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Examiners' Report
June 2018

GCSE Biology 1BI0 2H

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Introduction

Paper 1BI0_2H is taken by candidates doing GCSE biology as part of a linear assessment model at the end of the course. This was the first paper for the new specification. The paper consists of 100 marks assessed by a variety of questions including multiple choice, short answer and two extended answer questions worth 6 marks each. Candidates should answer all questions in a time period of 1 hour and 45 minutes. In the extended answer questions marks are also awarded for the ability to structure a response logically; these questions are marked with an asterisk (*). In addition, the new specification assesses practical knowledge and maths skills in the papers. These requirements are given in the specification and there are 8 core practicals which candidates must complete prior to the exam. Aspects of working scientifically were also assessed in questions throughout the paper.

The paper contained questions assessing the content from topics 1 and topics 6 - 9. These included the kidney, osmosis, transpiration and translocation, energy transfer and pyramids of biomass, thermoregulation including vasodilation, the nitrogen cycle, photosynthesis, the hormones of the menstrual cycle, the action of adrenalin and adaptations of plants specifically related to Marram grass. Questions on practical work included writing a plan for an investigation, safety precautions including aseptic techniques, using a microscope, controlled variables and the method and analysis of results for the practical testing of the elasticity of an artery. The maths skills assessed included surface area calculations, percentage increase calculations, probabilities and rate calculations.

The assessment of practical in examinations has replaced the controlled assessment component of the previous specification. Candidates of all abilities were able to answer questions using their practical skills knowledge including questions on safety precautions and the identification of controlled variables. However, candidates need to ensure that they use terms including volume and mass accurately. Most candidates were able to recall methods including the phototropic responses of the plant and the elasticity of the artery. They also made good attempts at writing a method to test a hypothesis. Explaining why a variable needed to be controlled was more challenging, especially as it was not in the context of a core practical. There was also some confusion between what ‘a control’ is as opposed to controlling variables, and it is essential that candidates can distinguish between these two very separate practical skills.

Candidates of all abilities were able to access the more straightforward maths questions including a rate calculation and microscope calculations including the ability to write answers in standard form. Candidates found the calculation of a percentage increase more challenging, often using an incorrect method and thus not producing the correct response. Candidates of all abilities were able to analyse data to give a conclusion but often confused describing and explaining data, giving the incorrect response and thus losing marks unnecessarily .

Question 1 (a)

This question required the candidates to correctly identify the structures of the nephron where P was the glomerulus and Q was the Bowman's capsule. Acceptable responses for P were capillaries or capillary network, and for Q renal capsule was acceptable. Many candidates confused these structures with the convoluted tubule and collecting duct but it was pleasing to note the number of candidates who could accurately identify at least one of the structures.

Question 1 (b) (i)

This was one of the new style of maths questions targeting a slightly higher demand; in this case candidates have to work in standard form and give their responses in standard form. Common errors were selecting incorrect data from the table or giving incorrect values for the standard form.

(b) Figure 2 shows information about some of the components in the blood and in the filtrate in this part of the nephron.

component	concentration in the blood	concentration in the filtrate in the nephron
glucose	1.0 mg per cm^3	1.0 mg per cm^3
protein	47.0 g per dm^3	0.0 g per dm^3
red blood cells	4.5×10^6 per cm^3	0.0 per cm^3
white blood cells	8.0×10^3 per cm^3	0.0 per cm^3

Figure 2

(i) Calculate the difference in the number of red blood cells and the number of white blood cells in 1 cm^3 blood.

Give your answer in standard form.

(2)

$4.5 \times 10^6 - 8.0 \times 10^3 = 4492000$

4.492×10^6

4.492×10^6

ResultsPlus
Examiner Comments

The working and the answer are correct for 2 marks. The candidate has correctly put the answer in standard form as requested.

ResultsPlus
Examiner Tip

Always read the question carefully as there may be instructions that are missed if you fail to do so.

Question 1 (b) (ii)

This question was applied and required the candidates to apply their knowledge of the components that pass into the nephron during ultrafiltration and why larger molecules such as proteins did not pass through. Many candidates were able to use the table to identify that glucose passes into the filtrate in the nephron but did not justify why this was the case. There was some confusion about the idea that blood cells were needed in the blood rather than in the nephron. Further confusion was with the idea that selective reabsorption was occurring in the glomerulus.

(ii) Explain why there are differences in the concentrations of some components in the blood and some components in this part of the nephron.

(2)

there are differances in concentration because the blood has been filtered so some components have been taken out.

ResultsPlus
Examiner Comments

Unfortunately the candidate has not mentioned what was filtered and into where. When answering a question try to use the terminology in the question to try to help form the response.

Question 1 (c)

The hormone ADH / anti diuretic hormone was the expected response. Many candidates were able to correctly identify the hormone. The main confusion was with thyroxine or insulin.

Question 2 (a) (ii)

It was pleasing to note than the majority of candidates were able to access this mathematical challenge and correctly apply the magnification calculation. As this is an overlap question with the foundation paper there was not a conversion between units required; however, at a different stage in the paper this may also have been asked for. Common errors were dividing the actual size of the cell by the magnification rather than multiplying it.

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

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

(2)

~~Actual~~ ~~mag~~

20.5 × 400 = 8200 µm

8200 µm

ResultsPlus
Examiner Comments

Clear working is shown and the correct answer is on the answer line for 2 marks. In this case no conversion was required but it is always worth checking the units on questions to ensure that all measurements are in the same unit.

Question 2 (a) (iii)

This magnification calculation also required candidates to convert their answer into standard form. Several candidates calculated the correct response but missed the instruction to present their answer in standard form so lost 1 mark.

(iii) The width of the human red blood cell, when magnified 400×, is 3.08 mm. – 1

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

(2)

$M = \frac{1}{A}$

$A = \frac{1}{M} = \frac{3.08}{400} = 7.7 \times 10^{-3}$ mm

7.7×10^{-3} mm

ResultsPlus
Examiner Comments

This is the correct calculation and the answer is in standard form on the answer line so 2 marks can be awarded.

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

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

(2)

Actual size = $\frac{\text{Image size}}{\text{magnification}}$

7.7×10^{-3}

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

0.0077 mm

ResultsPlus
Examiner Comments

The question asks for the answer to be put in standard form which is the second marking point. This response can only be awarded 1 mark as they either missed the instruction or did not understand standard form.

ResultsPlus
Examiner Tip

Maths skills are now an implicit part of the biology specification: make sure you are familiar with the common calculations such as magnification calculation, calculating a mean, rate calculations and percentage change calculations. All of these are common in biology.

Question 2 (b) (i)

This is one of the new style of questions on planning an experiment. The experiment may be a required practical or, as in this case, one of the suggested practical tasks. This was generally well answered with almost all candidates getting the idea that the artery needed to be measured and masses added. There were some responses which referred to stretching the artery with no reference to how, and others referred to stretching the artery until it broke which did not answer the question.

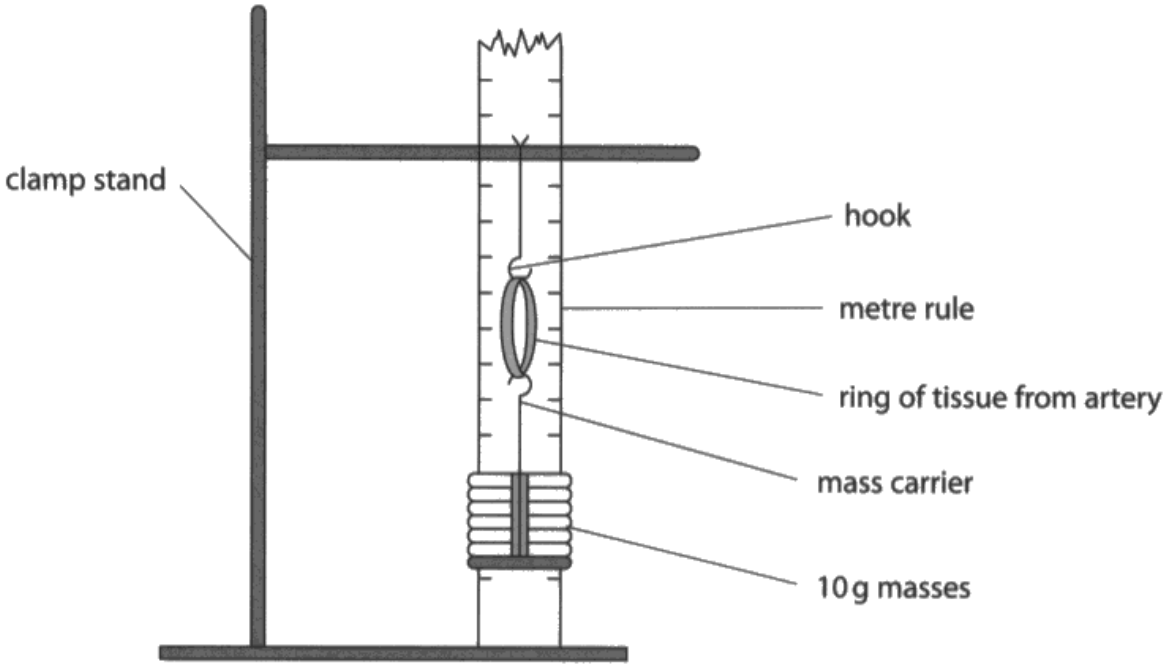

Figure 4

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

(3)

Hook the tissue to clamp stand and hook on 10g mass to the bottom. ~~[illegible]~~ Then measure how far the tissue has stretched with the metre rule. Remove mass and then see whether it returns to original size, if it does continue to add more masses. Do so until it doesn't return to original size.

ResultsPlus
Examiner Comments

This candidate has been awarded all three marks. They do not have the first marking point as they have measured the artery once stretched not at the beginning. They can have a marking point for add mass. They can be awarded another marking point as they state remove the mass and see if it returns to its normal size: this indicates the idea of measuring the artery. They can also be awarded a mark for repeating until it no longer returns to its normal size.

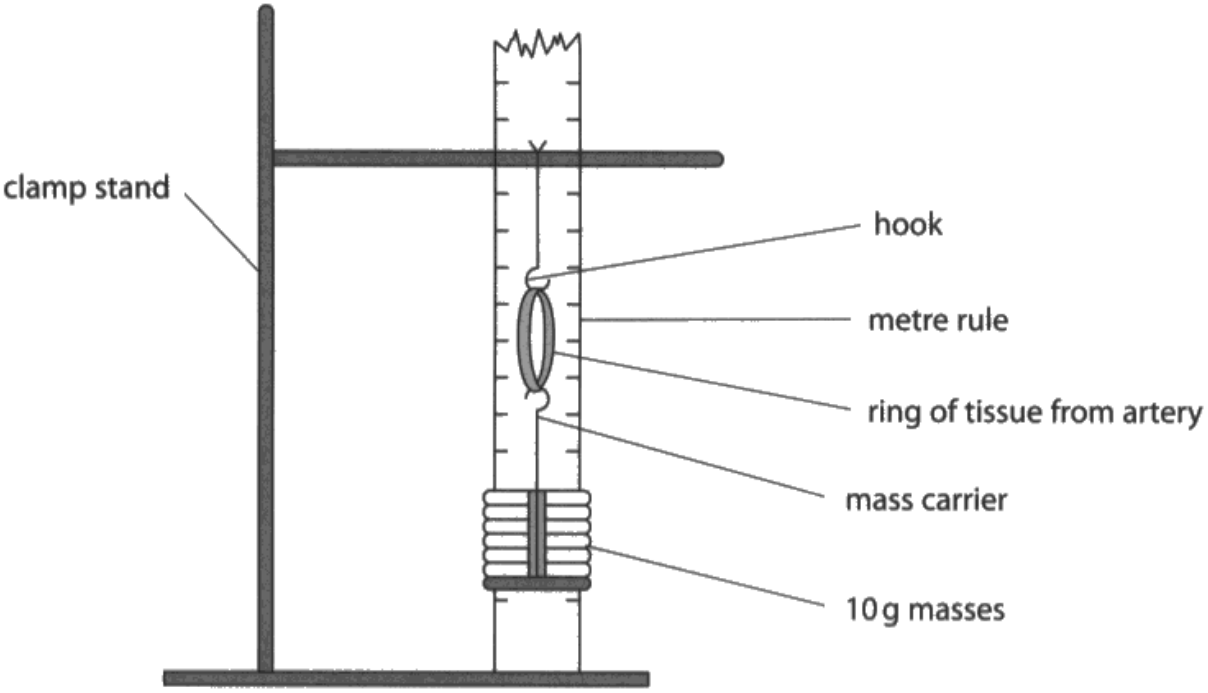

Figure 4

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

(3)

You can add on more weights to make the ring stretch up until a point where it loses its elasticity. You would then have to measure the mass of the overall weights used to get it to that point.

ResultsPlus
Examiner Comments

This candidate has not measured anything but they have added weight which we will accept for mass for 1 mark. When answering questions about planning think the experiment through before writing the plan - think about how you will be able to record results.

Question 2 (b) (ii)

Safety precautions must be appropriate to the practical task being assessed, in this case dealing with animal tissue, so gloves, washing hands and sterilising equipment were the relevant precautions. General lab practice will not be awarded marks on this style of question as it has to be specific to the task.

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

(1)

Wear protective clothing eg. gloves & goggles.

ResultsPlus
Examiner Comments

There are no marks available for standard lab safety rules such as protective clothing or goggles; the safety precaution must be specific to the practical. In this case gloves are a relevant safety precaution so 1 mark can be awarded.

Question 3 (a) (i)

There are some misconceptions about the use of a coverslip with many candidates believing that it is used to allow light to shine onto the sample which is not the case. Acceptable responses were those which referred to keeping the sample still or keeping it flat. Also acceptable was the idea of protecting the sample from damage. Protecting the sample from bacteria was not acceptable as a marking point.

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

She completed a leaf peel as shown in Figure 5.

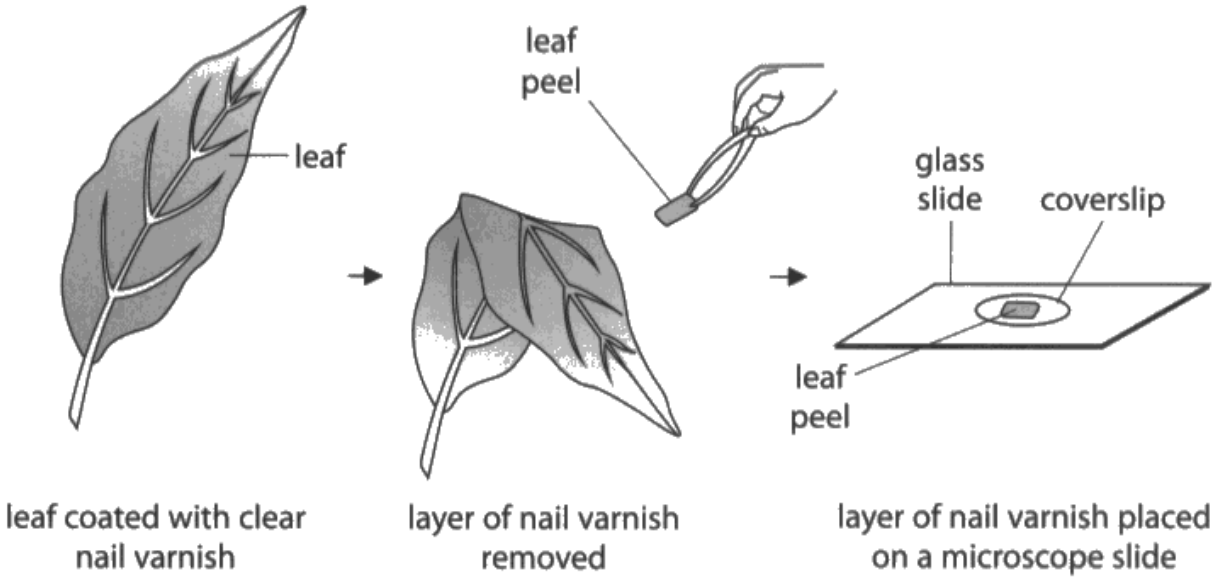

Figure 5

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

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

(1)

to hold the leaf peel in place

ResultsPlus
Examiner Comments

This was acceptable for preventing the leaf from moving for 1 mark.

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

She completed a leaf peel as shown in Figure 5.

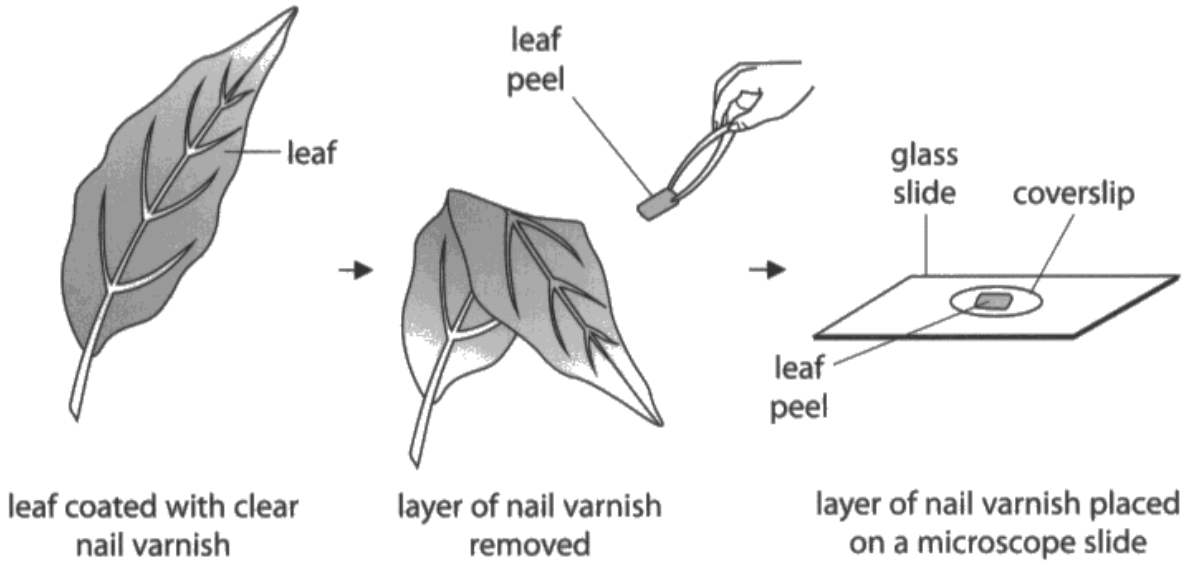

Figure 5

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

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

(1)

To prevent the impression being altered

ResultsPlus
Examiner Comments

Prevent the impression being altered is equivalent to protect the specimen, so it is not damaged by the objective lens was also acceptable for 1 mark.

Question 3 (a) (ii)

The leaf peel was observed because it was thinner and light could pass through more easily. Common errors by candidates were the idea that the leaf was too big: this was not acceptable. The idea that the stomata could be seen was acceptable for a mark.

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

(2)

Because the microscope can only look at a small section at one time, you would not be able to view the whole leaf as it is too big. The cells are also more visible on a leaf peel.

ResultsPlus
Examiner Comments

This was awarded 1 mark for the idea that the cells could be seen, also acceptable was that the stomata/guard cells were visible.

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

(2)

leaf would be too thick to view under microscope as light coudn't travel through it while the leaf peal was thin enough to allow light through it and be seen under a microscope.

ResultsPlus
Examiner Comments

This response attains both marks for the leaf being too thick which is the reverse argument that the leaf peel is thin enough to see and that light can pass through making the cells visible.

Question 3 (b) (i)

Candidates had to identify that there were three stomata present. Some candidates counted all the cells and others counted the number of guard cells.

Question 3 (b) (ii)

This question caused some issues for candidates with many not answering the question posed. The question asked them to describe HOW the stomata open but many of the responses were to do with why stomata open including gas exchange, water loss etc. The response should have been the idea that water moves into guard cells by osmosis causing them to become turgid or swell.

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

Describe how stomata open.

(3)

the water ~~passes~~ passes the guard cells causing them to ~~well~~ swell up ~~and this~~ and then ~~there~~ the ~~the~~ stomata opens allowing the water ~~the~~ to pass through it.

ResultsPlus
Examiner Comments

This response scores 2 marks, one for guard cells and the other for well up which is equivalent to become turgid. The candidate has not stated that the water moves into the guard cell so this mark could not be awarded. Several candidates referred to the stomata swelling but this is incorrect.

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Examiner Tip

Always read the question carefully. In this case many candidates described why stomata open rather than how they open.

Question 3 (b) (iii)

The question asked for why the distribution of stomata was different on the top of the leaf to the bottom and candidates were told that no stomata were present on the top of the leaf. In general they lost marks due to the fact that they did not read that no stomata were present on the top of the leaf and referred to why stomata were on top thus did not score any marks. The responses that gained the marks referred to more stomata on the underside of the leaf to reduce water loss by evaporation or transpiration, or stomata on the underside of the leaf to facilitate gas exchange for photosynthesis.

(iii) The leaf peel from the upper surface of this leaf showed no stomata.

Explain why it is an advantage to the plant to have this distribution of stomata in the upper and lower surfaces of the leaf.

(2)

If the stomata are on the upper surface of the leaf, the rate of transpiration will increase when the stomata open. This makes the leaf to lose more water easier.

ResultsPlus
Examiner Comments

This candidate has correctly given the reverse argument of the first 2 marking points which is acceptable for both marks. They are referring to the fact that there are no stomata on the upper surface because there would be water loss by transpiration. Also acceptable would be stomata on the lower surface needed for gas exchange for photosynthesis.

(iii) The leaf peel from the upper surface of this leaf showed no stomata.

Explain why it is an advantage to the plant to have this distribution of stomata in the upper and lower surfaces of the leaf.

(2)

This allows for more carbon dioxide to enter the plant. When more carbon dioxide is present, photosynthesis will happen at a faster rate. If stomata is on both sides of the leaf then it has a larger surface area where the carbon dioxide can enter.

ResultsPlus
Examiner Comments

This candidate has not gained the first marking point as they have not referred to the location of the stomata but can be awarded the second marking point as these points are independent.

Question 4 (a) (i)

This is a biology only topic and candidates were asked to draw a pyramid of biomass. The pyramid should be composed of bars and these should be labelled and in the correct proportions. As this is also an overlap question we allowed some leeway in terms of the size of the bars where we allowed the mark if the bars were a maximum of 50% smaller at each trophic level. Candidates generally lost a mark due to drawing a triangle rather than a pyramid or failing to label the bars.

4 Since 2003, in France, people have been buying Siberian chipmunks as pets but then releasing them into the wild when they are no longer wanted.

They are now classified as an invasive species.

Figure 7 shows a Siberian chipmunk (*Tamias sibiricus*).

© 2011, Søren Brøndum Christensen

Figure 7

(a) Siberian chipmunks eat acorns, which are the seeds of oak trees.

In Siberia, the natural predators of Siberian chipmunks are wild dogs.

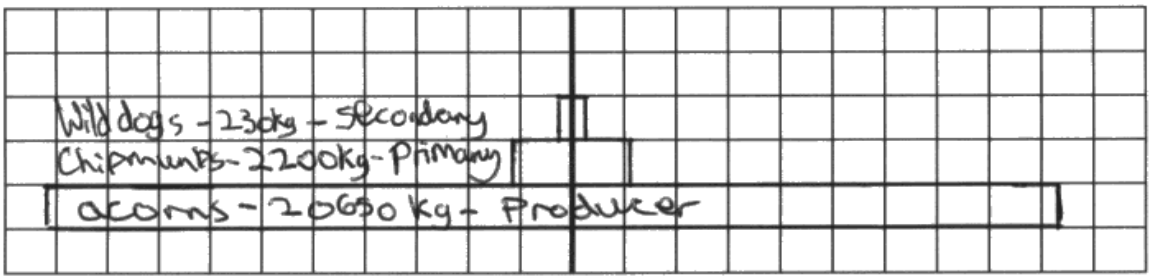
(i) Figure 8 shows the biomass of three organisms in a food chain from one area of Siberia.

organisms	biomass in kg
acorns	20 650
chipmunks	2 200
wild dogs	230

Figure 8

Draw a pyramid of biomass for this food chain.

(2)



ResultsPlus
Examiner Comments

This is a well drawn pyramid and it is labelled correctly. The proportions are within the stated boundaries so both marks can be awarded.

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In Siberia, the natural predators of Siberian chipmunks are wild dogs.

(i) Figure 8 shows the biomass of three organisms in a food chain from one area of Siberia.

organisms	biomass in kg
acorns	20650
chipmunks	2200
wild dogs	230

Figure 8

Draw a pyramid of biomass for this food chain.

(2)

ResultsPlus
Examiner Comments

This candidate has drawn a triangle so the proportion mark cannot be given. They have also labelled it incorrectly so no marks were awarded. If the labels had been correct they could have the shape/label mark, even in a triangle.

ResultsPlus
Examiner Tip

Pyramids of biomass should always be pyramid-shaped and bars rather than triangles must be used.

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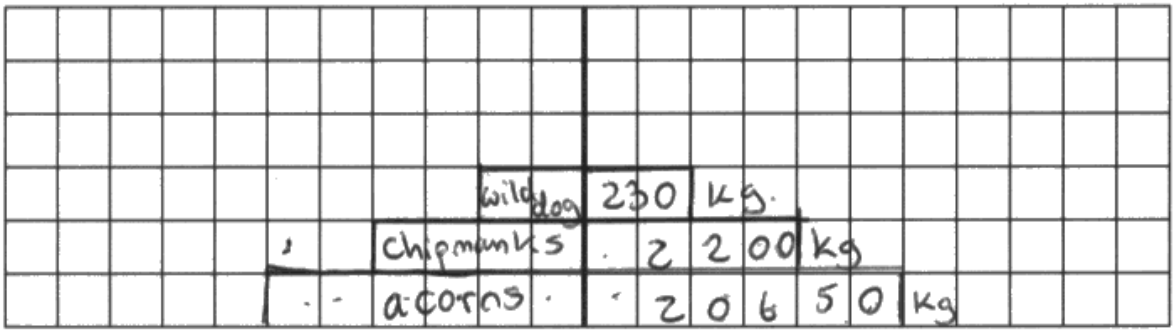

ResultsPlus
Examiner Comments

The proportions on this pyramid are out of the 50% tolerance so the proportion mark cannot be given. The labels and shape are correct so 1 mark can be awarded.

Question 4 (a) (ii)

This was generally well answered with most candidates able to identify that the population of the chipmunks increased. Marks were also awarded for more reproduction and the idea that fewer chipmunks were killed/eaten.

(ii) In France, Siberian chipmunks have very few natural predators.

Describe how this affected the Siberian chipmunk population in France.

(2)

The Siberian chipmunk population in France would increase as they aren't being hunted as much.

ResultsPlus
Examiner Comments

This candidate has correctly answered that the chipmunk population is increasing but hunted is equivalent to predated which is in the question. For the first marking point we need to see not being eaten, killed etc.

(ii) In France, Siberian chipmunks have very few natural predators.

Describe how this affected the Siberian chipmunk population in France.

(2)

This does not decrease the Siberian chipmunk population because there are few predators that will eat and kill them.

ResultsPlus
Examiner Comments

This response does not score a mark for 'does not decrease' as this could mean the population remained the same. A mark can be given for the idea that they are not being eaten.

Question 4 (a) (iii)

It is good to see that many candidates can now do percentage calculations and most candidates were able to calculate the amount of energy transferred correctly. There were some candidates who lost out on a mark by not giving the answer to the nearest whole number as requested in the question.

(iii) The percentage of energy transferred from the acorns to the chipmunks is 9.5%.

The energy contained in the acorns is 97 500 kJ.

Calculate the amount of energy transferred to the chipmunks.

Give your answer to the nearest whole number.

(3)

$9.5 + 100 = \frac{109.5}{100} = 1.095$

$97500 \div 1.095 = 89041$ 89041 kJ

ResultsPlus
Examiner Comments

This candidate has completed an incorrect calculation so no marks can be awarded here. The final mark on the mark scheme is for a correct rounding of the answer: we did not give this mark for any whole number on the answer line as this will not show the maths skill we are testing.

(iii) The percentage of energy transferred from the acorns to the chipmunks is 9.5%.

The energy contained in the acorns is 97 500 kJ.

Calculate the amount of energy transferred to the chipmunks.

Give your answer to the nearest whole number.

(3)

100% = 97500
10% = 9750
1% = 975
0.5% = 487.5
9.5% = 9750 - 487.5 = 9262.5

9263 kJ

ResultsPlus
Examiner Comments

This is a correct answer with an alternative method of calculation so all three marks can be awarded.

ResultsPlus
Examiner Tip

Always read the instructions on the mathematical questions as in this case rounding to the nearest whole number was the third marking point.

Question 4 (b) (i)

This percentage change calculation was the least well accessed of all the mathematical skills tested in the paper. Candidates often divided the change in population size by the 2015 data rather than the 2003 data and thus did not attain the correct outcome. A few candidates clearly do not think that 184% is a reasonable percentage change and took the 100 off the answer therefore lost 1 mark by having the incorrect answer on the answer line.

(b) The black-legged tick (*Ixodes scapularis*) is a parasite that feeds on the blood of animals including Siberian chipmunks and humans.

The tick transmits the Lyme disease pathogen.

Figure 9 shows the number of cases of Lyme disease in humans in France in 2003 and 2015.

Number of cases of Lyme disease in humans in France	
2003	2015
9 500	27 000

Figure 9

(i) Calculate the percentage increase in the number of cases of Lyme disease in humans in France from 2003 to 2015.

(2)

~~27000-9500=~~

27000−9500=17500

$\frac{17500}{9500}$ = 1.84 (2 decimal places)

184 %

ResultsPlus
Examiner Comments

This is a correct calculation and was awarded 2 marks. Working was shown so even if the answer was incorrect it could have been awarded 1 mark.

(b) The black-legged tick (*Ixodes scapularis*) is a parasite that feeds on the blood of animals including Siberian chipmunks and humans.

The tick transmits the Lyme disease pathogen.

Figure 9 shows the number of cases of Lyme disease in humans in France in 2003 and 2015.

Number of cases of Lyme disease in humans in France	
2003	2015
9 500	27 000

Figure 9

(i) Calculate the percentage increase in the number of cases of Lyme disease in humans in France from 2003 to 2015.

(2)

$\frac{27000}{9500} \times 100 = 284.2105$

284 %

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Examiner Comments

This was the most common error in the calculation completed. The candidate has divided by the 2015 figure rather than the 2003 figure. No marks can be awarded.

ResultsPlus
Examiner Tip

When calculating percentage change, always calculate the difference and then divide by the initial figure. This answer can then be multiplied by 100 to find the percentage change.

Question 4 (b) (ii)

Most candidates were able to identify that more black legged ticks were present thus more Lyme disease occurred. For the second marking point they needed to state that therefore there were more ticks infecting humans/biting humans or even feeding on the blood of humans.

(ii) Explain why there has been an increase in the number of cases of Lyme disease in humans in France.

(2)

The siberian chipmunk ~~[illegible]~~ is a host to the ticks, if the chipmunks population has increased so has the ticks meaning the likelihood of getting the tick disease increased too.

ResultsPlus
Examiner Comments

The chipmunk is a host to ticks is enough for the idea that the ticks feed on the chipmunks and the candidate has related this to the increase in chipmunk population for 1 mark. There is no mention of the ticks then biting or infecting humans so the second mark cannot be awarded.

(ii) Explain why there has been an increase in the number of cases of Lyme disease in humans in France.

(2)

The increase in Siberian chipmunk population meant that the black-legged tick had more animals to feed on. As a result, the population of the black-legged tick increased, so more humans were fed on and given Lyme disease.

ResultsPlus
Examiner Comments

In this case both marks can be awarded: more animals to feed off for the first marking point, and ticks feed off humans and give them Lyme disease for the second marking point.

Question 5 (a)

This is a classic case of candidates misunderstanding the command word describe and actually giving a very creditable explanation of why blood flow increased to the muscle, but this only scored 1 mark for the idea of increased blood flow to the muscles. The describe command word requires the candidates to describe the data, so identify that the blood flow to the digestive system is reduced, the blood flow to the muscles is increased, and the blood flow to the brain remains the same or is only reduced by a small amount.

5 Figure 10 shows the estimated blood flow through some parts of the body when a person is at rest and during exercise.

part of the body	estimated rate of blood flow in cm^3 per minute	
	at rest	during exercise
brain	750	748
heart muscle	350	1 150
digestive system	2 500	1 200
other muscles	1 200	14 500
all other organs (except lungs)	1 423	1 420

Figure 10

(a) Compare the rate of blood flow through the body when this person is at rest and during exercise.

(3)

The brain has less blood during exercise because it has gone to the muscles. The heart has more blood flow in exercise because it's pumping faster so there is more blood flowing through it. The digestive system loses blood because there is lots of glucose in it, needed for respiration in muscles. The muscles have lots of blood because they need the oxygen and glucose, for respiration. Lungs are the only other organ not to lose blood as they carry out respiration.

ResultsPlus
Examiner Comments

This is data interpretation and the candidates are supposed to have recognised that the blood flow to the brain remains the same or only changes by a very small amount, but blood flow to muscles is increased and blood flow to the digestive system is decreased. This candidate has hit the second and third marking points for the muscles and the digestive system so 2 marks are awarded.

ResultsPlus
Examiner Tip

It is important to pay attention to the command word. In this case it is describe so observations based on the data presented should be included.

5 Figure 10 shows the estimated blood flow through some parts of the body when a person is at rest and during exercise.

part of the body	estimated rate of blood flow in cm^3 per minute	
	at rest	during exercise
brain	750	748
heart muscle	350	1 150
digestive system	2 500	1 200
other muscles	1 200	14 500
all other organs (except lungs)	1 423	1 420

Figure 10

(a) Compare the rate of blood flow through the body when this person is at rest and during exercise.

(3)

At rest, the majority of rate of blood flow is to the digestive system at 2500 with the least to heart muscle at 350. During exercise, the total rate of blood flow increases from rest. ~~Only a~~ ~~sm~~ The rate of blood flow ~~small~~ to the brain and other organs only decreases by a small amount, but the blood flow to the digestive system decreases greatly by 1300, whilst rate of blood flow to the muscles hugely increases, with heart muscles by 800 and other muscles by 13300.

ResultsPlus
Examiner Comments

This candidate has quoted data to back up their answer and had hit the first marking point as they have mentioned that the blood flow to the brain reduces by a very small amount. All three marks can be given.

Question 5 (b)

Candidates were asked for an explanation of why there was a change in blood flow to the muscles and a mark was awarded for there is less blood flow to the digestive system or there was increased blood flow to the muscles. The explanation was that the blood was needed in the muscles was for increased (aerobic) respiration. Most candidates accessed the first point.

(b) Explain why there is a change in the rate of blood flow through the digestive system during exercise.

(2)

Because during exercise the body does not need to digest food ~~as~~ and so the energy + blood used to do this ~~and~~ is transferred to the other muscles to help them respire faster during exercise.

ResultsPlus
Examiner Comments

This candidate has responded by stating that the blood flow is transferred to the muscles from the digestive system which is enough for the first marking point. Respiration is also written which is enough for the second marking point.

remain mostly the same.

(b) Explain why there is a change in the rate of blood flow through the digestive system during exercise.

(2)

The body needs energy during exercise, which it takes from the food eaten. This means that the food will be broken down this way, instead of through digestion.

ResultsPlus
Examiner Comments

This response is referring to food rather than blood flow so no marks can be awarded.

Question 5 (d)

Candidates were required to apply the equation for cardiac output which is in the specification: Unit 8, spec point 8.12. There was no mark attributed to the recall of the equation as both marks were maths calculation marks. The correct answer was 70 b.p.m.

(d) A person has a cardiac output of 4.9 litres per minute. The stroke volume of each heart beat is 70 ml.

Calculate the heart rate.

(2)

cardiac output = stroke volume × heart rate.

$\frac{4.9}{70}$

$\frac{\text{cardiac output}}{\text{stroke volume}}$ = heart rate

0.07 beats per minute

ResultsPlus
Examiner Comments

This candidate has recalled the equation but has not given the correct conversion. We do not penalise the candidate twice for the same mark point so 1 mark can be awarded. Please note there is no mark for recalling the equation as both of these marks are maths marks.

Question 6 (a) (i)

It was pleasing to note the number of candidates who were able to achieve this mark by quoting as the body temperature increased so did the oxygen consumption of the iguana. Occasionally a candidate answered that as oxygen consumption increases the temperature increases; this is the incorrect causation and was not awarded the mark.

Question 6 (a) (ii)

This was an explain question and many candidates just started to describe the data in more detail which did not score the marks. The idea of increased chemical reactions, metabolic reactions to facilitate respiration which required oxygen was required. Increased oxygen was not given alone as this is not an explanation but must be linked to the idea of increased respiration.

(ii) Explain why the body temperature of the iguana affects its oxygen consumption.

(3)

As the increase in body temperature, its ~~bodyon~~ will have the increase of blood flow which allows it to transfer more energy to the surrounding. The increase of blood flow carries more oxygen into the body. This makes an increase in its oxygen consumption.

ResultsPlus
Examiner Comments

This response does not answer the question. They are referring to increased blood flow rather than why more oxygen is needed.

(ii) Explain why the body temperature of the iguana affects its oxygen consumption.

(3)

As a hotter body temperature means that the enzymes in the iguana will be able to work faster as they move around faster. This means that processes such as digestion are happening at a faster rate and so ~~then~~ more oxygen is needed to fuel them. So the hotter it is the more oxygen is consumed.

ResultsPlus
Examiner Comments

This candidate has referred to increased enzyme action (working faster is OK) so can be awarded one mark. There is no reference to respiration using the oxygen so no further marks can be awarded.

Question 6 (a) (iii)

The idea that iguanas do not sweat was given to draw candidates into the idea that panting reduced heat loss in a similar way. This is also an explain question so more water loss by evaporation was required for the mark.

(iii) Iguanas do not have sweat glands.

When an iguana is too hot, it pants by opening its mouth to cool down.

Explain how this behaviour helps to cool the iguana down.

(2)

Like how sweating causes evaporation (and therefore heat loss) panting has a similar effect. The heat inside the iguana ~~g~~ can be released through panting.

ResultsPlus
Examiner Comments

This response can be awarded 1 mark for the idea of evaporation but they have not linked this directly to water loss so can only be awarded 1 mark.

(iii) Iguanas do not have sweat glands.

When an iguana is too hot, it pants by opening its mouth to cool down.

Explain how this behaviour helps to cool the iguana down.

(2)

It helps it to take in a larger amount of oxygen to cool down. It increases the surface area for diffusion of gases. It allows for water in the mouth to evaporate and decrease temperature.

ResultsPlus
Examiner Comments

This candidate has linked water loss in the mouth to evaporation so can be awarded 2 marks.

Question 6 (b) (ii)

Those candidates who focused on the question and the role of vasodilation achieved well, where they were able to refer to more blood flowing near the surface of the skin due to deep capillaries being constricted, or understanding the role of the shunt valve in giving more heat loss by radiation to allow cooling. There still remain many incorrect ideas about vasodilation, for example that the capillaries move. Several candidates gave vague references to sweating or piloerection concentrating on the thermoregulation rather than vasodilation.

(ii) Explain the role of vasodilation in thermoregulation.

(4)

Vasodilation is where the body varies itself in order to be the correct temperature. If you're too hot the body will open up sweat glands, will put the hairs on your skin flat down so that there's no insulation and bring the blood to the surface of your skin to cool down (why you go red). When you're too cold, the hairs on your body will stick up to form an area of insulation and you will shiver which is constant shaking of the body to warm up your body.

ResultsPlus
Examiner Comments

This candidate has given a list of things but they are correct. They have stated that more blood flows near the surface of the skin to cool you down for 2 marks. We do not penalise candidates for listing references to sweating or piloerection but they are not creditable for the marks.

(ii) Explain the role of vasodilation in thermoregulation.

(4)

The blood vessels ~~veins~~ ~~arteries~~ widen, allowing for a greater blood flow towards the skin. This allows for more thermal energy to be transferred from the blood to the skin, keeping the internal environment at 37°C. This excess heat on the skin is then dissipated to the surroundings through radiation (e.g. sweat from sweat glands, allowing the skin to cool down.

ResultsPlus
Examiner Comments

This candidate has scored 3 marks. They have correctly identified more blood flow near the surface of the skin/to the skin, which is enough. Thermal energy released cooling the body down are the next two marking points.

Question 7 (a) (i)

Candidates seem to struggle with the new practical style questions across the paper. In this case they were asked to give a control for this experiment which is where the apparatus is set up in the same way as figure 13 but with (distilled) water or no nitrate pellets added. Many gave a control variable such as keeping the volume of solution the same but this is not the same thing.

7 (a) A student investigated the effect of nitrate ion concentration on plant growth. She placed barley seedlings in three test tubes containing different concentrations of nitrate fertiliser.

Test tube 1 contained distilled water with 1 pellet of nitrate fertiliser.
Test tube 2 contained distilled water with 2 pellets of nitrate fertiliser.
Test tube 3 contained distilled water with 3 pellets of nitrate fertiliser.

After 7 days, the lengths of the seedlings were measured.

Figure 13 shows an example of the apparatus used.

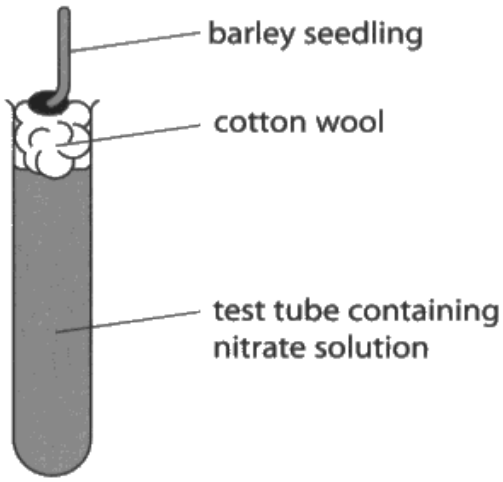

Figure 13

(i) Describe a control for this investigation.

(2)

Starting length of seedlings need to be the same for each, so that the change thereafter can be accurately measured

ResultsPlus
Examiner Comments

This candidate is talking about controlling variables rather than giving a control. This is not creditable.

7 (a) A student investigated the effect of nitrate ion concentration on plant growth. She placed barley seedlings in three test tubes containing different concentrations of nitrate fertiliser.

Test tube 1 contained distilled water with 1 pellet of nitrate fertiliser.
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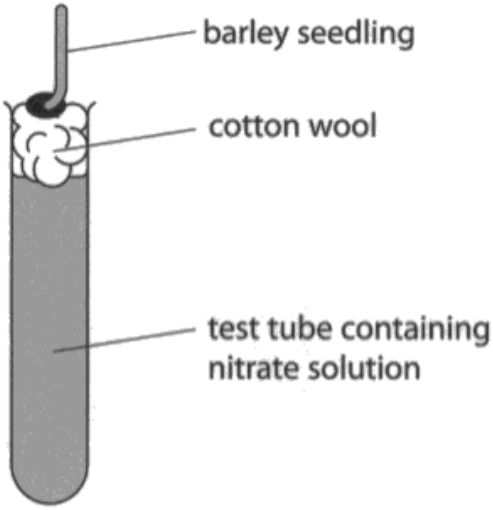


Figure 13

(i) Describe a control for this investigation.

(2)

Another test tube ~~ex~~ containing distilled water with no pellets of nitrate ~~fertiliser~~ fertiliser. This would allow for the student to compare the effects of the nitrate fertiliser with no fertiliser.

ResultsPlus
Examiner Comments

This candidate can be awarded the second marking point for distilled water instead of nitrate solution. Just another test tube is not enough for the first marking point.

Question 7 (a) (iii)

As is often the case with practically based questions the answers must be specific to the question. In this case it was about measuring the growth of seedlings rather than length. Many candidates referred to ideas of measuring the nitrate solution absorbed or the rate of photosynthesis – not an easy thing to do. The expected answers were measure the change in mass or number of leaves present.

(iii) Give a method, other than measuring the change in length, that would show the growth of the seedlings.

(1)

compare the mass of the seedlings.

ResultsPlus
Examiner Comments

This is the correct response for 1 mark.

Question 7 (b) (i)

This is an explain question so candidates who answered correctly that there was more growth with increased nitrate concentration gained the first mark. The second mark was based on why this happens because nitrates are needed to make proteins. Several candidates just repeated the question or started to refer to nutrients which was too vague.

(b) Figure 15 shows the results of this investigation.

seedling in test tube	length at the start in mm	length after 7 days in mm
1	4	11
2	6	17
3	5	26

Figure 15

(i) Explain why there are differences in the change in the lengths of the seedlings.

(2)

The different seedlings have a different change in length because of the way they absorb different nitrates and some had less nitrates than others, may have access to different amounts of sunlight, water or are in different temperatures

ResultsPlus
Examiner Comments

This is too vague for a mark, there is no reference to most growth with the increased amount of nitrate fertiliser.

Question 7 (b) (ii)

This question asked candidates to explain why legumes are used in crop rotation. The simple response is to increase the amount of nitrates in the soil although many candidates missed this. The explanation as to why this happens is because nitrogen fixing bacteria living in plant nodules convert nitrogen gas into nitrates (or other nitrogen compounds). Several candidates were able to access 1-2 of these marks.

(ii) Explain how nitrate ions were absorbed by the seedling in test tube 3.

(3)

nitrate ions were absorbed into the root hair cells of the seedling by active transport. This is because the roots have a higher nitrate ~~solution~~ concentration than the nitrate solution.

ResultsPlus
Examiner Comments

This is 3 marks. Root hair cell for the first marking point and by active transport linked to the idea of against the concentration gradient, from low concentration to high concentration.

Question 7 (c)

This caused a few issues with several candidates talking generally about crop rotation and describing this. In order to attain the marks they needed to explain that the nitrogen fixing bacteria were found in the root nodules and that they convert nitrogen gas into nitrates in order to raise the nitrate levels in the soil.

(c) Farmers use crop rotation to reduce the need to add nitrate fertilisers to the soil.

Plants such as peas and beans have a mutualistic relationship with nitrogen-fixing bacteria.

Explain why farmers use these plants in their crop rotation cycle.

(3)

as the nitrogen-fixing bacteria turn nitrogen gas which is abundant in the air into ammonium ions which in the soil and roots, which can then be turned into nitrites then nitrates through nitrifying bacteria which means when the next + rotation occurs there will be lots of nitrates in the soil for future crops to grow due to the presence of the pea + bean plants.

ResultsPlus
Examiner Comments

This candidate is awarded 3 marks. Change nitrogen gas into ammonia/nitrates. They have also stated that they increase nitrates in the soil.

Question 8 (a) (i)

Many candidates were able to describe the graph, saying that as light intensity increases the rate of photosynthesis increases until a point at which light is no longer a limiting factor. Many stated that something else became a limiting factor which was also acceptable.

8 (a) Figure 16 shows the effect of light intensity and temperature on the rate of photosynthesis.

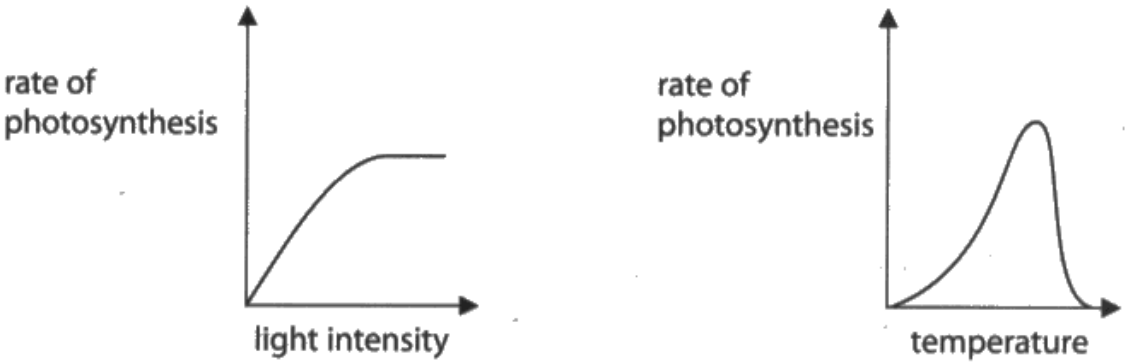


Figure 16

(i) Describe the effect of light intensity on the rate of photosynthesis.

(2)

As light temperature increases the rate of photosynthesis increases until ~~the~~ it reaches ~~reaches~~ a limiting factor (not enough of other factors for photosynthesis to increase rate).

ResultsPlus
Examiner Comments

This scores 2 marking points: both light intensity increases and photosynthesis increases. There is also a reference to another limiting factor for the second marking point.

8 (a) Figure 16 shows the effect of light intensity and temperature on the rate of photosynthesis.

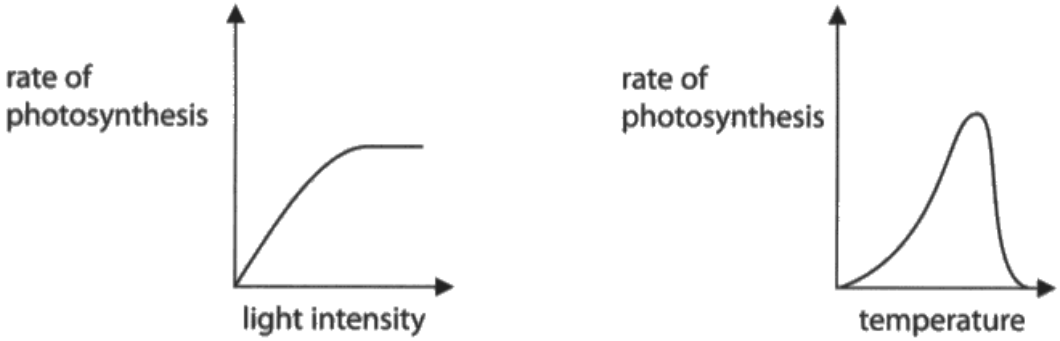


Figure 16

(i) Describe the effect of light intensity on the rate of photosynthesis.

(2)

The rate of photosynthesis steadily increases as the light intensity increases. This is until the rate of photosynthesis remains constant as does the light intensity

ResultsPlus
Examiner Comments

This can be awarded a marking point for as light intensity increases photosynthesis increases. The second marking point can only be awarded if there is a reference to limiting factors or specific limiting factors.

Question 8 (a) (ii)

In order to attain the marks here the candidate had to explain the graph rather than describe the graph and many candidates lost marks here as they did not do this. The idea that at lower temperature reactions are slower due to fewer collisions was rarely seen. Several candidates identified the optimum point of photosynthesis being the point at which enzymes are working at their optimum. The most common answer was after the optimum there is reduced photosynthesis as enzymes are becoming denatured. Some candidates failed to write **after** the optimum and also lost this mark.

(ii) Explain the effect of temperature on the rate of photosynthesis.

(2)

as temperature increases the rate of photosynthesis increases too ~~until~~ until the enzymes pass their optimum temperature where the enzyme will denature and a rate decrease

ResultsPlus
Examiner Comments

At higher temperatures the enzymes denature so 1 mark available. There is no reference to the maximum rate of enzyme action at the optimum temperature.

ResultsPlus
Examiner Tip

As this is an explain question it is vital that a scientific explanation is given in order to gain the marks; a simple description of the graph does not score.

(ii) Explain the effect of temperature on the rate of photosynthesis.

(2)

As the temperature increases the rate of photosynthesis increases because enzymes work better and faster with a higher amount of energy. Once temperature has reached optimum (about 45°C) enzymes begin to denature and no longer function.

ResultsPlus
Examiner Comments

This candidate has the wrong end of the stick. They have stated that as the temperature increases to the optimum the enzyme denatures. This was a common error by candidates.

Question 8 (c)

It is clear that candidates have a good understanding of the transport of substances through a plant and there was evidence of some excellent understanding of the structure and function of the xylem and phloem which was very pleasing to see. Those candidates who separated transpiration and translocation into separate paragraphs generally got less confused than those who tried to mix the two.

*(c) Explain how substances are moved through a plant by transpiration and translocation.

(6)

Water in the soil is absorbed via the root hair cells by osmosis and travels through the plant in xylem vessels where it's used for photosynthesis or diffuses out of the plant via the stomata.

Mineral ions in the soil are also absorbed via the root hair cells but by a process called active transport. They move around the plant via the phloem vessels.

Glucose in the plant is made from sucrose which travels in phloem vessels and goes through seive tubes via active transport. Energy is provided by the oxygen the mitochondria make in the phloem's cell wall. Glucose is then stored and used for food and photosynthesis.

ResultsPlus
Examiner Comments

As this candidate has given a good account of both transpiration and translocation they could have been awarded 6 marks. They have not identified which is transpiration and which is translocation so they cannot be awarded level 3. In this case level 2 can be awarded for 4 marks.

*(c) Explain how substances are moved through a plant by transpiration and translocation.

(6)

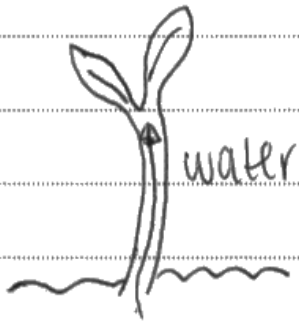
In transpiration the roots of the plant absorb ~~the~~ substances. This is also helped through the root hair cells on the roots creating a larger surface area. The substances then pass through the plant through the xylem cells made up of dead plant cells joined together by lignin. The substances that the plant uptakes are then ~~&~~ passed on through the plant's cells, ~~where~~ this is called translocation. The substances absorbed by the plant are then used for photosynthesis, ~~which produces~~ whereby ~~&~~ water is a by product of this. The stomata at the bottom of the plant open as the guard cells are turgid as ~~&~~ then allow water to pass out of the plant. If the water could not pass ~~&~~ out of the plant, the ~~pe~~ plant's cells may become too swollen and burst causing the ~~&~~ plant to die.

ResultsPlus
Examiner Comments

This is a detailed description of transpiration including xylem, dead cells made of lignin and water. There is no detail about translocation which is creditworthy so level 2 can be given. Three marks are awarded as some of the answer is not well structured and incorrect.

*(c) Explain how substances are moved through a plant by transpiration and translocation.
(6)

Transpiration:
This is the movement of water through a plant which occurs in the xylem. As water evaporates from the leaves of a plant ~~the concentratio~~ diffusion draws more up from the roots to balance the concentration. This results in a cycle where more is evaporated and then drawn up, called transpiration.



Translocation:
This occurs in the phloem and is the movement of ions and substances/food in the plant like glucose. Through active transport, ions in the soil are ~~pu~~ absorbed into the roots and travel through the phloem to areas in the plant. These ions are able to move to the areas they are most needed by translocation.

ResultsPlus
Examiner Comments

This candidate has correctly linked transpiration to the movement of water through the xylem and translocation to the movement of glucose (acceptable for sucrose) in the phloem.

Question 9 (a) (i)

The majority of candidates were able to extract the information from the graph that there were low levels of oestrogen. Only the better candidates were able to link the fact that low levels of oestrogen meant that LH could not be released and LH is needed for ovulation.

9 (a) Figure 17 shows the concentration of the hormones oestrogen and progesterone in the blood of women of different ages.

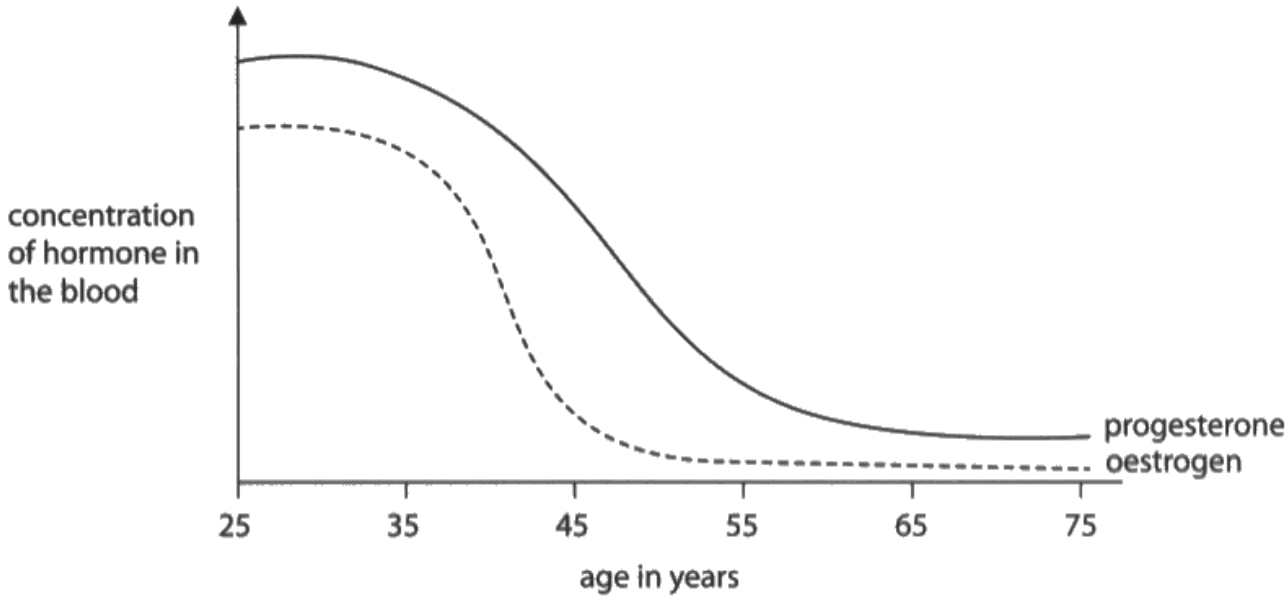


Figure 17

(i) Use information from Figure 17 to explain why women over the age of 50 are less likely to ovulate.

(2)

women over 50 produce less oestrogen and progesterone meaning they can't build up their uterus lining

ResultsPlus
Examiner Comments

Women over the age of 50 produce less oestrogen is MP1 for 1 mark. This was achieved by many of the candidates.

FOLP

9 (a) Figure 17 shows the concentration of the hormones oestrogen and progesterone in the blood of women of different ages.

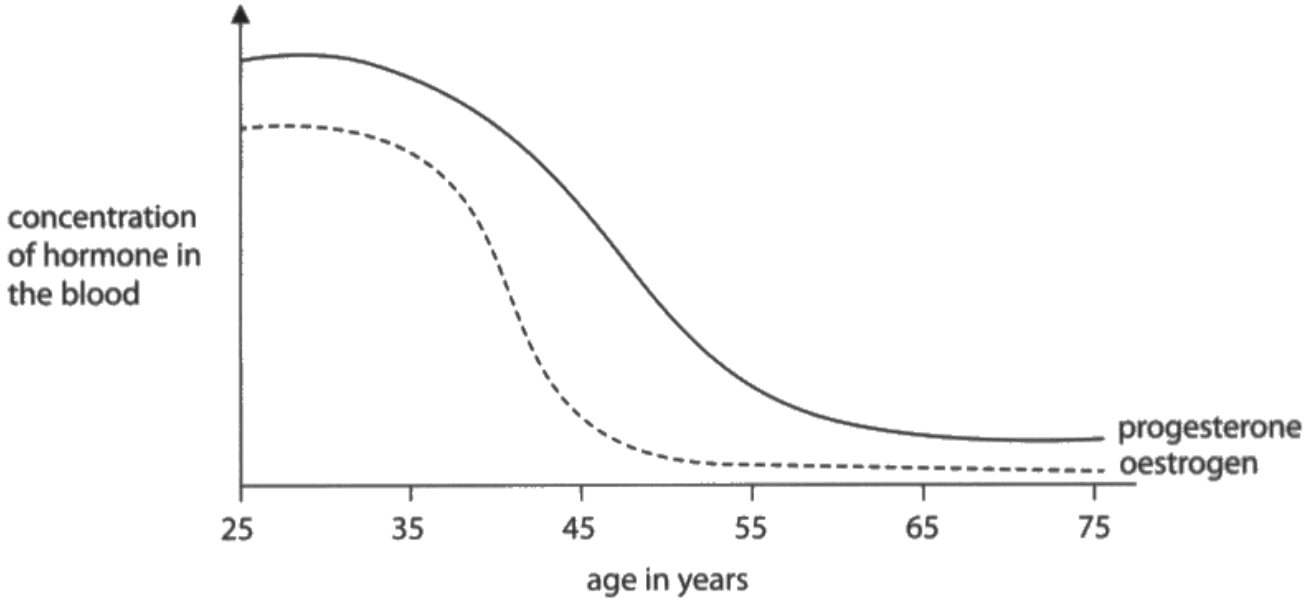


Figure 17

(i) Use information from Figure 17 to explain why women over the age of 50 are less likely to ovulate.

(2)

oestrogen ~~rela~~ helps release LH and so having less means the egg is less likely to ovulate as well as having low progesterone means the body can't restart the cycle.

ResultsPlus
Examiner Comments

This candidate has correctly linked oestrogen levels to releasing LH which is MP2 and also LH to ovulation so 2 marks can be awarded. As an explain question it is not sufficient just to describe the trend in the graph.

Question 9 (a) (ii)

Candidates here generally tried to link low levels of progesterone meaning that the uterus lining would not be maintained which would lead to menstruation rather than the idea that low levels of oestrogen would not allow the uterus lining to build up in the first place thus there would be no menstruation.

(ii) Use information from Figure 17 to explain why women are less likely to menstruate after the age of 60.

(2)

Women are less likely to menstruate because there is a reduction in the concentration of oestrogen and progesterone, and the menstrual cycle cannot occur if these hormones are limited.

ResultsPlus
Examiner Comments

In this case the candidate is stating low levels of oestrogen and progesterone so cannot be given the low oestrogen levels mark. Progesterone was a reject here. It is important that candidates realise that it is oestrogen that builds up the lining of the uterus.

(ii) Use information from Figure 17 to explain why women are less likely to menstruate after the age of 60.

cannot shed lining

(2)

Produce less oestrogen so blood lining not thicke enough to menstruate, ~~so~~ · produce less progesterone so corpus luteum breaks down,

ResultsPlus
Examiner Comments

This candidate has linked oestrogen to building up the lining of the uterus and then has said so it cannot be broken down so 2 marks awarded.

Question 9 (a) (iii)

The introduction of ART and clomifene therapy into this specification seems to have been missed by some candidates. For this question we were looking for the effect of clomifene therapy. The mechanism is quite complicated but the effects are twofold and either of these was acceptable for the marks: increasing the release of FSH so more eggs are developed in the follicle, or increasing the release of LH so there is more chance of ovulation. It is not the case that clomifene therapy injects these two hormones.

(iii) Explain how clomifene therapy may increase the chance of a woman over the age of 50 becoming pregnant.

(2)

Clomifene therapy increases the amount of eggs released and therefore there is a higher chance of an egg being ~~[illegible]~~ fertilised.

ResultsPlus
Examiner Comments

Although this candidate has not linked the clomifene therapy to FSH/LH, they have stated that more eggs will be produced for marking point 2. These are independent marking points.

(iii) Explain how clomifene therapy may increase the chance of a woman over the age of 50 becoming pregnant.

(2)

Clomifene increases the amount of FSH produced in the body so the menstrual cycle can begin and have much higher chances of working correctly and a woman becoming pregnant.

ResultsPlus
Examiner Comments

This candidate has linked clomifene therapy to an increase in FSH so 1 mark can be awarded.

Question 9 (b)

Candidates produced some excellent responses to this question including the action on the heart increasing heart rate and blood pressure, and the action on the liver in the conversion of glycogen to glucose. Candidates were also able to relate this to the performance of the athlete in increasing reactants for respiration thus increased performance. There were many references to the flight or fight response but this did not answer the question.

(b) Explain how the release of adrenalin can result in the improved performance of an athlete.

(4)

Adrenalin is a hormone produced by the adrenal glands, and it allows a 'fight or flight' response. The adrenalin bonds to the receptors in the heart therefore causing a faster heart rate and a higher blood pressure and so the athlete may perform better because he/she will have a response where in which their body has provided enough energy to allow the response to be positive, and so the athletes performance will be improved. A surge of energy will be released from this adrenaline, so the athlete may perform better

ResultsPlus
Examiner Comments

Faster heart rate is worthy of a mark but there is nothing further to be awarded. Candidates needed to link this to faster blood flow so more oxygen/glucose is delivered to the muscles for increased respiration.

(b) Explain how the release of adrenalin can result in the improved performance of an athlete.

(4)

It will cause cause the athlete's heart to pump out more blood to his muscles. Also the adrenalin will cause the liver to release more glucose which is need for aerobic and anaerobic respiration. Also the the muscles in the blood arteries will expand so that more oxygenated blood can travel to the target organs.

ResultsPlus
Examiner Comments

This candidate has accessed several marking points. More glucose released from the liver is in the accept column against the glycogen mark. More oxygenated blood is actually 2 marking points: more oxygen and more blood flow to the muscles. All 4 marks were awarded.

Question 10 (a) (i)

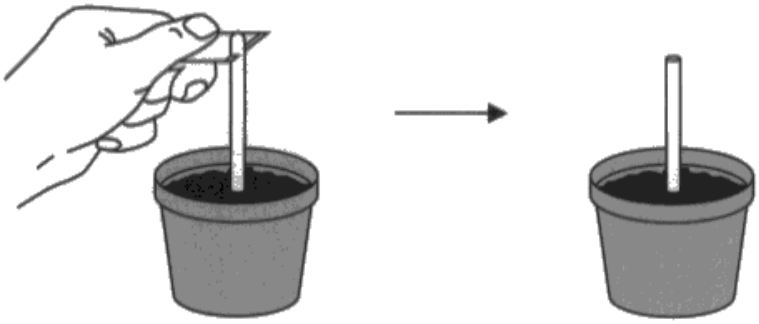
Generally this was well answered with most candidates able to recognise that it was the direction of the light that was important. Misunderstandings included light intensity and the amount of tip removed which were not creditworthy.

10 (a) Figure 18 shows an investigation into the growth of plant shoots.

Experiment 1:

The tip of a shoot was removed from the plant.

There was no growth in the shoot after 3 days.



Experiment 2:

The tip of a shoot was cut off and then placed back onto the shoot.

The shoot had grown 6 mm after 3 days.

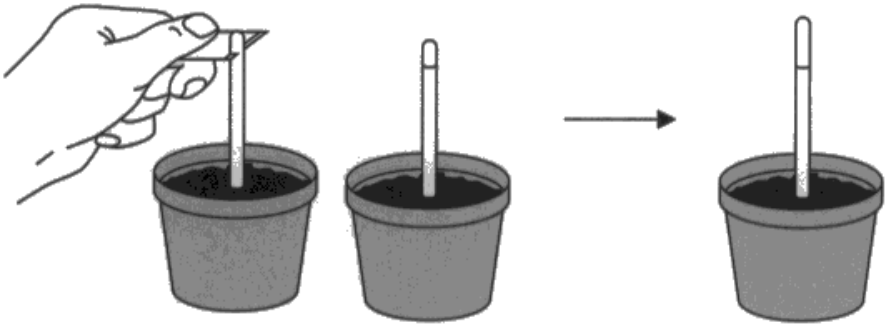


Figure 18

(i) Give **one** variable that must have been controlled for the plant shoot to grow vertically, as shown in experiment 2.

(1)

the size ~~[illegible]~~ of the tip you cut off

ResultsPlus
Examiner Comments

The key to this question is that the shoot grows vertically, thus the only possible answer is about light direction (from above). No other controls will allow the plant to grow vertically so no marks for other responses.

10 (a) Figure 18 shows an investigation into the growth of plant shoots.

Experiment 1:

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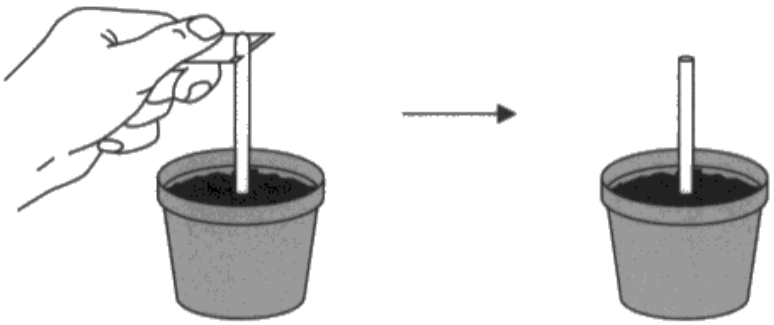

Experiment 2:

The tip of a shoot was cut off and then placed back onto the shoot.

The shoot had grown 6 mm after 3 days.

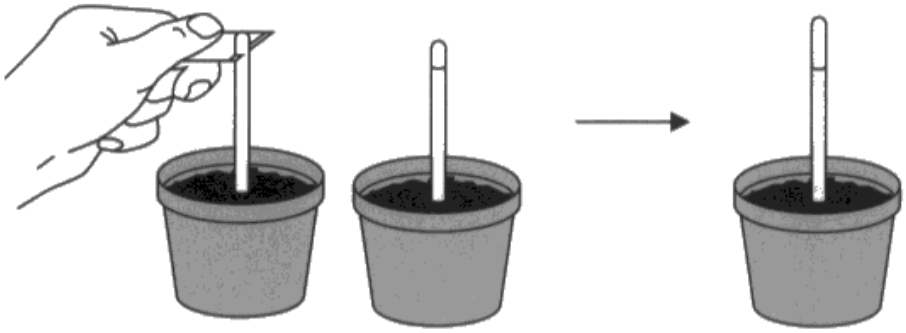

Figure 18

(i) Give **one** variable that must have been controlled for the plant shoot to grow vertically, as shown in experiment 2.

(1)

Light intensity must have been the same from all directions.

ResultsPlus
Examiner Comments

Light from all directions was acceptable for the mark.

Question 10 (a) (ii)

It was good to see that most candidates could make a relevant conclusion based on the data referring either to growth happening in the tip or that growth hormones were found in the tip. Candidates lost marks here by only referring to the shoot rather than the shoot tip.

(ii) State **one** conclusion that could be made based on these two experiments.

(1)

The shoot (containing auxin) is what makes the plant grow, the removal of the shoot will mean the plant won't grow

ResultsPlus
Examiner Comments

The shoot is not acceptable for the tip of the shoot; they must state the shoot tip/end/top. This was a common error; candidates need to be specific describing what part is essential to growth.

Question 10 (a) (iv)

Many candidates lost marks here as they did not refer to this experiment and the idea that they should improve this experiment. There were many changes to the experiment such as using different plants or different amounts of fertiliser. These are different experiments. The most common correct response was to repeat the experiment in order to obtain an average.

(iv) Explain **one** way that this investigation could be improved.

(2)

Instead of cutting the tip off, cover the tip with foil to block the sunlight completely and investigate the change in growth.

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Examiner Comments

Covering the tip with an opaque substance is acceptable for an improvement as it doesn't involve damaging the tip. The candidate did not go on to explain that this would allow for comparisons to be made, so only 1 mark awarded.

(iv) Explain **one** way that this investigation could be improved.

(2)

have the experiment be repeated and with other plant species

ResultsPlus
Examiner Comments

This is a change to the experiment rather than an improvement so the marks cannot be awarded. It is important to note that improvements involve doing the same type of thing having the same effect, not testing something new.

(iv) Explain **one** way that this investigation could be improved.

(2)

The experiment should specify where the plant was kept → eg in direct sunlight or in a shaded area. as that will affect the rate of photosynthesis which will allow the plant to grow.

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Examiner Comments

This is controlling a variable which is acceptable for 1 mark.

Question 10 (b)

There were some excellent responses on how the structures of the leaf allowed for reduced water loss and increased gas exchange where appropriate. It was surprising how many candidates did not consider the adaptations of the marram grass plant, despite there being an image of the plant in the sand dunes with flexible leaves to withstand wind damage without being uprooted, or the idea that the root system must be effective to prevent uprooting of the plant. There were some misunderstandings of the hairs on the leaves being confused with root hair cells to anchor the plant.

*(b) Marram grass is a plant that grows on exposed areas of sand dunes.

Figure 19 shows marram grass growing and a cross section through a leaf of marram grass.

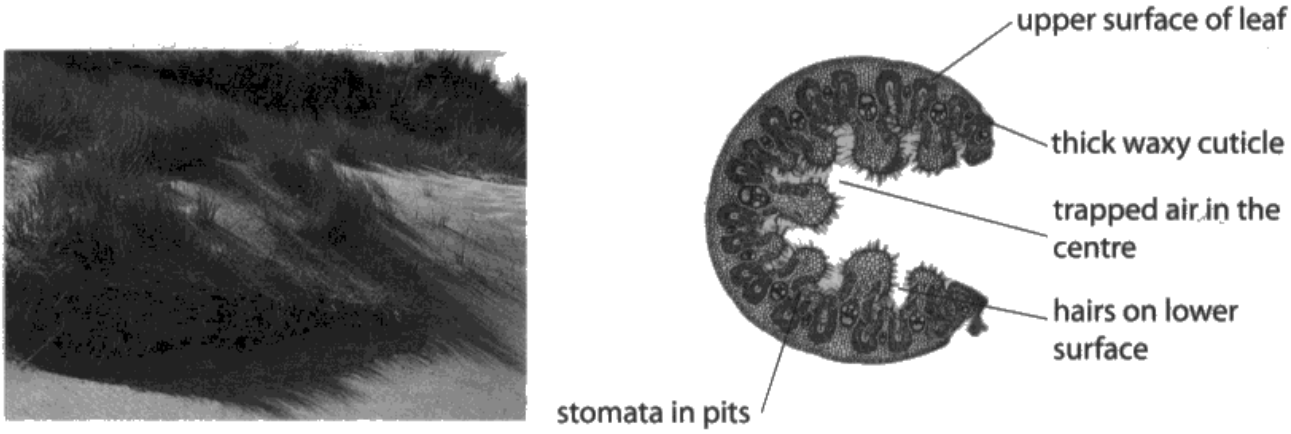

Figure 19

Explain how marram grass is adapted to survive in the hot, windy and dry conditions of a sand dune.

(6)

The marram grass has a thick waxy cuticle to prevent water loss due to transpiration. It has hairs on its lower surface to trap and absorb water particles and vapours. Stomata in pits allow for air to ~~be~~ ~~be~~ diffuse through into the plant for photosynthesis. The curved upper surface of the leaf increases the surface area for sunlight ~~be~~ ~~be~~ to be absorbed, which can be used for photosynthesis. Overall these adaptations mean that minimal water is lost ~~in~~ which is important in a hot and dry environment where water is sparse.

ResultsPlus
Examiner Comments

This candidate has got several simple marking points about the leaf structure. They have linked some to an explanation e.g. transpiration so can be awarded level 2. They have not given a plant adaptation so cannot be moved up to level 3. The answer has structure and is in a logical order so 4 marks can be awarded.

ResultsPlus
Examiner Tip

It is always worth answering the 6 mark questions. As they are generically marked the marks are often more easy to attain.

✓ WIND

*(b) Marram grass is a plant that grows on exposed areas of sand dunes.

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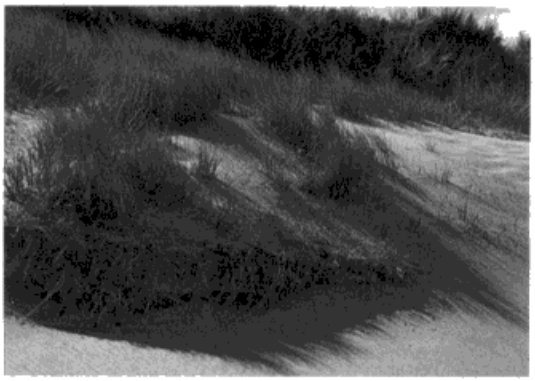

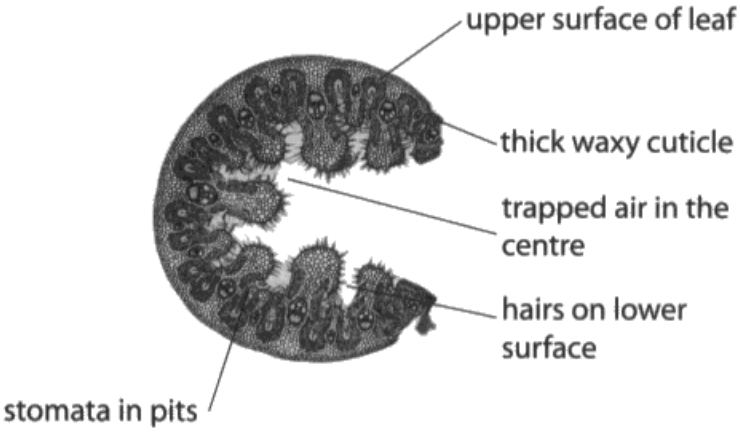

Figure 19

Explain how marram grass is adapted to survive in the hot, windy and dry conditions of a sand dune.

(6)

Firstly, the thick waxy cuticle helps to prevent water loss by transpiration (and gas exchange). The stomata in pits reduces water loss ~~as~~ as in pits water vapour gets trapped as it is less exposed to air movement. This means the difference in concentration gradient between the grass and the air is less, so diffusion occurs at a much lower rate so the diffusion of water vapour out of the grass and into the surroundings is less. Again, the air trapped in the centre reduces the difference of concentration between the water vapour in the leaf and the water vapour in the air so less water vapour diffuses out of the leaf thus less water loss. The hairs on the lower surface also trap air and water vapour levelling out the concentration gradients reducing water loss. The leaves of the grass are also very thin meaning they have little wind resistance so can withstand

high winds. The upper surface of the plant has no stomata as the upper surface contains a steep concentration gradient between the leaves and the air so diffusion would happen at a fast rate

(Total for Question 10 = 11 marks)

ResultsPlus
Examiner Comments

This candidate has given an explanation of reduced water loss from the waxy cuticle through transpiration. They have correctly linked other leaf structures to reduced water loss. In addition to this they have given a plant adaptation of the leaves being very thin so are resistant to windy conditions so can be given a level 3. The answer has a logical order and structure so 6 marks can be awarded.

Paper Summary

Based on their performance on this paper, candidates should:

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

Grade Boundaries

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

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

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