **two** from:
- time before mixing (starch and amylase) solutions
ignore time unqualified
 - volume / 5 cm³ of starch (solution)
 - volume / 1 cm³ of amylase (solution)
 - volume / 1 drop of mixture added to spotting tile
 - volume / 2 drops of iodine (solution)
allow amount as an alternative to volume once only
*do **not** accept temperature*
- 2
- (e) to allow the solutions to reach the same temperature as the water
or
to allow both solutions to reach 5 °C
allow so the solutions can equilibrate with the temperature of the water
- 1
- (f) as temperature increases, (amylase / enzyme) activity increases, to 35 °C after which activity decreases
ignore reference to time
- 1
- (g) (iodine is not yellow-brown because) starch is still present **or** starch has not been broken down
allow enzyme for amylase and substrate for starch throughout
- 1
- at 5 °C amylase / starch / molecules have low (kinetic) energy
- 1
- (therefore) there are fewer (enzyme-substrate) collisions
allow fewer enzyme-substrate complexes are formed
- 1
- at 80 °C the amylase has been denatured
*do **not** accept the amylase is killed / has died*
allow the shape of the amylase / active site changes
- 1
- (so) the starch can no longer fit
allow the bonds holding the amylase in its (3D) shape have broken
- 1

- (h) keep temperature constant 1
- (but) change named factor **and** test a range of values of named factor
named factor e.g. pH or enzyme concentration or substrate concentration or inhibitor concentration

1
[17]

6.

- (a) A 1
- (b) chloroplast(s)
ignore chlorophyll 1
- (c) guard (cells)
ignore stoma(ta) 1
- (d) transpiration stream
ignore transpiration unqualified 1
- (e) increased humidity 1
- (f) **Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar/different is made clear and (where appropriate) the magnitude of the similarity/difference is noted. 4–6
- Level 1:** Relevant features are identified and differences noted. 1–3 1–3
- No relevant content.** 0

Indicative content:

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

- both transport liquids / substances throughout the stem / leaves / roots / plant

For **Level 2**, students must refer to both structure and function of xylem and phloem tissue.

- (g) *(correct division)*
 $40 \div 7$ (in hours)
or
 $40 \div 420$ (in minutes)
allow correct answer from student's readings throughout

1

- 5.71 (in hours)
or
0.0952...(in minutes)
allow correct division from incorrect reading(s) from the tangent

1

- (correct conversion to minutes)*
0.0952...
allow correct conversion at any point in the calculation
allow correct conversion of calculated value to minutes

1

- (answer in standard form)*
 $9.5(238) \times 10^{-2}$
allow correct conversion of calculated value to standard form

1

- (h) (less water loss at night)
allow converse if clearly describing 12:00

stomata are (almost completely) closed

1

- (because) it's cooler / colder
or
(because) there's less / no light
ignore it's dark at night

1

[17]