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Examiners' Report
June 2023

GCSE Biology 1BI0 2F

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June 2023

Publications Code 1BI0_2F_2306_ER

Introduction

Paper 1BI0_2F is taken by candidates who have followed the GCSE Biology specification.

The paper consists of 100 marks assessed by a mixture of different question styles, including multiple-choice questions, short answer questions, calculations and two extended open-response questions. All questions should be answered in the allowed time of 1 hour 45 minutes. The extended open-response questions are identified by an asterisk (*) in the question paper to indicate that marks are also awarded for the ability to structure a response logically.

The Biology papers assess aspects of working scientifically and mathematical skills, the requirements of which are given in the specification.

There are eight core practicals in the Biology content which must be completed prior to sitting the examination.

Paper 1BI0_2F assesses content from Topic 1 and Topics 6 – 9. The 2023 paper covered areas of the specification including: feeding relationships, the carbon cycle, enzymes, global warming, food security, the heart and circulation, hormones, the menstrual cycle, contraception, the kidney, the nephron, biodiversity, surface area to volume ratios, diabetes and blood glucose concentration, Type 2 diabetes, respiration, and homeostasis. The extended open-response questions were based on a leaf structure related to photosynthesis and investigating the effect of speed on an athletes carbon dioxide production.

Questions assessing practical skills included testing for glucose, ecological sampling, calorimetry and respiration.

Mathematical skills tested included interpretation of data from tables and graphs, fractions, calculating pressure, drawing a regression line and surface area to volume ratios.

There were several questions that tested candidates' ability to apply their knowledge to different situations but in these cases, all the information needed to lead candidates to the required responses was supplied in the stems of the questions.

Candidates could benefit from practising reading the stem carefully 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 as well as annotating and writing key words by the question for extended prose responses.

The more straightforward questions where marks could be gained by interpreting given information were answered reasonably well, although some candidates had difficulty in expressing themselves. It was pleasing to see a few examples of good, coherent answers that covered the main points outlined in the mark scheme.

It was encouraging that some candidates used the scaffolding provided to guide their responses. Even when candidates scored low or no marks there was clear use, by a reasonable number of candidates, of using the diagrams, graphs and information in the stem of the question to guide their responses. As in past years, some candidates confused the requirements for describe with the requirements for explain. Explain items were often only partly answered as the candidate had only included a description in their response. It was also not uncommon to see a question using the command word describe being extended to include an explanation.

It was pleasing to see that almost all questions were accessible to candidates with comparatively few blank responses seen. It was also pleasing to see very little evidence where candidates had 'given up' before the end of the paper.

Question 1 (a)(ii)

This item required candidates to apply their knowledge of the carbon cycle to select words from a box to complete two sentences. The item showed reasonable discrimination with few candidates achieving no marks and just under half gaining either 1 or 2 marks. Common errors included saying that the buffalo gains carbon from the energy it eats.

Question 1 (a)(iii)

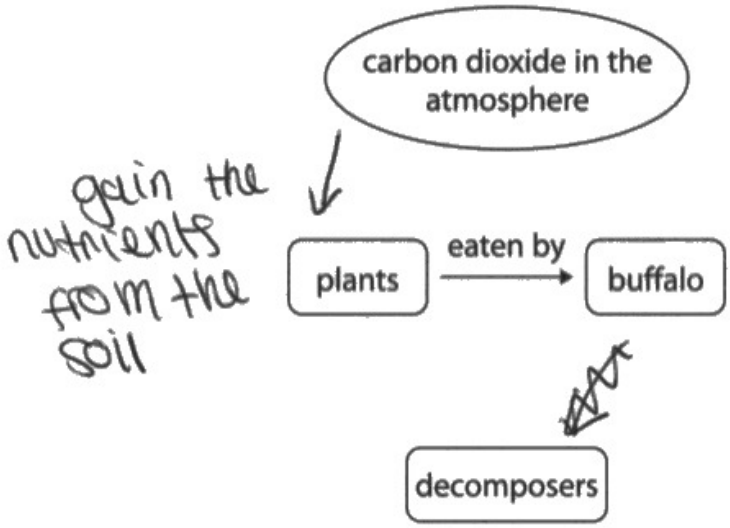
To gain marks here, candidates had to draw an arrow on figure 2 and label it with the word photosynthesis to show the process by which plants make glucose from carbon dioxide. The arrow needed to be drawn from the atmosphere to the plants.

It was disappointing that only 30% of candidates scored here with many candidates drawing more than one arrow, often nowhere near the plant, instead of just one as instructed. Other non-compromising arrows were ignored but a significant number of candidates lost their marks by drawing on other arrows labelled photosynthesis.

(iii) Figure 2 shows part of the carbon cycle.

Draw and label an arrow on Figure 2 to show the process plants use to make glucose from carbon dioxide.

(2)



ResultsPlus
Examiner Comments

This item scores just one of the two marks available for drawing an arrow correctly from the atmosphere to the plant. The label is incorrect so the second mark is not awarded.

ResultsPlus
Examiner Tip

The clue here is the process plants use to make glucose. Think of a plant process, and at least put that down rather than gains the nutrients from the soil for an arrow going from the atmosphere to the plant.

Question 1 (b)

This item required candidates to explain how boiling an enzyme stops it from digesting a protein. The candidates were supplied with a diagram of an enzyme and a protein which had complimentary shapes. This item discriminated well with roughly one third of candidates scoring 0, 1 or 2 marks. Most candidates gained their marks by stating that the enzyme denatures which changes the shape of the active site. Mark Point 3, the substrate cannot fit into the active site was seen less often. Candidates that did not score either gave very vague responses or talked about the protein changing shape which was incorrect as the stem stated it was the enzyme that was being boiled.

(b) Enzymes are used to digest proteins.

Figure 3 shows an enzyme and a protein.

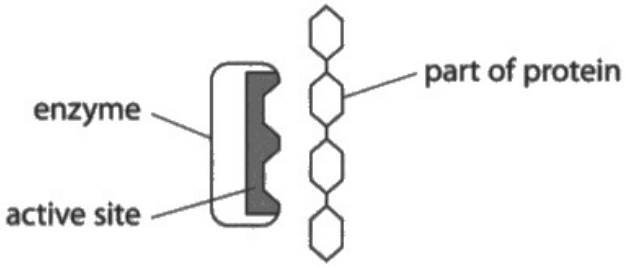


Figure 3

Explain how boiling the enzyme stops the protein being digested.

(2)

The enzyme denatures because of the heat and can not ~~complete digest~~ complete the reaction

ResultsPlus
Examiner Comments

A good start for 1 mark, but the last part is too vague for credit.

ResultsPlus
Examiner Tip

Try to be as specific as possible. Use the clues given, here the diagram showing the complimentary shape of the enzyme and the protein as well the active site being labelled, both clues to gaining the second mark.

Question 2 (b)(i)

Candidates had to extract information and make two conclusions from a bar chart and compare the monthly actual rainfall with the average rainfall for the last ten years for an area of England. Some candidates gave vague responses with some comparing actual rainfall with other actual rainfall or average with average leading to about one third of candidates not scoring. Again good discrimination was seen. Candidates that scored tended to get marking point 1, overall there was less rain in 2022 or that February was the only month when actual rainfall was higher than the average for the last ten years.

(b) Figure 4 shows the rainfall for one area in England for part of 2022.

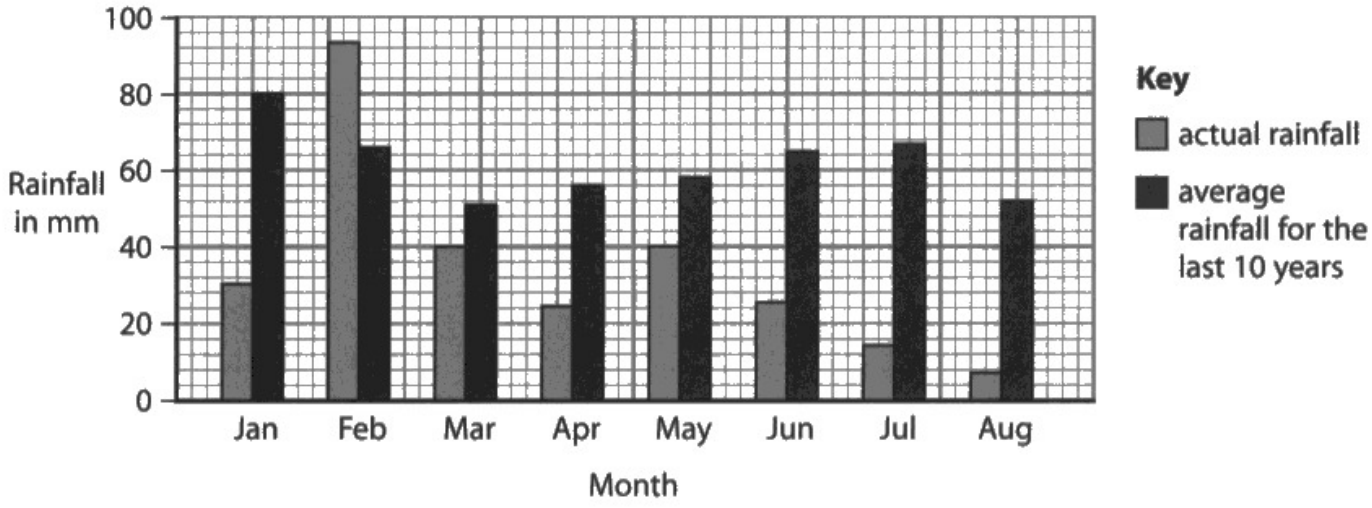


Figure 4

(i) State **two** conclusions about the actual rainfall compared with the average rainfall shown in Figure 4.

(2)

1 The actual rainfall is alot lower in 2022 compared with the average rainfall.

2 The rainfall was unpredictable because all the months had lower than average, except february which was higher.

ResultsPlus
Examiner Comments

A good answer with a general comparison and a specific one to gain both available marks.

ResultsPlus
Examiner Tip

There is a lot of data here. Make sure that you read the question carefully so that you are sure that you are choosing the right pieces of data to base the conclusion on to gain credit.

(b) Figure 4 shows the rainfall for one area in England for part of 2022.

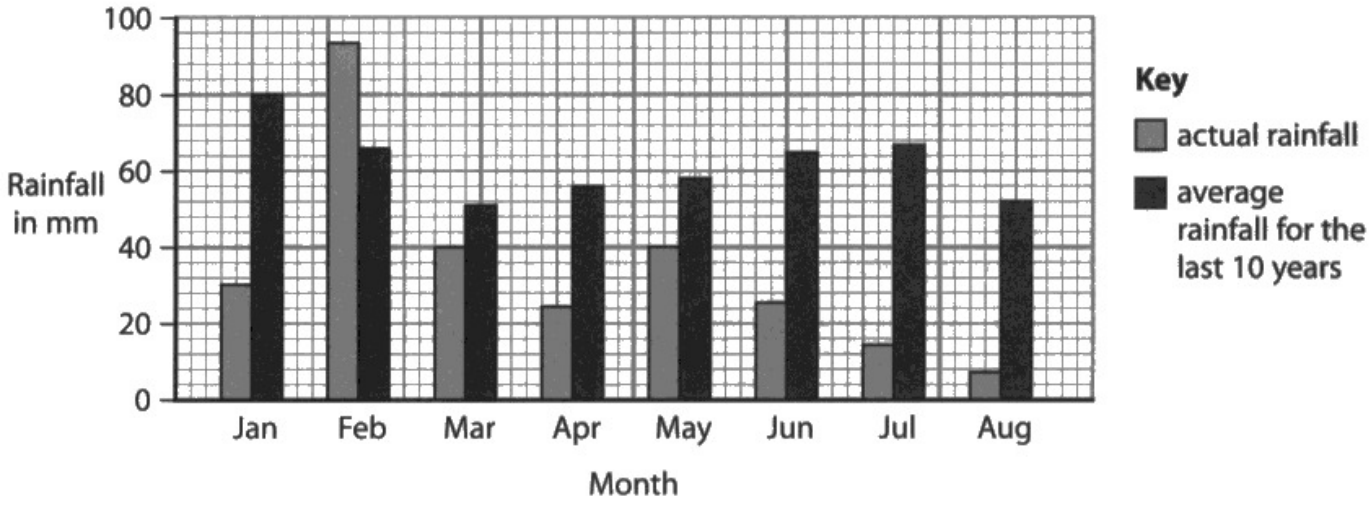


Figure 4

(i) State **two** conclusions about the actual rainfall compared with the average rainfall shown in Figure 4.

(2)

1 A lower average of actual rainfall in 2022 than the last 10 years.

2 Lower rainfall links back to global warming.

ResultsPlus
Examiner Comments

One mark scored here for actual rainfall is lower than average.

ResultsPlus
Examiner Tip

The second statement here does not answer the question but tries to explain the first. If the instruction is to state two conclusions, then pick two, and write each one out separately.

Question 2 (b)(ii)

Candidates had to calculate the yield in 2022 having been told that the average yield is 44 tonnes and the drought had caused the yield to fall by one quarter. Just over half of the candidates gained both marks here with about one quarter of candidates working out that one quarter of the normal yield was 11 tonnes but then failing to take the 11 tones away from 44 tonnes to give the actual yield for the year as 33 tonnes.

(ii) The average potato yield for a field is 44 tonnes.

The weather in 2022 meant that the actual yield for this field was one quarter lower than this average.

Calculate the actual yield of potatoes for this field in 2022.

(2)

$44 \div 4 = 11$

$44 - 11 = 33$

33 tonnes

ResultsPlus
Examiner Comments

A nicely set out response gaining both marks available.

ResultsPlus
Examiner Tip

Set out any calculations neatly and clearly so the examiner can see where marks can be allocated.

Question 2 (b)(iii)

Some excellent answers were seen here with about three quarter of candidates scoring by explaining how reduced yields could affect food security with the majority scoring one or two marks. Many candidates forgot to state how food security would change, eg reducing food security, gaining their marks by stating less food is available and a consequence of that, eg prices of food then rise. The UN definition of food security was included so stating not enough nutritious food, which is part of the definition was insufficient for credit, but not getting the nutrients a person needs to be healthy was credited.

(iii) Food security occurs when all people are able to access enough safe and nutritious food to meet their requirements for a healthy life.

Explain how lower yields of potatoes and other crops could affect food security.

(3)

If there is lower yield not as many is produced. Therefore there will be a lack of food for humans and ~~creatures~~ creature ~~like~~ Then ~~potatoes~~ less people will ~~get~~ not get the right foods for nutrients they need

ResultsPlus
Examiner Comments

This response gains two marks for less food is available and people would get less nutrients.

ResultsPlus
Examiner Tip

This response gives a definition of food security so there will be no marks for just copying parts of it. However, rephrasing it to not get enough nutrients gains a mark for understanding what the definition says about nutritious food.

(iii) Food security occurs when all people are able to access enough safe and nutritious food to meet their requirements for a healthy life.

Explain how lower yields of potatoes and other crops could affect food security.

(3)

not enough food produced

It might decrease food security

ResultsPlus
Examiner Comments

This gains two of the three marks available for simply stating that less food will be available but also answering the question saying that food security will fall.

ResultsPlus
Examiner Tip

Make sure you have answered the question, here it asks how lower yields will affect food security so an easy mark is stating food security will decrease.

Question 3 (a)(i)

Less than one fifth of candidates scored here, possibly because they did not realise that the aorta is still called the aorta after it has left the heart.

Question 3 (b)

Q03(b) tested the mathematics skill of reading two blood pressures from the graph and finding the difference. The majority of candidates scored both marks or none with just a few reading the graph from where it started rather than the maximum, thus gaining just 1 mark.

(b) Figure 6 shows the pressure of blood flowing through the arteries, capillaries and veins of a person.

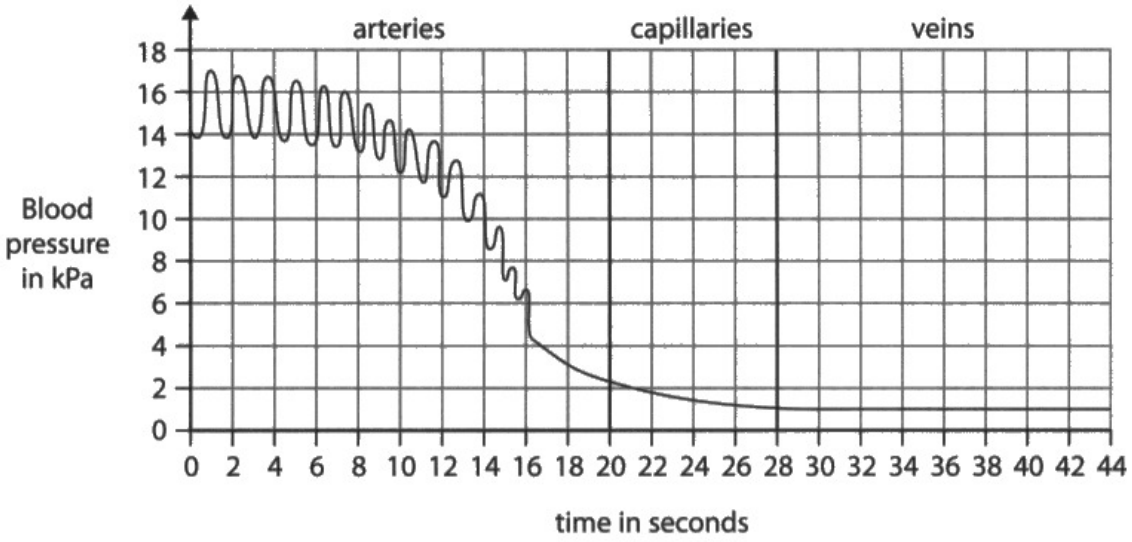


Figure 6

Calculate the difference in blood pressure from the maximum in the arteries to the minimum in the veins.

(2)

17 - 1 =

16 kPa

ResultsPlus
Examiner Comments

This gains both available marks, the readings from the graph being 17 and 1 with the difference being 16.

ResultsPlus
Examiner Tip

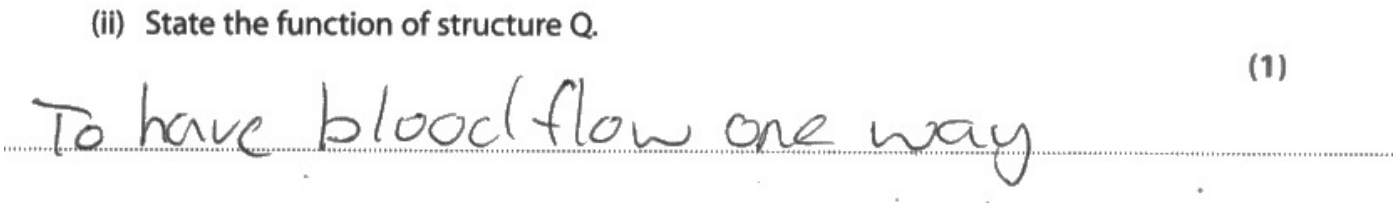
Take care with how you write figures. Here the 1 in 17 looks like a 2 so could easily be 27. However comparing it to the 1 and the 1 in the 16 it can be taken as 17, so both marks can be awarded.

Question 3 (c)(i)

Candidates were presented with a diagram of a valve in a vein and told that this was a vein with blood cells. It was therefore disappointing that almost two thirds of candidates failed to score with not uncommon responses identifying the valve as a root hair cell.

Question 3 (c)(ii)

The candidates were then asked to state the function of the structure that they should have identified as a valve. It is interesting that some of those candidates that said it was a root hair cell gave the correct function of a valve as stopping backflow of blood. Roughly twice as many candidates gained the mark for stopping backflow of blood than could identify the structure as a valve.



ResultsPlus
Examiner Comments

A basic answer that gains the available mark.

ResultsPlus
Examiner Tip

If you give an answer like this right after getting the linked one wrong, think, it can't be a root hair cell so I better go back and change my answer to something else.

Question 3 (d)

Candidates were asked to describe how the heart causes the blood to move to the lungs.

This proved to be an easy one mark with about half the candidates stating that the heart contracts / beats or pumps/pushes blood to the lungs. The 'beats' being a generous acceptable alternative to contract. Three marks was not common but seen regularly with candidates saying the heart **contracts** / **beats**, which **pumps** / **puts pressure** on the blood / forces blood out of the heart, down the **pulmonary artery** to the lungs.

(d) Describe how the heart causes blood to move to the lungs.

(3)

When the heart beats, muscles inside the heart contract to force blood out of the heart, then relax to let de-oxygenated blood into the heart. The process repeats many times a minute to ensure a constant blood flow to important organs, including the lungs. The de-oxygenated blood travels through the left atrium into the lungs due to the heart's contraction of muscles.

ResultsPlus
Examiner Comments

A good understanding at foundation level of how the heart moves blood around the body.

ResultsPlus
Examiner Tip

Learn sequences like this for many processes in biology. Number the steps and you will find it easier to recall them when you need the information.

(d) Describe how the heart causes blood to move to the lungs.

(3)

The heart causes blood to move to the lungs by pumping blood through the veins.

ResultsPlus
Examiner Comments

A basic understanding worth 1 mark. To get more marks, some of the structures outlined in the specification need to be learnt.

ResultsPlus
Examiner Tip

Learn the names of the parts of the heart and other organs in the specification if you want to improve your total score.

Question 4 (a)

This was a relatively easy item with candidates required to join the hormone to the endocrine gland that secretes it; thyroxine to the thyroid gland and adrenaline to the adrenal glands. Most candidates scored full marks on this item.

Question 4 (b)(i)

For this item figure 8 presented the candidates with a graph/diagram showing the changes in uterus thickness, levels of oestrogen and progesterone as well as the thickness of the uterus lining.

Q04(b)(i) asked candidates to state the effect on the follicle caused by the peak in oestrogen.

Candidates needed to look at when the oestrogen peaked and relate that to the follicle which shows an egg being released.

Under a third of candidates scored this mark saying ovulation occurs / an egg is released. Candidates that did not score talked about the follicle getting larger, which happens as the oestrogen levels increase or couldn't relate the diagram to ovulation and talked about the follicle breaking up or talked about the uterus lining.

(b) Figure 8 shows some of the changes that occur during the menstrual cycle.

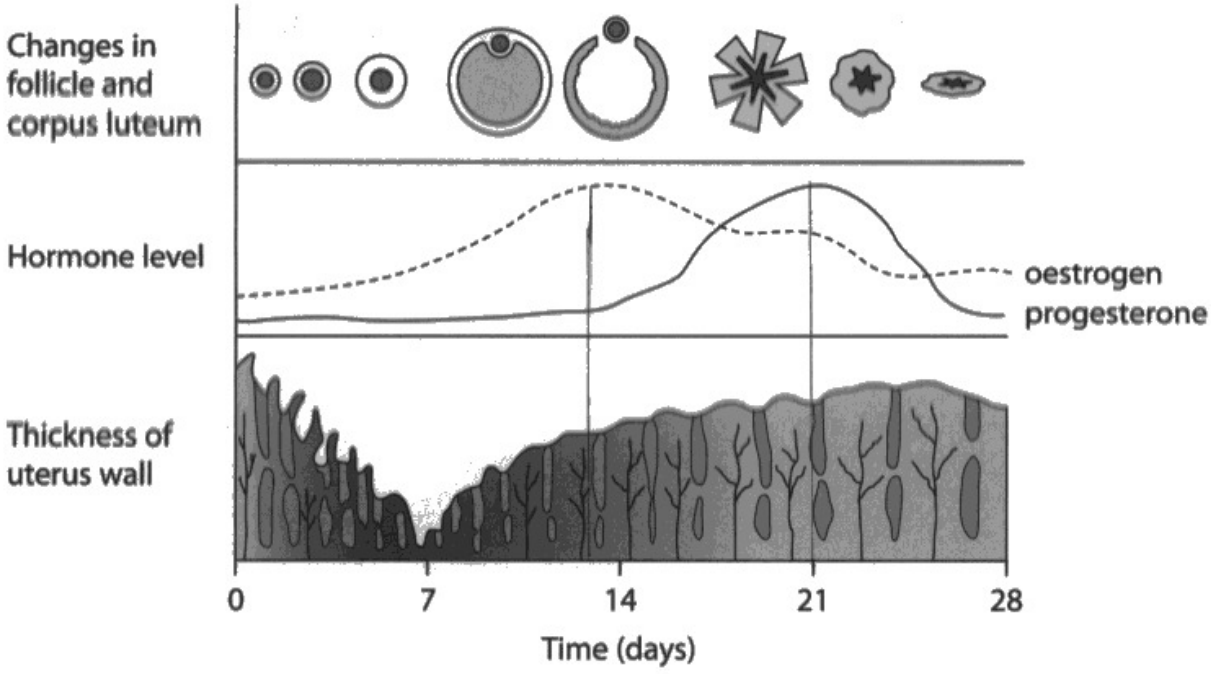


Figure 8

(i) The level of oestrogen peaks on day 13.

State the effect on the follicle caused by the peak in oestrogen.

(1)

In the peak in oestrogen, follicle broke and release egg.

ResultsPlus
Examiner Comments

A nice foundation type answer for 1 mark for describing ovulation.

ResultsPlus
Examiner Tip

When presented with an interpretation of a diagram, as shown here, just saying what you see is often mark yielding.

Question 4 (b)(ii)

Candidates were provided with the information here in Figure 8 showing the hormone levels for oestrogen and progesterone as well as the thickness of the uterus wall. The skill was to firstly use the progesterone level and then match the changes there from day 13 to day 21 with the changes in the thickness of the uterus lining. Candidates that scored just one mark tended to state that the uterus lining thickened but did not relate this to the increasing level of progesterone.

A one mark response that does not address the cause of the thickening of the uterus lining with the increasing levels of progesterone. However, they do refer to from day 13 to day 21.

(ii) Describe the effect of progesterone on the uterus lining from day 13 to day 21.

(2)

theres a huge in crease from day 13 to day 21 it reaches its highest point

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Examiner Comments

It is good to see this candidate referring to the days stated in the stem of the question in their response. Many candidates that did this drew lines up from the 'x' axis to help them see the days to which they needed to refer. Both good practices that highlight the parts of the information on which to focus.

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Examiner Tip

A two mark question means that two points need to be made. Ensure that you read the question carefully so that you address it fully to gain both marks.

Question 4 (c)

Q04(c) asks the candidates to state one advantage and one disadvantage of using a condom as a barrier method of contraception.

About half of the candidates scored 1 mark with about one quarter scoring 0 and 2 marks. More candidates gained the disadvantage mark than the advantage mark. Candidates lost the advantage mark by giving vague comments about effectiveness with some stating the effectiveness for both the advantage and the disadvantage. Other candidates stated that condoms stopped the woman getting pregnant which is not an advantage of the method of contraception but a definition of contraception. Others lost the mark by saying it prevents diseases instead of being specific eg protects from STIs. Some candidates gave a disadvantage as it does not always work, where we again were looking for a more specific response, eg condoms can split.

(c) The condom is an example of a barrier contraceptive.

State **one** advantage and **one** disadvantage of using this barrier method of contraception.

(2)

Advantage

It stops the semen and sperm from getting into the vagina (pregnancy)

Disadvantage

the barrier can always break or fall of during intercourse.

ResultsPlus
Examiner Comments

A common error mistaking the reason for using a condom with an advantage of using condoms compared to other contraceptives. The disadvantage gains one mark.

ResultsPlus
Examiner Tip

Read the question carefully, this does not say how does a condom stop pregnancy, it is asking you to say why using condoms as a contraceptive is better than using other methods of (barrier) contraception.

Question 4 (d)

It was pleasing to see responses that covered all marking points on the mark scheme including thickens mucus so that sperm can't reach the ovum to fertilise it. The majority of candidates that scored here, did so by stating that the pill contains progesterone which prevents oestrogen or the pill prevents ovulation for one mark, with many of these candidates adding the explanation so sperm can't fertilise the ovum.

The ovum is already formed, with the pill stopping development and release, and so this response does not gain credit.

(d) The contraceptive pill is an example of a hormonal method of contraception.

Explain **one** way that the contraceptive pill stops a woman from becoming pregnant.

(2)

It staps the egg forming.

ResultsPlus
Examiner Comments

This is a two mark question and so candidates should be trained to state two points.

The command word is 'Explain' and therefore a conjunctive adverb should be used. Therefore or so would be appropriate to address the second point eg "so sperm and egg can't join' and would have gained the second mark.

ResultsPlus
Examiner Tip

If the question states two marks are available, make sure you state two points so that you have the opportunity to score both of the marks available.

A clear, detailed response that explains the effect of thicker mucus to answer the question set, which gains the two marks available.

(d) The contraceptive pill is an example of a hormonal method of contraception.

Explain **one** way that the contraceptive pill stops a woman from becoming pregnant.

(2)

The contraceptive pill forms a sticky mucus around the entrance to the uterus. By doing this it prevents any sperm being allowed to enter and get the female from being pregnant.

ResultsPlus
Examiner Comments

As the command word is 'explain', the response has to, as illustrated here, link the effect with a reason.

ResultsPlus
Examiner Tip

The clearer you make your ideas, the more likely you are to gain marks available as the examiner can see what you mean and credit your response.

Question 5 (a)(i)

Q05(a)(i) asked candidates to calculate the pressure in the glomerulus having given the pressure in the Bowman's capsule and how many times more it is in the glomerulus than the Bowman's capsule. It also tested the mathematical skill of rounding up to one decimal place.

Over half of the candidates gained both marks here with over a quarter of candidates gaining 1 mark. The latter tended to lose the mark for not rounding up the 7.28 kPa to 7.29 kPa.

5 Figure 9 shows a nephron from a kidney.

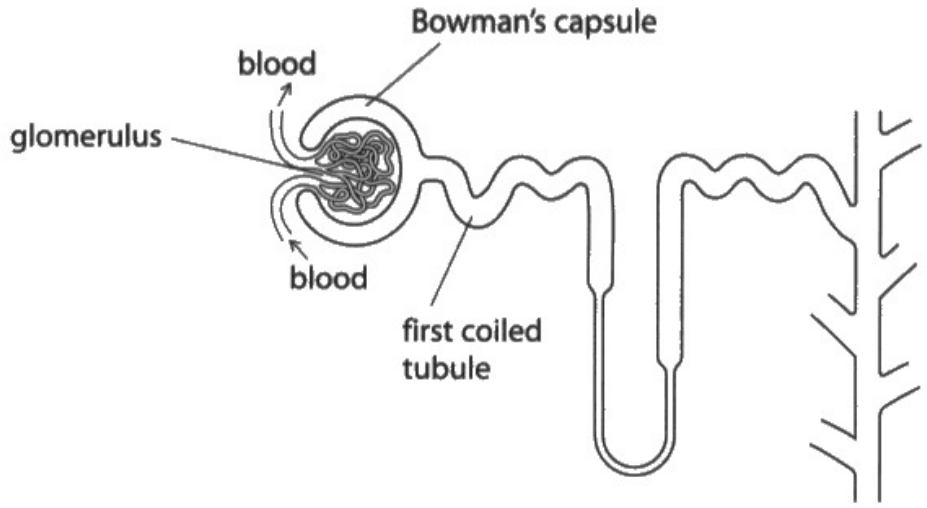

Figure 9

(a) The pressure of the liquid in the Bowman's capsule is 1.3 kPa.

The pressure of the liquid in the glomerulus is 5.6 times greater than the pressure in the Bowman's capsule.

(i) Calculate the pressure in the glomerulus.

Give your answer to one decimal place.

(2)

1.3 x 5.6 = 7.28

7.28 kPa

ResultsPlus
Examiner Comments

Just 1 mark scored here as the candidate did not round 7.28 up to 7.29.

ResultsPlus
Examiner Tip

Always check that your answers match the question. Particularly with maths questions that often ask you to give the answer to 1DP, 1SF, the nearest whole number etc.

Candidates should be trained to underline the part of the question to focus their mind on it, as well as draw their attention to it when they check if they have answered the question.

Question 5 (b)(i)

Candidates are generally, it seems, not very good at experimental procedures. Here the task is to describe how the equipment shown can be used to see if three liquids from different parts of the nephron contain different concentrations of glucose. One of the supplied items was a bottle with a stopper labelled Benedict's. It is disappointing that about one third of candidates could not even say add some Benedict's to each of the liquids and heat it up which would have gained two marks. Over a third of candidates scored no marks with roughly one tenth getting one mark, often for stating that you need to heat the Benedict's or put the different liquids in different test tubes. Over 40% of candidates gained three or four marks with some relatively good responses.

(b) A scientist investigated the concentration of glucose in liquids from three different parts of the nephron.

(i) Describe how the equipment shown in Figure 10 can be used to see if these liquids contain different concentrations of glucose.

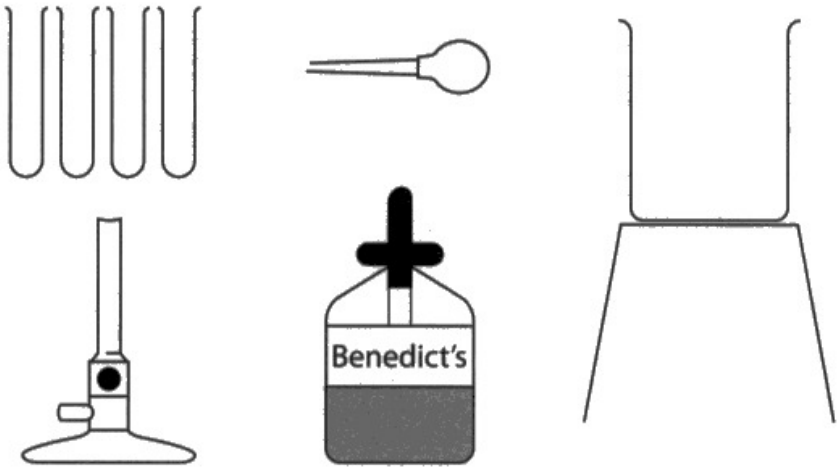

Figure 10

(4)

If you add drops of benedicts solution to one of the test tubes (each containing a liquid from one of the three parts of the nephron) and heat it up above the bunsen burner. The ~~reac~~ reaction you receive from each liquid will tell you the level of concentration of glucose.

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Examiner Comments

This is a good answer covering the basic method. The last mark could have been gained by describing the results that would show which liquid had the most glucose in it or by controlling a variable. If they had said 'three drops' of Benedict's instead of just 'drops' they would have scored full marks.

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Examiner Tip

In experimental procedure / devise a plan type questions there is invariably a mark for controlling a variable. Here the temperature or use a water bath / time heated / volume of nephron liquid / and volume of Benedict's solution are all fairly easy parameters to state. Remember the same 'amount' is not usually credited.

Question 5 (b)(ii)

To gain marks here, candidates had to look at the data in a table showing that the concentration of glucose in the Bowman's capsule of the nephron is the same, 8mmols per dm^3 as at the start of the first coiled tubule but had fallen to 0mmols per dm^3 by the end of the first coiled tubule. For one mark the candidate had to state that the concentration stayed the same in the Bowman's capsule **or** that the concentration had dropped from 8 to 0 mmol per dm^3 in the first coiled tubule. For the second mark the candidate then had to state either none had been (re)absorbed (into the blood / body) in the Bowman's capsule, or all had been (re)absorbed (into the blood) in the first coiled tubule. Around half of the candidates scored the first mark with only a few also stating where the glucose had gone for the second mark.

(ii) Figure 11 shows the concentration of glucose in the three different parts of the nephron.

	part of nephron		
	Bowman's capsule	start of first coiled tubule	end of first coiled tubule
concentration of glucose in millimoles per dm^3	8	8	0

Figure 11

Explain **one** conclusion that can be made from the data in Figure 11.

(2)

All of the glucose are absorbed in the first coiled tube as it starts at 8 then ends at 0

ResultsPlus
Examiner Comments

A nice succinct answer covering both marking points.

ResultsPlus
Examiner Tip

When presented with data in a table to analyse, the first thing to do is just state clearly the changes, or lack of them, in different parts. If possible quantify them as well.

Question 6 (b)(i)-(ii)

For Q06(b)(i), candidates had to draw a line showing the trend in data from the points plotted on a graph.

For 6(b)(ii) the candidate had to extrapolate to estimate the animal biodiversity in the area studied in 2022. A significant number of candidates did not understand the idea here as they drew vertical, horizontal and oblique lines that did not reflect the trend at all. For credit, the line drawn had to be roughly within the trend of the data but with at least four crosses on either side.

For Q06(b)(ii) a tolerance of + / – one small square was allowed. If the line was not drawn or not extrapolated, then a biodiversity between 0.65 and 0.8 was allowed.

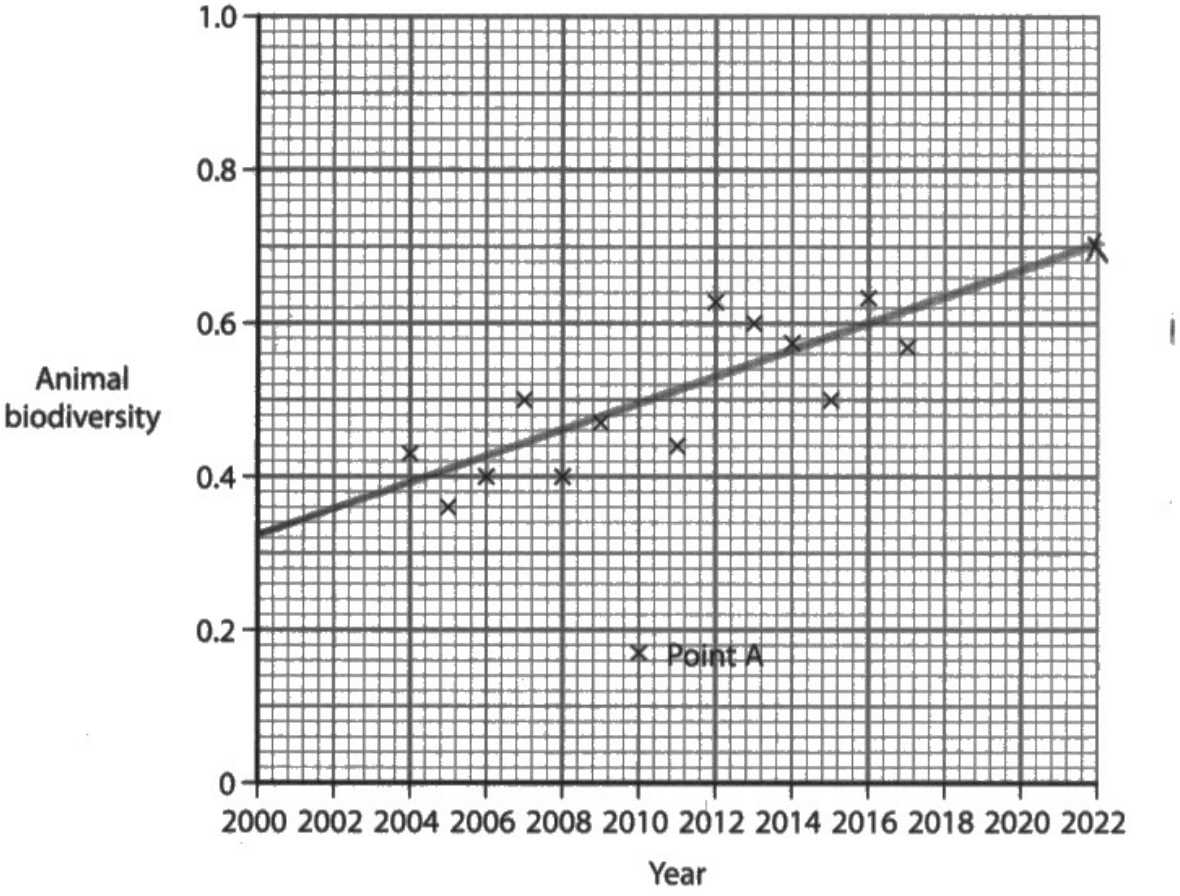
(b) The animal biodiversity in this reforested area was measured from 2004 to 2017.

Biodiversity is measured on a scale from 0 to 1.

0 = low biodiversity

1 = maximum biodiversity

Figure 12 shows the results.



(i) Draw a straight line of best fit on Figure 12 to show the main trend in this data.

(1)

(ii) Estimate the animal biodiversity of the reforested area in 2022.

(1)

0·7

ResultsPlus
Examiner Comments

Clearly a line that shows the trend with at least four crosses on either side for the mark for Q06(b)(i).

Although not shown here the mark for the biodiversity in 2022 was also awarded.

ResultsPlus
Examiner Tip

When drawing lines of best fit on a graph – draw with your finger the shape around most of the dots – here all but the one labelled point A. In this example you should get a flattened oval shape.

Then try to draw your line through the middle of the long part of the oval. Check to see if there are roughly the same distribution of points on either side of the line. If so, then your line is likely to be creditworthy.

Question 6 (c)(i)

Candidates are roughly split equally between 0, 1 and 2 marks here. To be credited, candidates had to suggest two ways that the quality of the results from the method used could be improved. The method was to put down 3 1m^2 quadrats in a randomly chosen area of the forest. Creditworthy changes to the method seen include to look at other areas of the forest and use more / larger quadrats, with very occasional responses of calculate a mean and very rarely look at animals on the trees as well.

(c) (i) The data to calculate animal biodiversity was collected using the following method.

- a 100 m^2 area was chosen
- three 1 m^2 quadrats were placed randomly on the ground
- animals inside the quadrat were counted
- the number of each species of animal was recorded

State **two** ways that the quality of the results from this method could be improved.

(2)

1 increase number of quadrats used

2 increase size of quadrats used so they cover a wider area

ResultsPlus
Examiner Comments

These two valid suggestions are basically the same point, sample more of the area and so only one mark was awarded here.

ResultsPlus
Examiner Tip

When making more than one suggestion / comment / improvement try to make them different so that they are not alternative ways of doing the same thing, here sampling more of the area chosen.

Question 6 (c)(ii)

The majority of candidates scored here with saying that point A was ignored because it was an anomaly / an outlier or that it was too different to the trend to be included.

Question 6 (c)(iii)

Q06(c)(iii) asked candidate to explain why the biodiversity might have been different if the data had been collected in the winter.

Almost two thirds gave good reasons why it would be different eg animals hibernate / migrate / stay deeper in the soil but only a few candidates went on to state that this would make the biodiversity lower.

(iii) The data shown in Figure 12 was collected during the summer.

Explain why animal biodiversity would be different if the data had been collected in the winter.

(2)

Because animals seek shelter in winter, lots of animals hibernate as well.

ResultsPlus
Examiner Comments

This covers the same point twice – less animals will be active and thereby less recorded.

ResultsPlus
Examiner Tip

When you get an explain question on why x would be different, don't forget to state how the parameter would be changed, eg here biodiversity would be lower.

(iii) The data shown in Figure 12 was collected during the summer.

Explain why animal biodiversity would be different if the data had been collected in the winter.

(2)

More animals hibinate in the winter so fewer animals will be outside so there would seem to be less biodiversity of animals

ResultsPlus
Examiner Comments

A better answer as it is extended to say how fewer animals 'about' would reduce the calculated biodiversity.

ResultsPlus
Examiner Tip

Make sure you make two points for a two mark question.

Question 6 (d)

The answers given here suggested that very few candidates had used a belt transect to sample species distribution or biodiversity, even though it is part of a core practical. Many candidates gained a mark for saying sample the plants growing in a sunny and shady area which was a very weak interpretation of using a belt transect. even then, the mean mark was 0.57 out of 3.

(d) A scientist observes that trees at the edge of a forest shade part of a field.

Describe how a belt transect could be used to see how light intensity affects the biodiversity of plants growing in the field.

* (3)

A belt transect can be used so that you can exame if there is less plant grown ~~on~~ in the shade or light part of the field

ResultsPlus
Examiner Comments

A very weak interpretation to gain one mark.

ResultsPlus
Examiner Tip

Ensure that you have covered all the core practicals and know the key words associated with each one as they will be tested in the exams.

(d) A scientist observes that trees at the edge of a forest shade part of a field.

Describe how a belt transect could be used to see how light intensity affects the biodiversity of plants growing in the field.

(3)

The scientist could lie the belt transect from the darkest point under the trees to the lightest point where the sun is. The scientist must then pick a plant eg daisy and place a quadrat as close to the start of the belt transect as possible. The scientist must now count the daisies in the quadrat, record the light intensity and flip the quadrat. The scientist must repeat until they reach the end of the belt.

ResultsPlus
Examiner Comments

A rare, good description of using a belt transect, including the use of a light meter for all three marks available.

ResultsPlus
Examiner Tip

When describing something like using quadrats or a belt transect don't forget to measure the abiotic factor if one is being investigated.

Question 7 (a)(ii)

This mathematical task was to express the surface area and the volume as a ratio.

Roughly half of the candidates scored here, with many failing to score because of mistakes when cancelling the numbers downs.

(ii) Species B has a surface area of 9000 μm^2 and a volume of 6000 μm^3.

Calculate surface area to volume ratio for species B.

(2)

9000 : 6000
900 : 600
90 : 60
9 : 6
3 : 2

9000 : 6000 =
450 : 3000
225 : 1500
45 : 300
9 : 60
3 : 20

ratio 3 : 2

ResultsPlus Examiner Comments

The correct answer gains both available marks.

ResultsPlus Examiner Tip

Take care, and use a calculator if you wish, to cancel the numbers down until you reach two whole numbers that will not cancel down any further to give you the ratio in its lowest whole number form.

Question 7 (a)(iii)

This item was harder than it needed to be because the surface area to volume ratios were given as 1:1 for species A and 1:4 for species C which confused a significant number of candidates. As a result only one third gained marks here.

(iii) The surface area to volume ratio for a cell of species A is 1 : 1.

The surface area to volume ratio for each cell in species C is 1 : 4.

Explain how the different surface areas will affect the diffusion of oxygen out of the cells of species A and species C.

(2)

~~Vicky~~ The cell with a larger surface area will cause the diffusion of oxygen out of the cell to be ~~to~~ quicker. This means that cell A would be much quicker.

ResultsPlus
Examiner Comments

An answer that gained both marks available.

ResultsPlus
Examiner Tip

There are two parts to this response: which cell will have the greater rate of diffusion and stating that diffusion will occur faster with a larger surface area to volume. State both parts clearly.

Question 7 (b)

This item required candidates to realise that algae, being photosynthetic, required light to survive. Candidates then merely needed to say if the algae float, they will get more light (for photosynthesis), just under one fifth of candidates gained the mark with those that did not score stating drowning, needing oxygen from the air, to float and avoiding predators as reasons to have gas in vacuoles.

(b) Some species of algae that photosynthesise have vacuoles that are filled with gas.

These vacuoles help the algae to float in water.

State how these vacuoles help the algae survive.

(1)

They store glucose to allow the algae to carry out photosynthesis, which is required to survive.

ResultsPlus
Examiner Comments

Here the candidate has realised that the answer relates to photosynthesis, but then stated to get glucose which is a product of photosynthesis not a requirement for it to take place.

Question 7 (c)

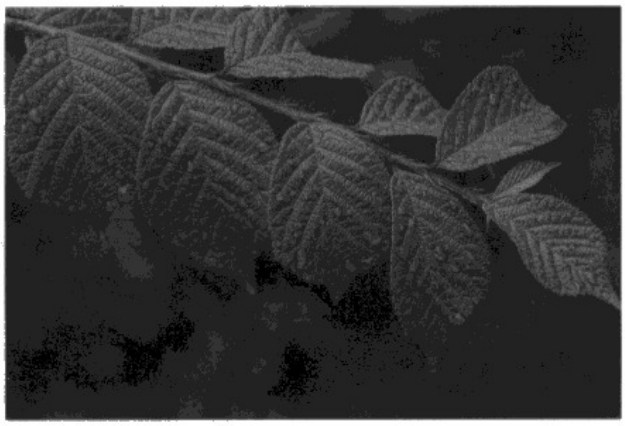
This 6 mark extended prose item required candidates to explain how leaves are adapted for photosynthesis.

The stimulus in figure 14 showed a branch of leaves that are hardly overlapping to give an idea to candidates. This level was driven by the adaptations stated with the mark within the level determined by linking the adaptations to an explanation / photosynthesis.

The item worked well for discrimination with reasonable proportions of candidates scoring across the board except for the disappointingly large number of candidates that scored 0 with no adaptations of leaves given.

Common creditworthy responses include being flat, large surface area, containing chloroplasts, chloroplasts being near the top of the leaf and stomata for gas exchange.

*(c) Figure 14 shows leaves on a branch of a tree.



(Source: © Butus/Shutterstock)

Figure 14

Explain how leaves are adapted for photosynthesis.

(6)

leaves have stomatas underneath which allows water to travel to the leaf. They hold lots of chloroplasts to convert more light energy. Have large surface areas to have more light hit them.

ResultsPlus
Examiner Comments

Three adaptations are stated gaining Level 3. There is not the explanations and reasons for the adaptations linked to photosynthesis to gain the upper mark for Level 3 and so 5 marks are awarded.

Question 8 (a)(i)

This graph interpretation item required candidates to compare the blood glucose concentrations of a person with diabetes with a person without diabetes.

Candidates scored well here with over 75% of candidates scoring marks. Most commonly stated differences were that the blood glucose concentration was higher than the person without diabetes all the time, their blood glucose level increased by more and did so quicker and took longer / was slower to fall. A few candidates also mentioned that the blood glucose concentration for the non-diabetic started to rise again before 4 hours after the meal.

8 People with diabetes cannot always control the concentration of glucose in their blood.

(a) Two people eat identical meals.

One person has diabetes, the other person does not have diabetes.

Figure 15 shows the concentration of glucose in the blood of these two people after eating the meals.

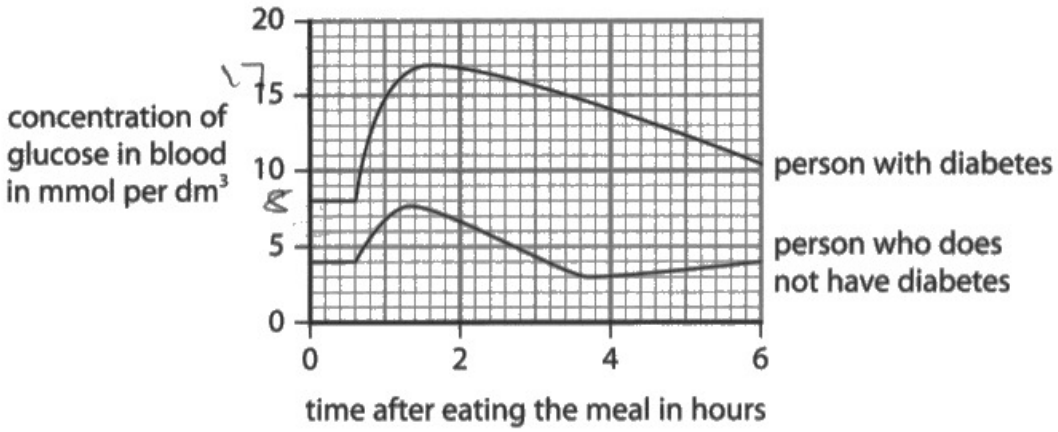


Figure 15

(i) Describe **two** differences in the concentration of glucose in the blood of the two people shown in Figure 15.

(2)

1 person with diabetes has a higher concentration of blood glucose.

2 The person who does not have diabetes has a lower concentration of blood glucose.

ResultsPlus
Examiner Comments

Here the candidate has made the classic error of giving the opposite argument for the two people as two separate points when they are the reverse of the same point. So only one mark is awarded.

ResultsPlus
Examiner Tip

Ensure that if you give two reasons as different points that they are not just opposite sides of the same coin.

8 People with diabetes cannot always control the concentration of glucose in their blood.

(a) Two people eat identical meals.

One person has diabetes, the other person does not have diabetes.

Figure 15 shows the concentration of glucose in the blood of these two people after eating the meals.

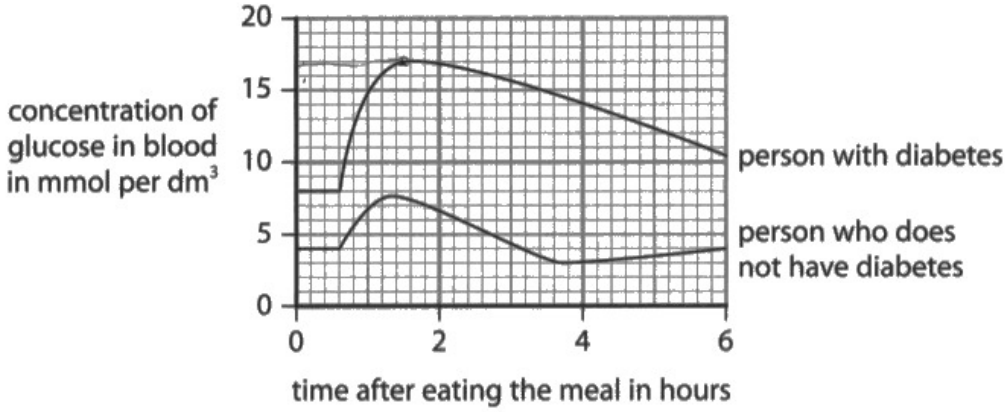


Figure 15

(i) Describe **two** differences in the concentration of glucose in the blood of the two people shown in Figure 15.

(2)

1 The concentration of glucose in Blood is much higher

2 ~~The~~ person with Diabetes increases much faster

ResultsPlus
Examiner Comments

The first point does not state to which person it refers so cannot be credited. The second point is creditable.

ResultsPlus
Examiner Tip

When you are comparing two things, make sure that you state to which one each refers.

Question 8 (a)(ii)

To score the available mark here, candidates had to read the blood glucose concentration before the meal and at its peak and find the difference. Most candidates that did not score the mark simply read and stated the peak level – 17 mmol per dm^3.

Those that did score took the starting point of 8 mmol per dm^3 away from this to give a rise of 9 mmol per dm^3.

Question 8 (a)(iii)

Candidates found this question hard and many lost marks because they did not express themselves clearly enough, for example stating high concentration instead of higher concentration.

As always with osmosis questions, candidates can either express the concentrations in terms of the solute or the water concentration.

Candidates confused the relative concentrations, but many also did not gain the relatively easy mark of saying 'the water moves by osmosis'.

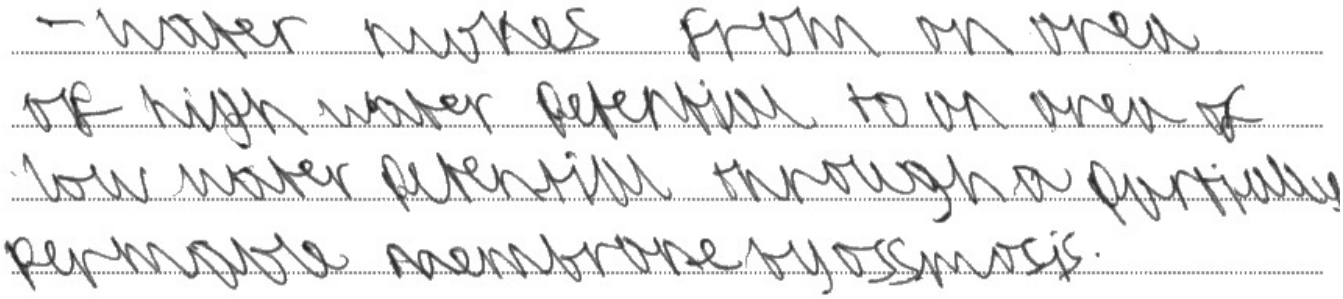
Only about 1 in 10 candidates scored any marks here with most gaining just 1 mark for Mark Point 1: the water moves by osmosis.

Although it was on the mark scheme, no references to water potential were seen on the foundation papers.

(iii) Water moved out of the red blood cells of the person with diabetes when the concentration of glucose in the blood was above 15 mmol per dm^3.

Explain why water moved out of the red blood cells of the person with diabetes.

(2)



ResultsPlus
Examiner Comments

This full response covers the three marking points gaining the candidate both marks available.

ResultsPlus
Examiner Tip

As soon as you see water moving into / out of cells think 'osmosis'. Then state that 'the water will be moving from where there is a high concentration of water to a low concentration of water,' and if possible, continue with 'across a partially permeable membrane'.

Question 8 (b)(i)

Candidates had to state that the hormone that causes the concentration of glucose in the blood to decrease is insulin.

Just over half of the foundation candidates answering this question gained credit for getting this correct.

Question 8 (b)(ii)

Q08(b)(ii) follows on from Q08(b)(i), insulin, asking how it is transported to its target organ.

Roughly half of candidates correctly stated in the blood (plasma) / through the arteries and veins. Common errors included in blood cells and a few candidates referring through the endocrine system.

(ii) State how this hormone is transported from the pancreas to its target organs.

(1)

by red blood cells

ResultsPlus
Examiner Comments

No mark awarded here for stating the wrong part of blood to transport insulin to its target organ.

ResultsPlus
Examiner Tip

Red blood cells = oxygen.

White blood cells = immune system.

Platelets = clot blood.

Everything else is transported in the blood plasma.

Question 8 (c)

This item required candidates to explain how type 2 diabetes can be controlled.

With the command word explain, at least one mark must give a positive consequence of the actions taken.

Over three quarters of the candidates scored marks here but most of them just gained one mark by stating more exercise, often coupled with the explanation to reduce blood glucose concentration. Whilst many referred to diet, a significant number of these were not specific enough to gain credit, eg have a healthy / better / balanced diet. Significantly fewer candidates gained marks by referencing testing blood for glucose levels and injecting insulin when needed.

(c) Explain how type 2 diabetes can be controlled.

(3)

exercise more often and eat a less fatty or sugary diet.

ResultsPlus
Examiner Comments

2 marks gained here by a specific reference to reducing fats / sugars in the diet and a general exercise more often.

ResultsPlus
Examiner Tip

When referring to a change in diet be specific, either refer to which parts of the diet should be reduced as stated here or refer to dieting to lose weight.

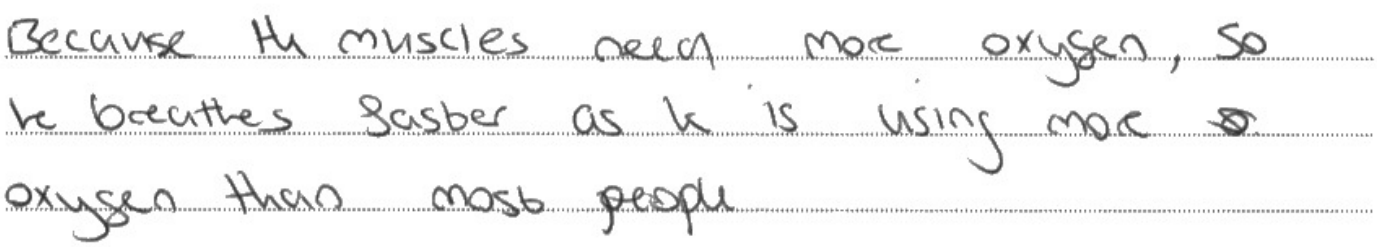
Question 9 (b)(i)

It was surprising to see many candidates missing out on linking more breathing to increased amounts of oxygen absorbed, with many just referring to when you breath you absorb oxygen. Roughly half of the candidates scored here with most scoring just one mark for absorb more oxygen / supply more oxygen with a few linking this to increased respiration. No answers referring to increased removal of carbon dioxide were seen.

(b) An athlete runs every day as part of their training.

(i) Explain why the breathing rate of the athlete increases when running.

(2)



ResultsPlus
Examiner Comments

The majority of candidates that scored, scored just one mark for more oxygen absorbed / transported in the blood / carried to the muscles as exemplified here.

ResultsPlus
Examiner Tip

Try to extend your answers. If you start by saying more of substance X then state why more of it is needed / how the extra amount of it will be used.

(b) An athlete runs every day as part of their training.

(i) Explain why the breathing rate of the athlete increases when running.

(2)

Because the oxygen intake has to increase, More oxygen is needed for a higher level of respiration because the body requires more energy.

ResultsPlus
Examiner Comments

A better response completing the story for two marks.

ResultsPlus
Examiner Tip

Explain is the command word here so make sure you give a reason / consequence of the initial point made as shown here.

Question 9 (b)(ii)

Q09(b)(ii) asks candidates to state two differences between aerobic and anaerobic respiration in the context of muscle cells. Less than 40% of candidates scored any marks here with the majority of these gaining 1 mark, commonly for stating aerobic uses oxygen. It is a pity that many candidates gave the second difference as anaerobic doesn't use oxygen instead of stating the difference in products. Those candidates that scored two marks did refer to carbon dioxide produced in aerobic against lactic acid in anaerobic respiration. Few, if any, candidates referred to Mark Point 2, the different amounts of ATP / energy released by the two types of respiration in muscles.

(ii) When the athlete is running, their muscle cells use both aerobic respiration and anaerobic respiration.

State **two** differences between aerobic respiration and anaerobic respiration.

(2)

1 Anaerobic respiration takes place without oxygen.

2 Aerobic respiration takes place with oxygen

ResultsPlus
Examiner Comments

An example of the same point being given twice, which was not uncommon gaining just one mark.

(ii) When the athlete is running, their muscle cells use both aerobic respiration and anaerobic respiration.

State **two** differences between aerobic respiration and anaerobic respiration.

(2)

1 Aerobic respiration [redacted] has the equation glucose + oxygen → carbon dioxide + water.

2 anaerobic respiration [redacted] has the equation glucose → lactic acid.

ResultsPlus
Examiner Comments

A clever way of gaining two marks giving the relevant chemical word equation showing the difference in reactants and products.

ResultsPlus
Examiner Tip

If you have learnt details such as the aerobic and anaerobic respiration equations, use them if and when applicable.

Question 9 (c)(i)

This item introduces BTB as an indicator for carbon dioxide. Candidates had to explain why BTB changed to yellow when someone breathed out into it.

To score here, candidates had to explain that BTB turned yellow because the carbon dioxide in the breath 'is acidic'. The majority of candidates scored here with the majority gaining one mark, mainly for stating that air breathed contained carbon dioxide.

(c) Bromothymol blue (BTB) solution is an indicator of pH.

Figure 16 shows the colour of BTB at different pH levels.

pH	4	5	6	7 (neutral)	8
colour	yellow	yellowy green	light green	green	blue

Figure 16

When air is passed through green BTB, for one minute, the solution stays green.

When a person breathes out through a straw into BTB for one minute the solution turns yellow.

(i) Explain why the air breathed out turns the BTB solution yellow.

(2)

because the person breathes out carbon dioxide which causes the solution to become more acidic and in doing so it turns yellow

ResultsPlus
Examiner Comments

A clear two marks here for linking carbon dioxide breathed out to being acidic which caused the colour change in BTB.

ResultsPlus
Examiner Tip

When faced with a question like this where you have to make links, think what do I know about air that is breathed out and then develop your thinking from there.

Question 9 (c)(ii)

This 6 marker, which scored less well than expected, required candidates to devise a plan to investigate the amount of carbon dioxide in the air breathed out of athletes running at different speeds.

The candidates were instructed to include how they would use BTB and control at least two variables.

The level driver was the 'workability' of the plan with the mark within level determined by the control of variables.

Although the majority of candidates scored marks here, it was disappointing that some could not access any marks by saying, for example, get an athlete to run at different speeds and then continue with and then breathe out through BTB.

Those candidates that did score gave a roughly even spread between all 6 marks available in this extended prose item.

*(ii) Devise a plan, using green BTB solution, to investigate the amount of carbon dioxide in the air athletes breathe out after they have been running at different speeds.

Include:

- how you would use green BTB solution.
- how you would control at least two variables.

(6)

you could get each athlete to run at different speeds, then record the results by getting each one to breathe through a straw into the BTB solution, then check the PH level to see how much carbon dioxide each athlete breathed out.

ResultsPlus
Examiner Comments

A comprehensive plan that covers the main aspects but due to lack of control of variables it only scores 5 marks.

ResultsPlus
Examiner Tip

When presented with a task like this, break it down.

Look at each part of the question, annotating if you can, to decide what are you going to change (here running speeds) what you are going to control (eg run for the same length of time / use the same volume of BTB), how will you use the BTB to measure the amount of carbon dioxide breathed out etc. This way a big problem becomes a series of small problem which you can answer / solve.

Question 10 (a)(ii)

Q10(a)(ii) is set in the context of using calorimeters to test the thermal retaining properties of different materials.

Candidates had to state one variable to control when measuring the change in temperature over time in the calorimeter filled with hot water and wrapped in different materials, namely wool and polyester.

Fewer than one quarter of candidates scored here with many that did stating the thickness of each material and starting temperature. Many candidates who did not score just stated the temperature, which of course was the dependant variable being measured.

It was disappointing that after many years of feedback that explains we don't credit amount of eg water, that the majority of candidates still state amount instead of volume or mass.

Few foundation candidates will have seen a calorimeter like this, but it should not have been difficult for them to understand how these work.

(ii) State **one** variable that should be controlled in this investigation.

(1)

- Make sure that the hot water for both beakers is the same temperature, for the start of the experiment.

ResultsPlus
Examiner Comments

A response that shows that this candidate understands what is going on and what to control.

ResultsPlus
Examiner Tip

When it comes to controlling a variable, think, what am I changing and what is being measured as anything else has to be kept the same.

Question 10 (a)(iii)

The idea of a control, ie a set-up which you compare other results to, is a hard concept for candidates when control is also used for which variables should be controlled.

For credit there are two requirements:

1. that the set-up is the same.
2. that the thing you are changing / investigating is not used.

To score here you need to say that the temperature change over the same time should be measured using the same set-up but with no insulation.

(iii) Describe a control that could be used for this investigation.

(2)

a beaker with no insulation around it to compare how fast the water cools with non on it

ResultsPlus
Examiner Comments

One mark is scored here for starting with no material / insulation wrapped around it.

The second mark is for having the same set-up, here the thermometer and lid are not mentioned and although the thermometer may be implied by seeing how fast the water cools it is not enough for crediting Mark Point 1.

Question 10 (b)(i)

Candidates were given two sets of results in a table, one for wool, as the insulator and one for polyester.

To score candidates had to compare and contrast the temperature change stating that temperatures in both fell, but polyester fell faster. This was made harder as the polyester set up started at higher temperature.

Most candidates that scored here stated that polyester cooled faster than wool, thereby gaining both marks.

(b) The results for this investigation are shown in Figure 18.

wool			polyester		
time in minutes	temperature in °C		time in minutes	temperature in °C	
0	64	-3	0	82	-8
2	61	-5	2	74	-4
4	56	-3	4	68	-5
6	53	-4	6	63	-4
8	49	-4	8	59	-6
10	45	-3	10	53	-5
12	42		12	48	

Figure 18

(i) Compare and contrast the temperature changes for wool and polyester in this investigation.

it is clear that wool tends to have a lower drop in temp per 2 minutes where as polyester seems to have a higher (2)

ResultsPlus
Examiner Comments

Both drop but the drops for polyester are larger being creditworthy is supported by the temperature drop for every two minutes for each material being written on the table.

ResultsPlus
Examiner Tip

When asked to analyse changes shown in a table, spend a little time in calculating things like the change for each one either overall, or for each step as the candidate has done on this table. This helps to see patterns and trends that are not always obvious when looking at the raw data.

Question 10 (b)(ii)

Candidates had to suggest an improvement that would make the results more comparable. Most candidates that scored stated to have both start at the same temperature, although some said run the investigation for longer until both are at the same end temperature.

(ii) State **one** improvement to this investigation that would make the results more comparable.

(1)

Starting both materials at the same temperature.

ResultsPlus
Examiner Comments

This is the scoring response seen most often.

ResultsPlus
Examiner Tip

Look for the obvious part of the investigation that made it harder for you to analyse the data generated and start thinking about how, and which parts, to modify.

Question 10 (c)(i)

This item neatly finishes with a consequence of the earlier work discussed, that when wearing a good insulating garment you may sweat to cool down. The item asked how does sweating regulate temperature.

Most candidates gained one mark here by stating that sweating cools you down whilst stronger answers explained how sweat cools you down through the water in it evaporating. Some candidates lost marks by saying the heat evaporated, but overall a good understanding of how sweating cools you down was frequently seen.

(c) (i) Wearing an insulated jacket may cause a person to sweat.

Explain how sweating helps to regulate temperature in humans.

(2)

After a person sweats, their sweat evaporates using the ~~hot~~ heat inside our body and this evaporation is what causes our body temperature to cool down because the heat left the body in the gas evaporated.

ResultsPlus
Examiner Comments

Both available marks are scored here with the link to sweat evaporating to remove heat from the body for both available marks.

Question 10 (c)(ii)

Foundation candidates found this last question hard and few accessed it for marks. Less than 10% of candidates scored 1 mark here with even fewer gaining both marks. To score candidates had to merely state that urea is made in the liver from excess amino acids. Most candidates stated in the kidney with a few of these saying from excess proteins / amino acids.

(ii) Sweat contains urea.

State where and how urea is produced in the human body.

(2)

Urea is a waste product of the breakdown of excess amino acids in the liver.

ResultsPlus Examiner Comments

A good answer succinctly addressing both marking points gaining two marks.

(ii) Sweat contains urea.

State where and how urea is produced in the human body.

(2)

urea is found in the kidneys of the body and can be produced by the bladder.

ResultsPlus Examiner Comments

A common error confusing where urea is filtered from the body and stored, with what it is made from and where it is made.

Paper Summary

Based on their performance on this paper, candidates should:

- Ensure that they read the question carefully and follow the instructions given, for example if the instruction is to draw one arrow on the diagram, don't draw more than one.
- Recognise that 'describe' requires candidates to give an account of something or to compare or say how information in a diagram, a table or graph changes.
- Remember when describing a trend in a graph to refer to data at key points where changes occur.
- Recognise that the word 'explain' means additional scientific information is needed that is linked to the answer, giving a justification or reason.
- Use all the information given in the question to help them construct their answer but avoid just repeating the information given.
- Learn the structures required by the specification points so that they can apply them to the start of their responses as this then allows them to develop their answer more easily.
- Consider the context of the question to ensure they apply their scientific knowledge to the question being asked.
- Spend more time practising the different types of calculations that are set eg rates and percentages. A full list of the types of mathematical skills expected is listed in appendix 1 in the specification.
- Develop their practical skills knowledge to ensure they can answer questions in detail on all the practical activities outlined in the specification, including planning an investigation.
- Check the number of marks given for the question and ensure that they have included enough facts to match the marks available.
- Think about the structure of the answer before starting to write when tackling the extended answers and ensure that all parts of the question have been addressed.

Grade boundaries

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

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