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GCSE Applied Science/Biology 5BI2H 01

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Introduction

The paper assessed 28 of the 2011 B2 specification statements within six questions that increased in complexity both across the paper and within each question. All three topics of the specification: the building blocks of cells, organisms and energy and common systems were covered including the following specific areas: Bacterial cell structure, aerobic and anaerobic respiration, digestion in the small intestine, pentadactyl limbs and evolution, gene mutations, DNA structure, meiosis and mitosis, The circulatory system as well as photosynthesis and transport in plants. it was very pleasing to see excellent understanding of scientific concepts and ideas expressed coherently and scientifically from many candidates. As in former years Mathematical concepts covered included data analysis and simple calculations. There was an emphasis in applying knowledge in the later items. Although this requirement allowed some candidates to demonstrate their ability that matched the'A'grade descriptors in the specification, a significant number of candidates showed that they knew biological terms and structures but could not link them together and develop them into a set of reasoned, coherent points. The following areas of concern were were highlighted. A small, but significant number of candidates showed that they misread questions often describing ideas taught instead of addressing the points rerquired and often shooting themsleves in the foot. It was noticed that a significant number of candidates could not distinguish between the comand words: 'describe' and 'explain' resulting in answers not matching the marking criteria. Some candidates that changed their responses on short answer and multiple choice items did not make their preferred response clear. This was mentioned in previous year's reports and still causes candidates to lose marks.

The paper compared favourably with the equivalent 2015 paper. The paper discriminted well with some excellent answers being submitted from higher grade candidates. Middle grade candidates demonstrated that they had a firm grasp of the facts, structures and basic biological processes in the specification being awarded marks across all items although as mentioned earlier not applying their knowledge to fully answer the application style items. it was disappointing to see too many scripts from candidates that were entered for the incorrect tier who could not access the questions with, in a significant number of cases, the question being asked not being addressed and contradictions disqualifying answers and poor expression resulting on marking criteria not being met. Numbers of candidates who used extra sheets of paper to complete responses were in line with previous years. There were a small number of candidates who's writing was so poor that their responses were unmarkable.

Overall it was rewarding to see many excellent repsonses that showed a firm undesrtanding of the biological principles covered in the specification coupled with the ability to apply it to different situations. Higher grade candidates showed an ability to put their answers logically, coherently and extend their answers to give consequences of their initial points, for ecxamples see the comments made for item 5b. The ability to extract and analyse data was in line with previous years although it was surprising to see so many candidates using the wrong calculation to work out the number of bases reaquired in item 3b. A complete range of ability was demonstrated with candidates scoring from one to sixty marks out of the sixty available.

Question 1 (a)

This item required candidates to recall the structures found in a bacterial cell and compare them to the structures shown in the diagram of the yeast cell. The majority of the candidates gained both marks available with some candidates gaining 1 mark only. Of those that gained 1 mark, commonly a mark was lost by giving two correct responses and one wrong one; for example, bacteria do not have a nucleus, vacuole or cytoplasm. It is possible that these answers were taking three of the structures shown in the diagram and saying that they were not found in the bacteria cell as few of those that lost marks answered by stating bacterial structures, e.g. bacteria don't have a nucleus but sometimes have a flagellum, which was a common 2 mark response.

(a) Describe how the structure of a bacterial cell differs from this yeast cell.

(2)

Bacterial cells also contain plasmid DNA and chromosomal DNA, Yeast cells do not. Bacterial cells have no nucleus and some bacterial cells have a flagellum.

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Examiner Comments

A good response giving more than required for full marks.It was not uncommon to see this quality of response showing that a significant number of candidates had learnt the relevant part of the specification.

(a) Describe how the structure of a bacterial cell differs from this yeast cell.

(2)

a cell wall doesn't have ce cell Wall or Vacuole

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Examiner Comments

This would have gained 1 mark if the candidate had written bacterial cell instead of the first 'cell wall'.

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Examiner Tip

Reread your answer so that you are sure that what you have written is what you mean.

Question 1 (b)(i)

More than half of the candidates correctly stated that mitochondria are the site of aerobic respiration to gain the one mark available. There were some blank answers seen. Some candidates responded with cytoplasm, indicating that they may be using their knowledge about the function of the nucleus and membrane, and thereby stating the other part where they are simplistically told that the cytoplasm is where all the cell reactions occur. Some candidates guessed at the vacuole.

Question 1 (b)(ii)

The candidates were required to compare aerobic respiration with the given anaerobic respiration equation in yeast. Many candidates who gained both marks included the aerobic respiration equation in their response, which would have been sufficient on its own to gain both marks. Some candidates lost a mark by stating that alcohol was still produced, e.g. yeast produces cabon dioxide, water and alcohol, or by stating that only oxygen was used to create glucose. 'Creating energy' disqualified the mark for products. A significant number of the candidates who did not gain any marks had rearranged the anaerobic respiration equation, often by just reversing it, e.g. alcohol and carbon dioxide gives glucose. To be awarded MP1, candidates had to show that oxygen was a reactant. Vague answers, such as 'aerobic respiration involves oxygen' or 'aerobic respiration contains oxygen' were deemed insufficient.

(ii) The word equation for anaerobic respiration in yeast is

glucose ⟶ alcohol + carbon dioxide

Describe how aerobic respiration is different from anaerobic respiration in yeast.

(2)

Aerobic respiration is glucose + oxygen → carbon dioxide + water (+ energy) in yeast. As anerobic respiration doesn't use oxygen, the products are only alcohol and carbon dioxide which are a different set of products.

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Examiner Comments

A good example of a question showing that the candidate not only knew the aerobic equation but had the understanding of how the equations modelled the processes to be confident in writing their response.

(ii) The word equation for anaerobic respiration in yeast is

glucose ⟶ alcohol + carbon dioxide

Describe how aerobic respiration is different from anaerobic respiration in yeast.

(2)

Aerobic is when you are inhaling and exhaling oxygen and carbon dioxide whereas anerobic respiration is when you absorb oxygen and water vapour.

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Examiner Comments

Here the candidate has confused respiration with breathing. This used to be a common error seen and it was surprising to see several answers confusing these concepts in this examination series. It is important that candidates are clear about the two processes.

Question 1 (c)(i)

This item required candidates to use the data given for yeast respiring sucrose at pH 9, 7 and 5 to estimate the volume of carbon dioxide produced when yeast respires lactose in an environment of pH5. The best estimate would be around 17/18 presuming that the different pH values had the same effect on the yeast for sucrose and lactose, which was indicated by the similar difference between the volumes of carbon dioxide produced at pH 9 and 7. There were excellent answers seen with working on the table showing candidates dividing the values for sucrose and then applying this to the lactose data. A range from 10 to 24 was accepted, which allowed appoximately half of the candidates to be awarded the one mark available. Of those who did not gain this mark, many had looked at the figures for lactose, e.g. 28cm^3 for pH5 and 35cm^3 for pH7, and continued the trend giving responses of between 40 and 50 cm^3 of carbon dioxide.

Question 1 (c)(ii)

This item further tested the candidates' ability to explain the differences in volume of carbon dioxide produced by yeast with sucrose at pH 9, 7 and 5. Around half of candidates gained one mark. Most candidates gained this mark by stating that yeast at pH7 produced the highest volume of carbon dioxide. No marks were given for candidates who had quoted the figures from the table. The majority of the candidates who gained both marks extended the first point by suggesting that pH7 was therefore close to, or was the optimum pH for yeast. A few candidates gained the second mark by suggesting that the enzymes at pH5 and/or pH9 changed shape so were less effective, although we did accept denatured for this mark. Some candidates had talked about temperature, suggesting that they looked at the volumes produced in the table without considering all the data supplied in the question. A few candidates stated that as the pH increased the volume of carbon dioxide increased, although some then stated that V (pH7) didn't follow the trend.

(ii) Explain the differences in the volume of carbon dioxide produced in test tubes U, V and W.

(2)

PH 5 produced the least amount of CO_2 because it is acidic PH 7 produced the most amount of CO_2 because it is neutral and pH 9 produced an amount in between because it is Alkali

(Total for Question 1 = 8 marks)

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Examiner Comments

A typical one mark response where the candidate has correctly identified and described the key data in the table but has failed to extend this to answer the question which requires them to explain the data.

(ii) Explain the differences in the volume of carbon dioxide produced in test tubes U, V and W.

(2)

Test tube U shows that sugar (sucrose) in PH 9 produces the ~~worst~~ less carbondioxide than V in PH 7. The carbon dioxide further decreases in test tube W where the PH is 5, this tells us that the optimum PH ~~does~~ for sucrose is PH 7.

(Total for Question 1 = 8 marks)

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Examiner Comments

The writing here is not clear, however it is clear that this candidate has understood the requirement. They correctly identified that yeast in pH 7 produces the largest volume of carbon dioxide but unfortunately make a small mistake when they try to explain the reason for this stating that the pH is optimum for sucrose when they needed to say that pH7 was the optimum for yeast / enzymes. One mark was therefore awarded.

(ii) Explain the differences in the volume of carbon dioxide produced in test tubes U, V and W.

(2)

Test tube U has a PH of 9 and a volume of 369, whereas V and W have volumes of 455 and 225

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Examiner Comments

Responses that just quote the figures from a given data table are not normally credited. Although it seems obvious that 455 is larger than 369 and that 225 is less than 369 the candidate needs to state this. It is even better if they calculate the difference and state that for example here they could easily say that V produces 86 cm^3 more than U and 230 cm^3 more than W.

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Examiner Tip

When asked to describe or explain data from a table which states quantities, for example volumes as in this item, do not just quote figures but say which is largest or state how much more one is than the other.
To gain more marks you need to extend the response to explain why the increase / decrease has occurred.

Question 2 (a)

Approximately half of the candidates could identify the process of squeezing food through the small intestine as peristalsis. There were several blank responses, whilst some candidates described the process when the question had asked the candidate to name the process, and others had stated that the process was a structure, most commonly the oesophagus.

Question 2 (b)(i)

Candidates tend to be much better at describing trends in graphs in comparison to trends for data in a table, which was the requirement for this item. Many candidates unexpectedly did not pick up the second mark. It is not understood why so many candidates stated that the concentration stopped increasing at 90 seconds when it is higher at 120 seconds in the table. Those candidates that scored 0 marks tended to just say that the concentration increased, sometimes stating the increase from 9 to 32mg per cm^3. Some candidates did extend this comment by manipulating these figures, for example saying that this was a rise of 23 mg per cm^3, and were thereby awarded a mark.

(i) Describe how the concentration of sugar in the liquid changes between 0 and 180 seconds.

(2)

The concentration of Sugar increase as the time went up to 120 Seconds then Stayed Constant

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Examiner Comments

A typical good response stating the basic trend and identifying the main key point where the trend changed.

The reaction took longer to kick in, as by 120 seconds the sugar had met its peak

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Examiner Comments

This response is unclear and therefore gained no marks. The candidate has however stated 120 seconds, which is a key point where the trend changes. Thus they may well have known the answer and it is their English that has let them down. A significant number of marks could be gained throughout all the papers if candidates phrased their responses precisely and without ambiguity.

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Examiner Tip

Read your response and think about whether it makes sense and is clear. This candidate is trying to say the concentration increased up to 120 seconds after which time it stayed the same. You need to ensure that your answers state the key points simply and clearly as in the first example shown.

(i) Describe how the concentration of sugar in the liquid changes between 0 and 180 seconds.

(2)

at 0s there is ~~aaa~~ 9mg/cm³ whereas at 180 it is 32 mg/cm³

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Examiner Comments

When a candidate is asked to describe a trend it is insufficient to just quote data from the table. Invariably there will be an increase or decrease which will often change in rate at specific points. Candidates need to be trained in this skill. There was also a mark available for stating that the concentration increases by 23 mg per cm^3 which comes under the manipulation of data mark.

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Examiner Tip

Just stating the data from a table is very unlikely to gain credit. Furthermore this candidate has missed the key time of 120s when the trend changed. Make sure that you identify the point where the trend changes and state that figure in your answer.

(i) Describe how the concentration of sugar in the liquid changes between 0 and 180 seconds.

(2)

~~Eg~~ From 0 to 90 seconds the concentration of sugar increases. At 120 seconds to 180 seconds the concentration of sugar stays the same because all of the sugar has diffused

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Examiner Comments

The candidate has correctly identified that the concentration stays the same from 120s to 180s gaining 1 mark. They have also stated that the concentration increases from 0 to 90s, not 120s. A large number of candidates produced similar responses. If they had also said that the concentration only increases a small amount between 90 and 120s then this would have been creditable, but this common mistake needs to be pointed out to candidates when describing trends in graphs.

Question 2 (b)(ii)

This item required candidates to recognise that bread and saliva were put into the model intestine and thereby state that the sugar produced was from the enzyme digesting the starch/carbohydrate in the bread. Nearly half of the candidates scored both of these marks. Some candidates lost one mark by stating that the enzyme/amylase/carbohydrase broke down bread, by talking about the sugar being part of the yeast or made by the yeast, and sometimes saying by photosynthesis.

(ii) Explain how the sugar was produced in the bread mixture.

(2)

Amalayse is an enzyme that converts starch into sugars. So during the process amalayse started turning sterch in tu bread into sugars.

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Examiner Comments

A good response where both available marks were credited.

Question 2 (b)(iii)

Nearly half of the candidates suggested a creditable way in which the small intestines model in the question was not a good model. It was insufficient to state a difference, for example the small intestine is longer, as such points did not make a difference to the processes being shown. Most candidates that gained the mark stated that the model did not have anatomical details, for example the model lacked blood capillaries in the wall to absorb the sugars or villi to increase the surface area. A significant number stated that the holes in the tights let too much material through.

(iii) Suggest **one** way that the tube is not a good model of the small intestine.

(1)

It is not very accurate for copying the process of the small intestines

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Examiner Comments

It is important that candidates answer the question. Here they merely state that the model is not good which they are told in the question.

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Examiner Tip

When asnswering a question you must be specific and not merely reword the question. Here you are being asked how the model is not good, you are not being asked if the model is good or not.

Question 3 (a) (ii)

This item required candidates to describe the structure of a pentadactyl limb. Some very good answers were seen discriminating between higher grade candidates. Some candidates scored no marks due to common mistakes such as describing how pentadactyl limbs are adapted to different environments, which is how this specification point has been tested previously, or by simply stating some names of bones. Some candidates did not recognise the term 'pentadactyl limb' stating that they had never heard of it, whilst others guessed, for example it was a limb with 5 bones in it. Around half of the candidates scored one mark with 5 digits being the most common answer seen. Most of these stated the fact confidently but had problems giving specific details of the other bones found in the limb. Candidates scored both marks available by clearly stating not only the name of a bone but by indicating its correct position in the limb.

(ii) The scientists compared the pentadactyl limbs of these groups of mammals.

Describe the structure of a pentadactyl limb.

(2)

Pentadachyl limb is a five digit limb that can be found in many animals. There is also similar bone structure to show we have common ancestors.

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Examiner Comments

This is a standard one mark response where after a good start stating that the limb has 5 digits the candidate has failed to describe the structure of a pentadactyl limb in more detail and has then diverged into explaining how the pentadactyl limb can be used to compare relationships between different mammalian groups.

(ii) The scientists compared the pentadactyl limbs of these groups of mammals.

Describe the structure of a pentadactyl limb.

(2)

Pentadactyl limb has 5 digits and usually has the humerus which shows a link between all mammals perhaps coming from ~~the~~ same ancestors

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Examiner Comments

This candidate gets one mark for stating that a pentadactyl limb has five digits but needed to indicate where the humerus is in the arm, e.g. by saying it is in the upper arm, or it is next to the radius and ulna.

(ii) The scientists compared the pentadactyl limbs of these groups of mammals.

Describe the structure of a pentadactyl limb.

(2)

The structure of Pentadactyl limbs is the same in most mammals. It consists of a large upper bone, in the human leg this would be the phemur. It then consists of two bones together further down. It then has a whist like corrector which is consistent with all mammals before comming to the fingers or toes.

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Examiner Comments

This mark is sufficient to be awarded 2 marks as it states how many bones are in which part of the limb and names some correctly.

Question 3 (a) (iii)

Some excellent answers were seen where candidates followed a logical sequence in their responses using the data in all of the diagram. Most candidates stated that the population decreased and most developed this further giving one or more of the following commonly seen points: a change in the environment, inability to adapt to a changed environment, and less food. Some candidates suggested excellent ideas regarding the population of species C growing causing either increased predation or increased competition. Some candidates misread the vertical axis scale stating that the population increased, possibly because it was million of years ago and they read it as just millions of years. Some of these candidates were still able to score one mark for stating that this could be caused by a change in envoironment but they were unlikely to score other points as they would then suggest, for example, that the decrease in population of species C meant that there was more food available for species A. To gain the mark for predation, candidates had to indicate that predation increased.

(iii) Suggest reasons for the change in the estimated population size of group A from 10 million to 7 million years ago.

(3)

Between 10 and 7 million years ago, the population size of group A is estimated to have decreased. This could have been because they had more predators or could not predate themselves due to lack of prey, better adapted prey or competition. They may have potentially died out due to competition over resource (eg food and water) and survival of the fittest. Also, perhaps the environment changed (eg in ice age) and some individuals could not adapt to the new conditions.

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Although not written well, this candidate covers more points than required to be awarded all three marks available. After stating that the population of species A decreased, they went on state several good points including 'more predation' and stating that 'the environment changed' and some individuals could 'not adapt to the new conditions'.

(iii) Suggest reasons for the change in the estimated population size of group A from 10 million to 7 million years ago.

(3)

They may not have as much evidence for fossils from 7 million years ago. This could be due to fossils not being found, soft tissue decay (only hard tissue tends to fossilise) and not the correct conditions for things to fossilise e.g. too acidic.

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This was a common response seen where the candidate has misread the question and is answering why are there gaps in the fossil record. This is the question that has been asked before and is the context in which fossils are commonly taught with this specification. This may imply that candidates need to be taught to read questions carefully and ensure that they are answering the question instead of seeing a keyword and writing about that topic.

Question 3 (b)

This question required candidates to multiply the number of amino acids given, 630, by three to find the minimum number of bases required to code for the protein in question. Some candidates divided 630 by three, thereby giving an incorrect answer of 210. It is possible that these candidates had practised the reverse way of testing the specification point thereby generating an incorrect response.

(b) Scientists investigated a protein found in a mammal.

The protein contains 630 amino acids.

What is the minimum number of bases in the gene that codes for this protein?

(2)

630÷3=210

210 bases

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The common response seen from candidates who gained 0 marks.

(b) Scientists investigated a protein found in a mammal.

The protein contains 630 amino acids.

What is the minimum number of bases in the gene that codes for this protein?

(2)

3:1 630x3= 1890 bases

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Examiner Comments

Although the diagram is wrong, it may well of helped this candidate to carry out the correct sum.

Question 3 (c)

Candidates were required to explain how a mutation in DNA could result in a different protein being made. There were excellent answers seen showing a clear understanding of this specifiaction area linking changes in base sequence to changes in codons matching different anticodons thereby coding for a different amino acid. It was pleasing to see technical teerms, for example, substitution and addition being used, although not required for this GCSE specification. Candidates credited with both marks available commonly wrote that a change in the base sequence led to a change in the amino acid sequence. Some candidates confused DNA, bases, proteins and amino acids, e.g. stating that the amino acids on the DNA were changed. Some candidates stated that the base pairs changed so that A will now pair with, for example G. which will cause the protein to be different. It was rare to see the final part of the story that the change in amino acid sequence can result in the protein being shaped differently, although some candidates had briefly said that this could affect the way the polypeptide folds.

Question 4 (a) (i)

The introduction to question 4 was a recipe for extracting DNA from peas. The item asked candidates to explain why two parts of the recipe, adding detergent and crushing the peas, were needed. This required candidates to apply their knowledge that the DNA is found in the nucleus, thus to extract it cell walls and membranes, either cell or nuclear, have to be broken. Some candidates who scored no marks made errors talking about the detergent making the DNA separate, breaking hydrogen bonds, killing bacteria and cleaning the cells/ DNA, or breaking the cell walls. Restating the question, saying that crushing was required to allow the extration of peas/DNA, was a common response. Most candidates who gained both marks stated that crushing broke the cell wall and membranes down, although many candidates were more specific referring to the cell and the nuclear membrane.

Question 4 (b)

The majority of candidates scored marks here. This was a recall question where candidates had to state the role that Watson and Crick played in understanding the structure of DNA. Excellent answers were commonly seen with the roles and names of other scientists quoted. Common answers matched marking points 1, 2 and 3. Marks were lost by candidates stating that Watson and Crick took x-rays of DNA themselves, and that they discovered the bases rather than stating that they showed how the bases in DNA paired together.

Question 4 (c)

This item allowed candidates to demonstate their knowledge of meiosis and mitosis. It was pleasing to see the vast majority of candidates writing about both meiosis and mitosis setting their answers out logically stating one point about meiosis and mitosis in turn, or the points about meiosis and then mitosis respectively. Some candidates scored no marks on this item as they got mitosis and meiosis confused. Nearly half of the candidates gained all three marks available. Commonly seen responses were that meiosis produced 4 haploid cells, with genetically different and produce gametes less commonly seen. It was noted that many candidates wrote that mitosis produced genetically identical cells but that meiosis produces different cells omitting the word genetically which meant that MP2 was not awarded. Some candidates lost marks through stating that meiosis occurs in gametes rather than meiosis makes gametes.

(c) DNA is involved in the processes of meiosis and mitosis.

Describe how the cells formed by meiosis are different from the cells formed by mitosis.

(3)

In mitosis (used for grōth, repair and asexual reproduction) there is one cell division that produces two diploid daughter cells that are genetically identical. In meiosis (used for sexual reproduction) there are two cell divisions which produce four haploid daughter cells that have different genetics.

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A good standard answer setting three creditable responses out logically and coherently.

Meiosis is a one cell ~~divi~~ division whereas mitosis is a two cell division. Mitosis occurs in the sexual organs, to produce gametes and meiosis occurs in the body cells. Meiosis is a diploid cell division whereas ~~mi~~ mitosis is a haploid cell division.

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Examiner Comments

This answer is a little muddled anyway, but it is a pity that the candidate interchanged meiosis and mitosis thereby stopping any marks being awarded.

Question 4 (d)

More than half of the candidates scored either 1 or both of the marks available for this item, which required candidates to explain how embryonic cells can become specialised. Good answers succinctly wrote about stem cells either differentiating or becoming different types of cell. Totipotent was rarely seen. Some candidates restated the question partly by saying that stem cells specialise, thus gaining 1 mark. Common errors included vague answers e.g. some embryo cells can become other cells. Some candidates described how sperm and eggs produced embryos, often stating that the gametes were haploid and that the embryo was diploid, whilst others wrote about embryos producing sperm and eggs.

(d) A fertilised ovum (egg cell) divides by mitosis to form an embryo.

Describe how some cells in an embryo become specialised cells.

(2)

A stem cell can differentiate when needed by the embryo to do specific tasks which the embryo cannot complete. Embryonic stem cells also specialise to any other cell if the original cell is damaged or more cells are required.

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An excellent answer gaining both marks available showing that this area of the specification is understood well.

Question 5 (a) (ii)

This item asked candidates to recall the structure of the heart and to describe how blood moves from the right atrium through the heart and to the lungs. The first mark was awarded for identifying that chamber Y was the right atrium and then from there blood moves down into the right ventricle and out through the pulmonary artery, with credit being given for reference to the atrium/ventricle contracting and valves either correctly placed or stopping backflow. Excellent answers were seen covering all the main points with responses scoring 1 or 2 marks often stating that blood moves from chamber Y to the right ventricle and then through the pulmonary artery. Common errors included moving from the right to the left side of the heart and getting the atrium and ventricle the wrong way round.

(ii) Deoxygenated blood enters the heart in the chamber labelled Y.

Explain how blood is moved from chamber Y to the lungs.

(3)

The blood enters the right atrium (the chamber labelled Y) from the vena cava and is pumped through the valves into the right ventricle. The blood is then pumped through the pulmonary artery which takes it to the lungs to become oxygenated.

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A good response covering the four most commonly seen ways to gain marks, Y is the right atrium, a correct reference to the position of a valve, in this case the right atrioventricular valve, through the right ventricle and through the pulmonary artery. It should be noted that 'pumped' was considered too simplistic at this level to be credited. This marking point needed to say the muscles, or the ventricle / atrium heart contracted.

The blood flows through the heart, pumping the heart, and then the blood moves up the middle tube and then into the lungs.

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Examiner Comments

This is a vague answer. Candidates need to learn the key structures in the specification as questions and mark schemes are written to examine what is set out in the targeted specification point.

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Examiner Tip

This response gained 0 marks.

Learn the biological terms and names, the minimum being those stated in the specification as marks are seldom given for vague answers.

Question 5 (a) (iii)

This question required candidates to demonstrate their knowledge about how substances are transferred between the blood in capillaries and body cells. Over half of the candidates scored 1 or more marks. Common errors included answers such as: the aorta transported capillaries around the bodies, that blood cells move out of the capillaries and collect the substances, that the blood cells move into the lungs, and that substances move up and down the gradient. There were several ways to gain marks here, for example by stating oxygen diffuses from the blood in the capillary into the body cells, which would gain both marks available. Oxygen moving from cells into the blood would be credited if it was made clear that this happens in the lungs. Nearly half of the candidates gained full marks. Excellent responses were seen describing a variety of substances and how they are exchanged between capillaries and body cells.

(iii) The blood vessel labelled X carries blood to capillaries.

Explain how substances are exchanged between capillaries and body cells.

(2)

As the capillaries carry the oxygenated blood around the body to the body cells. They are a thin bee structure which allows the red blood cells, plasma, red blood cells and the platelets to glide through them easily.

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Examiner Comments

This response has not answered the question and it just describes how blood moves through the capillaries rather than explain how substances are exchanged between capillaries and body cells.

capillaries have 1 cell thick walls for oxygen to diffuss through easily to the body cells and food can come in through this wall and into the blood.

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Examiner Comments

This candidate gets both marks available for the first sentence. However the second part is weak as it states 'food', rather than naming a specific nutrient that is exchanged between capillaries and body cells.

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Examiner Tip

Read the question and ensure that you have answered it with specific examples. Here the response gains the full two marks for oxygen diffusing, but try not use general terms like food which could mean fish and chips and use the more specific food carried by the blood, for example, glucose or amino acids.

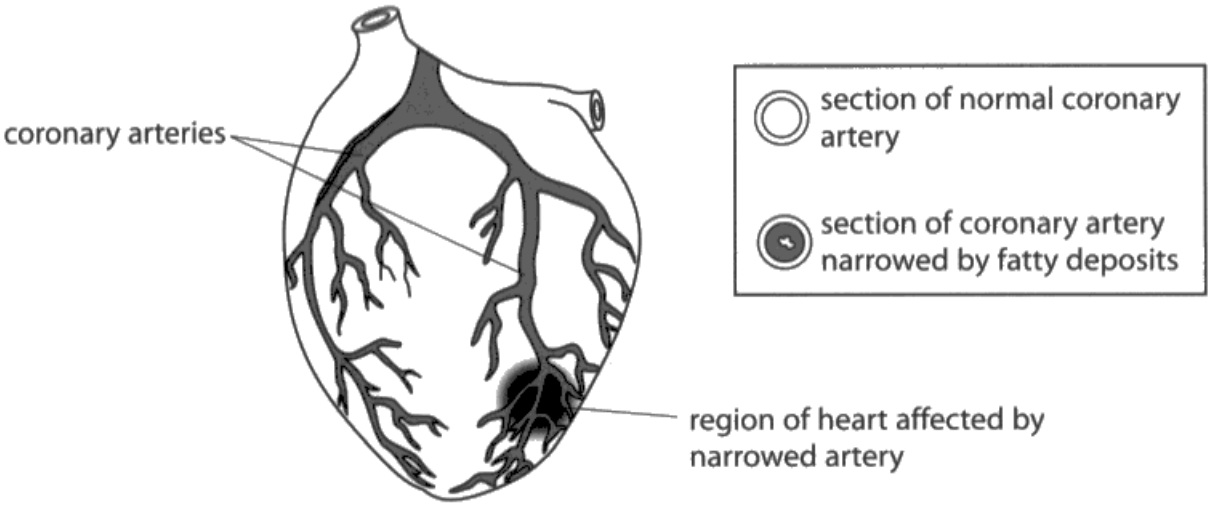
Question 5 (b)

This item required candidates to apply their knowledge to a situation where the coronary artery was narrowed. The stem of the question instructed candidates that the coronary artery took blood to the heart cells. Even so, a significant number of candidates still talked about the coronary artery taking blood to the body or the lungs or both. It was not unusual to see answers stating that the pulmonary artery carries blood to the heart cells, which gained no credit as it was in the stem of the question. Candidates gaining two marks generally stated that the narrowing would restrict blood flow to the heart/to the body but did not develop their response further to state any consequences of this. Four mark responses typically took this a little further with the consequence that the areas beyond the narrowing would receive less oxygen/the heart would be less efffective, and so the body would receive less oxygen. Six mark responses were either more detailed stating, for example, that less oxygen and glucose would be supplied to cells or that with less oxygen cells would start respiring anaerobically.

*(b) The diagram shows the coronary arteries surrounding a human heart.

The coronary arteries deliver blood to the muscle cells in the heart.

The coronary arteries can become narrowed or blocked by fatty deposits.



Suggest how the narrowing of the coronary artery may affect how the heart functions and how this may affect other body cells.

(6)

Why this is a 6 marker I will never know.

Those coronary arteries have blood inside them.

Our hearts need them to carry our blood.

If some genius was to make these smaller...

The blood would eventually stop.

And you'd die.

Common Sense...

Genius...

ResultsPlus
Examiner Comments

Each year we see a few answers like this where the candidate shows that he does understand the problem and knows at least one basic creditable response. Candidates need to be discouraged from making comments like this and taught to use their energy to answer the question set.

ResultsPlus
Examiner Tip

In our experience, answers like this not only waste time but usually do not gain the marks the candidate probably should gain. There are parts of this response that if put a little more clearly like simply stating that less blood would pass to the heart cells instead of stating that the blood would stop then marks would have been gained.

Question 6 (a) (ii)

Item 6aii required candidates to interpret a diagram of a cross section of a leaf and apply their knowledge to explain the different numbers of chloroplasts in different cells. A common response that was not creditable addressed the different question of why do some leaves have more chloroplasts in them than others. Around half of the candidates scored 1 or 2 marks. The common mark that most candidates gained was for linking chloroplasts to photosynthesis. High scoring responses clearly linked more light at the top of leaves to more chloroplasts being there with less lower down as less light penetrated to those areas. Many candidates correctly referred to named layers of cells such as pallisade and spongy mesophyll. Few candidates gained marking point 5 saying how chloroplasts were in guard cells as part of the process of opening and closing stoma.

(ii) Suggest the benefits to a plant of having different numbers of chloroplasts in different types of cell in the leaf.

(3)

There are ~~lots~~ the most chloroplasts containing chlorophyll in the cells near the top of the leaf which will recieve the most light, so photosynthesis can happen at the highest rate possible. There are only a few chloroplasts in cells near the middle of the leaf because it does not recieve much light, but does recieve gases. The cells on the bottom of the leaf recieve the least light, so it would be a waste of energy to have ~~them~~ chlorophyll there.

ResultsPlus

Examiner Comments

A good response gaining all three marks available, showing a good understanding of photosynthesis and applying it to the distribution of chloroplasts shown in the diagram.

(ii) Suggest the benefits to a plant of having different numbers of chloroplasts in different types of cell in the leaf.

(3)

Chloroplasts contain chlorophyll which is where photosynthesis takes place. some places in the plant may not need to photosynthesise as fast so less chloroplasts in that area are needed. some areas of the plant need to photosynthesise at a higher rate so having different amounts of chloroplasts is beneficial.

ResultsPlus
Examiner Comments

This candidate is awarded 1 mark for relating chloroplasts to photosynthesis. However, there are indications that the candidate had an understanding that more chloroplasts were related to more photosynthesis but has failed to use the diagram. When diagrams are put in they can be to help set the context but often they are there to help the candidate answer the question. Candidates should be encouraged to use all the information given to help them ensure that their response relates strongly to the question set. In this question, credit was given when specific names were not known, and a candidate described where the cells are in relation to other cells in the diagram, e.g. saying the cells near the top have more chloroplsts than those lower down because more light is at the top.

ResultsPlus
Examiner Tip

When answering a difficult question like this, use the diagram and information given to make your answers more specific. If you do not know the names of regions or cells, draw a line to them on the diagram or describe where they are in relation to the rest of the diagram.

(ii) Suggest the benefits to a plant of having different numbers of chloroplasts in different types of cell in the leaf.

(3)

~~A~~ f Some benefits are that more photosynthesis can take place in places it is needed most and places where it isn't. More chlorophyll which will make that section of the plant more green ~~greener~~ which would take in ~~attract~~ more sunlight and photosynthesise better

ResultsPlus

Examiner Comments

This candidate has made some vague comments at the start but clearly links chloroplasts to photosynthesis and so can be credited for MP1.

Question 6 (b)

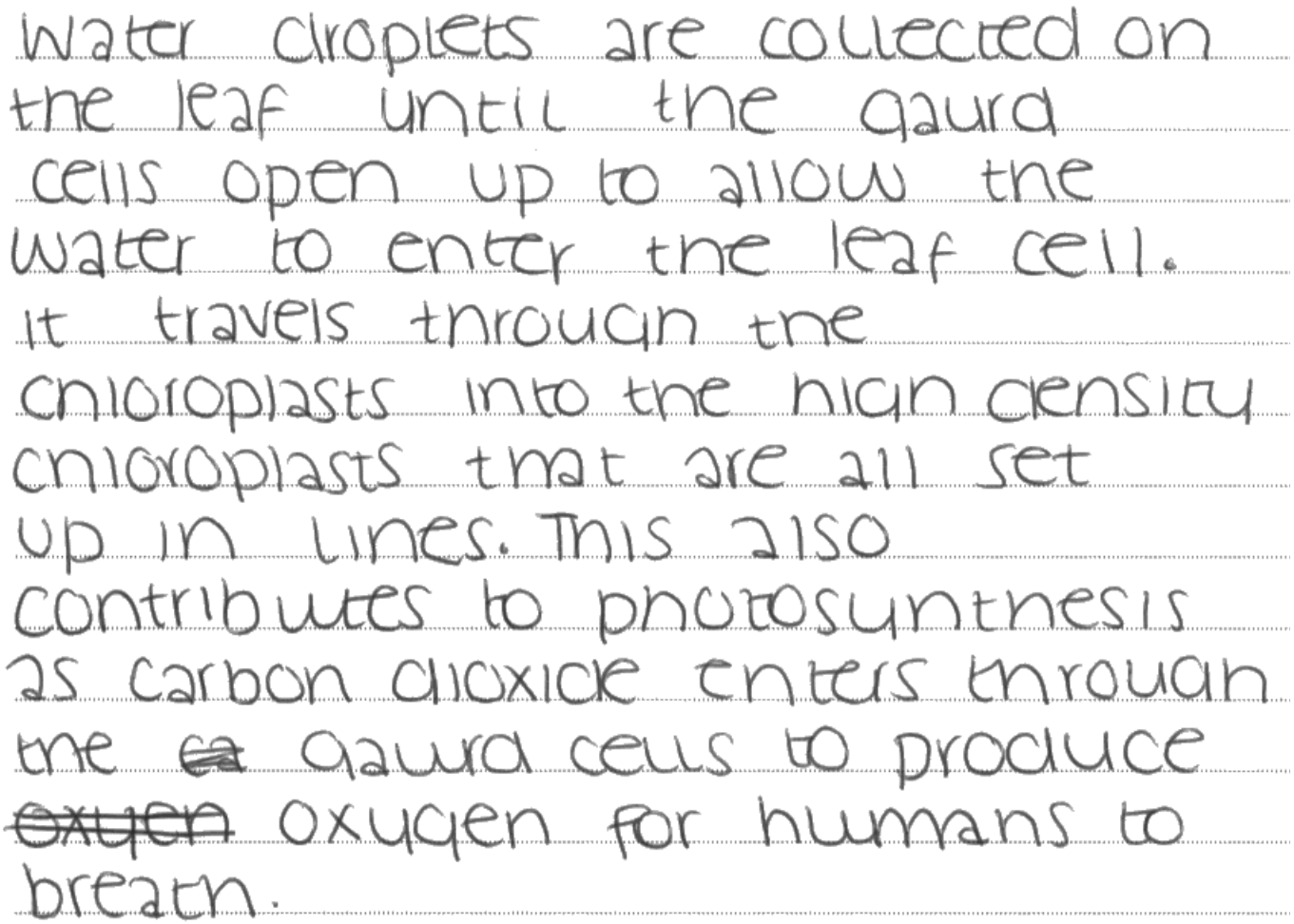
There were excellent answers seen in response to this item. Candidates who gained one mark usually gained it for stating that light is no longer the limiting factor without developing the response to suggest what has now become the new limiting factor. Candidates that gained both marks often gave a list of possible other limiting factors. Some candidates who had scored 0 had left the question blank; others had described the graph and stated that no matter how much light the plant was given the optimum light level or equivalant had been reached.

Question 6 (c)

This six mark question was accessible to most candidates. Many responses seen incorrectly referred to plants absorbing water through their leaves or talked about sending their leaves down to the soil to drink. Some candidates wrote a good response and then added the leaves drinking water as an extra point. Very few candidates scored no marks. A few candidates gained 1, 3 and 5 marks due to a low quality of written response. Excellent answers were seen that went beyond the GCSE criteria, e.g. discussing cohesion, adhesion and capillary action in relation to movement through the stem. Not many candidates covered how water moves from the root hair cells across the root to the xylem.

*(c) Explain how water enters a plant and is moved to the leaf.

(6)



ResultsPlus
Examiner Comments

Many candidates wrote incorrect answers like this thinking that plants absorb water through their leaves.

*(c) Explain how water enters a plant and is moved to the leaf.

(6)

Water enters a plant through the root hair cells. It is absorbed from the soil into the roots by Osmosis - movement of water particles from an area of high concentration to low concentration across a semi-permeable membrane. It moves from the roots to the leaves via the Xylem tube networks along with minerals. This is due to the transpiration stream. Water evaporates or diffuses out of the *leaves creating a water shortage in the leaves. Then more water is drawn up ~~from~~ through the rest of the plant ~~As a result~~ through the xylem tubes. As a result more water is absorbed through the root hair cells by Osmosis. This makes a steady flow of water to the leaves.

The root hair cells provide a large surface area for absorption.

* Stomata in the

ResultsPlus
Examiner Comments

An excellent GCSE answer covering how water moves into roots, and how water moves up the stem. To gain level 3, six marks, two areas had to be covered, here into roots and up the stem including some technical details, here osmosis, xylem and transpiration stream is more than sufficient for six marks.

Paper Summary

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

- ensure that they read the question carefully and make sure that they answer what is being asked
- have a clear understanding of the difference required in answering 'describe' and 'explain' questions
- put thier answers clearly with correct terminolgy
- do not give alternative ideas in that more often than not disqualify credit awarded
- develop repsonses so that consequencies of initial points are covered in items where more than 2 points are available
- be specific as many vague answers seen showed that candidates had a basic understanding of the concepts being tested but were unable to express their ideas spefically enough to be awarded marks.

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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