

Examiners' Report

June 2018

GCSE Science 1SC0 2BF

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June 2018

Publications Code 1SC0_2BF_1806_ER

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Introduction

Paper 1SC0_2BF is taken by candidates doing GCSE Combined Science as part of a linear assessment model at the end of the course. This was the first paper for the new specification. The paper consists of 60 marks assessed by a variety of questions including multiple choice, short answer and one extended answer question worth 6 marks. Candidates should answer all questions in a time period of 1 hour and 10 minutes. In the extended answer question marks are also awarded for the ability to structure a response logically; this question is marked with an asterisk (*). In addition, the new specification assesses practical knowledge and mathematical skills in the papers. These requirements are given in the specification and there are 6 Biology core practical investigations which candidates must complete prior to the exam. Aspects of working scientifically were also assessed in questions throughout the paper.

The paper contained questions assessing the content from topic 1 and topics 6 - 9. These included questions in relation to enzyme action and specificity, cell structure, endocrine organs, the role of insulin and diabetes, exchange surfaces and the transport of substances, the role of blood plasma, heart structure, oxygen absorption in relation to exercise, the role of nitrate ions in plants, root hair cells and structure of a leaf. The one six-mark question covered transport of water and sucrose in plants. Questions on practical work included writing methods, describing techniques or suggesting relevant steps for a number of investigations. Additionally, candidates were required to show understanding of using a microscope as well as identifying a safety precaution, variables and improvements when working scientifically. The maths skills assessed included interpreting graphs, magnification, surface area and use of standard form.

The assessment of practical work in examinations has replaced the controlled assessment component of the previous specification. Candidates were able to answer questions using their practical skills knowledge including questions on safety precautions and the identification of factors to be considered. However, candidates need to ensure they provide answers that are specific to the investigation they are being tested on rather than giving responses pertaining to general laboratory safety. Many candidates were able to recall practical methods including the use of quadrats to investigate populations, however they found describing a method for the elasticity of the artery more challenging.

There were several questions where candidates needed to apply their knowledge to situations that may be new to them, but in these cases all the required information needed to lead candidates to the required responses was supplied in the stems of the questions and items. Candidates could benefit from practising reading the stem and considering which parts are key to stimulate the connections to areas of the specification covered. It was pleasing to see examples where candidates had underlined the command words and key words in the given information. Overall it was felt that these candidates gave more targeted and balanced responses than average.

The more straightforward questions where marks could be gained by interpreting given information were answered well although it was pleasing to see some excellent, coherent answers accurately applying germane scientific terminology to many items that required extended prose. It was encouraging to see that some candidates used the scaffolding provided to guide their responses. Even when candidates scored low or no marks there was evidence from a reasonable number of an attempt to use the diagrams, graphs and information in the stem of the question to try to guide their response. Good examples of this would be annotations on the graph in 3(c) or the diagram in 6(c). There was an emphasis in a range of items on applying knowledge with a pleasing number of candidates clearly showing an understanding of the response required where the command word explain was used. However, too many candidates could still not develop their responses into a logical specific set of sequential points that answered the question. Some candidates found it hard to answer the question, often reproducing stock answers related to the

topic or based only on linked key words instead of addressing the construct of the question. It was also not uncommon to see a question using the command word describe being extended to include an explanation or a question using the command word explain only including a description within the answer.

The number of blank responses seen was in line with expectations throughout the paper but there was a notable increase in the number of candidates who stopped answering all items in question 6 and in particular the extended answer question 6(c) which required a longer written response.

A large proportion of candidates were able to describe basic trends in graphs and the mathematical items were answered well by many candidates, although they were less able to express their answer in the format requested, for example as a ratio or more commonly in standard form.

Question 1 (b)

This item gave rise to a wide range of answers and therefore a wide range of marks were awarded. Whilst many responses mentioned glucose and/or insulin, a significant proportion clearly did not understand their roles fully. Answers about these substances included vague statements, lacking scientific language, which as a result were often not creditworthy. The inclusion of a graph, which should have helped candidates, seemed to confuse them rather than being used as a tool to help them craft a good answer. Some took the clue from the graph about insulin but then made completely incorrect statements about it, such as that glucose would break down into insulin.

(b) Figure 1 shows the blood glucose and blood insulin concentration for a healthy person during one day.

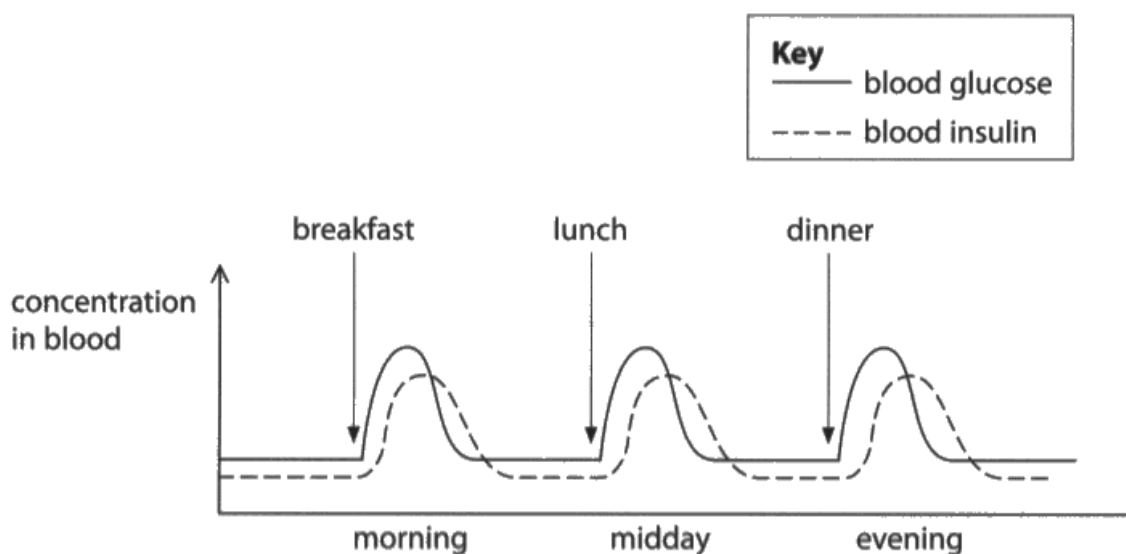


Figure 1

The blood glucose concentration increases after a meal.

Explain why the blood glucose concentration then decreases.

(2)

because the energy of each meal is used by the body.



This response scored 0 as like many responses it failed to provide an explanation as to why the blood glucose concentration had decreased. Candidates seemed to overlook figure 1; by using the graph more answers are likely to have identified that insulin was released to at least pick up 1 mark. Even those who did, often did not seem to be fully aware of the role of insulin and even less its effect on glucose.



Use the figures provided to help you construct your answers. Here, identifying that insulin was released, which can be seen in the graph by a rise in the blood insulin line on the graph, is worth 1 mark and a good starting point to an explanation.

(b) Figure 1 shows the blood glucose and blood insulin concentration for a healthy person during one day.

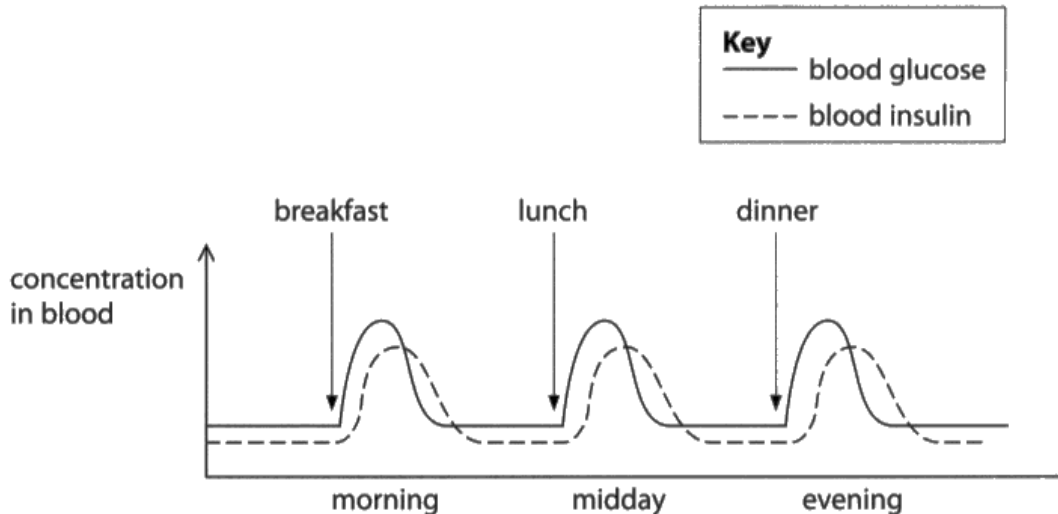


Figure 1

The blood glucose concentration increases after a meal.

Explain why the blood glucose concentration then decreases.

(2)

Because the pancreas produced insulin. The insulin then causes cells to remove glucose from blood, and then the liver/muscle converts glucose into glycogen and it's stored.



This scored 2 marks. The candidate more than likely used a combination of their own knowledge and the information in the question to provide a detailed response. Many candidates were unable to describe what happened to the glucose either in terms of conversion to glycogen or storage or for use in respiration to release energy.



Whilst using information in the question, including data and diagrams, there is no substitute for good scientific knowledge. This candidate had a very clear understanding of the link between insulin and glucose so was able to provide an explanation which was awarded 2 marks.

Know the difference and be able to use key words confidently, especially those which are similar such as those in this answer (glucose and glycogen)

Question 1 (c)

This question required candidates to state the cause of type 1 diabetes. Although nearly always attempted, candidates often confused type 1 and type 2 diabetes, therefore responses were mixed between those incorrectly giving a cause of type 2 diabetes and those giving the correct response. Credit was awarded most frequently for answers stating that no or very little insulin is being produced, it being genetic or inherited.

(c) State **one** cause of type 1 diabetes.

(1)

Too much sugar.



This scored 0. It shows a common misconception or misunderstanding between the causes of type 1 and type 2 diabetes.



When revising diabetes make sure you can confidently and correctly distinguish between the causes and effects of type 1 and type 2.

(c) State **one** cause of type 1 diabetes.

(1)

not being able to produce insulin.



This scored 1 mark for stating a cause of type 1 diabetes. It would be pleasing to see candidates giving a more detailed answer in relation to what was unable to produce insulin, i.e. the pancreas



If possible also try to be specific in your answer so here for example the answer would be improved by saying that the pancreas cannot make/produce insulin. Although here it wouldn't have gained an additional mark it is details like this that might in another similar question.

Question 1 (d)

Most candidates that gained at least one mark here by stating that controlling the diet would either reduce the sugar eaten or cause weight loss. Some extended their initial point to explain further by saying that low amounts of sugar will either keep the blood glucose level lower or that by losing weight, the cells of a type 2 diabetic can better respond to any insulin produced. A significant number of candidates simply stated that they should control what is eaten which was considered to be too vague for credit or gave answers referring to exercise which were also not creditworthy as the question required an explanation linked to the control of diet.

(d) Explain how controlling the diet can be used to treat type 2 diabetes.

(2)

therefore you dont have too
much sugar



ResultsPlus
Examiner Comments

This response scored 1 out of 2 marks available. In this question candidates frequently only gave 1 response to a 2 mark question, so need to be encouraged to extend their explanations to pick up further marks: in this case by saying what the effect on blood glucose levels would be by reducing sugar intake.



ResultsPlus
Examiner Tip

Check the number of marks available and make sure you include enough points in your explanation to achieve all those on offer. Here, add the effect on blood glucose levels by not having too much sugar.

(d) Explain how controlling the diet can be used to treat type 2 diabetes.

(2)

Type 2 diabetes are people who are obese and they BMI is over 30. They should eat healthy food because they need to loose weight. Less fat food but more vegetables.



ResultsPlus
Examiner Comments

The candidate describes type 2 diabetes which shows their knowledge but unfortunately does not answer the explain question that was asked. It is pleasing to see the candidate underlining the reference in the question to 'how controlling diet can be used', as they gain the 1 mark achieved for losing weight. To gain the second mark they needed to focus on the explanation element of the question, explaining how losing weight would be used to treat type 2 diabetes.



ResultsPlus
Examiner Tip

It is good to see key information being underlined but try to also highlight/box command words. In this case the answer needed to explain how control of diet could be used to treat type 2 diabetes yet offered a description of the cause of diabetes followed by an explanation about the control of diet without explaining how this would treat the condition.

(d) Explain how controlling the diet can be used to treat type 2 diabetes.

(2)

Exercise and diet helps to maintain a healthy life style, therefore when consuming foods the amount will be decreased.



This response gained 0. Although the candidate must have some understanding of type 2 diabetes the response lacked specificity and a clear explanation about how controlling diet can be used to treat type 1 diabetes.



Focus on the question and read it carefully! This answer talks about exercise when the question clearly asks about diet. Be specific in answers given; for example if you know the amount of foods will be decreased, say which type of foods too i.e. sugars/carbohydrates.

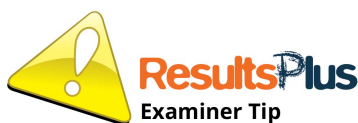
(d) Explain how controlling the diet can be used to treat type 2 diabetes.

(2)

A healthier diet with less sugar will help lose weight and stop blood sugar levels becoming too high. This will help control and treat type 2 diabetes.



A very good example of a response gaining 2 marks. The answer provides specific explanatory points in relation to control of diet and then further explains how these will help treat diabetes in relation to blood sugar/glucose levels. It shows a good knowledge and understanding of both the cause and effect of type 2 diabetes and how it can be controlled effectively, alongside good exam technique.,



This answer is clear and links key ideas together using relevant scientific terminology to provide an explanation which answers the question at hand. They make sure not to just repeat the stem of the question but to add value!

Question 1 (e)

This item assessed candidate's ability to control variables in an investigation, in this case selecting people with type 2 diabetes for a clinical trial. It was pleasing to see that candidates had a good idea of what was required to be given credit, with weight, age, gender and health being commonly seen creditable responses. Some marks were lost by candidates stating height, often when weight had been given as the first answer, presumably because these two are used in calculating BMI or alternatively giving 2 examples from the same marking point. On occasion candidates missed out on marks by giving answers outlining ethical considerations or relating to the type of diabetes which had already been outlined in the stem of the question.

(e) A scientist is planning to test a new treatment for type 2 diabetes.

She selects 300 volunteers who have type 2 diabetes.

State **two** other factors that the scientist should consider when selecting the 300 volunteers.

(2)

- 1 people that dont have it
- 2 people with type 1 diabetes



ResultsPlus
Examiner Comments

This response does not provide any relevant answers to the question asked, so scored 0 marks. Some answers included one response such as these but were able to pick up 1 mark for also stating a correct factor to consider.



ResultsPlus
Examiner Tip

Try to use the information provided in the question to keep your answer relevant. This question says that the scientist selects 300 volunteers who have **type 2** diabetes so the scientist would not consider people without diabetes or those with type 1 diabetes as they do not fall into this category. Try to think of other factors for consideration when selecting human volunteers for clinical trials.

(e) A scientist is planning to test a new treatment for type 2 diabetes.

She selects 300 volunteers who have type 2 diabetes.

State **two** other factors that the scientist should consider when selecting the 300 volunteers.

(2)

1 Their age

2 How long they've had it for



This scored 1 mark for stating 1 correct factor to consider - age. The length of time a person may have had diabetes for, (or its severity), were not creditworthy answers.



When checking your answer, make sure both responses answer the question asked.

(e) A scientist is planning to test a new treatment for type 2 diabetes.

She selects 300 volunteers who have type 2 diabetes.

State **two** other factors that the scientist should consider when selecting the 300 volunteers.

(2)

- 1 The Scientist should consider the ages.
- 2 The Scientist should consider each BMI (weight) of the person.



This scored 2 marks for giving 2 relevant factors the scientist should consider.



When the question asks you to state something, a full sentence answer including the question isn't always necessary: just state the answer requested and it will save you time.

(e) A scientist is planning to test a new treatment for type 2 diabetes.

She selects 300 volunteers who have type 2 diabetes.

State **two** other factors that the scientist should consider when selecting the 300 volunteers.

(2)

- 1 Lifestyle choices (e.g. amount of exercise they do, diet)
- 2 Severity of the volunteers diabetes (e.g. mildly diabetic)



Lifestyle is acceptable for 1 mark. The examples provided would also be worth one mark but as they all cover the same marking point only one mark was gained. Response 2 regarding severity of diabetes was not creditworthy.



When providing lists of answers ensure that they are not only relevant but also different to one another to avoid just covering one mark point and missing out on full marks.

Question 2 (a)

This question required candidates to use information from the two diagrams and their own knowledge to fill in the gaps in two sentences from the list of words supplied. It allowed most candidates to gain at least one of the two marks available with the two answers, smaller (surface area) and diffusion being seen in roughly equal amounts. A slightly smaller number of candidates gained both marks available.

Question 2 (b) (i)

For credit, candidates had to interpret the graph showing that oxygen consumption increases with running speed until a speed of 12km per hour with a generous range of 10 to 13km per hour being allowed, after which speed the oxygen consumption stays the same. Candidates were asked to describe the trend in the graph and most were able to give a basic description of the trend linking the two variables from the graph. Candidates lost marks by incorrectly stating as the athlete ran further rather than ran faster or for not being specific, for example, stating it goes up. Some candidates wrote that after 12km per hour there was no oxygen consumption. It was fortunate for most of these candidates that they had already gained the two marks available by already stating the former two marking points.

(b) The graph in Figure 4 shows the volume of oxygen an athlete absorbs at different running speeds.

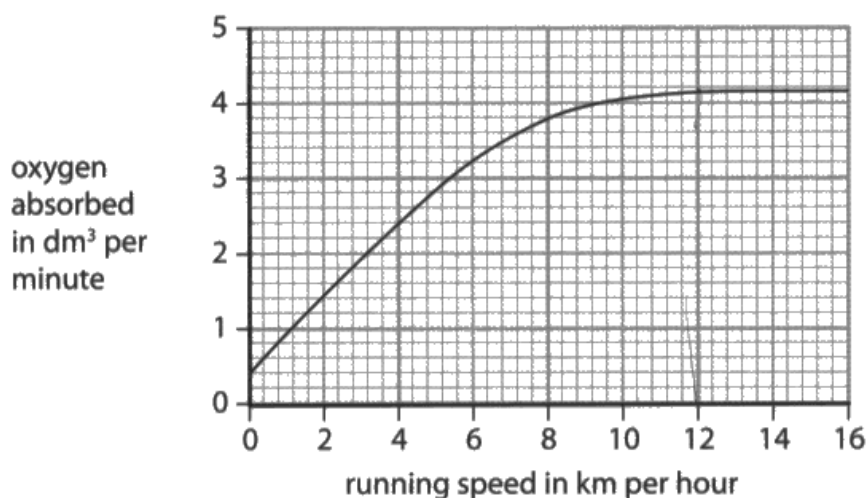


Figure 4

(i) Describe the trend shown in Figure 4.

(2)

The trend in figure 4 shows as the running speed increases the oxygen absorbed also increases until it reaches 12 km/h where the oxygen remains the same and constant until 16 km/h.



This response gained full marks but covered all three marking points. The candidate has used the graph effectively to describe the trend shown in figure 4 and shows very good skills in analysing patterns in data in graphical form.



When describing a trend in a graph use the wording from the axes labels and link them together to provide your main point as the candidate did here. Always start with saying what happened to the variable on the X axis and then linking this to what happened to the variable on the Y axis.

If there is more than 1 mark, you need to say more than 1 thing in your description, so try to look out for when the graph changes and how it changes, and describe this and also give specific figures/data from the graph when the change occurs. When doing so make sure you include the relevant units from the graph, for example here the candidate pointed out that at 12km/h the oxygen absorption stopped increasing and remained the same.

- (b) The graph in Figure 4 shows the volume of oxygen an athlete absorbs at different running speeds.

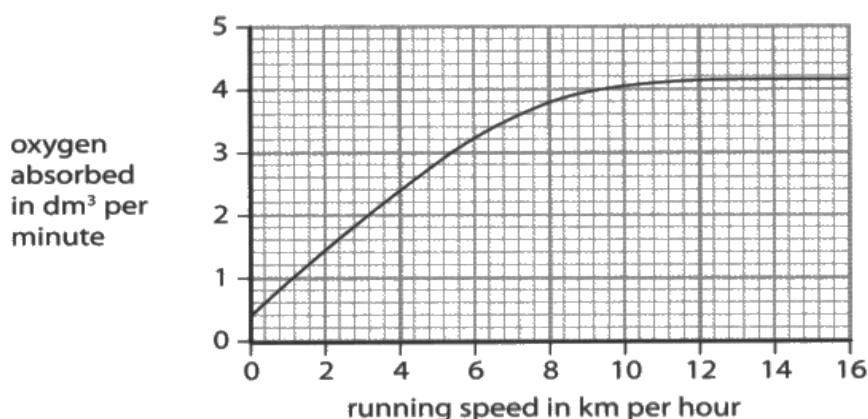


Figure 4

- (i) Describe the trend shown in Figure 4.

(2)

more oxygen is absorbed when running/during exercise because your heart is beating faster, so it needs more oxygen.



This response did not gain any marks. The candidate has made an attempt but failed to describe the trend fully not making a clear, creditworthy comment on running speed in relation oxygen absorption. They then try to provide an explanation as opposed to focusing on the description asked for in the question. These were common errors for this question, resulting in marks being missed.



Remember that if the question asks you to describe the trend then there is no need to try and explain why what can be seen in the graph is happening. Focus on simply **describing** the trend in the graph - this is the main patterns (increases, decreases, levelling off) you can see and point out. If there is more than one mark, try to include some data from the graph in support of your description.

- (b) The graph in Figure 4 shows the volume of oxygen an athlete absorbs at different running speeds.

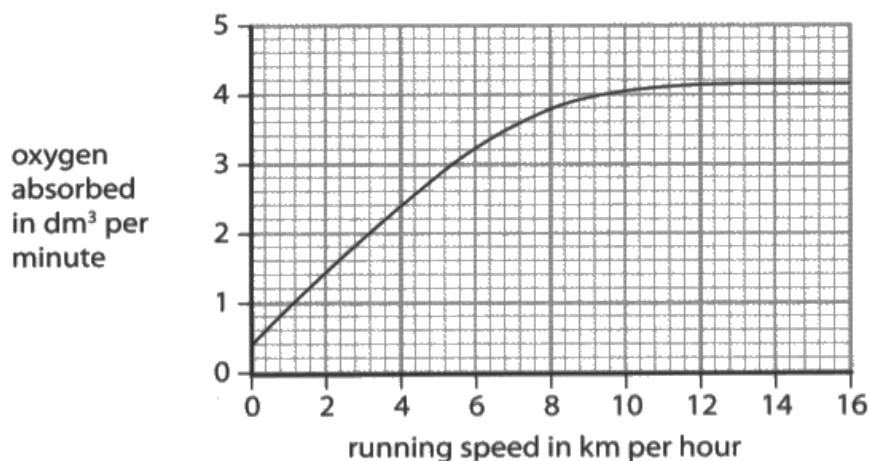


Figure 4

- (i) Describe the trend shown in Figure 4.

(2)

the trend shows us that every time the running speed increases the oxygen absorbed increases too. However when it gets to 8 km per hour the oxygen stays around 4 dm³ per min.



This answer gained 1 mark for mark point 1. The structure of the response would answer the description question posed, but the candidate misses out on mark point 3 as the figures quoted are incorrect. These were common figures incorrectly stated so ensuring students focus on identifying correct data could improve marks gained on data analysis questions.



Always be very specific when using data in answers. Try using a ruler from the point you have identified on the graph to the either the X or the Y axis to help in providing accurate figures.

Question 2 (b) (iii)

It was disappointing that many candidates could not gain credit on this item with a range of inaccurate reasons for producing lactic acid being given in responses including: as sweat to help cool you down, allowing you to keep running faster and faster, to burn fat, to lubricate joints and muscles and to break down glucose to name a few. Creditworthy responses were approximately equally likely to mention either anaerobic respiration or a lack of oxygen but rarely were both marking points seen and 2 marks awarded.

(iii) Explain why the athlete produces lactic acid when running at 14 km per hour.

(2)

An athlete who is running fast (14km) needs more oxygen to their muscles. Lactic acid is produced when your muscles do not have as much oxygen as they need.



This gained 1 mark for the comment about muscles not having as much oxygen as they need; however, they do not extend this explanation to say why this causes the lactic acid to be produced. This response used good phrasing in relation to oxygen in the muscles which should be noted as a number of candidates missed mark point 2 by incorrectly commenting on the muscles having no oxygen.



Check the number of marks available and read your answer back to check you have 2 clear explanation points that answer the question being asked. Don't get caught out by thinking that because you have filled all the lines you must have done this; this response has lots of information which just repeats the question and only 1 relevant point so only got 1 mark out of 2!

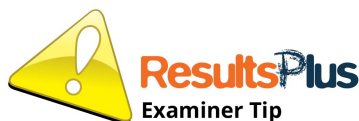
(iii) Explain why the athlete produces lactic acid when running at 14 km per hour.

(2)

Because the oxygen absorbed is not increasing which means the athlete is not using aerobic respiration, but anaerobic respiration does not need oxygen to happen, lactic acid is produced by anaerobic respiration



This response gained 2 marks for correctly explaining that the athletes used anaerobic respiration and that this process does not need/use oxygen. It demonstrates good knowledge of a key process and seems to use the graph to help them structure the explanation due to the comment on oxygen not increasing (at 14km/h). It is important candidates understand the subtleties in relation to oxygen requirement, absorption and use for types of respiration.



This answer was awarded 2 marks but take time when writing your answers to make sure your handwriting is as clear as possible!

(iii) Explain why the athlete produces lactic acid when running at 14 km per hour.

(2)

The body is respiring and produces lactic acid as a part of this process, this is when you get that 'stitch' feeling on the sides of your body when exercising.



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Examiner Comments

This response gained 0. Although the candidate describes correct information in relation to lactic acid they do not answer the question by explaining why it is produced when running at 14km/h. This response is very close to gaining one mark as they do identify the body is respiring but need to clearly identify the type of respiration. Candidates also could and should refer back to the graph in question 2(b)(i), which would direct them to the marking point in relation to oxygen at 14km/h.



ResultsPlus
Examiner Tip

If your answer is referring to respiration then try to include whether it is aerobic or anaerobic. This candidate missed out on a mark by not including that the respiration was anaerobic.

Question 3 (b) (i)

A large number of candidates displayed good mathematical skills, showing their working out and achieving full marks. 1:7 or 1:80 were the most frequent incorrect answers given with another error being a failure to give the answer as a ratio. The main reason for candidates gaining 0 marks when attempting the question, where working was shown, was for using the correct numbers incorrectly: for example either by using the incorrect equation (substituting the wrong way around or multiplying), employing a process of progressively dividing down both numbers, where they would at some stage make an error, or stopping when they reached an odd number (because they didn't think to try dividing by a number other than 2 or 10) or at some arbitrary point.

(b) Figure 5 shows part of a root as seen using a light microscope.

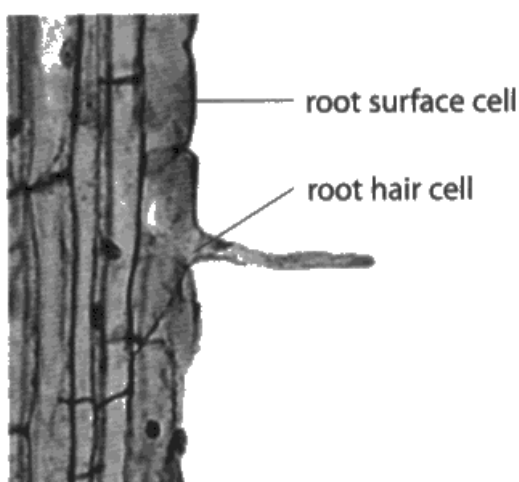


Figure 5

Figure 6 shows information about the two types of cell labelled in Figure 5.

type of cell	surface area in μm^2	volume in μm^3	surface area to volume ratio
root surface cell	5 000	250 000	1 : 50
root hair cell	36 000	288 000	?

Figure 6

(i) Calculate the surface area to volume ratio of the root hair cell.

(2)

$$288000 \div 36000$$

$$1 : 8$$



This response scored 2 marks for giving the correct answer as a ratio on the answer line. Although not needed it also showed the correct substitution of figures from the table and calculation being used which is pleasing.



It is always a good idea to include full working in the space provided. Although this is the correct calculation and answer so gained 2 marks it would have still been a good idea to have included the answer to the calculation i.e. = 8

(b) Figure 5 shows part of a root as seen using a light microscope.

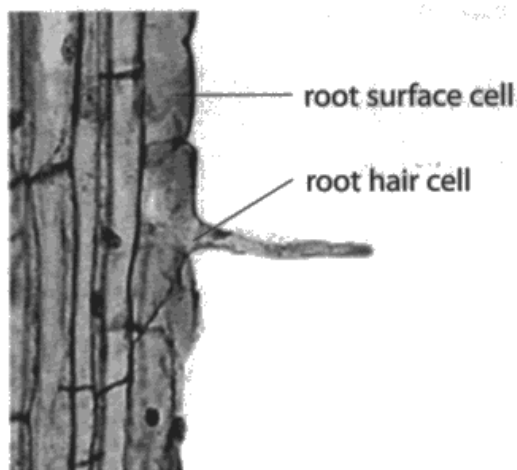


Figure 5

Figure 6 shows information about the two types of cell labelled in Figure 5.

type of cell	surface area in μm^2	volume in μm^3	surface area to volume ratio
root surface cell	5 000	250 000	1:50
root hair cell	36 000	288 000	?

Figure 6

(i) Calculate the surface area to volume ratio of the root hair cell.

(2)

8



This response scored 0. It is likely that the candidate had completed the correct calculation using the figures from the table ($288000/36000$) to get 8. However, they failed to then use this to give the answer as a ratio as requested and also failed to show their working out so were unable to pick up the substitution mark.



Always show your full working out in the space provided! Even if you get the final answer wrong you could still pick up some marks.

Question 3 (b) (ii)

This item required candidates to explain the benefit to plants of having root hair cells and was poorly answered by a large number of candidates, with only a small proportion gaining a mark and even fewer gaining the two marks available. As this is an explain question, simply stating that root hair cells absorb water or mineral salts was not enough for crediting marking point two, although if marking point one had been given then the more in this marking point could be taken as implicit e.g. the root hair cells increase the surface area for absorbing water. A very limited number of responses referring to root hairs providing anchorage were credited. Common misconceptions, of which there were many, included that root hair cells act as a form of protection i.e. from bacteria or disease, insulate the root or act as a point for light to enter the plant.

(ii) Explain the benefit to the plant of having root hair cells.

through the root hair cells.

(2)

↓ The plant can absorb minerals
and water from the soil to
make the plant function and be
able to photosynthesise



ResultsPlus
Examiner Comments

This response gained 0 marks. Many candidates failed to identify that root hair cells are specialised cells which increase the surface area of the root. Whilst this candidate stated that the plant could absorb water/minerals through the root hair cells, they failed to include a comparative term required to establish the benefit of the plant having the root hair cell on the root; i.e. the root would absorb the water/minerals without the root hair cells but these allow more/increased volume to be absorbed.



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Examiner Tip

Check if your answer requires a comparative term such as more. As roots would absorb water/minerals without the root hair cells, the explanation is that these allow **more** water/minerals to be absorbed as they increase the surface area of the root.

(ii) Explain the benefit to the plant of having root hair cells.

(2)

It increases the surface area for osmosis.

The larger surface area, the more water molecules can go through the semi permeable membrane.



This response gained 2 marks. The candidate shows a good understanding of the adaptation of a specialised root hair cell explaining this and the benefit to the plant clearly and in detail whilst also using comparative terminology.



This answer gained two marks and shows best practice. It doesn't repeat the question but links scientific ideas including comparative words to give a clear explanation of the benefit of root hair cells.

(ii) Explain the benefit to the plant of having root hair cells.

(2)

Large surface area so they can absorb more water.



This also gained 2 marks showing a very good knowledge and understanding of the question being asked.



Good answers do not always have to be long to gain full marks. This is short yet to the point and relevant - the candidate has an explanation which answers the question. They have two linked points to access the two marks available and include key scientific words in the answer (not just repeating those in the question) which is important to demonstrate a scientific understanding of the concept being tested.

Question 3 (c)

This item was an explain question that required the candidate to interpret the trend in the graph to make the judgement that the number of algae increased before further marking points could be awarded in explanation of this. The reasons given did require an idea of more/increase e.g. between February and June light/temperature or mineral ions were more/increased for credit to be given. This could be gained simply by saying it is warmer or there is more light in June to be awarded mp2, which were the most common reasons seen, with only a few candidates developing this to explain that as a result more photosynthesis will occur. The majority of candidates achieved 1 mark with a significant proportion offering at least one reason to achieve 2 of the 3 marks available. It was very rare for candidates to miss out on marks by failing to give an initial judgement in relation to how the number of algae changed.

(c) Algae are green plants.

Figure 7 shows the number of algae in a lake in the United Kingdom during one year.

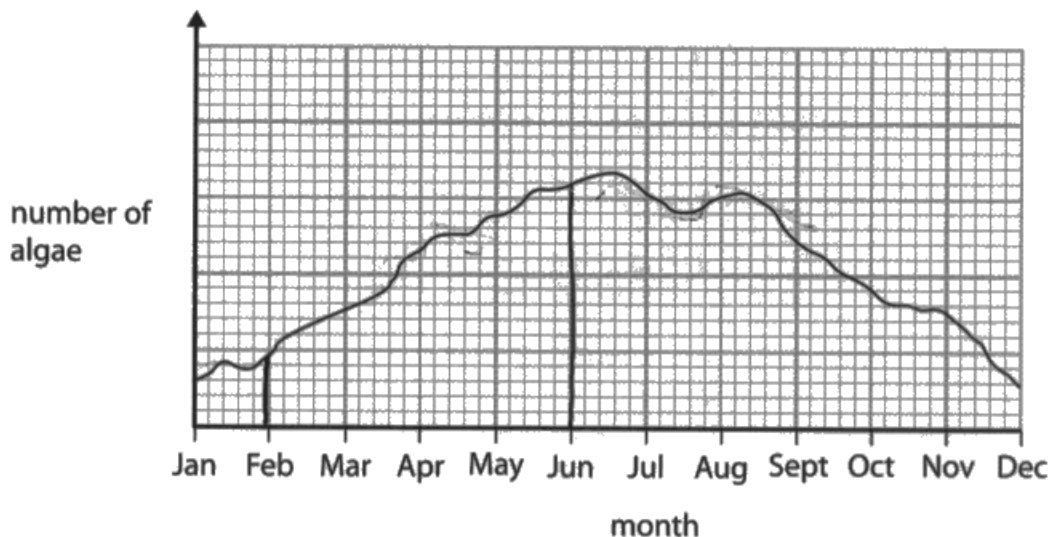


Figure 7

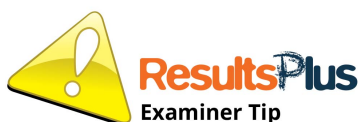
Explain the changes in the number of algae in the lake from February to June.

(3)

In february the number of algae in the lake is low however as the months lead up to June the number of algae increases at a consistant rate. from half way through march to April there is a sudden but short increase in algae numbers.



This response gained 1 mark. Many candidates failed to identify that this was an explain question simply describing the changes in the number of algae seen in the graph from February to June rather than offering explanations to the judgement that the number of algae increased which limited the number of marks accessible to 1. Additionally candidates often discussed every little change rather than identifying the overall change in the number of algae; however, like this example it was pleasing to see when candidates had identified February and June on Figure 7 to ensure they were only talking about the months being asked about in the question.



Check the command word in the question. If like here it is explain you need to make a judgement on what the change is, and then suggest reasons for this.

Like this example make a note on the graph of the relevant sections being asked about in the question (for this graph the months on the graph between February and June). This can help you stay focused on the relevant part of the graph and write a more succinct answer.

(c) Algae are green plants.

Figure 7 shows the number of algae in a lake in the United Kingdom during one year.

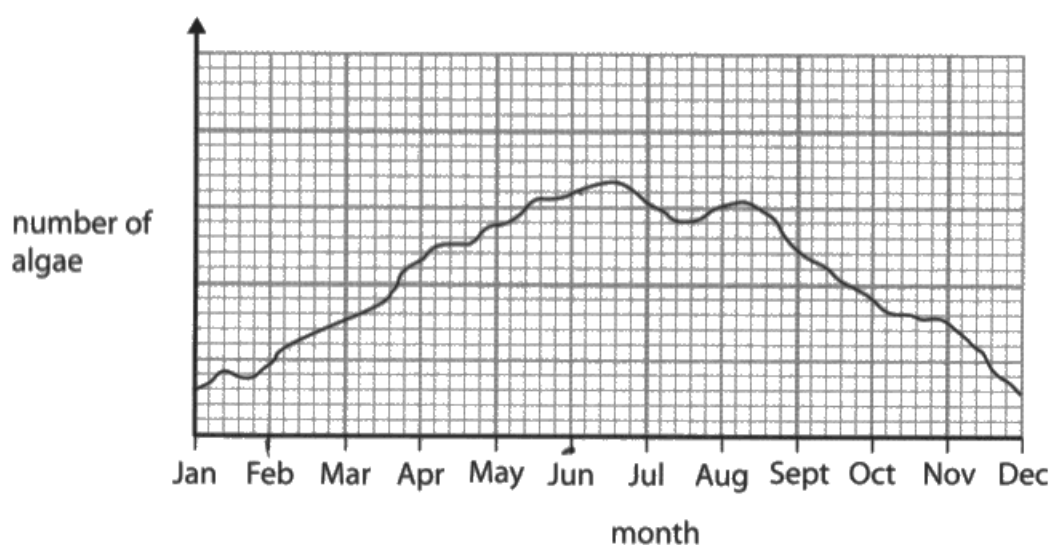


Figure 7

Explain the changes in the number of algae in the lake from February to June.

(3)

algae in the lake increases from ~~the~~ february to June by it increases due to light there is more light in June than february therefore more photosynthesis will occur producing more algae.



ResultsPlus
Examiner Comments

This gained the full 3 marks by providing a judgement in relation to the changes in the number of algae in the lake which was explained by two linked scientific reasons. The candidate's answer was succinct yet well-structured and included comparative terms.



Use all the information in the question. The first line tells you that algae are green plants which sets the context and you are then given a graph and asked to explain the changes from February to June. First identify the change by looking at the graph and then use your scientific and own knowledge to suggest scientific explanations for this change.

When you are explaining a change in something, always consider if you need to include a comparative term. Here the candidate included the word **more** twice to help explain the changes in the number of algae. It was necessary as there will be light and photosynthesis in February but there is **more** in June hence the number of algae increasing.

Question 4 (b) (i)

The first step in an investigation into how the concentration of oxygen affected an enzyme-controlled reaction is given in the stem of the question along with other relevant information required by the candidate. To gain marks candidates had provide the next two steps to obtain results for the investigation. This required them to say that enzyme had to be added for marking point 1 and to measure the length of time to glow or brightness of the glow caused by the light emitting reaction for marking point 2. It was pleasing to see that candidates could work their way through the investigation plan and frequently added the enzyme in either step 1 or 2 therefore gaining 1 mark. Many candidates then mixed the solutions which although valid was not credited, as allowing it would not answer the question. Few candidates were awarded marking point two as they failed to describe step 3 correctly, often simply stating time the reaction, or giving other vague alternatives which didn't clearly describe how to find and measure the end point that would allow results to be obtained which would allow the scientist to see the effect of changing the oxygen concentration on the reaction.

(b) Female glow-worms have an enzyme called **luciferase**.

The glow is produced when this enzyme catalyses a reaction between oxygen and a protein.

A scientist devised a plan to investigate the effect of oxygen concentration on this reaction.

The scientist had:

- five flasks of water each with a different concentration of dissolved oxygen
- a solution of the protein
- a solution of the enzyme.

The first step of this plan is:

Step 1. Add some of the protein solution to each of the five flasks.

(i) Describe the next **two** steps that should be in this plan to obtain results for this investigation.

(2)

Step 2 add some enzyme solution to each one of the five flasks.

Step 3 stir and leave for the same amount of time and gather the reaction.



Candidates often gained 1 mark but only infrequently accessed the second mark. This response gained 1 mark for being able to describe step 2 in the plan for describing adding enzymes to the flasks. Candidates struggled to give a correct response for step 3, often outlining relevant points such as in this example but failing to describe a step which would allow for results specific to this investigation to be obtained.



When describing a plan for an investigation make sure you read all the information provided and try to understand what the investigation is testing. Your answer should be specific to the question being asked. For step 3 you would need to describe exactly what measurement should be taken to obtain results in the investigation as opposed to saying measure the reaction, which is too vague.

(b) Female glow-worms have an enzyme called luciferase.

The glow is produced when this enzyme catalyses a reaction between oxygen and a protein.

A scientist devised a plan to investigate the effect of oxygen concentration on this reaction.

The scientist had:

- five flasks of water each with a different concentration of dissolved oxygen
- a solution of the protein
- a solution of the enzyme.

The first step of this plan is:

Step 1. Add some of the protein solution to each of the five flasks.

(i) Describe the next **two** steps that should be in this plan to obtain results for this investigation.

(2)

Step 2 Add some of the enzyme to each of the five flasks at the same time.

Step 3 Observe and see which flask shines the brightest.



ResultsPlus
Examiner Comments

This was one of the few responses on this paper which gained both marks available. The candidate correctly described both step 2 and 3 in the plan to establish how to obtain results in the investigation outlined.



ResultsPlus
Examiner Tip

When describing a plan for a practical investigation, even where the spaces for each step are not provided such as they are here, it is a good idea to try and think of your description a step at a time so you don't miss key stages out.

Don't forget you can write down your ideas in blank spaces before writing them out if needed. If you don't want rough work marked, just cross it out.

Question 4 (b) (iii)

This question stated that the best pH for the enzyme-controlled reaction was pH 8 and asked why the enzyme activity would decrease at pH 5. Many candidates just stated that pH 5 was not the best which was just restating the question or that pH 5 was the lower pH which was also not creditworthy. Some also wrongly stated that pH 8 was acidic and that pH 5 was alkaline with others referring to pH 5 being the wrong temperature, contradicting the question and their understanding. Frequently candidates gained marking point 2 for identifying that the enzyme would be denatured but overall candidates did not perform as well as expected on this question seemingly failing to link their expected knowledge of enzymes to the context they have been given. Some excellent responses were seen explaining that the optimum was pH 8, or that this was alkaline and pH 5 was acidic, and then continuing to link this to either the active site changing shape and/or therefore making it less easy to bind with the substrate. When a candidate used the technical term denatured they often also coupled this with a description such as the active site had changed shape which was pleasing to see.

(iii) The enzyme luciferase works best at pH 8.

Explain why the activity of the enzyme decreases at pH 5.

(2)

Because ~~the~~ pH 5 is not the enzyme's optimum pH where it work best at. Also the enzyme becomes denatured.



This response gained 2 marks for correctly explaining why the activity of the enzyme decreased at pH 5. The candidate used key words effectively to help access both mark points and didn't simply repeat the information in the question but added value. Candidates would benefit from extending their explanations by linking denaturing to the effect this causes (i.e. so the enzyme is not able to bind to the substrate) as this was rarely seen.



Use key scientific terms in your answers. Here the candidate had identified that the enzyme will be **denatured** and that pH 5 is not the **optimum** pH, so they accessed both marks available.

(iii) The enzyme luciferase works best at pH 8.

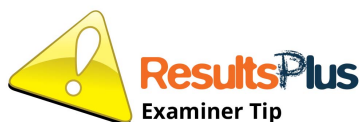
Explain why the activity of the enzyme decreases at pH 5.

(2)

The activity of enzyme decreases at pH 5 because it has gone to high the enzyme will work best at pH 8 but pH 5 might be too low for the enzyme the Luciferase.



This response gained 0 marks. It shows how responses often simply repeated the question rather providing an explanation as to why the activity of the enzyme decreased at pH 5.



Always read through and check your answers. One thing to check is that you haven't simply repeated the information in the question; another is that you have been specific with the words you have used - try to avoid the word 'it' without being clear what 'it' actually is and where possible use key scientific terms.

Here, if the candidate had replaced 'the enzyme will work best at pH 8' (on line 3) with 'the enzyme has an optimum of pH 8' then they would have achieved 1 mark instead of no marks.

Question 4 (c) (i)

A significant number of candidates gained maximum marks in this question for combinations of various marking points. In terms of describing the procedures for practical investigations and applications this item was well answered suggesting most candidates have had experience of sampling populations using quadrats. Most candidates understood that a quadrat needed to be used, although a substantial proportion did not state the required scientific term quadrat, instead giving descriptions such as a metal square, grid, quadrant or even punnet square, so therefore missed out on marking point one. Most were able to describe that the sampling must be done randomly with several samples taken but the range of descriptions was large with some answers showing greater clarity than others in relation to these marking points. There was a very limited understanding of how to calculate the mean number of female glow worms from the information given, with most describing how to work out an estimate of a total number instead.

(c) Female glow-worms are found attached to grass plants in a large field.

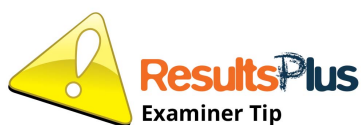
- (i) Describe a sampling technique to find the **mean** number of female glow-worms in 1 m^2 of the field.

(3)

You could place a quadrat in different 1 m^2 areas then add up however many female glow worms there are and divide them by how many quadrats you used.



This response gained 3 marks. Many candidates were able to give descriptions of a sampling technique to find the mean number of glow-worms in 1m^2 of the field. This example gained a marking point for correctly describing how to find the mean which candidates often found difficult to describe correctly. The response uses the correct term (quadrat) for the scientific equipment used and also comments on placing the quadrat in different areas so is therefore describing carrying out several samples.



Make sure you can confidently name scientific equipment which is used for practical investigations. Here it was necessary to use the correct scientific term - quadrat - to get marking point one. For practical investigations, knowing and using the terms for equipment is important and can help you pick up more marks than just a vague description.

(c) Female glow-worms are found attached to grass plants in a large field.

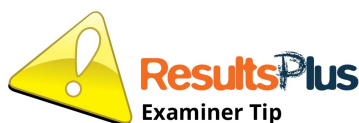
- (i) Describe a sampling technique to find the **mean** number of female glow-worms in 1 m^2 of the field.

(3)

Using a ~~or~~ quadrat put it ~~or~~ in different places in a field to find the mean number of glow-worms.



It is likely the candidate had some experience of carrying out this sampling technique as they used the scientific term for the equipment used and described that this was placed in different places in a field showing an understanding that several samples were taken. Therefore although appearing brief this response gained 2 marks.



Be careful not to just repeat the question, i.e. to find the number of mean glow worms. Describe how you do this after putting the quadrat in the different places of the field.

If you are being asked about a practical investigation you have had experience of, think back to what you did and try to describe the relevant parts.

(c) Female glow-worms are found attached to grass plants in a large field.

(i) Describe a sampling technique to find the **mean** number of female glow-worms in 1 m^2 of the field.

(3)

A sampling technique to find the mean number of female glow worms in 1 m^2 of the field is quadratic collect the results add the results together divide by the number of results.



ResultsPlus
Examiner Comments

This response failed to access any marks. A large proportion of the answer is a repeat of the question and the candidate doesn't use the correct scientific terminology for a quadrat so was not awarded marking point 1. Whilst it shows the candidate has some knowledge of the technique, they have struggled to describe this or give the specific details needed. For practical investigations candidates should be encouraged to describe what results need to be collected and how to collect these as opposed to simply collecting results. Where calculations may be needed these should be practised so they become more proficient in describing how to do them.



ResultsPlus
Examiner Tip

When describing practical investigations be as specific as possible - say what results you will collect and which results you will add together. Also don't forget details like repeat the investigation if relevant.

Question 4 (c) (ii)

This simple calculation of the number of female glow worms in the field using figures from the stem of the question was completed well with the majority of candidates gaining the one mark available. Those candidates who failed to achieve the mark most frequently did so for dividing as opposed to multiplying the figures.

(ii) The mean number of female glow-worms in 1 m^2 of the field is 5.

The field has a total area of 800 m^2 .

Estimate the number of female glow-worms in the whole field.

(1)

$$5 \times 800$$

4000



This answer scored 1 mark for correctly calculating the number of female glow-worms in the whole field. Although working out was not required it is always good practice to see candidates showing this in the space provided.



As in this answer always show your working out in the space provided. It can also help to identify the correct figures to use in your answer from the question by circling or underlining.

- (ii) The mean number of female glow-worms in 1 m^2 of the field is 5.

The field has a total area of 800 m^2 .

Estimate the number of female glow-worms in the whole field.

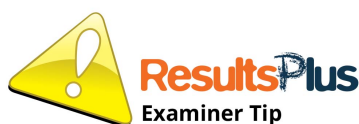
(1)

$$\begin{array}{r} 5 \times 800 \text{ m}^2 \text{ or } 800 \div 5 \\ \hline 4000 \qquad \qquad 160 \end{array}$$

160



The candidate was unsure on how to calculate the number of glow-worms in the field. They tried two calculations but selected and gave 160 on the answer line which was incorrect so this scored 0 marks.



Although this candidate got the answer incorrect it is good practice to see them working through the possible answers fully in the space provided. Remember if the answer is looking for a total number (i.e. in the whole field) and provides you with figures based on a smaller area (1 m^2) then you are more likely to need to multiply the numbers to make the answer larger than divide them.

It is also worth noting that if no answer was provided on the answer line the examiner would still have to award 0 as they cannot just credit the 4000 over the 160 - make sure you also write the answer you would like marked on the answer line provided.


Question 5 (a) (ii)

It was pleasing to note that a large proportion of candidates were able to access this mathematical challenge and correctly apply the magnification calculation when given the actual length of the red blood cell and magnification in the question. The most common error was to divide the actual size of the cell by the magnification rather than multiplying it. Candidates who had used the working out space provided effectively, showing the formula and their working out, more often went on to achieve the mark point than those who did not.

(ii) The actual length of the red blood cell from a turtle is 20.5 μm

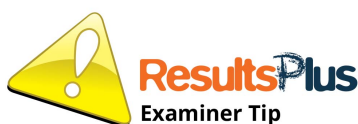
Calculate the length of the magnified image of the red blood cell of the turtle when magnified 400x.

(2)


$$20.5 \mu\text{m}.$$
$$20.5 \times 400 =$$
$$8200 \mu\text{m}$$



This response scored 2 marks. It shows good knowledge and application of the magnification equation and many examples of best practice including 'boxing' the actual length in the stem of the question, drawing and annotating the equation as a triangle and then showing the full working out in the space provided.



Try to identify all key figures in calculation questions by underlining, circling or boxing around them. Try using formula triangles to remember key equations and then draw and annotate them using the figures identified in the question. Don't forget to cover the value you want to find the calculation to use, and then write this out in full too.

(ii) The actual length of the red blood cell from a turtle is $20.5\text{ }\mu\text{m}$.

Calculate the length of the magnified image of the red blood cell of the turtle when magnified $400\times$.

(2)

.....8200..... μm



The candidate clearly knew the calculation to use and gave the correct answer on the answer line for 2 marks.



Even though this answer was awarded full marks, always try to show your working out in the space provided.

(ii) The actual length of the red blood cell from a turtle is $20.5\text{ }\mu\text{m}$.

Calculate the length of the magnified image of the red blood cell of the turtle when magnified $400\times$.

(2)

$$\frac{A}{M} = \frac{20.5}{400} = 0.05125$$

..... $0.05125\text{ }\mu\text{m}$



ResultsPlus
Examiner Comments

The candidate has incorrectly recalled the equation and as a result also done the incorrect calculation dividing 20.5 by 400 instead of multiplying them together. The substitution mark is only gained for showing the correct calculation so as this mark was not gained mark point two was also unavailable. There are no marks on this question for error carried forward.



ResultsPlus
Examiner Tip

Commit the key equations to memory and make sure you can confidently recall them in the exam. If you get the starting point correct the number of marks you achieve will be higher.

(ii) The actual length of the red blood cell from a turtle is $20.5\text{ }\mu\text{m}$.

Calculate the length of the magnified image of the red blood cell of the turtle when magnified $400\times$.

(2)

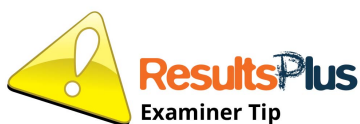
$$20.5\text{ }\mu\text{m} \times 400 \\ = \underline{8200}$$

$$\cancel{8200 \div 100 = 82} \\ 8200 \div 100 = 82$$

..... 82 μm



This response gained 1 mark for the substitution of the correct figures from the question into the correct calculation. The candidate did work out the correct answer of 8200 but then divided this by 100 resulting in the incorrect answer on the answer line and so they did not receive the evaluation mark.



Check the units on the answer line and units linked to figures within the question. In this case, both the actual length of the cell and the length of the magnified image required as the answer were given in micrometres; therefore there was no need for a conversion, such as dividing by 100 which this candidate did, as they are already the same. If they differ then you would need to identify what conversion would be needed .

Question 5 (a) (iii)

As with the previous question, 5(a)(ii), candidates who had used the working out space provided effectively, showing the formula and their working out, more often went on to achieve the marks available than those who did not. This magnification calculation also required candidates to convert their answer into standard form. Several candidates calculated the correct response but either missed the instruction to present their answer in standard form or did not know how to show their answer this way so therefore lost 1 mark. Only a very small number of candidates made no attempt to answer this question.

(iii) The width of the human red blood cell, when magnified $400\times$, is 3.08 mm.

Calculate the actual width of the cell and show your answer in standard form. (2)

$$\begin{array}{r} 308 \\ \hline 3.08 \div 400 = 0.77 \\ \text{mm} = \times 100 \end{array}$$

.....0.77.....mm



ResultsPlus
Examiner Comments

This answer is worth 0. Although the candidate understands the calculation needed they have unnecessarily converted the 3.08mm by multiplying it by 100 resulting in an incorrect answer for the substitution mark. They have also failed to show their answer in standard form.



ResultsPlus
Examiner Tip

Check the units on the answer line and in the question; there is no need for a conversion if they match like these which are both in mm.

Read the question carefully and follow the instructions accurately. This clearly asks for the answer in standard form whereas this response shows the answer as a decimal.

(iii) The width of the human red blood cell, when magnified $400\times$, is 3.08 mm.

Calculate the actual width of the cell and show your answer in standard form.

(2)

$$3.08 \times 400 = 1232 \text{ mm}$$

.....1232 mm



The candidate does not recall or use the correct equation so is not awarded any marks. Although there is no error carried forward for putting an incorrect number into standard form, the candidate also does not attempt to do this when the question asks for the answer to be given in this way.



Show your answer how the question asks you to; often this is linked to the number of marks available. In this case it asked for the answer to be shown in standard form.

(iii) The width of the human red blood cell, when magnified $400\times$, is 3.08 mm .

Calculate the actual width of the cell and show your answer in standard form.

(2)



$$\begin{array}{l} 3.08 \text{ ~~mm~~ } \\ 400\times \end{array} \quad \begin{array}{l} 3.08 \div 400 \\ = 0.0077 \end{array}$$
$$7.7 \times 10^{-3} \text{ mm}$$



ResultsPlus
Examiner Comments

This candidate understands the question and how to work out the correct answer. They underline the measurement being asked for, showing they have read the question carefully, and also display the equation to be used (in triangle form) to help ensure they get the correct answer. Finally having worked out the answer as a decimal, which is shown in the working out space, they convert this into standard form to achieve the full 2 marks.



ResultsPlus
Examiner Tip

Identifying key points in the question can help to keep you focused on what is being asked for and therefore ensure you work out the correct answer to the question. Make sure you can recall the equation and use it effectively, writing the equation out and giving the answer. Write the answer you want marked on the answer line in the way you have been asked to do so, i.e. in standard form for this question.

(iii) The width of the human red blood cell, when magnified $400\times$, is 3.08 mm.

Calculate the actual width of the cell and show your answer in standard form.

(2)

$$\frac{3.08}{400} = 0.0077$$

$$7.7 \times 10^{-4} \text{ mm}$$



This response gained the 1 substitution mark available as it correctly included the outcome of the substitution in the space provided but the candidate was unable to convert this into standard form so was not awarded the evaluation mark. Candidates should be encouraged to become confident in identifying and manipulating numbers to and from standard form.



Make sure you can convert from decimals to standard form (and vice versa) confidently.

Question 5 (b) (i)

This is one of the new style of questions on planning an experiment. The experiment may be a required practical or, as in this case, one of the suggested practical tasks. A significant number of candidates failed to score as they spoke generally about stretching the artery, which merely repeated the stem of the question. A significant number of candidates stated that masses had to be added to cause the stretching, gaining one mark, and many of these then extended the response with varying degrees of success. These extended responses were varied in frequency and clarity but included most commonly measuring the original length of the tissue and repeating until tissue no longer returned to its original length. The figure seemed to help some candidates whilst others simply described what they could see as opposed to describing a method to test a specific investigation outlined in the question. The disparity in responses between centres may reflect that some had not carried out this suggested practical task.

(b) Red blood cells are carried in veins and arteries.

Figure 10 shows the equipment used to measure the elasticity of an artery.

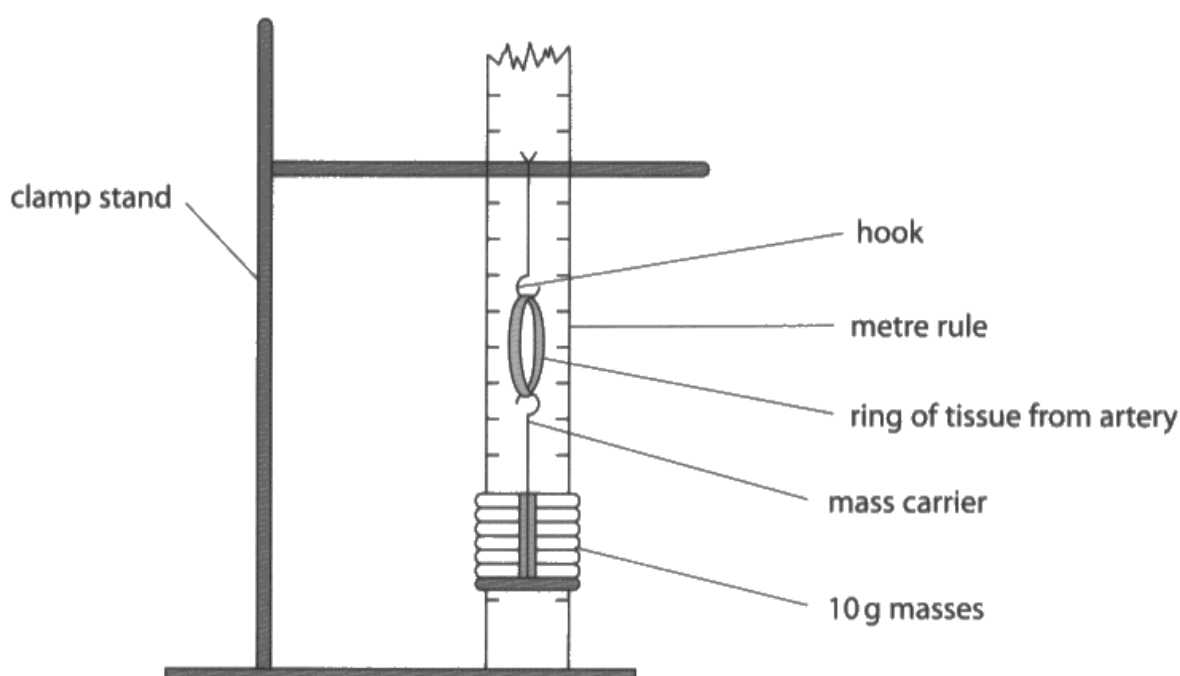


Figure 10

(i) Describe a method you could use to see how much the ring of tissue from an artery could stretch before it no longer returned to its original size.

(3)

Something you use and it will stretch the artery as much as it can and it will record how much it is pulled before snapping.



This response was too vague and didn't describe a method which could be used to measure the elasticity of an artery so achieved 0 marks. Candidates should practise describing methods to improve the number of marks they achieve in this new style of question.



Try to be specific in descriptions - avoid using words like 'it' and 'something'

(b) Red blood cells are carried in veins and arteries.

Figure 10 shows the equipment used to measure the elasticity of an artery.

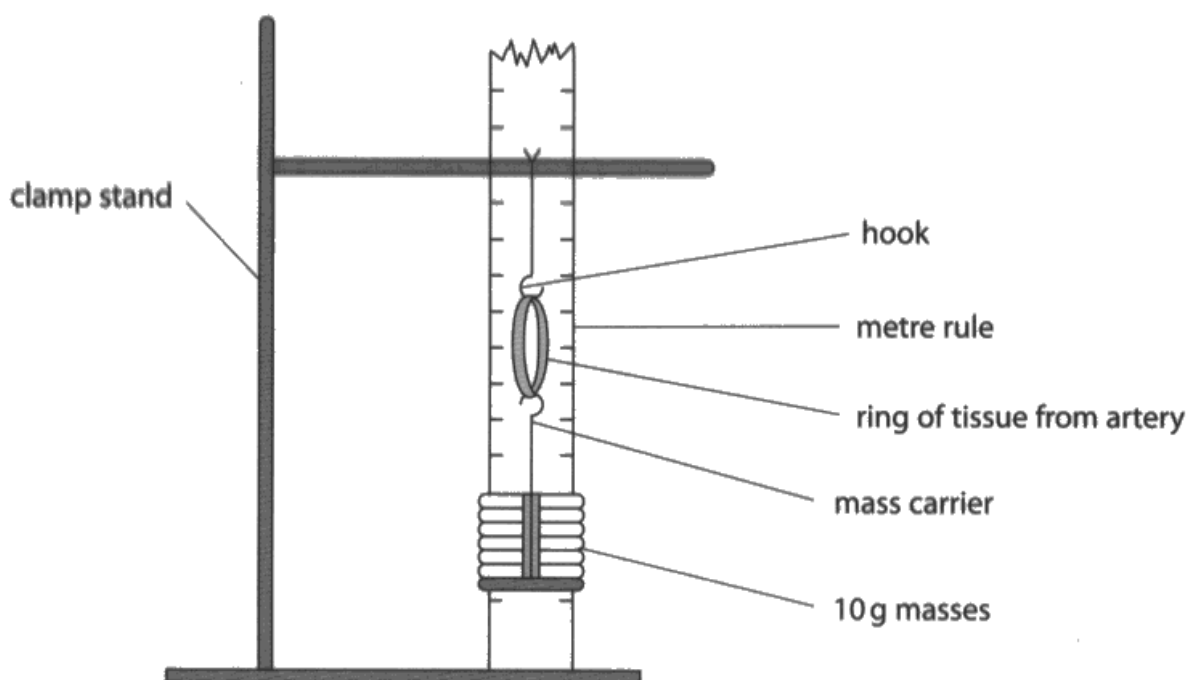


Figure 10

- (i) Describe a method you could use to see how much the ring of tissue from an artery could stretch before it no longer returned to its original size.

(3)

By measuring its original length and gradually adding weights onto the mass carrier. See how many weights it takes till it no longer returns to the original size you measured. After each weight measure the new length. The difference can be calculated



This response provides a good example of a clearly described method to measure the elasticity of an artery. Answers such as this gaining more marks often showed a good generic knowledge of how to carry out practical investigations and were then able to apply this to the context being given; specifically, for example, describing a start point and an end point and how to measure these.



Use ALL the information in the question provided including the diagram to help give you some ideas about the method you need to describe, especially if it is unfamiliar to you.

Remember when describing a method you need give clear details about each stage - try to write these in a logical order including a start point, what is being changed and measured throughout, and an end point.

Question 5 (b) (ii)

Safety precautions must be appropriate to the practical task being assessed, in this case handling animal tissue such as blood vessels, so gloves, washing hands and sterilising equipment after use were the relevant safety precautions. General laboratory rules and practice will not be awarded marks on this style of question as safety precautions have to be specific to the task. Most commonly students missed out on this mark for giving wearing safety goggles/glasses as their answer. However a significant proportion of candidates did gain the mark for stating that gloves should be worn. Some candidates were able to describe the reason for the safety precaution given and whilst this was pleasing to see this further description was unnecessary to gain the one mark available.

- (ii) Give **one** safety precaution you need to take when handling animal tissue such as blood vessels.

(1)

Wash your hands after before and
after handling animal tissue or wear gloves



This response gained the one mark available but actually gave two of the three possible answers available.



Be careful listing multiple answers when the question asks for **one** answer; sometimes list principle is applied where one incorrect answer can discredit a correct answer. Luckily this candidate gave two correct answers so still gained the mark.

- (ii) Give **one** safety precaution you need to take when handling animal tissue such as blood vessels.

(1)

~~wear gloves and~~ eye protection, such as goggles.



ResultsPlus
Examiner Comments

This response did not gain the 1 available mark. Students should avoid general laboratory rules when being asked about safety in practical situations and instead make sure their answer is specific to the context and practical situation being asked about.



ResultsPlus
Examiner Tip

Make sure answers to questions about safety precautions for practical investigations/situations are specific to the context given and the question being asked.

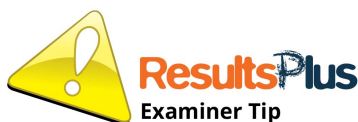
- (ii) Give **one** safety precaution you need to take when handling animal tissue such as blood vessels.

(1)

Make sure gloves are worn to protect
against any open cuts away from disease.



This response gains 1 mark for an acceptable answer that gives a specific safety precaution. The candidate understands the reasons for this going on to give a reason for wearing gloves; whilst this knowledge is pleasing to see it was not necessary for the question being asked.



When asked to **give** one example there is no need to **describe** it. Check the command word in the question so your answer reflects it accurately.

Question 5 (c)

This item required candidates to apply their knowledge of the human heart and circulatory system to that of the frog. The diagram showed the circulatory system of a frog and specifically its one ventricle; selecting this relevant piece of information was sufficient to be awarded one mark. Some excellent answers were seen that developed the creditworthy response of one ventricle by comparing it to two ventricles in humans and the best answers then summarised that this meant the oxygenated blood was separate from the deoxygenated blood, whilst being mixed in the frog. Common errors were that frogs are smaller than humans and so do not need such an efficient circulatory system or that frog capillaries are smaller than human capillaries.

(c) Figure 11 shows the circulatory system of a frog.

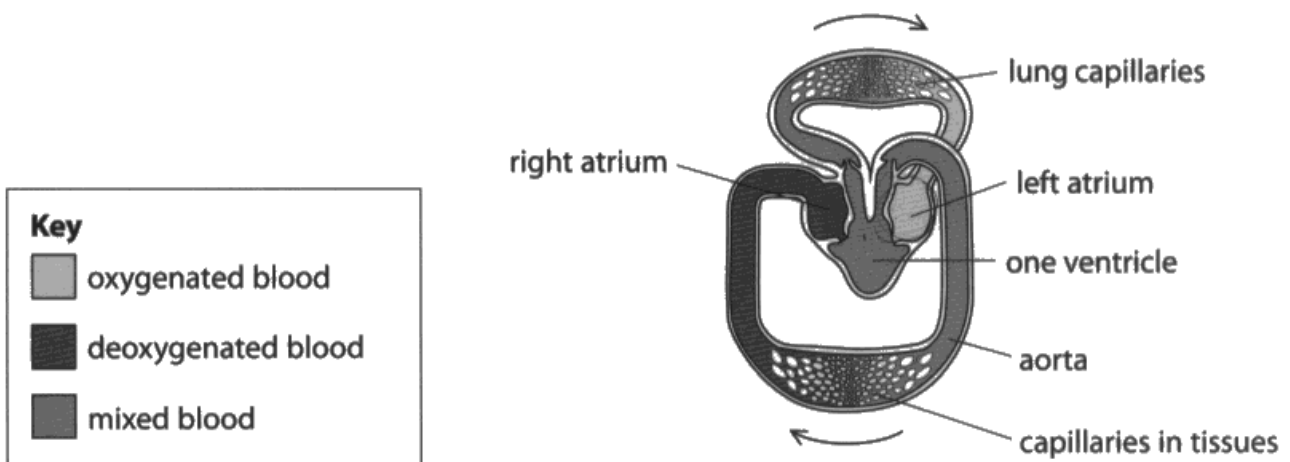


Figure 11

Explain why the circulatory system of a frog is less efficient at carrying oxygen to the tissues than the circulatory system of a human.

(3)

The circulatory system carries more deoxygenated blood than oxygenated blood. The frog starts off with mixed blood then goes through the capillaries and comes out deoxygenated with humans they start oxygenated. The frog only has one ventricle whereas humans have two therefore they can consume more and hold more oxygenated blood.



This response gained all 3 marks available for providing a clear explanation of why the circulatory system of a frog is less efficient at carrying oxygen to the tissues than that of a human. It shows the candidate has a good understanding of the human circulatory system and is able to use the information provided about the frog to give a relevant and accurate explanation to answer the question. Candidates should be encouraged to study and use the information provided, especially where some of the context may be unfamiliar to them.



Use the diagram to try and establish how the frog's circulatory system is different to a human's, and then use this to explain why it is less efficient. Pay particular attention to the annotation on the diagrams and key as these are likely to be pointing out relevant pieces of information to help.

You could also sketch a human heart in the space below to make deciding upon your explanation easier.

(c) Figure 11 shows the circulatory system of a frog.

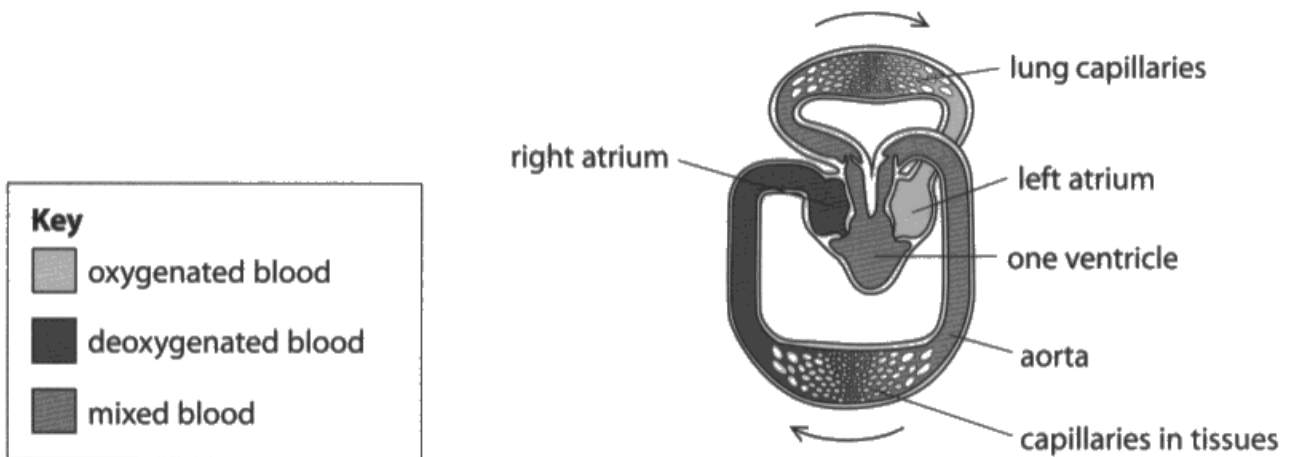


Figure 11

Explain why the circulatory system of a frog is less efficient at carrying oxygen to the tissues than the circulatory system of a human.

(3)

in a human circulatory system there are more capillaries in the tissues. Also in a frogs circulatory system there are no valves so the oxygen could go the wrong way causing the frog to ~~exhaust~~ be unable to breath.



This answer gained 0 marks. The answer lacks focus on key parts of the circulatory system such as blood and chambers of the heart which are identified in figure 11, or any clear explanations comparing these to explain why the frog's system is less efficient, specifically at carrying oxygen to the tissues.

(c) Figure 11 shows the circulatory system of a frog.

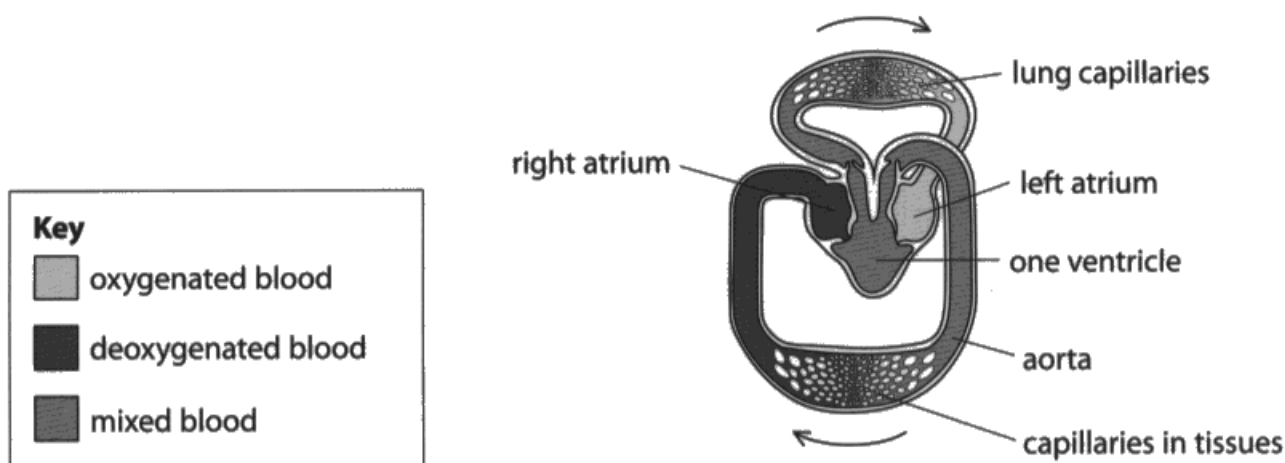


Figure 11

Explain why the circulatory system of a frog is less efficient at carrying oxygen to the tissues than the circulatory system of a human.

(3)

The frog is less efficient at carrying oxygen to the tissues than humans because it carries mixed blood to the capillaries in the tissues which humans don't do.



This answer gained 1 mark. It provides a relevant explanation using information provided in the diagram but only offers 1 point for a 3 mark question, with the first 3 lines simply repeating the stem of the question. Candidates should be encouraged to write their answers using good English but should also be mindful to check the number of marks available, making sure that their answer contains enough individual detail to access all of these. Had the candidate referred back to the diagram, taking and explaining further information from this (the picture specifically, as information from the key had already been used) whilst giving the comparison to humans, they would have been likely to pick up more marks.



Check the number of marks available and how many points your answer provides.

Examiners like to see candidates using good English and answering the question in full sentences but remember there will be no marks for the parts of your answer which just repeat the question. For example the first 2.5 lines of this answer are just repeating what the question has asked. It then gives one relevant point about mixed blood to gain 1 mark so needed two further relevant points.

Question 6 (a) (i)

There are some misconceptions about the use of a coverslip when preparing a microscope slide, with many candidates believing that it is used to allow light to shine onto the sample. Acceptable responses, of which there were a fair number, were those which referred to keeping the sample still or keeping it flat. Also acceptable was the idea of protecting the sample or the objective lens from damage. Contamination by bacteria was not creditable yet seen on a frequent basis.

6 A student compared the number of stomata on the upper and lower surfaces of a leaf.

She completed a leaf peel as shown in Figure 12.

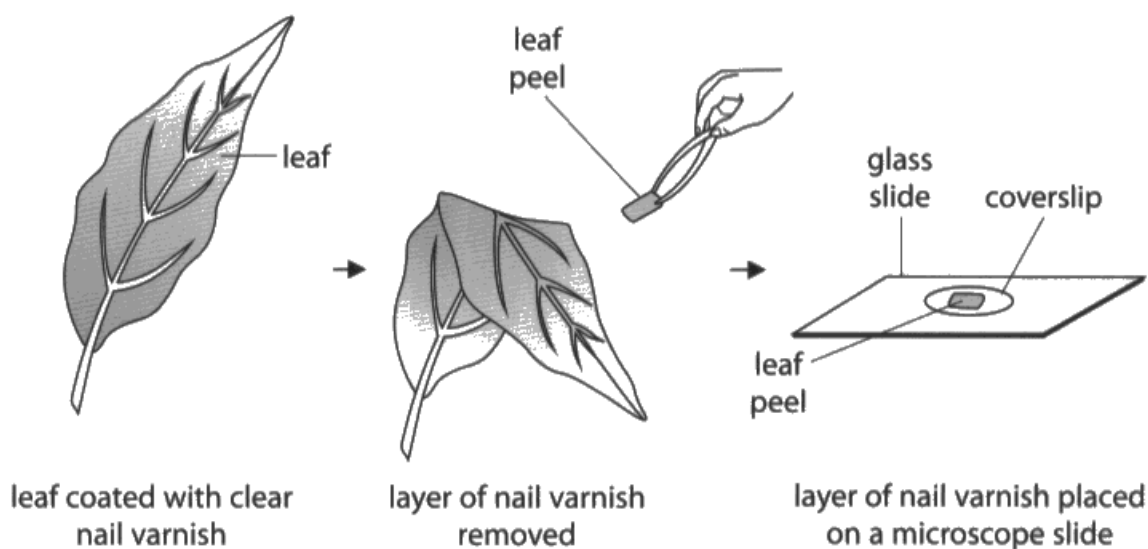


Figure 12

The layer of nail varnish shows an impression of the cells on the surface of the leaf.

(a) (i) State why a coverslip is placed on top of the leaf peel.

(1)

see the cells more clearly



This was a common answer that gained 0 marks. It suggests candidates could improve by being more confident in preparation and viewing of microscope slides and the techniques involved in this.

- 6 A student compared the number of stomata on the upper and lower surfaces of a leaf. She completed a leaf peel as shown in Figure 12.

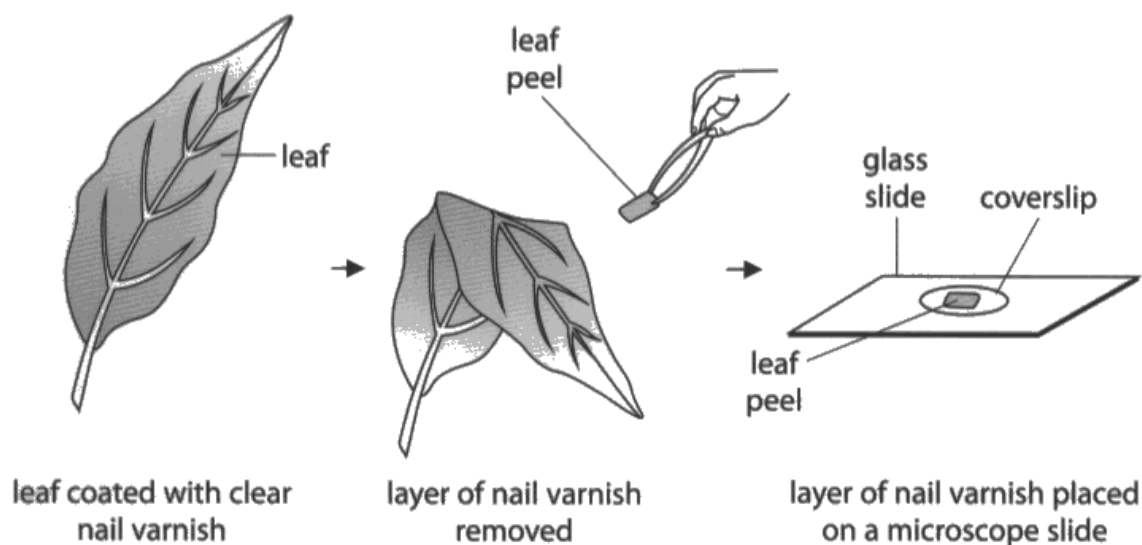


Figure 12

The layer of nail varnish shows an impression of the cells on the surface of the leaf.

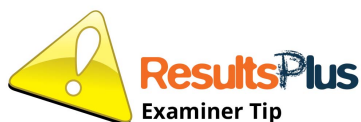
- (a) (i) State why a coverslip is placed on top of the leaf peel.

(1)

Stop the leaf peel moving. Flatten it, clearer image.



This response gained 1 mark but included 2 of the most common mark points awarded - stopping the leaf peel moving and to flattening it. Whilst the coverslip will not make the leaf peel clearer, this was ignored.



When asked to state a reason for something, be careful about giving more than one response; in this case the candidate gave two correct responses so was awarded one mark.

Question 6 (a) (ii)

Many candidates stated that the leaf would be too big to fit under the lens to answer this question which is not correct. To gain credit, candidates had to be more specific stating that the leaf peel was thinner than the whole leaf for 1 mark, which allowed light to pass through it for the second mark. As the aim of this procedure is to see the lower epidermal cells, stating that this would allow you to see the stomata or guard cells, for example, would also be given credit. Whilst the question was asking for an answer explaining the use of the leaf peel, responses which clearly gave the reverse argument for the whole leaf were also credited.

(ii) Explain why the leaf peel rather than the whole leaf was viewed with a microscope. (2)

The whole leaf would be too large to view with a microscope therefore a small sample is used that allows the surface to be magnified in detail.



This response failed to score any marks. It was common for candidates to comment on the whole leaf being too large/big. The candidate states that the surface can be magnified in detail but this lacks specificity in relation to what could be seen on a leaf peel but not a whole leaf, i.e. stomata.



Be specific in answers - if saying something can be seen/magnified in detail try to provide an example of what detail could be seen.

(ii) Explain why the leaf peel rather than the whole leaf was viewed with a microscope.

(2)

So that the cells are easier to see as a leaf is very thick so the light would not be able to shine through it.



This response gained the full 2 marks and shows good knowledge and understanding of the concept being tested which may indicate that they have prepared a leaf peel and viewed it with a microscope.



Improve the clarity of longer answers by writing explanations from one perspective/context (either the leaf peel or the whole leaf) in a logical order.

- (ii) Explain why the leaf peel rather than the whole leaf was viewed with a microscope.
(2)

The leaf peel is thinner so the microscope could more easily see the cells and stomata than a thick leaf.



This is a clear 2 mark response which is well expressed explaining not only that the leaf peel was thinner but that this made viewing the cells/stomata possible.



Try to write your answers in the context which the question has asked. In this question better answers explained why the leaf peel was used (rather than why the whole leaf wasn't used), such as the leaf peel is thinner so you could see the cells/stomata (rather than on a thick leaf).

Although sometimes you can gain answers in reverse, this is not always the case so this is best practice.

Question 6 (b) (i)

This was a very well answered question with the majority of students being able to identify and state that there were three stomata visible in the diagram to gain one mark. The most common error was to count the guard cells as opposed to the stomata.

- (b) The student drew a biological diagram of the leaf peel taken from the underside of the leaf.

Figure 13 shows this diagram.

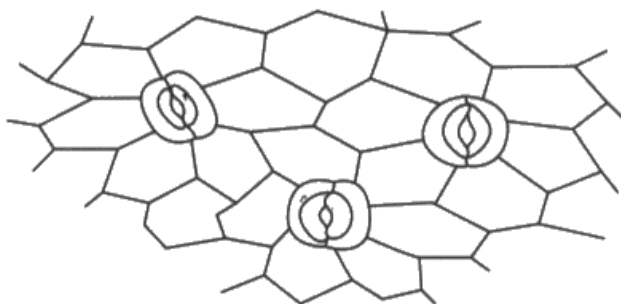


Figure 13

- (i) State the number of stomata visible on Figure 13.

(1)

6



ResultsPlus
Examiner Comments

This response gained 0 marks as the candidate was unable to state the number of stomata visible in figure 13. It is likely the candidate confused stomata and guard cells which was the most common error. It is expected that students who had carried out a leaf peel would be more likely to get the correct answer, showing the importance of giving candidates as much practical experience as possible.

(b) The student drew a biological diagram of the leaf peel taken from the underside of the leaf.

Figure 13 shows this diagram.

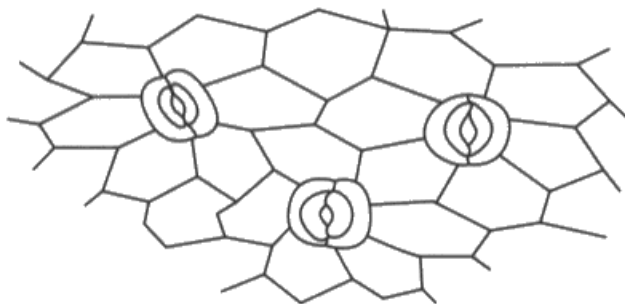


Figure 13

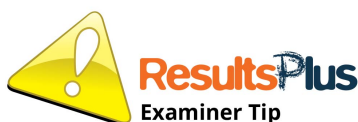
(i) State the number of stomata visible on Figure 13.

(1)

three
There are ~~three~~ letting plants pass through
and exit minerals.



This candidate did give the correct answer 'three' within their response so was awarded the one mark available.



This question is asking the candidate to 'state the number of stomata' only. It is OK to write the answer as 'three' or numerically as '3' however as it is a state question it is not necessary to give any further points as it just asking for the number of stomata to be stated. Doing more than needed on questions like this doesn't gain any more credit/marks and takes up time you might need on other questions.

Question 6 (b) (ii)

This question proved challenging for candidates with many not attempting an answer and many more failing to answer the question posed. The question asked them to describe HOW the stomata open but many of the responses were to do with WHY or WHEN the stomata open including gas exchange, water loss etc. The response should have been the idea that water moves into guard cells by osmosis causing them to become turgid or swell. A small number of candidates did gain one mark for identifying the involvement of guard cells but it was infrequent to then link this to additional mark points accurately.

(ii) The student observed that the stomata were open.

Describe how stomata open.

(3)

~~Guard cells~~ ~~at~~ when Guard cells absorb water, they swell up causing the stomata to open up. When Guard Cells release water, they become flaccid, ~~ca~~ causing the stomata to close.



ResultsPlus
Examiner Comments

This is a rare example of an excellent response gaining the full 3 marks available. The candidate clearly understood the question being asked in relation to HOW stomata open and had the scientific knowledge to answer this. Candidates regularly confused the roles of stomata and guard cells in this question, thinking that the stomata absorbed the water and became turgid.



ResultsPlus
Examiner Tip

Always read the question carefully. This question was asking the candidate to describe HOW the stomata opened yet many responses described WHEN or WHY they opened so failed to access any marks.

Don't forget to check the number of marks available and make sure you include enough information in your answer to access all the marks. - this was worth 3 marks and the candidate gave 3 correct points describing how the stomata opened so gained full marks.

(ii) The student observed that the stomata were open.

Describe how stomata open.

(3)

The stomata open so that the leaf catches nutrients and light water so that ~~pot~~ photosynthesis can happen, it absorbs water then stores it.



ResultsPlus
Examiner Comments

This was a fairly typical response gaining 0 marks. It is describing why the stomata open as opposed to how they open. The answer is not specific about the guard cells absorbing water, instead commenting on the leaf, so this mark was not accessed.

Question 6 (c)

This item was the six-mark question and required candidates to describe how water and sucrose moves through a plant. The diagram provided included arrows and labels to help candidates answer the question posed, and some candidates used this well by adding annotations to help them structure their own answers, often scoring more marks as a result. A simple answer would be to state that water/mineral ions are transported in the xylem and that sucrose is transported in the phloem, which many candidates were able to access. Writing that water and sucrose was carried in the xylem disqualified the water in xylem area of indicative content but as some water and mineral ions are transported in the phloem (along with sucrose) these were treated as neutral, although not deemed to be worthy of credit by themselves. It was pleasing to see answers that were able to describe further indicative content in terms of xylem and phloem structure linked to the movement of sucrose and water. The answers scoring the most marks tended to not only use terms correctly including transpiration, translocation, osmosis and active transport but described these accurately in the context given whilst also linking to other parts of the indicative content, for example, the structure of sieve tubes. Candidates that did not score tended to simply restate the information given in the question or diagram without adding value by using their own knowledge, or confused water/sucrose within the xylem and phloem.

*(c) Figure 14 shows xylem and phloem.

Xylem and phloem are involved in the transport of substances through a plant.

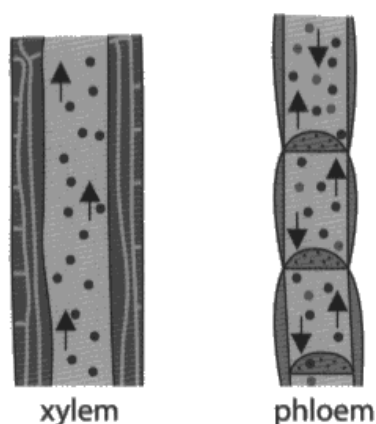


Figure 14

Use Figure 14 to help you describe how water and sucrose move through a plant.

(6)

When water is absorbed through the root hair cells it moves up through the xylem. When it reaches the phloem some of the water is moving and up and the other half is moving down. This is because some of the water is oxygenated and some is deoxygenated.



ResultsPlus
Examiner Comments

This was a level 1 response. There is a basic description demonstrating some understanding even though there are some inaccuracies.



Use the diagram to help pick out differences in the structures of xylem and phloem which could help you describe how the water and/or sucrose are transported through the plant.

This question asks about water and sucrose yet the answer does not mention sucrose at all - make sure you cover everything the question is asking about in your answer.

*(c) Figure 14 shows xylem and phloem.

Xylem and phloem are involved in the transport of substances through a plant.

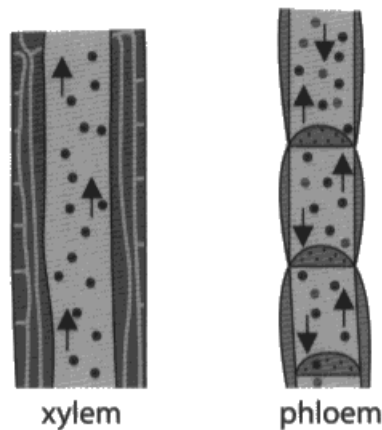


Figure 14

Use Figure 14 to help you describe how water and sucrose move through a plant.

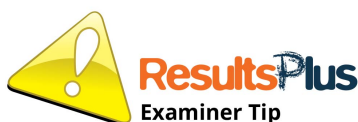
(6)

Water firstly moves into the root & hair & cells via osmosis. Osmosis is the movement of water from a high to low concentration through a semi-permeable membrane. Whereas sucrose moves in by active transport which goes against the concentration gradient, so energy is required. Water and mineral ions are both transported from roots to leaves through the xylem in only an upwards direction. This is transpiration. A xylem is made up of dead lignified cells. Whereas sucrose is moved in the phloem from leaves to the rest of the plant in both downward and upwards direction. This is translocation, and the phloem is made up of living elongated cells.



This is an example of a level 3 response. The candidate has very good knowledge and understanding of the structure and function of xylem and phloem and is able to apply this to the question being asked in relation to the transport of water and sucrose through a plant. The candidate accesses level 3 by using the information in the diagram and their own knowledge to provide an answer which is biologically accurate whilst linking pieces of indicative content to provide a detailed description.

Candidates who failed to achieve level 3 were often unable to give the level of detail required about both xylem and phloem correctly.



Using key words/terms when in context improves the detail and biological understanding shown. In longer answer questions this can improve the level accessed and therefore the number of marks.

For longer answer questions, make sure you link pieces of knowledge and information to answer the question posed.

Structure your answer logically so you don't forget to include all your knowledge and it is well expressed. For this question it may have helped to label the diagrams in figure 14 and then use this to help you structure the answer.

Try to keep answers focused and on point - whilst this answer gains full marks, the first line talks about water moving into the root hair cells which is irrelevant as the question being asked is about how water and sucrose move through, as opposed to into, the plant.

*(c) Figure 14 shows xylem and phloem.

Xylem and phloem are involved in the transport of substances through a plant.

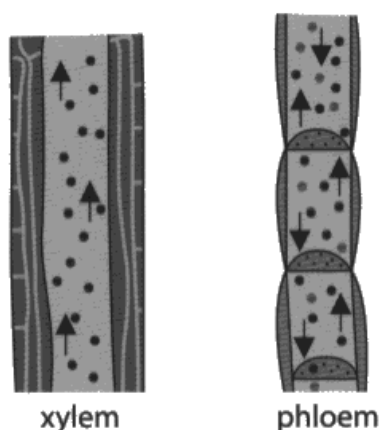


Figure 14

Use Figure 14 to help you describe how water and sucrose move through a plant.

(6)

xylem is hollow and it has dead cells inside, during transportation the xylem lets water and sucrose to move through the plant as its hollow, then it passes down through the phloem, where translocation is, and water and sucrose from the xylem exchange moves around ⁱⁿ the phloem up to the stomata where it opens and releases evaporation.



This is a level 2 response. It made the common error of referring to water and sucrose throughout the answer for both xylem and phloem rather than discussing these individually. Overall it includes a few inaccuracies but still demonstrates some relevant biological understanding about both xylem and phloem and is mostly clear. It uses some scientific terminology and covers points from the indicative content.

Paper Summary

Based on their performance on this paper, candidates should:

- Recognise that the word 'explain' means additional scientific information is needed that is linked to the answer given.
- Use all the information given in the question to help them guide their response and construct their answer but avoid repeating the information which has already been given and therefore giving vague responses which will not gain credit.
- Consider the context of the question to ensure they apply their scientific knowledge to the situation they are being asked about.
- Develop their practical skills knowledge to ensure they understand the difference between the factors being investigated and controlled variables.
- Check the number of marks given for the question and ensure that they have included enough facts to match the marks available.
- Use scientific terminology accurately where possible in responses.
- Always show the working when doing calculations as a mark can be awarded for errors carried forward in this case.
- Think about the structure of the answer before starting to write, especially when tackling the extended answers, to ensure that the answer shows clarity of writing and flows, while remembering that accurate spelling and grammar in these questions is also important.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

<http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx>

