

# Examiners' Report

## June 2019

### GCSE Combined Science 1SC0 2BF

## Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at [www.edexcel.com](http://www.edexcel.com) or [www.btec.co.uk](http://www.btec.co.uk).

Alternatively, you can get in touch with us using the details on our contact us page at [www.edexcel.com/contactus](http://www.edexcel.com/contactus).



### Giving you insight to inform next steps

ResultsPlus is Pearson's free online service giving instant and detailed analysis of your students' exam results.

- See students' scores for every exam question.
- Understand how your students' performance compares with class and national averages.
- Identify potential topics, skills and types of question where students may need to develop their learning further.

For more information on ResultsPlus, or to log in, visit [www.edexcel.com/resultsplus](http://www.edexcel.com/resultsplus). Your exams officer will be able to set up your ResultsPlus account in minutes via Edexcel Online.

### Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: [www.pearson.com/uk](http://www.pearson.com/uk).

June 2019

Publications Code 1SC0\_2BF\_1906\_ER

All the material in this publication is copyright  
© Pearson Education Ltd 2019

# Introduction

Paper 1SC0\_2BF is taken by candidates who have followed the GCSE Combined Science specification.

The paper consists of 60 marks assessed by a mixture of different question styles, including multiple-choice questions, short answer questions, calculations and one extended open-response question. All questions should be answered in the allowed time of 1 hour 10 minutes. The extended open-response question is identified by an asterisk (\*) in the question paper to indicate that marks are also awarded for the ability to structure a response logically.

The Combined Science Biology papers assess aspects of working scientifically and mathematical skills, the requirements of which are given in the specification. There are six core practicals in the biology content which must be completed prior to sitting the examination.

Paper 1SC0\_2BF assesses content from Topic 1 and Topics 6 - 9. In 2019 this included questions on the water cycle, hormones, blood glucose concentration, blood vessels, exercise, anaerobic respiration, cell structure, osmosis, populations, carbon cycle, nitrogen cycle and respiration. The extended open-response question focused on the structure and function of red blood cells and white blood cells.

Questions assessing practical skills included measuring structures, writing a method, using a microscope, drawing a cell, interpreting data, controlling variables and setting up control experiments. Mathematical skills included ratios and calculating biomass.

There were several questions where candidates needed to apply their knowledge and understanding to situations that were new to them. In these cases all the necessary information needed to lead candidates to the required responses was given in the stem of the questions. Candidates would benefit from reading the stem of questions carefully and considering how this links to what they have been taught. It was pleasing to see examples where candidates had underlined or highlighted the command words and key words in the information given.

The more straightforward questions where marks could be gained by interpreting information were answered well. It was also pleasing to see some excellent, coherent answers accurately applying relevant scientific terminology to questions that required extended prose.

In Q01 many candidates demonstrated good knowledge of the water cycle and treating water to make it safe to drink. In Q01(c) many candidates were able to describe a suitable procedure for turning seawater into drinking water, although relatively few made a straightforward comment about the need to remove salt.

The ability to describe a trend was demonstrated well by candidates in Q02(d)(i) where many used the data to good effect and commented accurately on blood glucose levels. However, in Q03(c)(i) they were less confident in describing the relationship shown by the data and far fewer candidates attempted to make use of the data as might have been expected.

Q03(a)(i) tested candidates' ability to measure the length of two lines. Many candidates were unable to do this accurately and thus did not score the mark. However, it was pleasing to see that a large proportion of candidates could state a ratio correctly in Q03(a)(ii).

The ability to draw a biological specimen is assessed very rarely, but many candidates made an excellent attempt in Q04(a). However, candidates are advised to read the stem of each question carefully, as a significant number drew a textbook style diagram rather than the one they had been asked to draw and as a result they scored no marks.

Different aspects of practical skills were assessed in several questions. Knowledge of control experiments was tested in Q04(c)(i) and Q06(a)(ii), but few candidates were able to answer them with any success. The distinction between a control and variables to be controlled was not understood by a large proportion of candidates. However, it was encouraging that most candidates could give appropriate variables to control in Q04(c)(ii) and Q06(a)(i), but in some instances they need to be more specific in terms of referring to masses or volumes rather than amounts.

Describing a method to estimate the population of slugs in a garden was done very successfully by many candidates and it was very apparent when they had first-hand experience of this method. There were good descriptions of random sampling, but describing how to scale up the sample for the whole garden proved to be too challenging for many.

It was pleasing that the extended open-response question was attempted by a large proportion of candidates. There was good evidence of planning, in terms of candidates annotating the stem of the question, or making lists of key points before they constructed their answer.

## Question 1 (a) (i)

In this question candidates were given a diagram of the water cycle. They were asked to name two processes shown in the diagram. A large proportion of candidates named the processes correctly, but sometimes processes G and H were incorrectly identified as transpiration and condensation.

1 (a) Figure 1 shows the water cycle.

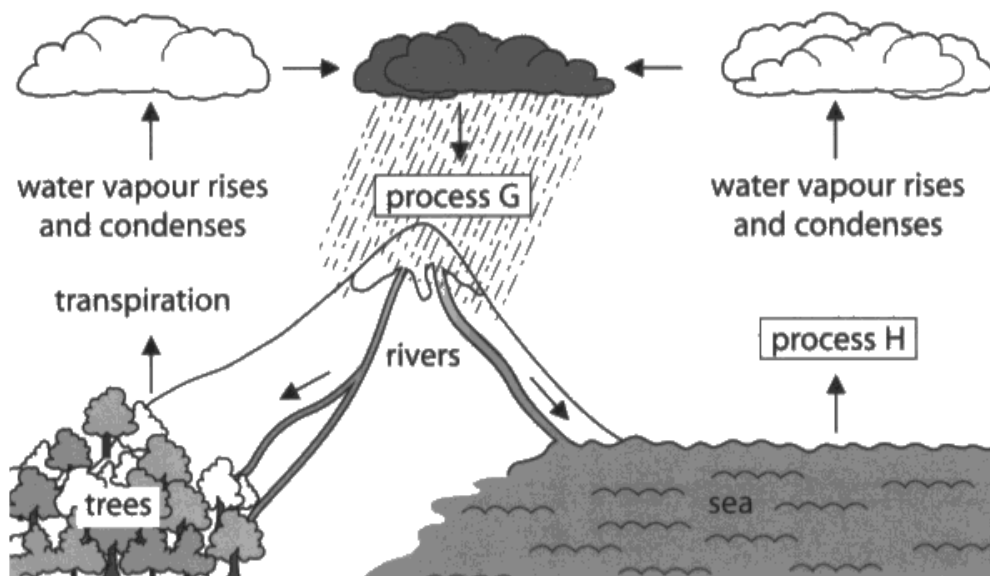


Figure 1

(i) Name process G and process H.

(2)

process G *Rain*

process H *Evaporation*



This answers scores two marks for naming process G and process H correctly.

1 (a) Figure 1 shows the water cycle.

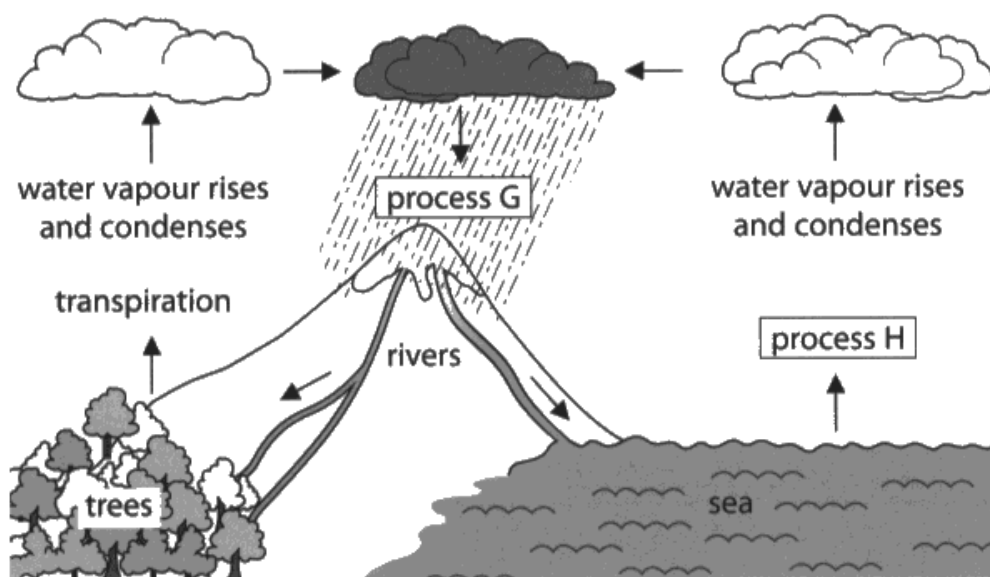


Figure 1

(i) Name process G and process H.

(2)

process G .....

process H ~~condensation~~ condensation / evaporation



This answer does not score any marks. The candidate has not named process G. Two processes have been named for H, one is correct and the other is incorrect.



Only write the name of **one** process on each line. If you write the name of two processes on a line, the examiner does not know which one to choose, so no marks are scored.

## Question 1 (b)

This was a very accessible question and most candidates scored both marks for completing the sentences correctly.

## Question 1 (c)

This question required candidates to describe how seawater can be turned into drinking water. Most candidates found it difficult to make the clear statement that the salt needs to be removed from seawater. A mark was frequently awarded for the idea of evaporating the water and many candidates then went on to give a description of condensing the water vapour. Candidates who wrote about heating the water to kill pathogens did not score a mark because this was not linked to turning seawater into drinking water.

Some candidates referred to distillation, which gained them two marks, since distillation involves evaporation and condensation.

(c) Figure 2 shows the Canary Islands.

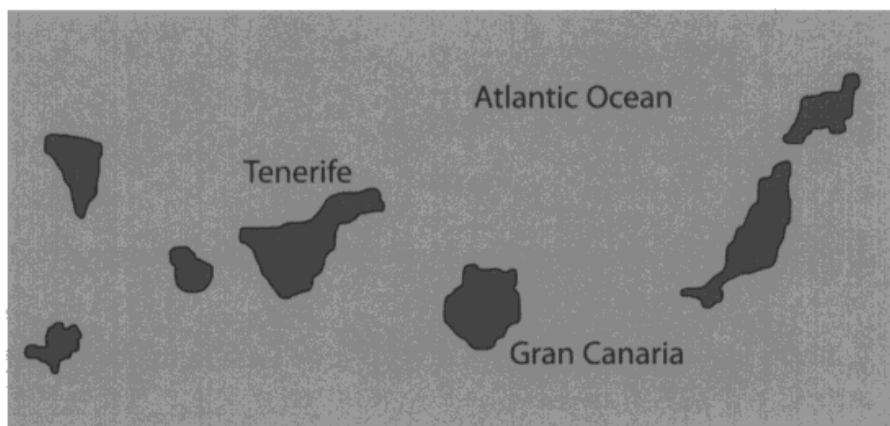


Figure 2

The Canary Islands do not have enough fresh water.

Describe how seawater can be turned into drinking water.

(2)

The salt water should be heated so the water evaporates (water vapour) then the water vapour should be cool down to form pure water.



This answer scores two marks for the idea of evaporating the water, then cooling the water vapour to produce water.

~~\* Filtered then~~ The sea water  
~~\* Heated & evaporated then is filtered then~~  
~~\* add chlorine then its potable~~ heated  
and evaporated to kill bacteria then its potable



Heating and evaporating water to kill bacteria does not score any marks because the answer is not linked to turning seawater into drinking water.



Read the question carefully and make sure that your answer is linked to the question.



## Question 2 (a)

In this question candidates had to draw lines between boxes to link a hormone with the effect of that hormone on the body. The majority of candidates followed the instruction in the stem of the question and just drew one straight line from each hormone. Many candidates were able to make the correct link for hormone K, but were less successful with hormone L.

## Question 2 (d) (i)

This question asked candidates to describe the trends shown in a graph of blood glucose concentration over a period of 60 minutes. The majority of candidates were able to score at least one mark, often for identifying the overall increase in glucose concentration. Many candidates gave detailed descriptions of the trends and were frequently awarded marking point 3 for making correct references to the data, such as glucose concentration increases to 5 mmol per litre. Many candidates found describing the trend for the first 20 minutes to be the most challenging as they did not recognise that the small fluctuations meant that blood glucose concentration was effectively staying the same.

(d) Figure 4 shows the concentration of glucose in the blood of a person.

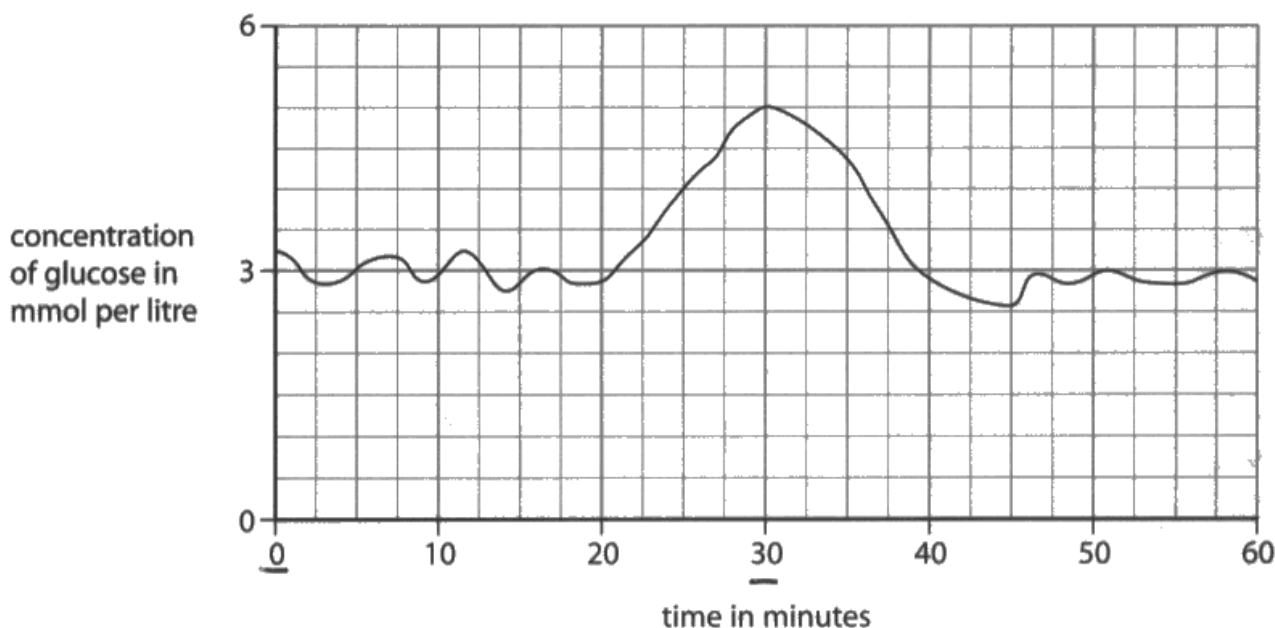


Figure 4

(i) Describe the trends shown in Figure 4 from 0 minutes to 30 minutes.

(2)

from 0-20 mins it starts to increase and decrease slightly by 1mmol however from 20-30 mins it increased rapidly more than 2mmol.



This is a detailed description of the trends shown in the graph. The candidate has used different aspects of the data, referring to both time and the concentration of glucose.



Always try to use data when you have been asked to describe the trends shown in a graph.

## Question 2 (d) (ii)

In this question candidates had to explain why the concentration of glucose decreases between 30 minutes to 40 minutes. This question challenged candidates across the ability range. Marks were awarded most frequently for the idea that insulin is released and glucose is used up. References to glucose being used in respiration were seen infrequently.

The marks available for explaining that insulin makes cells absorb glucose and that glucose is converted into glycogen, were rarely awarded.

- (ii) Explain why the concentration of glucose decreases from 30 minutes to 40 minutes. (2)

Because insulin has become present. Insulin reduces blood glucose levels making it into glycogen. When the concentration gets too high insulin makes sure it does not rise too much to the point it kills us.

(Total for Question 2 = 8 marks)



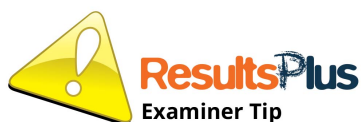
This answer scores both marks. The candidate has referred to insulin and the conversion of glucose into glycogen.

- (ii) Explain why the concentration of glucose decreases from 30 minutes to 40 minutes.  
(2)

The glucose has been used up between that time so it slowly goes down.



This answer scores one mark for the idea of glucose being used up, although a more specific reference to glucose being used in respiration or during exercise would have been better.



Always check the number of marks available for a question. If the question is worth two marks, try to give two points in your explanation.

## **Question 3 (a)**

### **Question 3(a)(i)**

In this question candidates were shown a cross section through an artery and a vein. Candidates were asked to measure the length of two lines on the cross section in mm. The expected answers of 8 mm and 4 mm were not seen very frequently. Many candidates measured line A as 9 mm and line B as 5 mm, which were outside the range of tolerance ( $\pm 0.5$  mm) allowed. In some cases it was apparent that measurements had been made in cm instead of mm, and some candidates misread the question and measured other parts of the artery and vein.

### **Question 3(a)(ii)**

In this question candidates were asked to state the ratio of the thickness of the artery wall to the thickness of the vein wall. An error from Q03(a)(i) could be carried forward and as a result many candidates were awarded the mark for giving a ratio correctly. In many instances, however, candidates wrote the ratio the wrong way round, such as 1:2.

- 3 (a) Figure 5 shows a cross section of an artery and a vein.



(Source: © The University of Kansas Medical Center)

**Figure 5**

- (i) Measure the length of line A and the length of line B in mm.

(1)

line A ~~80~~ 90 mm

line B 40 mm

- (ii) State the ratio of the thickness of the artery wall to the thickness of the vein wall.

(1)

9:4



**ResultsPlus**  
Examiner Comments

This candidate has measured the length of lines A and B incorrectly. However, Q03(a)(ii) allows an error to be carried forward from Q03(a)(i), so stating a ratio of 9:4 scores one mark.

- (i) Measure the length of line A and the length of line B in mm.

(1)

line A ..... 0.9 ..... mm

line B ..... 0.4 ..... mm

- (ii) State the ratio of the thickness of the artery wall to the thickness of the vein wall.

(1)

0.9 : 0.4



**ResultsPlus**  
Examiner Comments

This candidate appears to have measured the length of lines A and B in cm instead of mm.

A correct ratio has been stated for Q03(a)(ii), which scores the mark.



**ResultsPlus**  
Examiner Tip

Always read the question carefully and follow instructions. In this case, measurements should be in mm.

(i) Measure the length of line A and the length of line B in mm.

(1)

line A ..... 8 mm

line B ..... 4 mm

(ii) State the ratio of the thickness of the artery wall to the thickness of the vein wall.

(1)

1:2



**ResultsPlus**  
Examiner Comments

Lines A and B have been measured accurately, but the candidate has stated the ratio of thickness of artery to thickness of vein as 1:2 instead of 2:1.

This answer scores the mark for Q03(a)(i) but not for Q03(a)(ii).



- (i) Measure the length of line A and the length of line B in mm.

(1)

line A 0.8 mm

line B 0.4 mm 0.4

- (ii) State the ratio of the thickness of the artery wall to the thickness of the vein wall.

(1)

2:1



**ResultsPlus**  
Examiner Comments

This candidate appears to have measured the length of line A and line B in cm rather than mm, so no mark has been scored for Q03(a)(i). However, the error can be carried forward to Q03(a)(ii) which does score the mark.



**ResultsPlus**  
Examiner Tip

Always read the question carefully and follow the instruction, so in this case measure the length of the lines in mm.

## Question 3 (b)

### Question 3(b)(i)

This question asked candidates to give a reason why veins have valves. The expected answer was to prevent the backflow of blood, but there were lots of misconceptions with candidates often discussing how valves control how much oxygen gets into the blood. Some candidates stated that valves help blood to flow, without mentioning direction.

### Question 3(b)(ii)

In this question candidates were asked to name the artery that transports oxygenated blood from the heart to the body. It was not uncommon for candidates to respond with artery, vein, pulmonary artery, pulmonary vein and vena cava, instead of the aorta.

(b) (i) Give a reason why veins have valves.

(1)

To slow the blood flow and decrease pressure

(ii) Name the artery that transports oxygenated blood from the heart to the body.

(1)

Aorta



**ResultsPlus**  
Examiner Comments

A reason why veins have valves is because blood pressure in veins is low. Valves do not decrease blood pressure.

The spelling of aorta is just acceptable for Q03(b)(ii).



**ResultsPlus**  
Examiner Tip

Learn how to spell key words correctly, then you can be sure to be given credit for your work.

### Question 3 (c) (i)

In this question candidates were provided with a table of data and they were asked to describe the relationship between exercise and the ability to run at 3 metres per second for 20 minutes. Many candidates were able to describe the relationship that the more exercise people do the more likely they are to be able to run at 3 metres per second for 20 minutes. This gained them one mark, but most candidates found a second mark difficult to access as they did not use the data to help describe the relationship.

The relationship shows that ~~the~~ the more ~~exercise~~ <sup>hours</sup> of exercise they did per week, the more people could run at 3 metres per second for 20 minutes.



This candidate has made a clear statement about the relationship shown by the data, which scores one mark. To gain the second mark the candidate would need to refer to the data to exemplify the point made. An example would be describing that an increase from 0 to 2 hours of exercise per week has a bigger impact on the number of people who can run at 3 m/s for 20 minutes when compared to an increase of 6 to 8 hours of exercise per week.

That the more hours of exercise you did  
per week then the longer you could run at 3 metres  
per 20 minutes



**ResultsPlus**  
Examiner Comments

This candidate has not described the relationship shown by the data. They have referred to how long people could run at 3 m/s instead of how many people could run at 3 m/s for 20 minutes. The answer does not score any marks.



**ResultsPlus**  
Examiner Tip

If you are asked to describe a relationship in a table of results, always look at the headings in tables of results carefully. The headings will give the variables that you must try to link together. Try to use data to help with your description of the relationship between the variables.

### Question 3 (c) (ii)

This question asked candidates to explain why some people's leg muscles tired quickly and developed cramp when they were running. The mark awarded most frequently was for ideas about not stretching or not warming up before exercise. Many candidates also scored a mark for explaining that lactic acid builds up and causes tiredness and cramp in muscles. The award of marks for explaining that not enough blood or oxygen gets to the muscles and for references to anaerobic respiration was much less common. The majority of candidates found this question challenging and there was often a lack of clarity in their responses.

(ii) Explain why some people's leg muscles tired quickly and developed cramp when they were running.

(3)

Some people dont excercise regularly so they get cramps  
faster as their muscles are stiff. & So theres not enough  
blood flowing through and oxygen so anaerobic respiration  
Their muscles haven't been worked out.  
they dont get enough blood and oxygen.  
They are not trained well enough.  
The fat dosen't allow them.



This answer scores two marks. The candidate has referred to muscles not getting enough blood and oxygen, and they are aware that anaerobic respiration occurs in this situation.

Some people's leg muscles tire quickly and develop cramp when running because of anaerobic respiration. This is when the muscles don't take in enough oxygen so the glucose in your body splits in and forms lactic acid which makes your body develop cramps.



**ResultsPlus**  
Examiner Comments

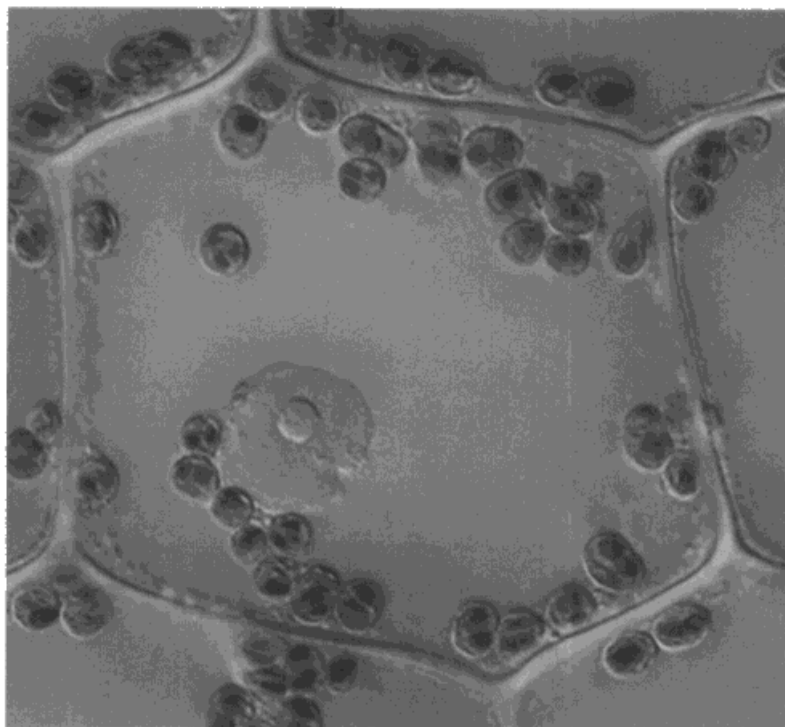
This is a concise answer which scores the full three marks. The candidate has referred to anaerobic respiration, a lack of oxygen in muscles and lactic acid.

## Question 4 (a)

This item tested part of the core practical skill of drawing and interpreting an image as seen through a light microscope as outlined in specification point 1.6.

Almost all candidates could access the question with very few blank responses seen. The instruction clearly stated to draw **this** plant cell and to label **three** parts of **this** cell. To be awarded the drawing mark, the candidate had to make a reasonable attempt at drawing the shape of the cell with a complete cell wall, the nucleus in roughly the correct position and some of the chloroplasts correctly shown. If the candidate's drawing was not creditworthy, then the three labelling marks could still be awarded. If more than three parts of the image were labelled, then the list rule was applied, with a significant number of candidates losing marks for incorrect labels being subtracted from those that were correct. A significant number of candidates drew and labelled a 'textbook' style diagram of a plant cell. These candidates were not awarded any marks as this item tested application of knowledge and not recall.

**4** Figure 7 shows a plant cell as seen under a light microscope.



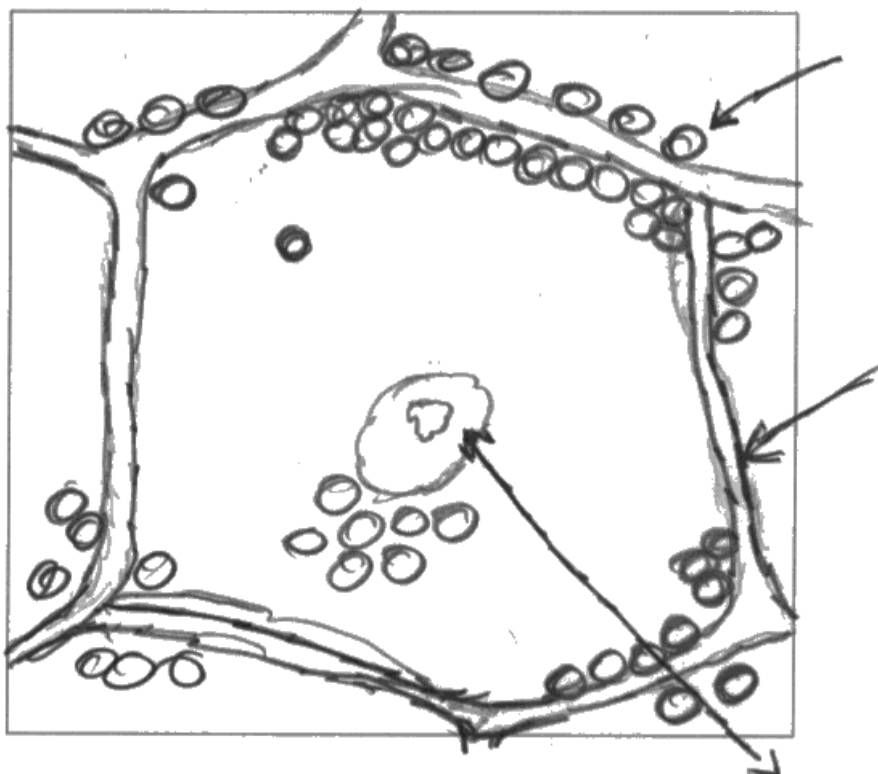
(Source: © HERVE CONGE, ISM/SCIENCE PHOTO LIBRARY)

**Figure 7**

(a) Draw this plant cell in the box below.

Label **three** parts of this cell.

(4)



This is a very good drawing of the plant cell. The candidate has drawn labelling lines to three structures, but none of the structures have been named.

This answer scores just one mark for the drawing.



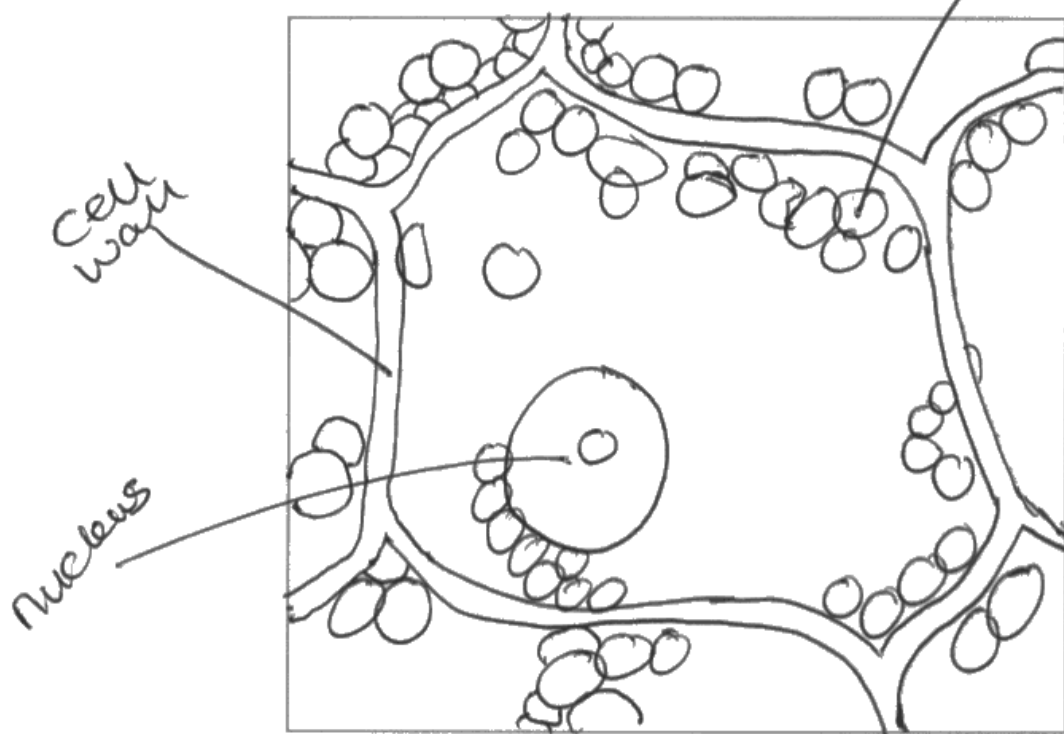
If you are asked to label structures on a drawing, write the names of the structures at the labelling lines.



Figure 7

(a) Draw this plant cell in the box below.

Label **three** parts of this cell.



(4)



This is a good drawing of the plant cell and three structures have been labelled. However, chloroplasts have been labelled as mitochondria, which is incorrect.

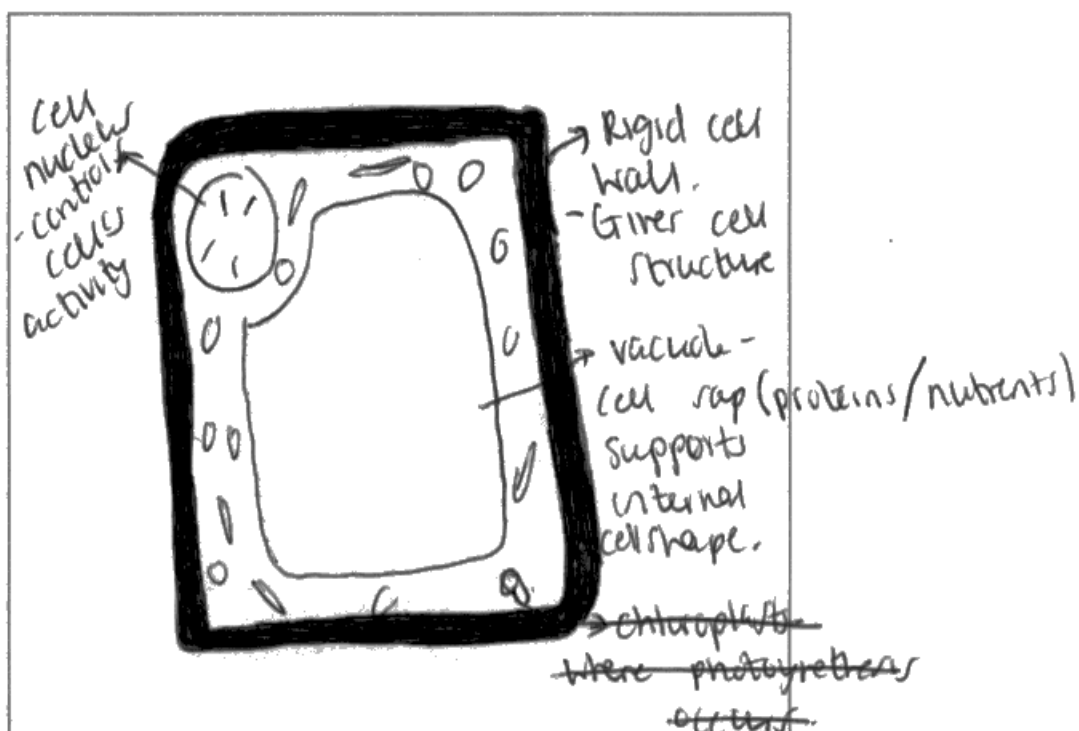


Make sure that you learn the names of cell structures that can be seen under a light microscope.

(a) Draw this plant cell in the box below.

Label **three** parts of this cell.

(4)



This is not a drawing of the plant cell shown. The candidate has drawn a typical textbook diagram of a plant cell, which does not score any marks.



Always follow the instructions given in the question. In this case, the instruction is to draw **this** plant cell, not one from a textbook or revision guide.

### Question 4 (c) (i)

This was a question about water movement into and out of cells in potatoes. Candidates were told that potato chips were placed in different concentrations of sodium chloride solution. Candidates were asked to state why there was a test tube containing distilled water and potato chips. This was a challenging question for many candidates and the expected answer, that this test tube was a control, was rarely seen.

(c) A student wanted to investigate the movement of water into and out of cells in potatoes.

The student had the equipment shown in Figure 8.

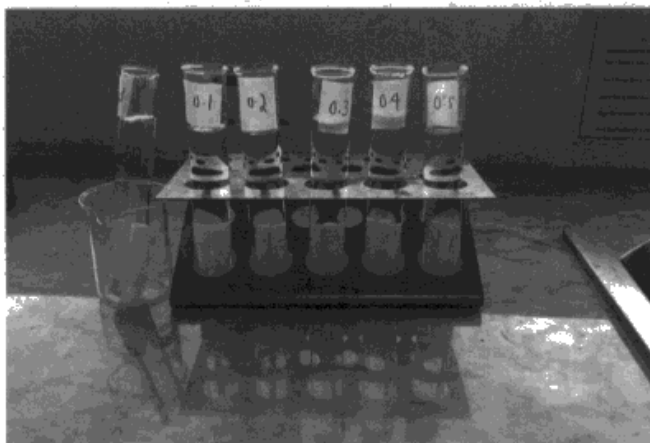


Figure 8

The test tubes in the rack contain different concentrations of sodium chloride solution.

The solutions were 0.1 M, 0.2 M, 0.3 M, 0.4 M and 0.5 M sodium chloride solution.

The test tube in the beaker contains distilled water.

There are three potato chips in each of the six test tubes.

(i) State why the test tube in the beaker only contains distilled water and three potato chips.

(1)

So that the student can ~~get~~ know how much water has been absorbed into the potato normally and can then compare to the sodium chloride ones and see what's changed easier



The idea of comparing the results from the test tube containing distilled water and potato chips, with the test tubes containing sodium chloride solution, was an acceptable alternative to 'use as a control'.

## Question 4 (c) (ii)

This question was attempted by most candidates. They were asked to state two variables that need to be controlled. Marks were awarded most frequently for referring to temperature, the size of the potato chips and the time left in the solutions. Many candidates commented on the amount of water or the amount of solution, but did not score a mark because there was no reference to **volume**.

(ii) State **two** variables that need to be controlled in this investigation.

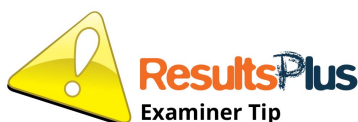
(2)

1 the same amount of sodium chloride solution

2 same size of the potato chips.



This answer scores one mark for referring to the size of the potato chip.  
Referring to the amount of sodium chloride solution does not gain credit.



Always use **mass** or **volume** if you are referring to the quantity of a solid or a liquid.

(ii) State **two** variables that need to be controlled in this investigation.

(2)

1 Temperature

2 Time



**ResultsPlus**  
Examiner Comments

This response scores one mark for stating temperature as a variable that needs to be controlled.

Just referring to time is too vague in this instance. A good answer would be the time the potato chips were left in the solutions.

### Question 4 (c) (iii)

In this question candidates had to explain why potato chips in 0.5 M sodium chloride solution lost mass. Many candidates realised that osmosis was taking place and some clearly stated that water was moving out of the chips. However, candidates found it difficult to explain that there is a difference in sodium chloride concentration between the inside and outside of the chips. There were also many misguided explanations of the salt solution destroying or dissolving the potato tissue and that this was the reason for a decrease in mass.

Through osmosis, the movement of water molecules through a semi-permeable membrane, from a high concentration to a low concentration, as the concentration of water inside the potato was more than in the solution causing the water to move into the solution causing the potato to lose mass.



This is a good answer which scores the full three marks. There is a correct reference to osmosis, water molecule concentration inside and outside the potato chip and the direction of water movement.



Make sure that you learn key scientific ideas so you can explain the results of core practicals such as investigating osmosis in potatoes.

## Question 5 (a) (i)

This question involved a simple calculation and the mark was scored by the vast majority of candidates.

## Question 5 (a) (ii)

In this question candidates were asked to explain how killing slugs would affect the population of earthworms in a garden. Candidates often scored both marks for the ideas that the population of earthworms would decrease because the hedgehogs would eat more of them. If candidates stated that the population of earthworms would increase, they had to explain that this would be due to more food being available, which scored them two marks. A relatively small number of responses involved misunderstandings of the food web and described earthworms eating slugs or vice versa.

- (ii) Hedgehogs eat slugs and earthworms.  
Slug pellets were used to kill the slugs.

Explain how killing the slugs would affect the population of earthworms in this garden.

(2)

If you killed the slugs then the earthworms could eat more of the cabbage and their population could increase / or ~~the~~ the hedgehogs would have to focus on eating the earthworms instead of the slugs and the earthworm population would decrease.



Both possible scenarios have been explained very clearly in this answer, so full marks can be awarded.



## Question 5 (a) (iii)

This question asked candidates to describe a method that could be used to estimate the number of slugs in a garden. Many candidates could describe how to use a quadrat and count the number of slugs in the sampled area. Some detailed explanations of random sampling were also seen, showing that these candidates had first-hand experience of the procedure. However, many candidates found it difficult to describe how to multiply up the number of slugs found in a quadrat to make an estimate for the whole garden. As a result marking point 3 was awarded less frequently.

(iii) Describe a method that could be used to estimate the population of slugs in the garden.

(3)  
Using a quadrat that you have randomly placed in ~~the field~~ <sup>the garden</sup>  
count how many slugs you have in that quadrat and then  
find out the area of the garden,  $100\text{m}^2$ , for example. If you  
using a  $10\text{m}^2$  quadrat you can times the number of slugs  
~~by~~ you found in the quadrat by 10 so it covers the whole  
field



This is a detailed answer which scores full marks. The candidate has described the three key points that score marks: using a quadrat, counting the number of slugs in the quadrat and multiplying that number up to estimate the population of the whole garden.

(iii) Describe a method that could be used to estimate the population of slugs in the garden.

(3)

A method that could be used to estimate the population of slugs in the garden would be quadratics. Quadratics are the squares that are placed at random and slugs that are in the quadratics are counted.



This answer scores just one mark for the idea of counting the number of slugs in a sampled area.



Make sure that you spell scientific terms and the names of pieces of equipment correctly. The equipment used to sample populations is a quadrat, not a quadratic.

## Question 5 (b)

This question asked candidates to explain how cabbages, earthworms and squirrels contribute to the carbon cycle. Candidates found this question challenging and showed weaknesses in their knowledge and understanding. There were frequent descriptions of food chains, which could only be credited if the transfer of carbon between organisms by eating was mentioned. References to releasing or taking in carbon were not credited if the correct context was the release or uptake of **carbon dioxide**. Candidates who made straightforward statements about the release of carbon dioxide due to respiration or the uptake of carbon dioxide for photosynthesis could score the full three marks. Marks for references to decomposers and egestion were awarded very infrequently; many candidates referred to the organisms dying, but there was usually no mention of the release of carbon dioxide by decomposers. Comments about egestion did not usually refer to the release of carbon into the soil.

(b) Explain how cabbages, earthworms and squirrels contribute to the carbon cycle.

(3)

The animals respire carbon dioxide and the cabbages that are eaten means the carbons being passed around by living organisms. When the squirrels and worms poo it means the carbon is now in the soil, so that when another cabbage is planted there, it will contain that carbon and another animal will eat it and the



**ResultsPlus**  
Examiner Comments

This answer covers several aspects of the carbon cycle. The link between respiration and carbon dioxide scores two marks. The candidate has then referred to egestion and carbon being released into the soil, which scores another mark. In addition, the candidate has implied that carbon is transferred between organisms by eating. Although this candidate has scored full marks with this answer, no reference has been made to photosynthesis.



Learn the key processes involved in the carbon cycle. Make sure that you refer to carbon dioxide being taken up from and released into the atmosphere, not carbon.

## Question 5 (c)

In this question candidates were asked to state three ways the concentration of nitrates in the soil can be increased. Knowledge and understanding of the nitrogen cycle appeared to be limited. Adding fertiliser or more nitrates were the most common responses seen. Many candidates also suggested adding manure, compost or decomposing matter which scored them a second mark. References to crop rotation, nitrogen-fixing bacteria and nitrifying bacteria were seen infrequently, although some candidates were awarded the additional marking point for referring to lightning.

(c) State **three** ways the concentration of nitrates in soil can be increased.

(3)

- 1 The amount of ~~many~~ Nitrifying bacteria increased.
- 2 Amount of Nitrogen Fixing Bacteria increased
- 3 Farmers could use Fertilisers.



**ResultsPlus**  
Examiner Comments

This answer shows a good knowledge of the nitrogen cycle and scores full marks.



**ResultsPlus**  
Examiner Tip

Make sure that you learn the key processes and types of bacteria involved in the nitrogen cycle. Check that you know how the concentration of nitrates in the soil can be increased or decreased.

## Question 6 (a) (i)

This question asked candidates to state two ways of improving a method. A wide range of responses was accepted, but marks were not awarded if candidates referred to amount instead of **mass** of organisms or **volume** of indicator. Many candidates suggested leaving the tubes for longer, but this would not make the results more comparable and a period of one hour is specified in the stem of the question.

### 6 (a) A student investigated respiration in three different organisms.

Red hydrogencarbonate indicator was placed in each of three test tubes.

Gauze was placed in each test tube to hold the organisms.

In test tube 1 the student placed four germinating peas.

In test tube 2 the student placed four dried peas.

In test tube 3 the student placed four mealworms.

Bungs were added to each of the test tubes.

The three test tubes were left for one hour.

The equipment used is shown in Figure 10.

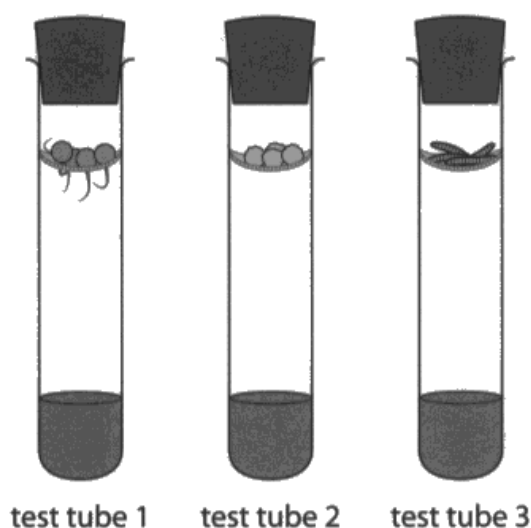


Figure 10

(i) State **two** ways this method could be improved to make the results for these three organisms more comparable.

(2)

1. Make the mass of the organisms the same size.
2. make sure that they all are at the same temperature.



This is a good answer. The candidate has stated very clearly that the mass of organisms should be kept the **same** and all tubes should be at the **same** temperature.



If a question asks you to state how results could be made more comparable, check that you have referred to variables such as mass, volume and temperature being the same.

Always avoid using the word amount if you are referring to the quantity of a solid or liquid. Always use mass or volume.

## Question 6 (a) (ii)

This question asked candidates to describe a suitable control for the respiration investigation. To be awarded one mark, candidates had to describe using the same test tube, gauze and bung with hydrogencarbonate indicator. For the second mark they had to describe that the control would not contain organisms. Candidates who understood the use of a control often scored this second marking point only. The vast majority of candidates misunderstood the question and wrote about variables that could be controlled in the investigation. It was evident that some candidates were familiar with this type of investigation though, because they described the use of respirometers, gas syringes and manometers. These suggestions did not gain credit because they were not related to the method given in the question.

(ii) Describe a suitable control for this investigation.

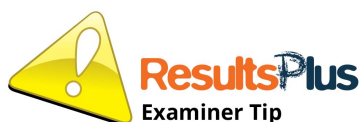
(2)

They would all need to be put in the tube for the same amount of time and controlled at the same temperature.



This candidate has misunderstood the question and has written about two variables to control.

A suitable control would be the **same** test tube, gauze, bung and hydrogencarbonate indicator, but **no** living organisms.



Many biology investigations use a control. The control lets you check that the results of the investigation are due to the independent variable. In this investigation the independent variable is the presence of living organisms, so the control does not have any living organisms.



## Question 6 (b) (i)

In this question candidates had to interpret data about the change in colour of hydrogencarbonate indicator and link this to germinating and dried peas. Many candidates repeated part of the stem of the question by referring to germinating peas containing more carbon dioxide, or that more carbon dioxide was present. To score marks candidates had to explain that germinating peas produce carbon dioxide and then link this to respiration. Candidates tended to be awarded the mark for referring to respiration more often than the mark for 'produce carbon dioxide'.

It was worrying that a minority of candidates thought that there were 'germs' on the peas and that these organisms were responsible for the changes seen in the indicator.

- (b) Hydrogencarbonate indicator changes from red to yellow when more carbon dioxide is present.

The results for this investigation are shown in Figure 11.

organisms	colour of hydrogencarbonate indicator
germinating peas	yellow
dried peas	red
mealworms	yellow

Figure 11

- (i) Explain why the result for the germinating peas is different from the result for the dried peas.

(2)

In germinating peas there is more  
Carbon dioxide present.



This answer does not score a mark. The candidate has repeated information from the stem of the question. There are no comments about germinating peas producing carbon dioxide because they respire.

- (i) Explain why the result for the germinating peas is different from the result for the dried peas.

(2)

it is different as the dried pea is not ~~using~~ ~~any~~ producing any carbon dioxide but the germinating pea is as it is using oxygen while germinating and then producing carbon dioxide.



**ResultsPlus**  
Examiner Comments

In this answer the candidate understands that germinating peas produce carbon dioxide. However, there is no explanation of how the carbon dioxide is produced, so just one mark is scored.



**ResultsPlus**  
Examiner Tip

Remember: if the command word in the question is **explain**, you must say how or why something happens.

## **Question 6 (c)**

This extended open-response question asked candidates to explain how the structure of red blood cells and white blood cells is related to their function.

The level of the response was determined by the functions given in the response. The mark within the level was determined by the linkage between structure and function.

A Level 1 response required candidates to give a simple reference to one function or structure of a red blood cell or a white blood cell. Linking one structure to a function allowed a mark at the top of Level 1 to be awarded.

A Level 2 response had to include a reference to at least two functions related to red blood cells or white blood cells. Linking two structures to their functions allowed a mark at the top of Level 2 to be awarded.

A Level 3 response had to include a detailed reference to at least three functions related to red and white blood cells. To score a mark at the top of Level 3 required the structure of a red blood cell and a white blood cell to be related to their function.

A large proportion of candidates scored marks for referring to red blood cells transporting oxygen and white blood cells fighting disease. There were many comments about the shape of red blood cells, but these were not usually linked to increased surface area or absorbing and releasing oxygen more quickly. Knowledge of white blood cells was less well developed than knowledge about red blood cells.

\*(c) Carbon dioxide is carried in blood plasma.

Human blood also contains red blood cells and white blood cells.

Explain how the structure of red blood cells and white blood cells is related to their function.

(6)

The structure of red blood cells are shaped with a biconcave so they have a larger surface area for osmosis and diffusion. they have thin walls so they can diffuse carbon dioxide easily and quickly. They are also thin so they can fit through smaller gaps to transport around the body. White blood cells also have a thin shape. They have a thick wall to keep their structure.



**ResultsPlus**  
Examiner Comments

In this answer the candidate has linked the biconcave shape of red blood cells to a larger surface area. The candidate has also mentioned that red blood cells are small, but this feature has been linked to fitting 'through smaller gaps' instead of movement through capillaries. There is no information about white blood cells.

Linking one structure to a function is a Level 1 response scoring two marks.



**ResultsPlus**  
Examiner Tip

The question asks about red blood cells and white blood cells, so make sure that you refer to both in your answer.

\*(c) Carbon dioxide is carried in blood plasma.

Human blood also contains red blood cells and white blood cells.

Explain how the structure of red blood cells and white blood cells is related to their function.

(6)

Red blood cells carry oxygen  
Red blood cells have no nucleus  
Which gives more space to carry oxygen  
~~White blood cell~~  
lymphocyte is in white blood cells  
which releases antibodies which has  
specific shape to attack the pathogens  
White blood cells also phagocyte  
which engulfs the pathogens



**ResultsPlus**  
Examiner Comments

In this response the candidate has listed several functions of red blood cells and white blood cells. This has allowed the candidate to access Level 3, but since there are no links between structure and function for red blood cells and white blood cells, the mark scored is at the bottom of Level 2.

## Paper Summary

Based on their performance on this paper, candidates are offered the following advice:

- 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 construct an answer but avoid repeating the information which has already been given, and giving vague responses that 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 mark available.
- Use accurate scientific terminology in responses.
- Always show mathematical workings when doing calculations as a mark may be awarded for an error carried forward.
- Think about the structure of the answer to the extended open-response questions before starting to write. This is to ensure that the answer shows clarity of writing, 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>

