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Examiners' report

GCSE

COMBINED SCIENCE B (TWENTY FIRST CENTURY SCIENCE)

OCR Level 1/Level 2 GCSE (9-1) in Combined Science B (Twenty First Century Science)

J260

For first teaching in 2016

J260/01 Summer 2025 series

Version 1

ocr.org.uk/science

Contents

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 responses is 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 Teach Cambridge.

Paper 1 series overview

J260/01 is the first of four Foundation tier papers taken for Combined Science. It covers content from the topics B1 to B6 plus ideas about science and practical skills. This paper requires candidates to apply their knowledge and understanding of scientific principles and be familiar with ideas about science and practical skills, by answering short answer questions and one Level of Response type question. The Level of Response question assesses the quality of communication as well as applying knowledge and understanding of scientific ideas. There are also questions that involve the assessment of key mathematical requirements from Appendix 5e of the specification. Questions 9 and 10 overlap with the Higher tier paper. Most candidates attempted all the questions but there was an increase in the omission of answers throughout Question 10, suggesting that candidates may have started to run out of time or that the level of question was too challenging.

It was good to see that candidates were able to successfully follow the instructions throughout the paper for different style responses such as ticking boxes, drawing rings and using letters. There were very few responses this year that had extra ticks in rows or columns.

Candidates that performed well on this paper were able to describe the relationship between health and disease in Question 1 (a). In addition, they could successfully apply knowledge and understanding of scientific enquiry and use their mathematical skills to calculate the mean number of daisies in Question 3 (b) (i), estimate the population size of daises in the garden in Question 3 (c) (i), and calculate the area of the clear zone in Question 5 (a). The Punnett square was completed well, showing a good understanding of genetic inheritance in Question 5 (b). The application of their knowledge and understanding of natural selection allowed the Level of Response to be a good differentiator in Question 7 (b). However, candidates did demonstrate some knowledge gaps on the specific type of pathogen that cause a specific infection, stem cells and their uses, and the function of valves in the heart. Some candidates found it challenging to apply knowledge and understanding of scientific ideas and scientific enquiry, techniques and procedures and to analyse information and ideas to develop and improve experimental procedures. Candidates should have the opportunity to develop these skills during practical work.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• demonstrated knowledge and understanding of health and communicable and non-communicable diseases in Question 1 (a) • could calculate the mean number of daisies in Question 3 (b) (i) • substituted numbers into the population size equation in Question 3 (c) (i) • could calculate the radius when given a diameter and use this to calculate the area of the clear zone in Question 5 (a) • could analyse information and draw conclusions about the clear zones in Question 5 (b) • completed a Punnett square by identifying the parent gametes and use these to work out the correct offspring genotypes in Question 6 (a) (i) • applied knowledge and understanding of evolution and natural selection to gain marks on the Level of Response question, Question 7 (b)* • applied knowledge and understanding of the procedure required to investigate the effect of sugar concentration on osmosis in Question 10 (a).	• could not recall the correct pathogens that cause the specific infections given in Question 1 (b) • could not provide ideas to improve experimental procedures in Question 3 (c) (ii) • could not apply knowledge of scientific enquiry to work out a ratio from the Punnett square in Question 6 (a) (ii) • could not apply knowledge and understanding of scientific ideas of stem cells in Question 6 (b) (ii) • demonstrated limited knowledge and understanding of natural selection in the Level of Response question, Question 7 (b)* • could not recall the function of valves in the heart in Question 8 (c) or the features of red blood cells and plasma in Question 8 (d) (ii) • could not describe how the changes (in DNA) led to a single cell forming a tumour in Question 9 (b) (ii).

Question 1 (a)

1 The health of most organisms is affected by disease.

(a) Complete the sentences to describe the relationship between health and disease.

Use words from the list.

absence	**cause**	**communicable**	**genetic**	**presence**

Good health is the ..... of disease.

All ..... diseases are spread by pathogens.

Some non-..... diseases are due to inherited genes.

[3]

The first question was answered well. Most candidates gained 2 or 3 marks. It did look like some candidates tried to correctly use the word communicable twice and then crossed out a correct response and replaced it with genetic. This was most common for the second or third sentence.

Question 1 (b)

(b) Common human infections are caused by pathogens.

Complete the table to describe which type of pathogen causes each infection.

Tick (✓) **one** box in each row.

Infection	**Type of pathogen**			
	Bacterium	**Fungus**	**Protist**	**Virus**
Athlete's foot				
Influenza				
Malaria				
Salmonella				

[4]

Most candidates achieved at least 2 marks or more, correctly identifying Athlete's foot as a fungus and Salmonella as a bacterium. Influenza as a virus was the next most common correct response. The most common incorrect box ticked was for Malaria.

Assessment for learning

Centres could reinforce that Malaria is an infection caused by a Protist when describing common human infections. This has been identified as a knowledge gap.

Question 1 (c) (i)

(c) Plant infections are caused by pathogens.

(i) What infection does fungus cause?

Tick (✓) **one** box.

Ash dieback ☐

Crown gall ☐

Tobacco Mosaic ☐

[1]

Only half of candidates knew that Ash dieback was caused by a fungus. Tobacco Mosaic was the most common incorrect response.

Assessment for learning

Centres could reinforce that Malaria is an infection caused by a Protist for Question 1 (b) and Ash dieback is caused by a fungus for Question 1 (c) (i) when describing common human infections and plant diseases.

Question 1 (c) (ii)

(ii) How is fungus spread between plants?

Tick (✓) **one** box.

By sexual intercourse ☐

In contaminated food ☐

Spores carried by the wind ☐

[1]

This question about the spread of the fungus was well answered. Most candidates could recall that a fungus is spread by spores carried by the wind.

Question 2 (a)

2

(a) Complete the sentences to describe the role of hormones in the human endocrine system.

Put a (ring) around each correct option.

Hormones are secreted by **glands** / **neurons** / **the blood**.

Hormones are transported by **glands** / **neurons** / **the blood**.

Responses provided by the endocrine system are
faster / **slower** / **the same speed** compared to the nervous system.

Responses provided by the endocrine system are
longer lasting / **shorter lasting** / **the same length of time** compared to the nervous system.

[4]

Many candidates scored at least 1 mark or more on this AO1 recall question. Hormones secreted by glands and hormones transported by blood were the most common correct responses. Candidates knew that there was a difference in the speed and length of the responses, so the same speed and the same length were very rarely chosen.

Question 2 (b)

(b) Statements **A** to **D** explain how blood sugar level is controlled in the human body.

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

A Blood sugar level increases after eating a sugary meal.

B Blood sugar level falls.

C Sugar is absorbed from the blood.

D The pancreas secretes insulin.

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

[3]

Many candidates were able to gain 1 or more marks on this question. If the sequence was incorrect, it was usually because C was put earlier, and D was put later in the sequence. ACBD was a common incorrect response.

Assessment for learning

Centres could reinforce the role of insulin in triggering cells to absorb sugar from the blood when the blood sugar levels increase after eating a sugary meal.

Question 2 (c)

(c) Diabetes is a disease that affects our body's ability to keep blood sugar level constant. There are two main types of diabetes, type 1 and type 2.

Describe how **type 2** diabetes can be treated.

.....

.....

.....

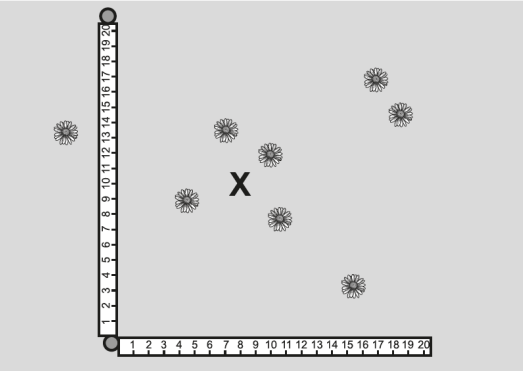
..... **[2]**

Most candidates scored at least 1 mark with many gaining 2 marks. The most common responses were about diet, exercise and insulin injections. Some candidates did confuse Type 1 and Type 2 diabetes and suggested eating more sugary snacks to keep the blood sugar levels up.

Question 3 (a)

3 A student estimates how many daisies are in a large garden.

They lay tape measures on the garden as shown in the diagram.



(a) The student places a metal square at point **X**. They count the daisies in the square.

What is the scientific name for the metal square?

Tick (✓) **one** box.

Identification key ☐

Quadrat ☐

Transect ☐

Tripod ☐

[1]

Candidates performed well on this question. They knew that the metal square is a quadrat.

Question 3 (b) (i)

(b) The student counts the number of daisies in a sample of five metal squares.

The table shows the results.

Square	Number of daisies
1	7
2	5
3	10
4	7
5	9

(i) Calculate the mean number of daisies in the sample of five squares.

Mean = ... **[2]**

Candidates had to add up the total number of daisies and divide by 5 to calculate the mean of 7.6. Many candidates did this successfully and some rounded to 8 as you can't get 0.6 of a daisy so this was allowed in the mark scheme guidance. Incorrect responses stopped at calculating the total number of the daisies and gave an answer of 38.

Question 3 (b) (ii) and (iii)

(ii) Write down the mode number of daisies in the sample.

Mode = ... **[1]**

(iii) Write down the median number of daisies in the sample.

Median = ... **[1]**

Mode (Question 3 (b) (ii)) and median (Question 3 (b) (iii)) were less understood than calculating the mean in Question 3 (b) (i) although many candidates gained marks. A common incorrect response for both questions was 10 which is the highest number in the table.

OCR support

The Science Mathematical Skills Handbook provides both teachers and students support on the use of mathematical skills in GCSE sciences.

Question 3 (b) (iv)

(iv) The student did **not** decide for themselves where to place the metal squares.
Instead they used a random number generator to produce coordinates to decide where to place the squares.

Suggest **one** reason why this gave a better estimate of the daisy population size.

.....

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

Candidates found it difficult to analyse the information and give a reason why this gave a better estimate of the daisy population. The most common correct response was to avoid bias. Candidates that did not score said to make it fair, or that it was the student choosing and picking an area with lots of daisies.

Question 3 (c) (i)

(c)

(i) The area of the garden is 4400 m^2.
The area of the metal square is 0.25 m^2.

Calculate the estimated population size of daisies in the garden.

Use the equation:

$$\text{estimated population size} = \frac{\text{area of garden}}{\text{area of metal square}} \times \text{mean number of daisies in sample}$$

Use your answer from **(b)(i)**.

Estimated population size = ... **[2]**

Most candidates could substitute the numbers given in the question and their mean from Question 3 (b) (i) into the equation to get 133760 or 140800 if they had rounded their mean to 8, for 2 marks. When only 1 mark was gained the main error was confusing the unit m^2 to mean they had to square the values for the area of the garden and the metal square.

Question 3 (c) (ii)

(ii) This is the student's method:

1. Generate random coordinates to decide where to place the metal squares.
2. Use metal squares with an area of 0.25 m^2.
3. Place five metal squares on the garden.
4. Count the daises in each metal square.

Suggest **one** way the student can improve their method to get an estimate that is closer to the true population size.

.....

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

Over half of candidates could suggest a way to improve the method. Good suggestions included more samples, bigger quadrats and repeats. Incorrect responses suggested sampling every m^2 of the garden or choosing where to put the quadrats where there are most daisies.

Question 3 (d)

(d) Population size can be affected by abiotic and biotic factors.

Complete the table to show if each factor is **abiotic** or **biotic**.

Tick (✓) **one** box in each row.

Factor	Abiotic	Biotic
Food availability		
Light intensity		
Predators		
Temperature		

[3]

Candidates often either got all 3 marks or 0 marks as they confused abiotic and biotic so ticked all the boxes correctly or ticked all the completely opposite boxes. Candidates that were given 1 or 2 marks often got that predators were biotic, and temperature is abiotic. The most common incorrectly ticked box was for food availability as many thoughts that it was an abiotic factor.

Question 4 (a)

4 Genetically engineered crops were first introduced in the USA in 1994 with the Flavr Savr tomato. This genetically engineered tomato had a slower ripening process, which delayed rotting.

(a) How did scientists use genetic engineering to produce the Flavr Savr tomato?

Tick (✓) **one** box.

They applied pesticides to the tomatoes. ☐

They modified the genome of the tomato. ☐

They used natural selection of the tomato. ☐

They used selective breeding of the tomato. ☐

[1]

Over half of the candidates could identify that the scientists had modified the genome of the tomato. Most incorrect responses were for the distractor statement about the use of selective breeding.

Question 4 (b)

(b) One benefit of this genetic engineering is that it delays rotting of the tomatoes.
One risk is the disruption of food chains.

Explain **one** other benefit **or** risk of growing these genetically engineered tomatoes.

.....

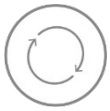
.....

.....

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

This question required applying knowledge and understanding of the benefits and risks of growing genetically engineered tomatoes. Nearly half of the candidates gained 1 mark for giving an example of a benefit or a risk. The most common benefits seen were longer shelf life and less food wastage. The most common risks seen were that it could make it taste bad and could grow slower. Very few candidates gained 2 marks. Many responses gave a risk and a benefit rather than explaining just one benefit or risk as the question required. Some responses were a repeat of the benefit and risk given in the question.

Assessment for learning



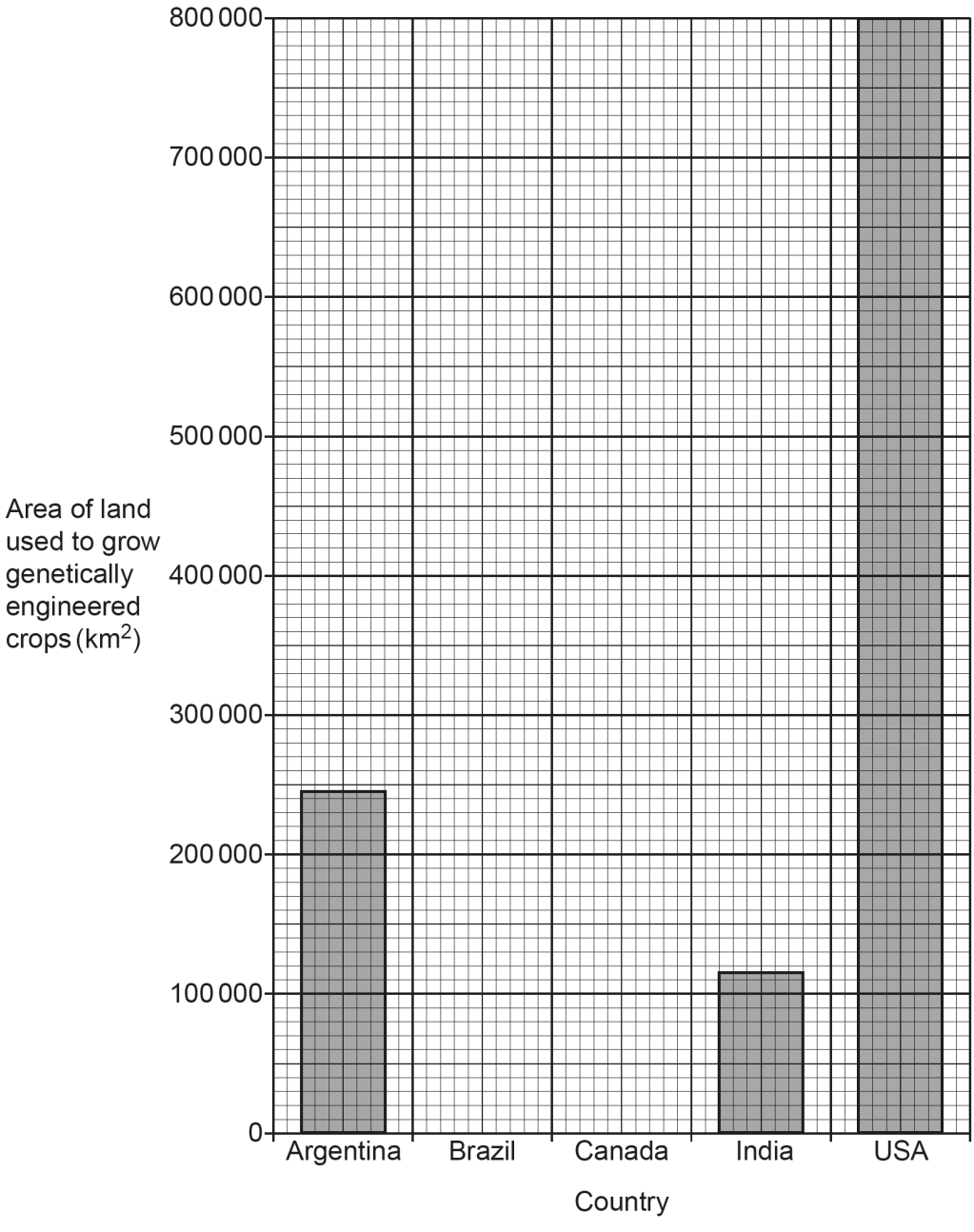
Candidates should be encouraged to read the question carefully and take note of the words 'explain' which requires an explanation, 'one' in bold, and 'other', so not the benefit or risk already given in the question.

Question 4 (c)

(c) The table shows which countries used the largest area of land to grow genetically engineered crops in 2015.

Country	Area of land used to grow genetically engineered crops (km^2)
Argentina	245 000
Brazil	440 000
Canada	110 000
India	115 000
USA	800 000

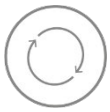
Plot the results for **Brazil** and **Canada** on the graph.



[2]

This was one of the most accessible questions on the paper as candidates were able to successfully use the scale on the y axes to draw the two bars correctly. Some bars were hand drawn and uneven.

Assessment for learning

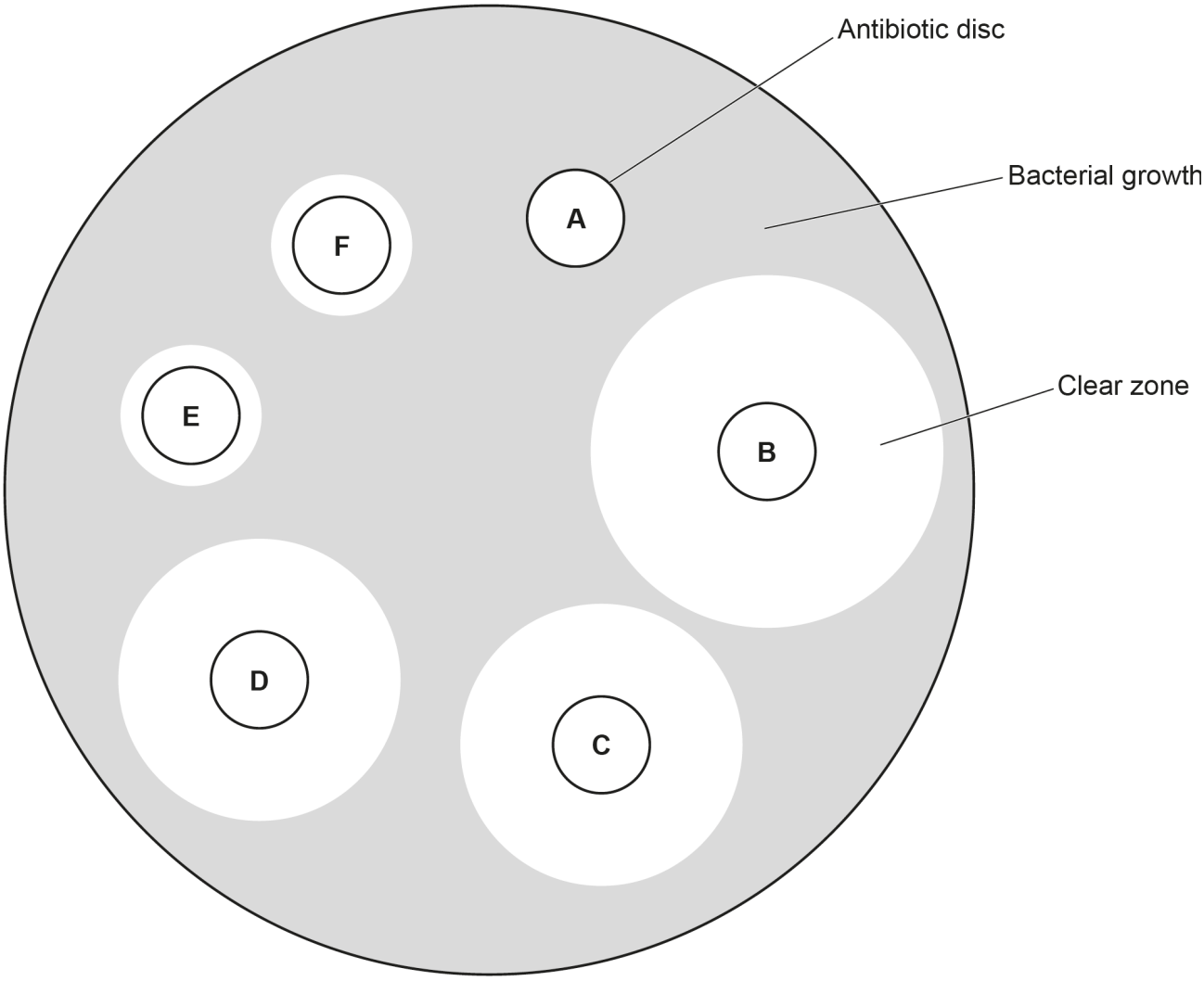


Candidates should be encouraged to use a ruler to draw bars straight on a bar chart.

Question 5 (a)

5 A scientist investigates the effect of six different antibiotics, **A** to **F**, on the growth of one type of bacteria.

The scientist grows the bacteria on agar with discs soaked in the six different antibiotics.



The results are shown in the table.

Antibiotic	Diameter of clear zone around disc (cm)
A	0
B	5
C	4
D	4
E	2
F	2

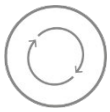
(a) Calculate the area of the clear zone around disc **F**.

Use the equation: area = 3.14 × r^2

Area = ... cm^2 **[3]**

This question discriminated well through the range of marks available. More than a half of candidates gained at least 2 marks. The main error when not gaining full marks was using the diameter of 2 for the radius instead of halving it to get 1 for the radius. This gave a response of 12.56 and although incorrect was given 2 marks for the correct working, if seen.

Assessment for learning



Centres should encourage candidates to show all the working out on a calculation question. Even if the answer is incorrect, candidates can be given working out marks, but only if this can be seen by the examiner.

Question 5 (b) and (c) (i)

(b) Explain which antibiotic is the best to treat an infection caused by these bacteria.

Antibiotic .....

Explanation .....

.....

.....

[2]

(c) The scientist concludes that antibiotic **A** does **not** work.

(i) Suggest **one** reason why the scientist's conclusion may be **correct**.

.....

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

Both Questions 5 (b) and 5 (c) (i) were well answered, and candidates clearly understood the practical being tested. Responses could relate the size of the clear zone to the antibiotic that was best to treat an infection, as it had the largest clear zone or had killed the most bacteria and the antibiotic that didn't work as it didn't have a clear zone. A few responses did not gain the second marking point in Question 5 (b) as they used words such as a large clear zone and a lot of bacteria were killed and not the comparative words as required.

Question 5 (c) (ii)

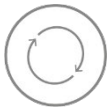
(ii) Suggest **one** reason why the scientist's conclusion may be **incorrect**.

.....

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

Candidates found this part of Question 5 more difficult than the previous ones with very few candidates gaining the mark. The most common correct responses were that it had only been carried out once or that it may not work on this type of bacteria. The most common incorrect response was that the antibiotic needed more time to work.

Assessment for learning



Centres could provide more opportunities for candidates to analyse information from the practical work carried out, in this case for B5 Microbiological techniques. These AO3 skills are accessed in the exam and make up 20%.

Question 6 (a) (i)

6

(a) Tay-Sachs disease is inherited.

It is caused by an allele of a single gene.

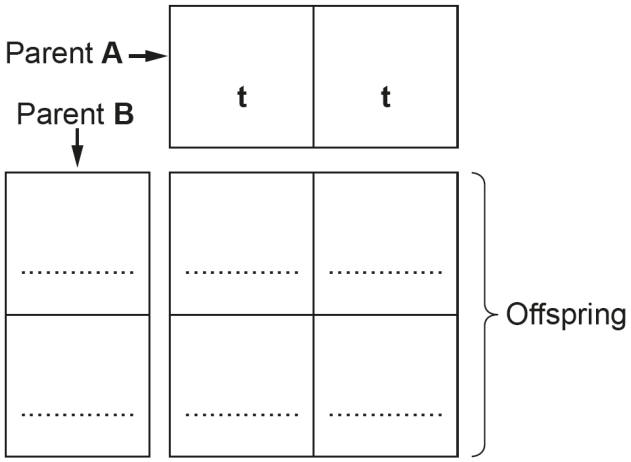
A person will only have the disease if they inherit this allele from **both** parents.

(i) Parent **A** has the disease and parent **B** is a carrier.

Complete the Punnett square to show the possible alleles of their offspring.

Use:

- **T** to represent a normal allele
- **t** to represent a Tay-Sachs disease allele.



[2]

Most candidates can carry out a genetic cross and were given at least 1 mark and many gained 2 marks. If an error was made on parent B gametes, for example written as TT, the candidate was given the correct offspring marking point for their cross.

Question 6 (a) (ii)

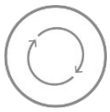
(ii) Calculate the expected ratio of children with Tay-Sachs disease to children without the disease for these parents.

Give your answer in its simplest form.

Ratio = ... : ..... **[2]**

Many candidates found this ratio question challenging and didn't gain any marks. Responses that didn't add up to 4 were common such as 4:1 and 3:4. A few candidates did not simplify the ratio and left it at 2:2 for 1 mark.

Assessment for learning



Centres should encourage students to practise calculating ratios and simplifying any ratios from their Punnett square when teaching how genetic information is inherited.

Question 6 (a) (iii)

(iii) Calculate the probability that these parents will have a child with Tay-Sachs disease.

Probability = ... **[1]**

More than half of the responses were correct on this question even if the ratio in Question 6 (a) (ii) was incorrect. The most common responses were a probability of 0.5 or 50%.

Question 6 (a) (iv)

(iv) How would you describe the genotype of a person with Tay-Sachs disease?

Tick (✓) **one** box.

Heterozygous dominant ☐

Heterozygous recessive ☐

Homozygous dominant ☐

Homozygous recessive ☐

[1]

Few candidates knew that the person with Tay-Sachs was homozygous recessive even if they had picked out the child for Question 6 (a) (iii) and given the correct probability, suggesting that the candidates were unfamiliar with these terms.

Assessment for learning

Centres should encourage the use of the correct terminology for describing genotypes when teaching genetics.

Question 6 (b) (i)

(b) Tay-Sachs disease damages nerve cells in the nervous system.

(i) The Tay-Sachs allele codes for a functional protein that has an active site.

What type of protein does the Tay-Sachs allele code for?

Tick (✓) **one** box.

Carbohydrate ☐

DNA ☐

Enzyme ☐

Fat ☐

[1]

More than half of the candidates knew that a protein with an active site would be an enzyme. Incorrect responses were mostly for the distractors of fat or carbohydrates.

Question 6 (b) (ii)

(ii) Scientists want to use stem cells as a treatment for this disease.

Explain why stem cells could be used to treat this disease.

.....

.....

.....

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

This was one of the most challenging questions on the paper with very few candidates gaining both marks available and a few candidates gaining one mark for stating that stem stems are undifferentiated or unspecialised cells. There was little to no reference about replacing the nerve cells or damaged cells.

Misconception

Some candidates thought that stem cells were part of the immune system and would fight the disease and some thought that stem cells were the cells in the stem of a plant. Centres should make sure that they explain the importance of cell differentiation and the function of stem cells in a variety of situations.

Question 6 (b) (iii)

(iii) Which statement is an ethical implication of using stem cells?

Tick (✓) **one** box.

It is possible for viruses to be transferred with the stem cells leading to infection. ☐

Stem cells are taken from an embryo which is a potential future life. ☐

Stem cells could potentially become cancerous. ☐

The treatment may be rejected by the immune system. ☐

[1]

Nearly half the responses were correct. The statement suggesting that viruses can be transferred with the stem cells was a strong distractor, with many candidates selecting it.

Question 6 (b) (iv)

(iv) State **two** reasons why new medical treatments are tested on animals during their development.

1 .....

.....

2 .....

.....

[2]

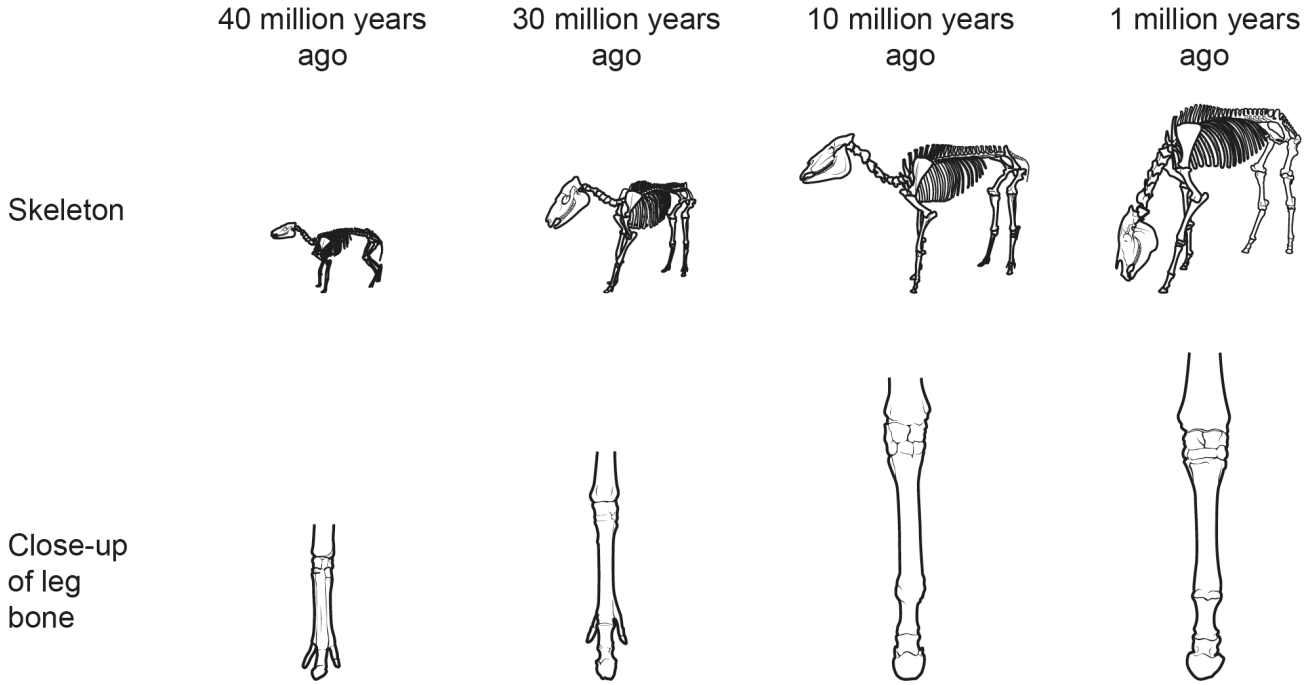
More than half of candidates gained at least 1 mark here and this was usually for a response that was about testing for safety or side effects. Marking point 1 and 3 were seen a lot less. Many candidates described how animals could be used instead of humans for their biological similarity to humans such as similar cells, similar DNA and that they would respond the same. This question was not asking why animals are used instead of humans, but why animals are used during the development of a new medical treatment.

Question 7 (a) (i)

7

(a) Fossils can show how a species has evolved.

The diagram shows fossils of some of the ancestors of the modern horse.
These fossils provide evidence of how the horse evolved.



(i) Describe **one** way in which this fossil evidence shows how the horse has evolved.

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

Candidates were asked to use the fossil evidence in the diagram. Correct responses mentioned that the horse got bigger and the leg bone got longer. Some candidates gave descriptions that couldn't by seen on the diagram, such as the legs got stronger, and some candidates read the timescale the wrong way and said the horse got smaller.

Question 7 (a) (ii)

(ii) Which **two** statements are **limitations** of using these fossils as evidence of the evolution of the horse?

Use the diagram to help you decide.

Tick (✓) **two** boxes.

There are no fossils older than 1 million years old. ☐

Each fossil is just one individual that might be different from others in the species. ☐

Fossils do **not** show all the features of the organism, such as hair colour. ☐

There are no differences between the fossils from different time periods. ☐

Fossils **cannot** be used to provide evidence for evolution. ☐

[2]

Many candidates gained 2 marks for this question. It was good to see that only two boxes were ticked. The first statement was the most common incorrect box ticked.

Question 7 (b)*

(b)* Bed bugs are insects that can live in a mattress.

They can be killed with a type of poison called Permethrin.

Resistance to this poison is becoming more common in bed bugs. This is an example of evolution.

Explain why resistance to this poison is becoming more common in bed bugs due to evolution.

.....

.....

.....

.....

.....

..... **[6]**

This 6-mark Level of Response question assessed AO2. It required knowledge of evolution and natural selection and the application of these ideas to the resistance to the poison becoming more common in bed bugs. More than half of the candidates did not gain any marks on this question and the rest were spread throughout the marks available. The most successful responses were able to describe natural selection from a mutation that led to increased survival and reproduction and the passing on of the resistant gene to the offspring. Some responses missed out a key detail in the process of natural selection and were limited to Level 2. Many candidates confused resistance with immunity as they talked about passing on immunity and making antibodies to fight the poison.

Exemplar 1

The bed bugs likely could have gone through a process of natural selection. This made sure that the poison ~~resis~~ the bed bugs formed poison resistant adaptations and as such have passed them down to their offspring until now where the poison is becoming obsolete.

Exemplar 1 gained Level 1, 2 marks, as the candidate gave a limited explanation about why the resistance to poison was becoming more common. They gave one part of the process of natural selection being that the resistance was passed on to offspring in lines 4 and 5.

Exemplar 2

The resistance to the poison called Permethrin is becoming more common in bed bugs. This is due to evolution, such as natural selection, in order to survive. This happens when bed bugs are born with genetic mutations, which makes them more adaptable than others to the poison. Eventually these bed bugs are more likely to survive, and when they do, they mate with eachother, producing more offspring with the genetic mutation/variant, making them stronger due to the natural selection. This entire process is called evolution/adaptation.

Exemplar 2 gained Level 3, 6 marks as the candidate gave a detailed description about why the resistance to poison was becoming more common. They first mentioned natural selection in line 3. The candidate then fully applied their knowledge to this question and process of evolution, identifying the starting point as genetic mutations in line 5, leading to increased survival and mating in lines 7 and 8, followed by the passing on of the genetic mutation/variant to offspring in lines 8 and 9.

OCR support

Candidates can use the support activities to practise Level of Response questions using How to answer 6 mark LOR questions.

Question 7 (c)

(c) Scientists used to classify organisms based only on their visible features.
Scientists now also use evidence from the cells of organisms.

Describe **one** piece of evidence from an organism's cells that could help a scientist to classify it.

.....

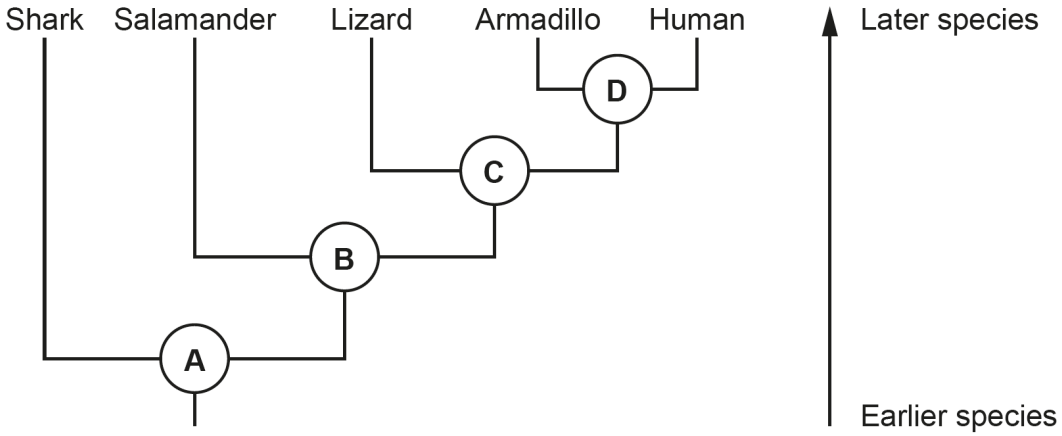
..... **[1]**

DNA and nucleus were the most common correct responses. Some candidates recognised that cells could be prokaryotic or eukaryotic but didn't give the evidence that would help to classify them.

Question 7 (d) (i)

(d) The evolutionary tree diagram shows the evolutionary relationships between some organisms, by showing how later species evolved from earlier ones.

- Shark, salamander, lizard, armadillo and human are all species of animal.
- **A**, **B**, **C** and **D** are also species of animal.



(i) Which species is the most closely related species to humans?

Tick (✓) **one** box.

Armadillo ☐

Lizard ☐

Salamander ☐

Shark ☐

[1]

Most candidates were able to read the evolutionary tree diagram and choose Armadillo as the most closely related species to humans.

Question 7 (d) (ii)

(ii) Which species is a common ancestor of both sharks and humans?

Put a (ring) around the correct option.

A **B** **C** **D**

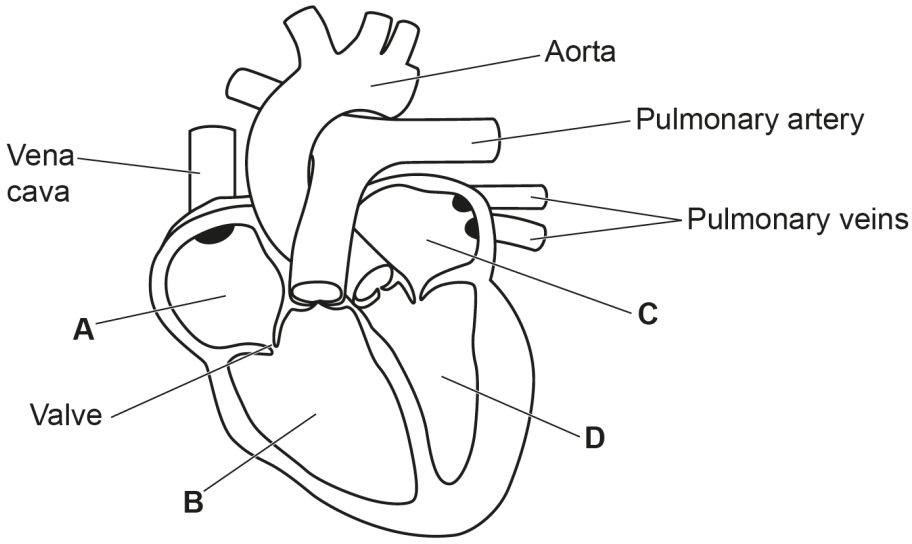
[1]

Identifying the common ancestor from the evolutionary tree proved to be more difficult than choosing animals that were closely related in the previous question. The most common incorrect responses chosen were B and C.

Question 8 (a) and (b)

8 The heart is an organ in the circulatory system.

The diagram shows the human heart.



(a) Which part of the heart pumps oxygenated blood to the body?

Tick (✓) **one** box.

A ☐

B ☐

C ☐

D ☐

[1]

(b) Which blood vessel carries deoxygenated blood back to the heart?

Tick (✓) **one** box.

Aorta ☐

Pulmonary artery ☐

Pulmonary vein ☐

Vena cava ☐

[1]

Many candidates could not recall and recognise that part D, the left ventricle would pump oxygenated blood to the body in Question 8 (a) and that the vena cava would carry deoxygenated blood back to the heart in Question 8 (b). Some chose C possibly getting the left and right side of the heart mixed up, while many also chose B. There was a range of incorrect responses for Question 8 (b) with pulmonary artery and aorta being the most common incorrect choices.

Question 8 (c)

(c) Explain the function of the valves in the heart.

.....

.....

.....

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

Very few candidates gained 2 marks with some gaining 1 mark for the prevent back flow of blood marking point. Responses did not then explain where or when the valves would work. Many incorrect responses referred to the valves pumping blood, controlling the flow of blood or separating oxygenated and deoxygenated blood.

Misconception

Many candidates thought that the valves pump blood around the body.

Question 8 (d) (i)

(d) Arteries, capillaries and veins are blood vessels in the human circulatory system.

(i) Complete the table by showing which feature each blood vessel has.

Tick (✓) **one** box in each row.

Feature	Arteries	Capillaries	Veins
The walls have a thick layer of muscle.			
They have valves along their length.			
The walls are permeable.			

[2]

This question required candidates to recall the differences between arteries, veins and capillaries. Many candidates could recall that arteries have walls with a thick layer of muscle but then were not as successful recalling the features of capillaries and veins. It was good to see most candidates only put one tick in each row as instructed.

Question 8 (d) (ii)

(ii) Explain how red blood cells and plasma are adapted to their functions in the blood.

Red blood cells .....

.....

.....

.....

Plasma .....

.....

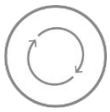
.....

.....

[4]

Many candidates did not gain any marks on this question, by not using the correct terminology for the feature of the red blood cell such as saying dented or by saying that the red blood cells carry oxygenated blood or that they carry blood. The most common features identified for the red blood cell were biconcave disc and large surface area, and candidates gained a mark for saying that they carry oxygen. The function of plasma was less known, many mistaking it for platelets and defence, with the very occasional correct response for carrying substances or carrying the blood cells. A high number of candidates did not provide a response.

Assessment for learning



Centres could reinforce how red blood cells and plasma are adapted to their functions in the blood, and the use of the correct terminology when describing the features of the red blood cell.

Question 9 (a)

9 There are two types of cell division, meiosis and mitosis.

(a) Complete the table to show which type of cell division is described by each statement.

Tick (✓) **one** box in each row.

Statement	Both types of cell division	Meiosis only	Mitosis only	Neither type of cell division
It involves two divisions to produce four new cells.				
It makes new cells for growth and repair of tissues in adults.				
It produces cells with half the number of chromosomes.				
It produces gametes.				

[4]

Question 9 (a) is the start of the overlap questions with the Higher tier paper.

Some candidates tried to respond to this question by ticking one box per column rather than one box per row. There were also two distractor columns. Many candidates did gain at least 1 or 2 marks. The most common correct response was for meiosis only, involving two divisions to produce four new cells.

Question 9 (b) (i)

(b) Cancer is the result of changes in cells.

(i) In which part of a cell do these changes occur?

Tick (✓) **one** box.

Cell membrane ☐

Cell wall ☐

Cytoplasm ☐

DNA ☐

[1]

Question 9 (b) (ii)

(ii) Describe how the changes lead to a single cell forming a tumour.

.....

.....

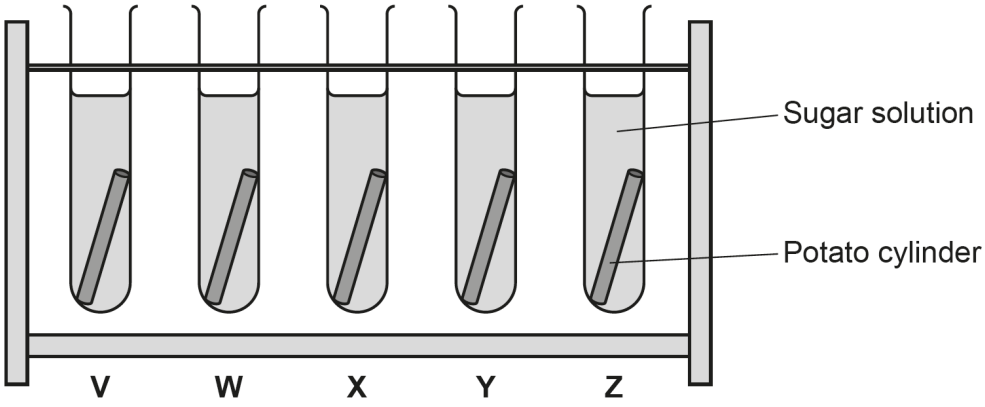
.....

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

Both Questions 9 (b) (i) and 9 (b) (ii) were recall questions about cancer that candidates found challenging and Question 9 (b) (ii) was the question that most candidates chose to not provide an response for. Many candidates did not know that cancer is the result of changes in the DNA and even less candidates could describe the changes that would lead to single cell forming a tumour. Correct responses included the idea the cells would divide faster or uncontrollably. Many candidates did mention mutation which was a non-scoring response.

Question 10 (a)

10 A student investigates the effect of sugar concentration on osmosis.
They use potato cylinders placed in sugar solutions of different concentrations.



(a) Statements **A** to **E** describe how the student does the investigation.

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

A Cut five potato cylinders.

B Calculate the change in mass.

C Measure the starting mass of the potato cylinders.

D Place the potato cylinders into each of the different sugar solutions for 24 hours.

E Remove and dry the potato cylinders, and measure their mass.

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

One has been done for you.

A				

[3]

This question was one of the most successfully answered questions on the paper showing good application of knowledge and understanding of the procedures involved in the osmosis practical method. The rest of Question 10 was found challenging by candidates.

Question 10 (b) (i)

(b)

(i) State **one** variable that the student should control in this investigation.

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

Common correct responses were for size and length of the potato. Many responses mentioned mass of potatoes but not starting mass and referred to the amount of solution and not volume. Time was often given as a non-scoring response.

Question 10 (b) (ii)

(ii) Suggest why the student dries the potato cylinders before measuring their final mass.

.....

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

Over half of candidates gained 1 mark for responses such as, so the liquid does not add extra mass. Some non-soring responses were not clear enough, or some said that the extra solution would be absorbed by the potato.

Question 10 (c) (i)

(c) The table shows the student's results.

Sugar solution	Mass of the potato cylinder at the start (g)	Mass of the potato cylinder after drying (g)	Change in mass (g)
V	1.10	1.21	+ 0.11
W	1.36	1.48	.....
X	1.42	1.42	0.00
Y	1.28	1.18	.....
Z	1.35	1.12	–0.23

(i) Calculate the change in mass for potato cylinders **W** and **Y**. **[1]**

This question required the candidates to calculate the change in mass. Over half of the responses were correct. Some responses that did not score missed the + or – before the number to show the increase or decrease in the change in mass like the rest of the column.

Question 10 (c) (ii)

(ii) The student uses the change in mass to conclude which sugar solution had the largest effect on the potato cylinders.

Suggest why the student **cannot** make a valid comparison between the potato cylinders using the change in mass.

Use the data in the table.

.....

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

This AO3 question was asking candidates to analyse information and make a suggestion. Many candidates described the results and said that some potatoes had increased in mass, and some had decreased in mass without looking at how the practical was set up as to the reason why a valid comparison could not be made. Again like Question 10 (b) (i), many responses had the idea of the mass being different, but omitted to say starting mass, so it was unclear what they meant.

Question 10 (c) (iii)

(iii) Suggest **two** ways in which the student could improve their method so they can make a valid comparison between potato cylinders.

1 .....

.....

2 .....

.....

[2]

Some candidates gained 1 mark on this AO3 with very few gaining 2 marks. Common correct responses were same size of potato, same starting mass, and same volume of sugar solution. Many responses made the same errors as the previous questions referring to time, mass, not starting mass and amount.

OCR support

The Purposeful Practical resource for investigating osmosis can be used with candidates to guide them through the practical. It is designed to encourage candidates to consider the purpose of each step of the practical and has further questions to check understanding.

Question 10 (d) (i) and (d) (ii)

(d)

(i) Explain why some of the potato cylinders decreased in mass.

Use ideas about osmosis.

.....

.....

.....

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

(ii) The potato cylinder placed in sugar solution **X** did **not** change in mass.

Suggest **one** reason why this might have happened.

.....

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

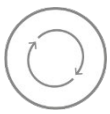
Both Question 10 (d) (i) and 10 (d) (ii) were application questions with very few marks given. Many candidates tried to explain the movement of water using the word concentration but often got it the wrong way around in Question 10 (b) (i). Many mentioned the sugar moving and some thought that the potato would dissolve and lose mass. Reasons for the no change in mass in Question 10 (b) (ii) were often about not enough or too much sugar solution or that it needed to be given more time. Some candidates had the idea that there was equal movement in and out of the potato but couldn't give enough detail or the reason why.

Misconception

Many candidates thought that the potato would dissolve in the sugar solution and lose mass.

Many candidates thought that water moved from a high concentration to a low concentration but were not clear what the concentration was.

Assessment for learning



Centres should encourage the correct use of terminology when carrying out a practical investigation. Volume should be used instead of amount.

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