

GCSE (9-1)

Examiners' report

TWENTY FIRST CENTURY SCIENCE COMBINED SCIENCE B

J260

For first teaching in 2016

J260/01 Summer 2022 series

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Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. A selection of candidate answers are also provided. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

Advance Information for Summer 2022 assessments

To support student revision, advance information was published about the focus of exams for Summer 2022 assessments. Advance information was available for most GCSE, AS and A Level subjects, Core Maths, FSMQ, and Cambridge Nationals Information Technologies. You can find more information on our [website](#).

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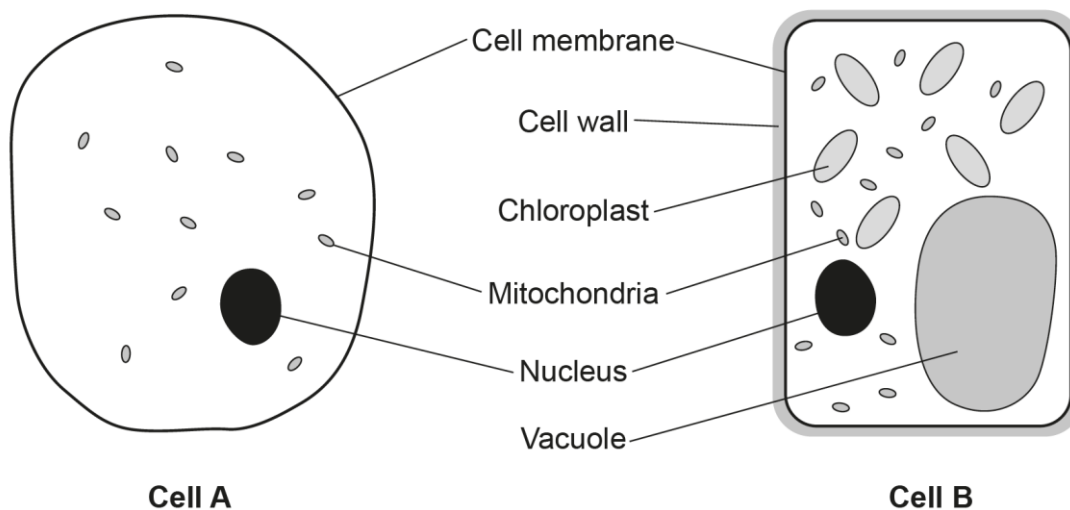
Paper 1 series overview

J260/01 Biology Foundation is the first examination of GCSE 21st Century Combined Science specification B since examinations have resumed after the absence of two series. The candidates have been given advanced information of the key areas of the specification which were assessed. The examination covered topics B1 to B6 plus ideas about science and practical skills. To do well on this paper, candidates need to be comfortable applying their knowledge and understanding of scientific principles. They must also be familiar with a range of practical equipment and techniques. Most candidates made a good attempt at answering all the questions and limited their responses to the available spaces. The paper was challenging and discriminated well between candidates. There was no evidence that candidates ran out of time on this paper and it was good to see that candidates attempted all the questions throughout the paper

Candidates who did well on this paper generally did the following:	Candidates who did less well on this paper generally did the following:
<ul style="list-style-type: none"> • explain how enzymes and substrates fit together using the lock and key theory in Question 2 (a) • describe two ways in which removing soil from peatlands could reduce biodiversity in Question 5 (b) • produced a clear and detailed response for the Level of Response question (Question 6 (a)) gaining at least a Level 2 • draw an accurate graph in Question 6 (b) and calculate the simplest ratio in Question 6 (c) • describe two control variables in Question 7 (a) • suggest conclusions from the results in Question 9 (d) (iv) • calculate a mean rate in Question 10 (e) (ii) • understood why a plant needs oxygen to absorb nitrate ions in Question 11. 	<ul style="list-style-type: none"> • found the calculations difficult to access in Question 5 (a) (ii) and Question 10 (e) (ii) more challenging • produced a limited Level of Response answer at Level 1 • misunderstood the study in Questions 9 (c) (i) and 9 (c) (iv) • could not recall what a placebo was and why it was ethical to use in Questions 9 (d) (ii) and 9 (d) (iii) • were unable to label a pore and guard cell in Question 10 (b).

Question 1 (a)

1 The diagram shows two cells.



(a) State **two** pieces of evidence from the diagram that show that cell **B** is a plant cell.

1

2 [2]

This question was answered well. Most candidates were given 2 marks as they could identify the evidence from the diagram that cell B was a plant cell. The most common answers indicated the presence of a cell wall and chloroplasts. Some candidates also gave the vacuole as evidence.

Question 1 (b)

(b) Which structure stores the genetic material in an animal cell?

Put a **ring** around the correct answer.

Cell membrane

Cell wall

Nucleus

Vacuole

[1]

The majority of candidates knew that the genetic material was in the nucleus. The most common incorrect answer was cell membrane.

Question 1 (c)

(c) Complete the sentences to describe the genetic material.

Use words from the list.

alleles	chromosomes	DNA	helix	lipids	nucleotides	protein
----------------	--------------------	------------	--------------	---------------	--------------------	----------------

In a human body cell, the genetic material is stored as 46 structures called

..... .

Each of these 46 structures is a long molecule of

These molecules have a double structure and are polymers made from

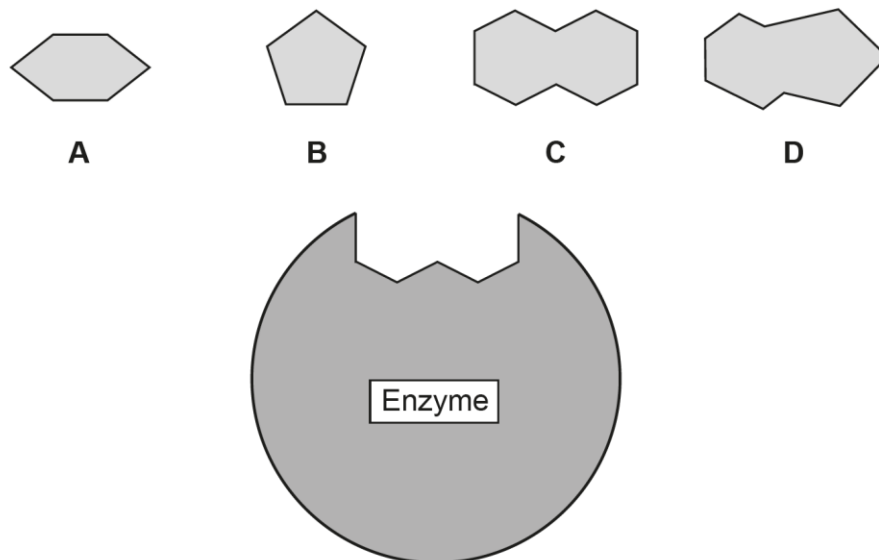
[4]

All candidates answered this question. The most common mark was for the first 3 marking points. The most common incorrect answer was protein, for what the polymers are made from.
--

Question 2 (a)

- 2 Milk contains a carbohydrate called lactose. Humans have an enzyme that breaks down this carbohydrate into sugars such as glucose.

The diagram shows a model of the enzyme and four carbohydrates, **A**, **B**, **C** and **D**.



- (a) Which carbohydrate, **A**, **B**, **C** or **D**, will be broken down by the enzyme?

Explain your answer.

Carbohydrate

Explanation

.....
.....
.....
.....

[3]

The majority of candidates were given the first marking point for correctly identifying C as the carbohydrate that would be broken down the enzyme. Over half could then explain this choice using ideas such as fitting together or matching shapes. Further explanation was limited to a small number of candidates that went on to mention the lock and key theory. Active site was rarely seen.

Question 2 (b)

- (b) Organ systems in the body have different roles in what happens to the sugar from the milk we drink.

Draw lines to connect the correct **three** organ system to their **roles**.

Organ system	Role
Circulatory system	Absorbs the sugar into the body.
Digestive system	Releases insulin to control blood sugar level.
Gaseous exchange system	Transports the sugar around the body in the blood.
Endocrine system	

[3]

This question has four organ boxes to match to three roles, so only three organ boxes were needed as directed by the question. Sometimes candidates matched all four organ boxes to the roles which lost them a mark. Many candidates could match the circulatory system to the transport of sugar around the body in the blood box and the digestive system to the absorbs sugar into the body box. The most common error was linking the gaseous exchange system to releases insulin to control blood sugar level.

Question 2 (c)

- (c) Describe how glucose and oxygen are used by body cells.

.....

.....

.....

..... [2]

Most candidates were not given any marks on this question. Some candidates separated the use of glucose and oxygen in their answer and linked them to use as a food and being transported in the blood respectively, rather than their use in body cells. Respiration was hardly ever seen.

Misconception

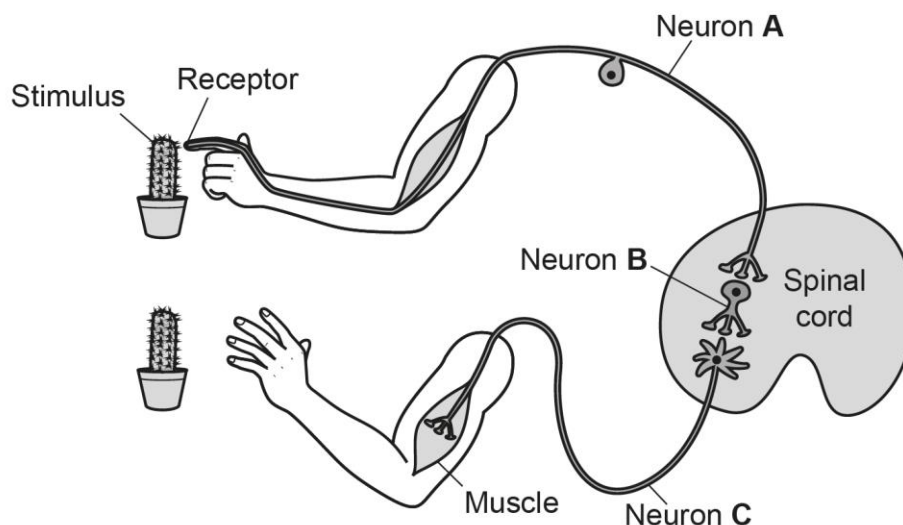
Many candidates thought that energy is produced by glucose (rather than released). This is a misconception by candidates seen often in the responses.

Misconception

Many candidates thought that the oxygen helps us breathe.

Question 3 (a)

3 The diagram shows a reflex arc.



(a) The reflex arc carries a nerve impulse.

Which statement shows the correct order of the neurons that the impulse travels through?

Tick (✓) **one** box.

From **A** to **B** to **C**.

☐

From **A** and **C** to **B**.

☐

From **B** to **A** and **C**.

☐

From **C** to **B** to **A**.

☐

[1]

Many candidates successfully identified the correct order of the neurons. The most common incorrect answer was the complete reverse, so C to B to A.

Question 3 (b)

(b) Draw lines to connect each **neuron** with its correct **name**.

Neuron	Name
A	Motor neuron
B	Relay neuron
C	Sensory neuron

[2]

A sizeable minority of candidates could correctly match the neuron with the name for 2 marks. A greater number of candidates could match one set of boxes. The most common being A to sensory neurone.

Question 3 (c)

(c) Reflex actions have a survival advantage.

Suggest **one** advantage of the reflex arc in the diagram.

.....
 [1]

Many candidates found this question a challenge. A good number were able to mention the reflex arc was quicker or a fast response, which although correct of a reflex arc did not answer the question. A minority could go on to say how this was an advantage. Common correct answers were that 'the arm moved the hand away from danger' and 'to prevent us getting injured by the cactus.'

Question 3 (d)

- (d) The body's response to a stimulus can also be coordinated by hormones.

Complete the sentences to describe how hormones do this.

Use words from the list.

blood

effectors

glands

neurons

receptors

Hormones are secreted by

Hormones are transported by

Hormones are detected by , which stimulates a response.

[3]

A small minority of candidates were given all 3 marks with most candidates still providing some correct answers. The most common correct answer was that hormones are transported by blood, followed by hormones are detected by receptors. Very few candidates knew that hormones are secreted by glands.

Question 4 (a)

- 4 This question is about influenza (flu).

- (a) What kind of pathogen causes flu?

Put a ring around the correct answer.

Bacteria

Fungus

Protist

Virus

[1]

This question was answered well as many candidates got the correct answer. The most common incorrect answer was bacteria.

Question 4 (b)

- (b) The flu vaccine contains a dead or inactive flu pathogen.

Explain why it is important that the flu pathogen in the vaccine is dead or inactive.

.....
..... [1]

Less than half of the candidates were given this mark. Many misunderstood the question and went on to describe how a vaccine would work. Answers included reference to white blood cells and fighting it again. The candidates that did answer the importance of the flu vaccine being dead often referred to 'not making us ill', 'not giving us the flu' or 'not spreading to other people'.

Question 4 (c)

- (c) The statements explain how vaccination can help to protect against flu.

The statements are **not** in the correct order.

- A Antibodies stick to the flu antigens, labelling them for attack by white blood cells.
- B Some white blood cells develop into memory cells.
- C The immune system makes antibodies against the flu antigens.
- D White blood cells recognise the flu antigens.
- E The vaccine is injected.

Write the letters in the boxes to show the correct order of the statements.

--	--	--	--	--

[4]

Many candidates were given 3 marks, with a small number gaining full marks. Most candidates correctly put E in the first box, identifying that the vaccine is injected first. B was the letter that was most likely to be in the incorrect order and was placed throughout any of the boxes, as candidates did not appreciate that memory cells were produced at the end of the process.

Assessment for learning



Centres could focus on the production of memory cells at the end of the vaccination process. Often candidates used the words remembering and cells remember, and this should be discouraged.

Question 5 (a) (i)

5 The image shows a type of ecosystem called a peatland.



Peatlands have high biodiversity. Many different species live there.

(a) The table shows the mass of carbon contained in peatland soil and in woodland soil.

Type of soil	Mass of carbon (kg per m ³ of soil)	Mass to the nearest 10 kg
Peatland	178
Woodland	124

(i) Complete the table by writing in the masses rounded to the nearest 10 kg.

[1]

More than half of candidates could successfully round the masses to 180 and 120. Some candidates changed the numbers or multiplied them up by 10.

Question 5 (a) (ii)

- (ii) Calculate how many times more carbon is contained in peatland soil than in woodland soil.

Number of times more carbon = times more [2]

A good number of students found this question a challenge. Most candidates calculated how much more carbon there was in peatland compared to woodland so calculated $178 - 124 = 54$ or $180 - 120 = 60$. The question asks for *how many times more* carbon is contained in peatland compared to woodland. Candidates could have used the original numbers or the rounded numbers to be given marks here.

OCR support



The [Mathematical Skills Handbook](#) provides both teachers and students support on the use of mathematical skills in GCSE sciences.

Question 5 (b)

- (b) Some companies remove large amounts of soil from peatlands to sell in garden centres.

Describe **two** ways in which this could reduce the biodiversity of the peatlands.

1

.....

2

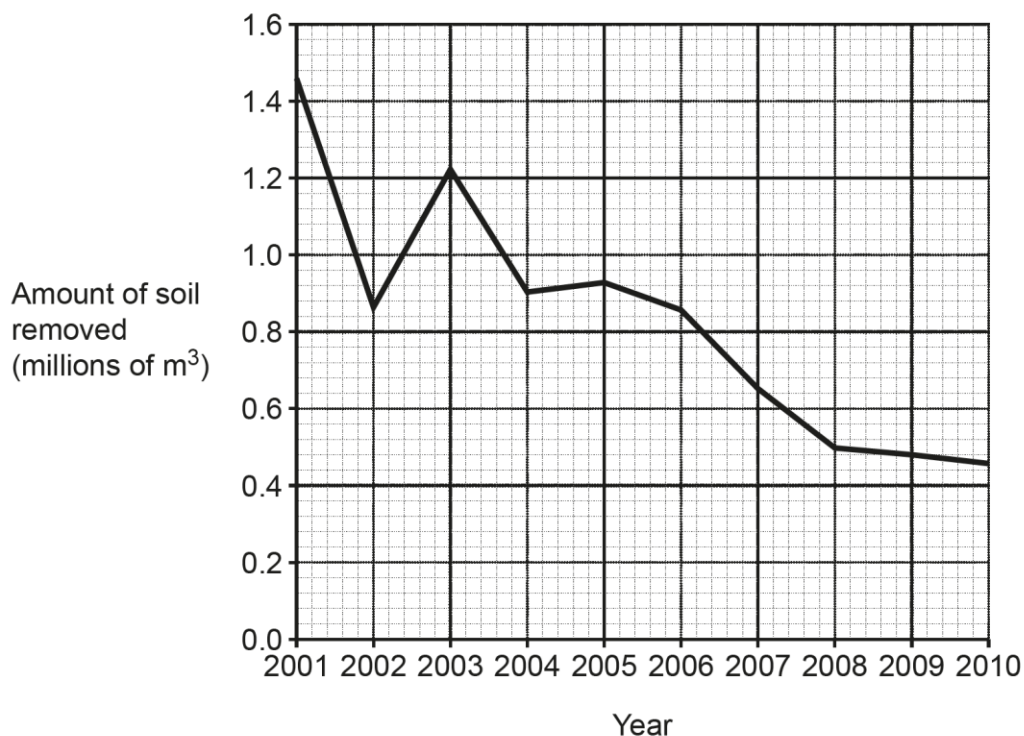
.....

[2]

The majority of candidates were given 1 or 2 marks for this question. Some responses lacked enough details to be given a mark here. Candidates tended to repeat the stem of the question about reduced diversity. A variety of correct answers were seen across the marking points available. The most common ones were the 'loss of habitats' and 'the loss of plants'. The least common being 'less fertile soil'.

Question 5 (c)

(c) The graph shows the amount of soil removed from peatlands in England over 10 years.



Which conclusion is supported by the data in the graph?

Tick (✓) **one** box.

Soil must have been added to the peatlands between 2002 and 2003.

☐

The amount of soil removed was highest in 2003.

☐

The threat to biodiversity in the peatlands decreased each year.

☐

The threat to biodiversity in the peatlands was lowest in 2010.

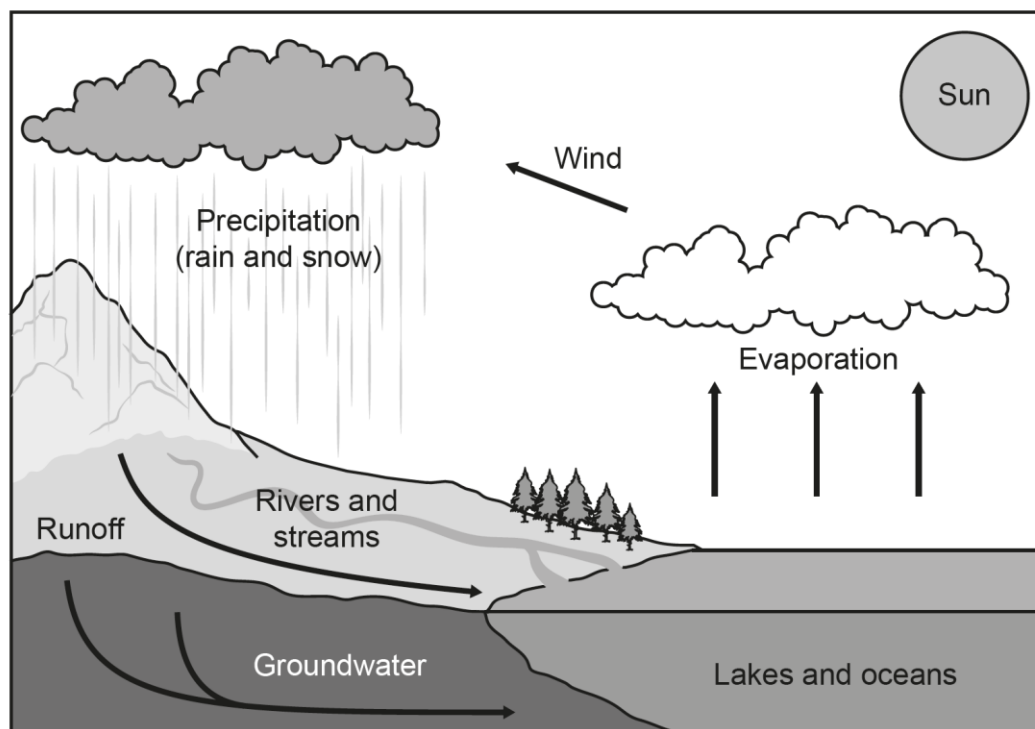
☐

[1]

The majority of candidates correctly identified that the threat to biodiversity in the peatlands was lowest in 2010. A common incorrect answer was due to the third box being ticked, which was a distractor. The general trend of the graph is a decrease in soil over the years which could have been seen as the threat to biodiversity in the peatlands decreasing each year. However, the graph has some years that increase so the statement is incorrect.

Question 6 (a)

6 The diagram shows an incomplete model of the water cycle.



(a)* The diagram does **not** show the roles of plants and animals in the water cycle.

Explain the roles of plants and animals in the water cycle, and why water is needed by plants and animals.

[6]

This was the six-mark Level of Response question. It required knowledge and understanding of the roles that plants and animals play in the water cycle and the uses of the water in these roles. Candidates could use the diagram to help identify and explain the roles. Many candidates attempted this question and secured marks at Level 1 by identifying one role or by explaining why water was needed. Some vague uses of water were given such as to live, to grow and for hydration. Responses that could do both parts in some detail gained Level 2. There were few responses that could fully explain in detail the roles of plants and animals and the uses of water in plants and animals in the water cycle. That plants use water for photosynthesis, plants take in water through their roots and animals drink water or need water for a habitat were the most common credit worthy points made. The use of water as a solvent or in transport systems was not well known. A good number of candidates communicated their answers well. Other candidates gave detail on the water cycle that was not relevant to the question.

Assessment for learning



A good technique for centres to adopt would be for their candidates to be able to de-construct the question. The first part of this question is asking for the roles of both plants and animals in the water cycle. The second part of this question is asking why water is needed by both plant and animals. So, there are four parts to this question.

Exemplar 1

Plants and animal need water to
~~be~~ keep them alive. Plants need water
 for photosynthesis and animals need
 water for respiration. Plants and animals
~~compete for water~~ both ~~comp~~ compete
 for water.

This candidate was given Level 1, 2 marks. They gave one correct use of water in plants – photosynthesis. They also say that water is needed to keep them alive, but this is not a detailed enough for a role or use.

Exemplar 2

Water is needed by plants and animals to maintain the water cycle and ecosystem.

- Plants absorb water taken in by their roots
- Some animals have lakes and oceans as their habitat
- animals need water to stay alive and hydrated and plants need water to complete photosynthesis.
- without water plants will not photosynthesise or grow and they will start to die as the same for animals
- if animals and plants die out it will effect the ecosystem for humans as well.

[6]

This candidate was placed in Level 3 and given 5 marks. They gave one correct role of plants. Plants absorb water taken in by their roots. They also give one correct use of water, as a habitat for animals. Plants use water for photosynthesis is a correct use of water in plants. This candidate does not have a fully explained role of animals in the water cycle, as animals staying hydrated is not detailed enough for the idea that animals drink water. This response has enough detail across the roles and uses to be placed in Level 3. The limited inclusion of the role of water in animals reduced this to 5 marks.

OCR support



The [How to answer level of response questions](#) resource has been produced to help candidates and teachers unpick how best to tackle level of response questions. This resource has been recently revised with extra example questions and candidate responses from June 2018.

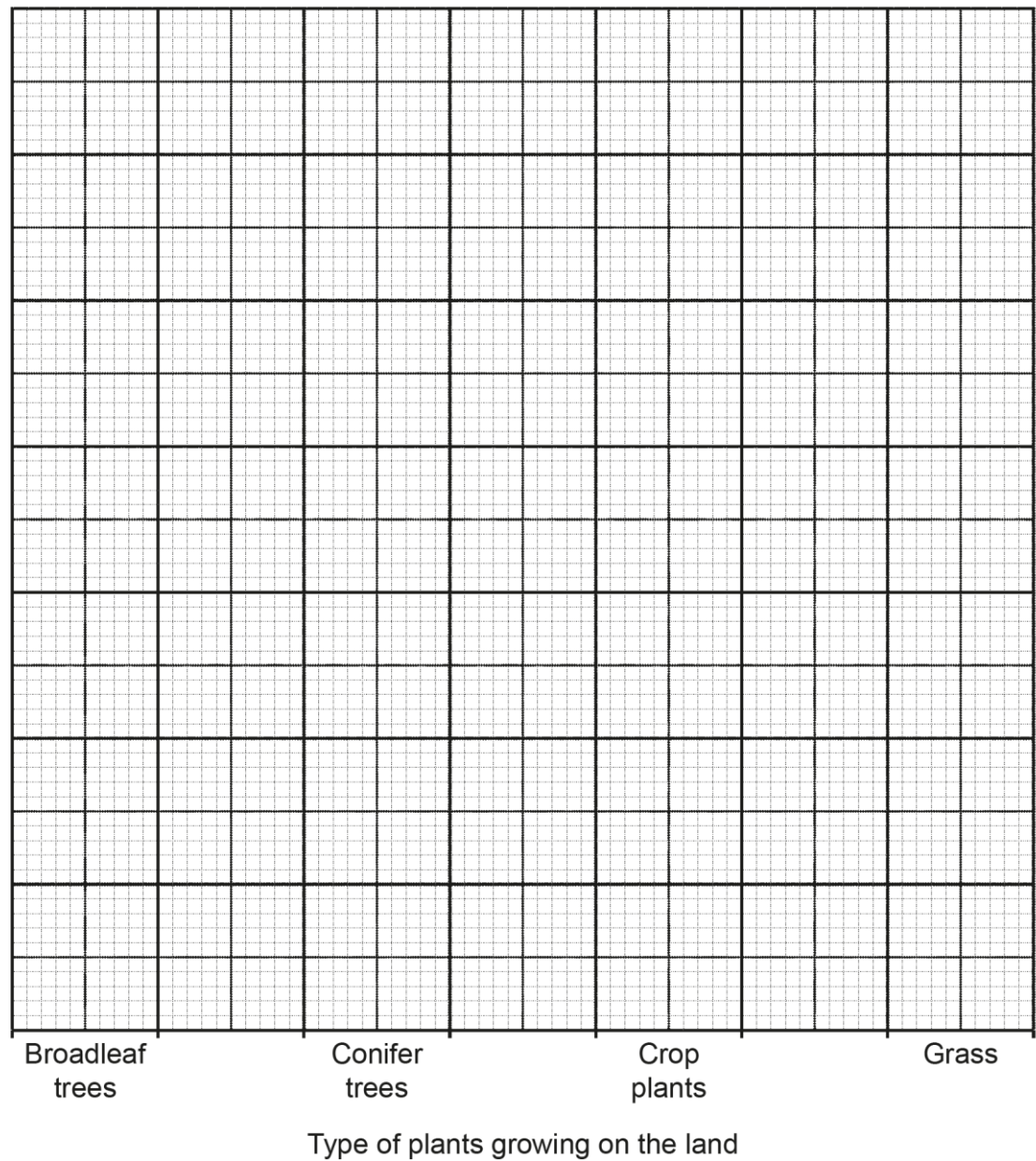
Question 6 (b)

(b) Some of the rain that falls on land evaporates.

The table shows how the type of plants growing on the land affects the percentage of rain that evaporates per year.

Type of plants growing on the land	Percentage of rain that evaporates per year (%)
Broadleaf trees	51.0
Conifer trees	67.5
Crop plants	40.0
Grass	50.0

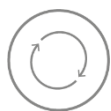
Plot a bar chart of the results from the table on the graph.



[4]

Candidates were asked to plot a bar chart of the results from the table. Most candidates could use the paper to draw an appropriate scale. Some chose a small scale that did not use more than half the paper, so lost this mark. When the axes were labelled, they were labelled correctly. The bar at 67.5% caused the most problem as candidates plotted this as 67 or 68 and did not attempt to draw the bar halfway between the two, so lost 1 mark for plotting.

Assessment for learning



Teachers are advised to provide opportunities to practice drawing bar charts with foundation tier students, and in particular data with decimal places.

Question 6 (c)

- (c) The UK has a target to plant new trees in 300 km^2 of land each year to help manage the water cycle. New trees were planted in 150 km^2 of land in 2020.

Calculate the simplest ratio of planted area : target area in 2020.

Simplest ratio = : [2]

This question had to be read carefully to get the ratio the correct way round, planted area : target area. A significant minority got this the wrong way round and went on to be given 1 mark for their fully simplified ratio.

OCR support



In addition to the [Mathematical Skills Handbook](#), teachers and candidates may also find the [Mathematical Check In](#) worksheets useful for practicing these key skills.

Question 6 (d)

(d) Water and carbon are both cycled through ecosystems.

Complete the table to show which parts of an ecosystem each substance is cycled through.

Tick (✓) **one** box in each row.

Substance	Cycled only through the abiotic parts	Cycled only through the biotic parts	Cycled through both parts
Water			
Carbon			

[2]

Over half the candidates gained at least 1 mark on this question. Some candidates did not follow the instructions in the question to tick one box in each row. Some ticked two or more boxes in each row and could not be given any marks.

Assessment for learning



Candidates ticking more than the number of boxes required could be overcome by improving examination technique.

OCR support



Our [Twenty First Century Biology Quizzes](#) resources is recommended here. You will need access to interchange to download this resource.

Question 7 (a)

7 Duckweed is a plant that grows in pondwater.

Each duckweed plant is made of one leaf and one root, as shown in **Fig. 7.1**.

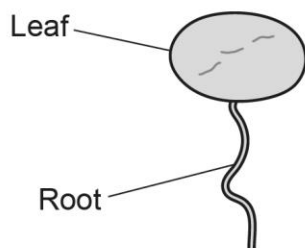


Fig. 7.1

(a) Photosynthesis in the leaf makes food, which allows the plant to reproduce.

Some students want to find out the pH at which duckweed photosynthesises best.

They put 100 duckweed plants in each of four beakers of water. **Fig. 7.2** shows the pH of the water in each beaker.

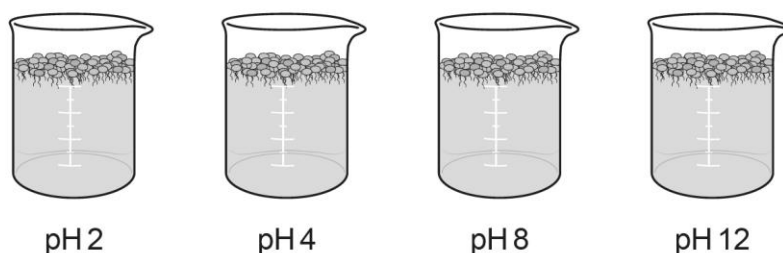


Fig. 7.2

Describe **two** variables that the students should keep the same for each beaker.

1

2

[2]

Many candidates were given some marks on this question, and there were a variety of variables that the candidate could have responded with. The most common correct answer was the amount of water. An ideal answer would have referred to volume of water. Many candidates did not gain 2 marks because they gave number of duckweed as an answer. This was already given in the question so was not credit worthy.

Question 7 (b)

(b) After seven days the students count the number of living duckweed plants in each beaker.

The table shows their results.

pH	Number of living duckweed plants
2	0
4	110
8	120
12	0

The students conclude that duckweed photosynthesises and reproduces best at pH 8.

They could investigate whether their conclusion is based on an **accurate** result by growing duckweed in two more beakers of water.

What should the pH of the water in these **two** beakers be?

Tick (✓) **two** boxes.

pH 1 ☐

pH 3 ☐

pH 7 ☐

pH 9 ☐

pH 13 ☐

[2]

This question was answered well with the majority of candidates gaining at least 1 mark. Most candidates also followed the instructions given and ticked two boxes. pH 3 was the most common incorrect box ticked.

Question 8 (a)

8 (a) The cell cycle has two phases, interphase and mitosis.

The table describes events in the cell cycle.

Complete the table to show if each event occurs in interphase or mitosis.

Tick (✓) **one** box in each row.

Event	Interphase	Mitosis
The cell grows larger.		
Chromosomes are copied.		
Chromosomes divide.		
More organelles form.		
The nucleus divides.		

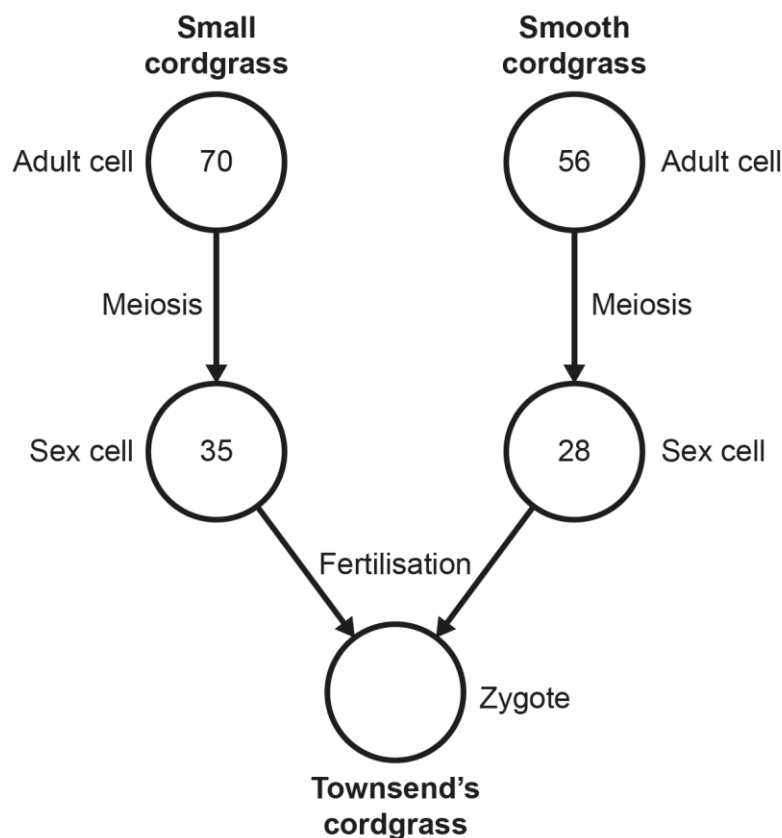
[4]

It was great to see so many students attempting this question, with the vast majority able to gain some marks. Three marks was the most common number of marks given here. Candidates often put chromosomes are copied in mitosis, which is incorrect.

Question 8 (b) (i)

- (b)** Two species of a plant called small cordgrass and smooth cordgrass are bred to produce a new species called Townsend's cordgrass.

The diagram shows the number of chromosomes in the cells of small cordgrass and smooth cordgrass.



- (i)** After meiosis, the number of chromosomes in the cordgrass sex cells is half the number in the adult cells.

Why is this important?

.....
..... [1]

Candidates found this question again a challenge, and it was sometimes omitted. Many candidates used their knowledge to describe the importance of the zygote having a full set of chromosomes due to the difference in the chromosome numbers of the two sex cells. This was not relevant to this question and a further reason was required. Very few candidates were given 1 mark.

Question 8 (b) (ii) and (iii)

- (ii)** How many chromosomes will be in the Townsend's cordgrass zygote?

Put a **ring** around the correct answer.

28 35 56 63 70

[1]

- (iii)** The zygote will enter the cell cycle to form an adult Townsend's cordgrass plant.

How many chromosomes will each adult cell have?

Put a **ring** around the correct answer.

28 35 56 63 70

[1]

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Chromosome number being the addition of both sex cell chromosomes was well understood for the 63 in Question 8 (b) (ii). Most got this correct. This was not translated into the chromosomes in an adult cell in Question 8 (b) (iii) and less than half got this correct, often circling 28 or 35. Candidates often don't like to use the same answer twice and this could have led to candidates looking for an alternative.

Question 8 (c)

- (c) Plant roots contain unspecialised cells, and specialised cells such as root hair cells.

Which statement explains how the unspecialised cells in a root become specialised?

Tick (✓) **one** box.

Cell growth becomes uncontrolled.

☐

Genes are turned off and on.

☐

New genes are made.

☐

Proteins are turned off and on.

☐

[1]

A small proportion of candidates got this correct. Common incorrect choices were for the first and third boxes.

Misconception



Many candidates thought that new genes could be made or that proteins are turned off or on.

Question 8 (d)

- (d) Explain why it is important for plants to have specialised root hair cells rather than only unspecialised cells.

.....

..... [1]

A small minority of candidates could explain why root hair cells or specialised cells were better at their job or how they were adapted for the role. Correct answers often made the link to an increased surface area.

Question 9 (a)

9 Diseases such as cardiovascular disease (CVD) are non-communicable.

(a) Define non-communicable.

.....
..... [1]

A good proportion of candidates could define non-communicable. Most used the idea of not transmitting it from person to person.

Misconception



Quite a few candidates thought that non-communicable means untreatable.

Question 9 (b)

(b) Give **two** causes of non-communicable diseases.

1
.....
2
..... [2]

Half of the candidates were given at least 1 mark. Often candidates gave two lifestyle ideas so could only be given the mark once. The candidates that did not gain any marks had often misinterpreted the question and gave two examples of non-communicable diseases such as cancer and diabetes, instead of two causes.

Question 9 (c) (i)

Scientists wanted to investigate the effects of two medicines on the risk of developing CVD. They did a study for 6 years which involved 12 000 people. All the people were over the age of 55 and did **not** have CVD.

(c) (i) Suggest why only people who did **not** have CVD were involved in the study.

.....
..... [1]

The idea that the study was about developing CVD and not treating it was missed by many candidates. They mentioned not wanting to make people more ill if they had CVD and the treatment didn't work. Some candidates also incorrectly suggested the treatment would cause CVD.

Question 9 (c) (ii)

(ii) Give **two** reasons why we can have confidence in conclusions drawn from this study.

1
.....
2
..... [2]

More than half of the candidates were given at least 1 mark on this question. Many could successfully identify the long length of the study and the large number of participants. Incorrect responses included ideas such as 'they tested on people over 55' or 'we could be confident the medicines do not cause CVD'. Some answers were too vague and just stated the length of the study and number of people.

Question 9 (c) (iii)

- (iii) Suggest **one** more piece of information that would be useful to know about the people in the study.

.....
..... [1]

Over half the candidates could identify one more piece of information about the people that would be useful to know in the study. Many candidates gave gender, lifestyle examples or family history as an answer. If they developed side effects from the treatment was a common incorrect answer, along with weight and being healthy.

Question 9 (c) (iv)

- (iv) Why do the conclusions of this study **not** apply to the whole population?

.....
..... [1]

Many candidates incorrectly referred to the sample size being too small, or that the whole population had not been studied. A smaller number of candidates could correctly identify that the study only had people over the age of 55 in it.

Question 9 (d) (i)

- (d) The people in the study were divided into four groups. Each group received a different treatment.

The table shows the results of the study.

Group	Treatment received	Percentage of people in group who developed CVD (%)
A	Placebo	5.0
B	Medicine 1 only	3.8
C	Medicine 2 only	4.6
D	Both medicines	3.6

- (i) Describe what a placebo is.

.....
 [1]

This question proved to be demanding for most candidates. Some candidates thought that the placebo was another kind of treatment. Vague answers said a pill or drug without referring to fake or dummy.

Question 9 (d) (ii)

- (ii) Suggest why a placebo was used.

.....
 [1]

Likewise, candidates found it tough to explain why a placebo might be used. The use of the placebo for comparison in this study was not well understood or expressed. Incorrect answers included, to see the psychological effects and to treat the patients.

Question 9 (d) (iii)

(iii) Which statement best explains why it was ethical to use a placebo in this study?

Tick (✓) **one** box.

Placebos do no harm.

☐

Placebos make people feel involved.

☐

No one in the study was ill with CVD.

☐

There are no treatments for CVD.

☐

[1]

A minority of candidates understood the ethical use of a placebo in this study and selected the correct option. Many candidates thought it was because placebos do no harm.

Assessment for learning

laS4: How do science and technology impact society?

The role of placebos and ethical questions about their use in clinical research has been an area that students have found challenging before. Candidates would benefit from further opportunities to explore this idea about science in a number of different contexts.

Question 9 (d) (iv)

(iv) Suggest **two** conclusions that can be made from the results.

1

.....

2

.....

[2]

The majority of candidates were given at least 1 mark on this question. When marks were not given it was because candidates had copied across the data without writing a conclusion. Some candidates were still referring to the treatments as medicines that cure CVD or treatments that caused CVD.

Question 9 (d) (v)

(v) Group **C** and group **D** each had 3000 people in them.

Calculate how many **more** people would have developed CVD in group **D** than in group **C**.

Number of people = [2]

Erratum notice

Turn to **page 21** of the **question paper** and look at **question 9(d)(v)**.

In the second sentence, cross out the word '**more**' and replace with '**fewer**'.

The question should now read:

'Group **C** and group **D** each had 3000 people in them.

Calculate how many **fewer** people would have developed CVD in group **D** than in group **C**.'

There was evidence that the candidates had been given the erratum notice and had crossed out the word more and written fewer. Candidates found this mathematical question challenging and over half of the candidates were not given any marks. Some candidates were very close with their working but had taken the wrong percentage from the table or only completed the first step and stopped at calculating the difference of 1%. More care is needed when transferring data from the table to the area of working.

Question 10 (a)

10 Transpiration takes place in plants.

(a) Complete the sentences to describe transpiration.

Put a **(ring)** around each correct answer.

Water is **absorbed** / **lost** / **translocated** through the stomata in a plant's leaves.

This causes **sugars** / **water** / **water and sugars** to move up the

meristem / **phloem** / **xylem** tissue in the plant's stem.

[3]

A good majority of students were able to gain at least 1 mark in this question. Some students confused translocation with transpiration in their responses. The most common correct answer was xylem.

Question 10 (b)

(b) **Fig. 10.1** shows one of the stomata from a leaf.

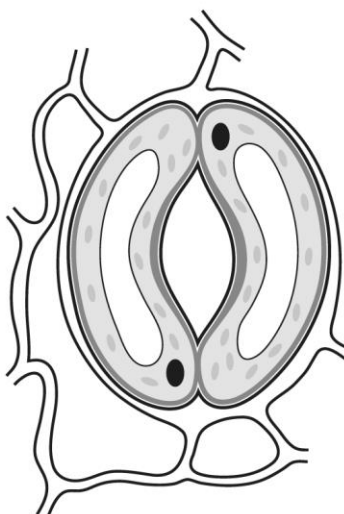


Fig. 10.1

Add **two** labels to **Fig. 10.1**.

Label 1 The pore through which water diffuses.

Label 2 A guard cell.

[1]

This question was particularly challenging for candidates with a significant number unable to offer any response. A small minority were given 1 mark. The vacuole in the cell was often incorrectly labelled as the pore, and the cells around the guard cells labelled guard cell.

Question 10 (c)

- (c) Complete the sentences to describe how to set up a light microscope to look at a slide of stomata from a leaf.

Put a ring around each correct answer.

First, turn to the **×4 / ×10 / ×20** objective lens.

Use the coarse focus knob to move the objective lens to its **lowest / middle / highest** position.

Then clip the slide onto the **eyepiece / objective lens / stage**.

[2]

It was good to see so many candidates attempting this question with many candidates getting two of the answers correct for 1 mark. The most common correct answer was stage.

Question 10 (d) (i)

(d) Amir sets up a leafy twig in a bubble potometer as shown in Fig. 10.2.

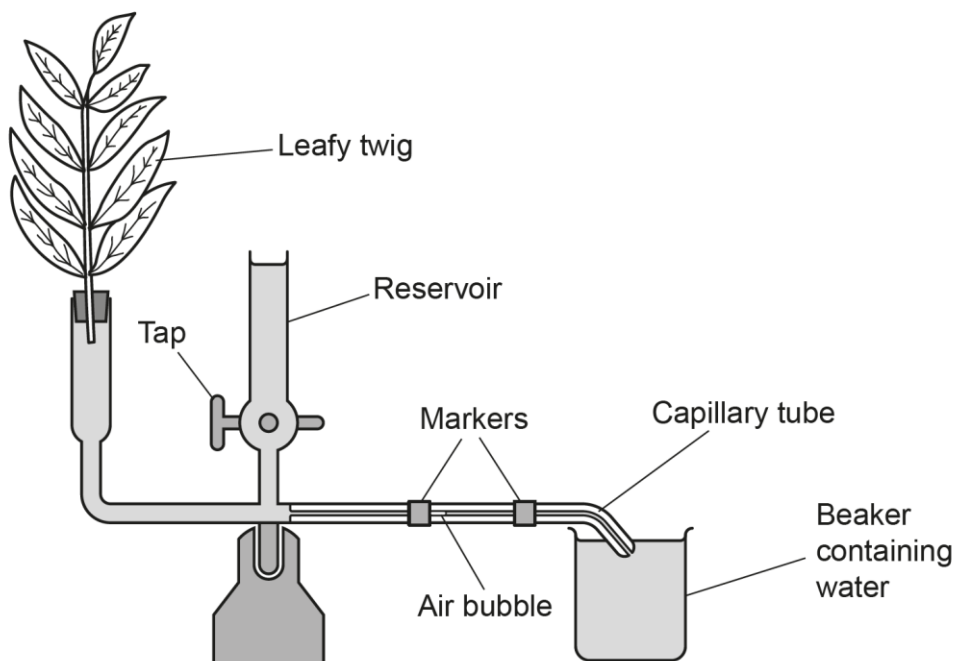


Fig. 10.2

Amir wants to use the bubble potometer to investigate the rate of transpiration in the leafy twig.

(i) Describe the **two** measurements Amir would need to make.

1

2

[2]

Candidates found this question demanding. It was clear that many did not understand how the potometer worked or what observations are required to collect transpiration data and the relevance of the two markers and the bubble. Many candidates suggested measuring the water, counting the bubbles or measuring the twig.

Assessment for learning



The learning outcome from chapter B3, describe how to use a simple potometer, was being assessed here, rather than a practical activity. Teachers are encouraged to offer a diverse range of practical opportunities to allow students to access the learning outcomes as well as those listed in the practical activity group. This would also include observing stomata under a microscope as suggested in the linked learning activities.

Question 10 (d) (ii)

(ii) Suggest the purpose of the reservoir **and** tap.

.....

.....

.....

..... **[2]**

A small number of candidates were given 2 marks on this question. Candidates that scored 1 mark were often able to describe the idea that the reservoir could be used to add water to the system. The idea of using the reservoir to reset the experiment to repeat the collection of data was not understood. Incorrect answers included add more air, to make a bubble, and count the bubbles.

Question 10 (e) (i)

(e) Amir investigated the rate of transpiration in the leafy twig in four different experiments.

The table shows Amir's results.

Experiment	Temperature (°C)	Wind speed (m/s)	Light level	Calculated mean rate (mm/s)
A	22	0.1	Dull	1.27
B	22	0.1	No light	0.61
C	20	4.8	Bright	1.54
D	28	0.3	Dull	

Amir has not yet calculated the mean rate for experiment **D**. The results from his three repeats of experiment **D** were 4.55, 4.17 and 0.75 mm/s.

(i) Discuss arguments for and against ignoring the result of 0.75 mm/s for experiment **D**.

For

.....

Against

.....

[2]

This question confused many candidates who understood that 0.75 mm/s did not fit the pattern and was an outlier but they often incorrectly put this for the against answer. The second marking point was very rarely seen with candidates suggesting that a result should always be used in the mean. A small minority could correctly identify that outliers should only be discarded if there was a reason to do so.

Question 10 (e) (ii)

- (ii) Amir decides to keep all three results for experiment **D**.

Calculate the mean rate for experiment **D**.

Give your answer to **two** decimal places.

Mean rate = mm/s [3]

Half of all candidates were given at least 1 mark for this calculation. This was often for the error carried forward answer to two decimal places. Some candidates had the correct calculation but did not round to two decimal places and left the answer as variations of 3.15666 so could only be given two marks. Nearly a third of candidates were given full marks.

Assessment for learning

All candidates should be encouraged to always show their working as they can gain marks for the correct steps in their method even when the final answer is incorrect.

Question 10 (f)

- (f) Amir wants to make a conclusion about the effect of light level on the rate of transpiration.

Explain why he can **only** do this by comparing experiments **A** and **B**.

.....

..... [1]

Some candidates understood that to compare the effect of light in experiments A and B the wind speed and temperature must be kept the same. Many candidates incorrectly thought that it was the difference in light levels that was the explanation.

Question 11

11 Plants need to absorb nitrate ions to stay alive.

Complete the sentences to explain why a plant needs oxygen to absorb nitrate ions.

Use words from the list.

active transport	aerobic	anaerobic	ATP	diffusion
DNA	light	osmosis	oxygen	photosynthesis

The plant uses the process of to absorb nitrate ions.

This process requires energy from molecules of

Oxygen is needed to make these molecules during cellular respiration.

[3]

The vast majority of students were able to attempt this question despite it being at the end of the paper and an overlap question with the Higher Tier paper. The most common mark given on this question was 1, for aerobic in the last space. Many candidates incorrectly put diffusion or osmosis for the process to absorb nitrate ions. Oxygen was the most common incorrect answer for the molecule that provides the energy.

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