

Examiners' Report
June 2014

GCSE Biology 5BI2H 01

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Introduction

This Paper tested a reasonable range of the specification including the following areas of the science 2011 B2 specification: DNA, mitosis and mutation, protein synthesis, fertilisation, cell structures, ecological surveying, the processes of osmosis, diffusion, active transport, exercise fitness and the digestive system and enzymes. The mathematical skills of graph drawing, graph interpretation, and calculating percentages and substituting data into equations were also tested. The paper consisted of 6 questions that increased in complexity. Questions included two six mark questions which were assessed on science as well as quality of written communication.

The paper differentiated well with some clear distinctions in answers seen with candidates awarded the higher grades demonstrating excellent specificity and ability to express their responses scientifically with exemplifications. All of the questions were accessible to the vast majority of candidates and although blank questions were seen, these were few and far between with additional pages being added with candidates keen to show the science that they knew far more common. Some candidates, however, clearly had problems explaining some areas of the paper with command words misinterpreted and responses not focussing on the science required to cover all marks.

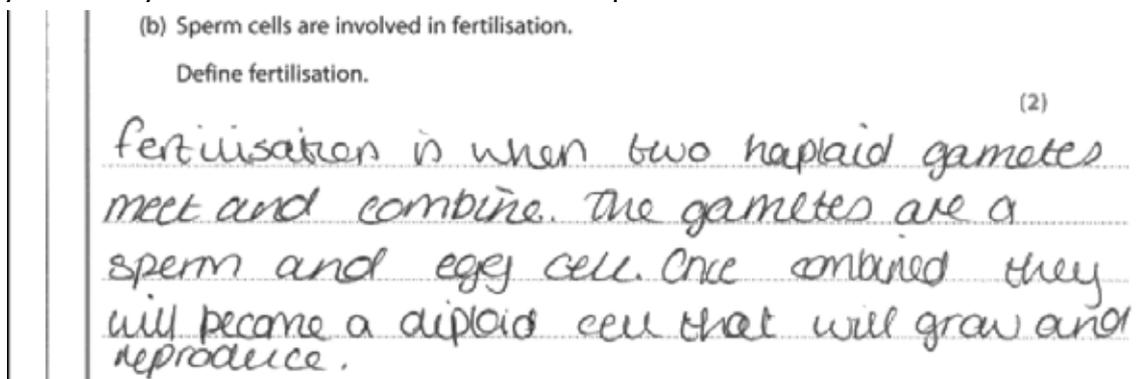
Overall, the paper allowed the candidates to demonstrate their scientific knowledge and ability to apply some of this to different situations and to explain data. Mathematical ability tended to be strong on graphs and equations although a significant number of candidates needed more preparation in extracting data from scales on graphs and in extracting data from tables to use in calculation percentages.

Question 01 (a) (i)

The majority of candidates correctly identified the nucleus on the diagram of the sperm cell. Whilst some candidates incorrectly stated that the structure was the acrosome which was an understandable error, a significant number labelled it as DNA or genetic material implying that they had not noticed that the question asked them to name a structure.

Question 01 (b)

This item required candidates to define fertilisation. The majority of candidates stated that it was when sperm and egg cell fuse with many marks being gained from stating that a zygote is formed with many candidates also stating that the gametes are haploid / fertilised egg is diploid. Many candidates wrote answers that covered all of the marking points. It was good to see that candidates knew the details of this area of biology in detail. Candidates lost marks by being vague, for example, stating that the sperm and egg cell meet or referring to sperm and egg as just gametes and the zygote as any later stage of development from embryo to baby as illustrated in the second clip below.



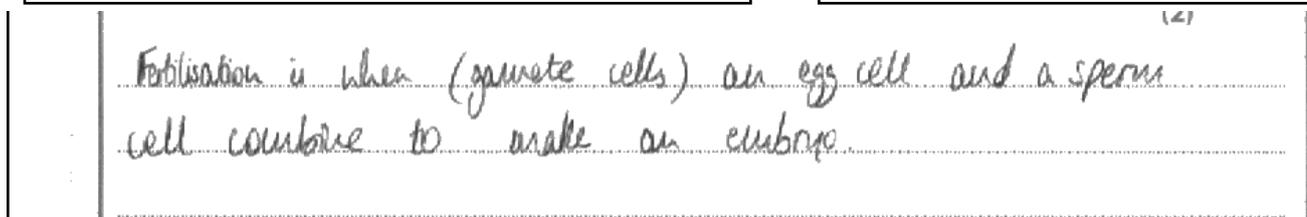
ResultsPlus Examiner Comments

This candidate has gained both marks through adding detail to the basic definition of fertilisation. They do say that sperm meets the egg; however, although meet is insufficient for credit, the candidate gets the mark as they then qualify the process with the word combine.



ResultsPlus Examiner Tip

When revising for a topic that is sequential, make sure that your learning techniques cover the process, the related scientific terminology and further details that will allow you to be credited for subsequent points made.



ResultsPlus Examiner Comments

Here the candidate has lost a mark by referring to the fertilised egg as an embryo rather than the correct term, zygote.



ResultsPlus Examiner Tip

In sequences like this, ensure that your revision includes all the stages with emphasis on including and learning the relevant scientific terminology.

Question 01 (c) (i)

To gain both marks, the candidate had to mention both respiration and releasing energy. 'Creates / makes' disqualified the energy mark as it is scientifically wrong. The latter part was the main reason why more candidates scored 1 mark on this item, with roughly one fifth getting both marks. Common incorrect responses included stating that the mitochondria controlled the cell and some that said it glued the sperm to the egg. A few candidates missed the key part of the question as a function and talked about the mitochondria in terms of structure.

(c) (i) Describe the function of mitochondria.

(2)
In cells mitochondria is where most of the reactions
for respiration take place. Respiration releases energy.
So the mitochondria releases energy in the cell



ResultsPlus

Examiner Comments

An example of a good response showing a clear understanding of the function of mitochondria.

(c) (i) Describe the function of mitochondria.

(2)
Mitochondria are used for aerobic
respiration in cells, so the cell
can create energy.



ResultsPlus

Examiner Comments

'Creating energy' is incorrect science so was not credited, the candidate does, however, get the respiration mark.



ResultsPlus

Examiner Tip

Use a good text / revision guide when revising so that basic definitions and scientific ideas are accurate.

Question 01 (c) (ii)

Marks were roughly evenly spread between 0, 1 and 2 on this item. Candidates had to explain how a mutation produces a different protein to gain credit in this item. The candidates here showed that they knew the related science in detail although many of them wrote confused answers that did not allow credit. Many excellent answers were seen explaining in detail how a change in the base sequence related to changing an amino acid with germane details about protein synthesis and it was pleasing to see a few candidates naming a specific type of mutation with deletion being the most common one seen. However, a significant number of candidates misread the question as, 'what is the effect of a changed protein', with some starting off well by stating that the mutation was a change in the base sequence but then going on to describe the lock and key theory and how the protein would not digest food if it was changed in shape.

(ii) Gene mutations in DNA can produce abnormal mitochondria.

Explain how a gene mutation can produce a different protein.

(2)
DNA is ~~not~~ used to give instructions ~~of~~ ~~how~~ how to make protein, there for if the DNA is different so are the instructions it gives to make protein, which which leads to a different protein being made.



ResultsPlus
Examiner Comments

The candidate here gains no marks as the definition of a mutation 'the DNA is different' is too vague with the rest of the response only restating the stem of the question saying that the protein will be different.



ResultsPlus
Examiner Tip

When revising, practise answering examination questions and have them checked by a teacher who can give guidance on how to ensure that the response answers the question.

Question 02 (b)

This item required candidates to explain how water is moved from cell to cell in a leaf. It was therefore disappointing that many candidates described how water is absorbed by roots or was moved by the transpiration stream through xylem. The majority of candidates were familiar with the process of osmosis although roughly half of the candidates were awarded just one mark as they only stated from a high to low concentration without specifying to what the concentration was referring. Most candidates who did get this marking point stated from a high concentration of water to a low concentration of water. A significant number stated from a low solute concentration to a high solute concentration. Some candidates who just wrote from a high to low concentration carried on and gained their second mark through stating that osmosis moves water through a partially permeable membrane.

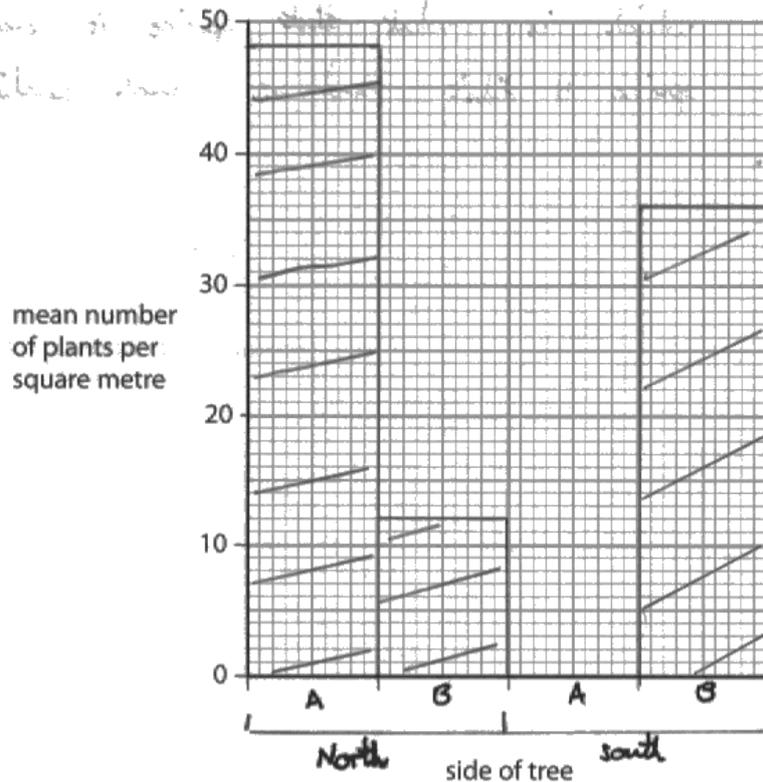
Question 02 (c) (i)

It was pleasing to see that the vast majority, over 80%, of candidates could draw a bar chart accurately. Candidates lost marks in two ways: some plotted the bars, mainly the species A north bar incorrectly with an almost equal number incorrectly labelling the bars. A few candidates gained no marks as they either completely failed to draw a correct bar chart or took an average of the species and then drew a chart based on just the north and south side.

It was pleasing to see that the majority of candidates, over 80%, could draw an accurate bar chart. Some candidates lost 1 of the 2 marks available by either, plotting a bar incorrectly, usually the species A north side, or incorrectly labelling the bars.

(i) Draw a bar chart to illustrate the data in this table.

(2)



ResultsPlus Examiner Comments

Here the candidate has drawn the bars accurately and correctly labelled the bars clearly. Many candidates had problems labelling the x axis this clearly with a variety of different systems used. These were still credited as long as they correctly referred to their respective bar.

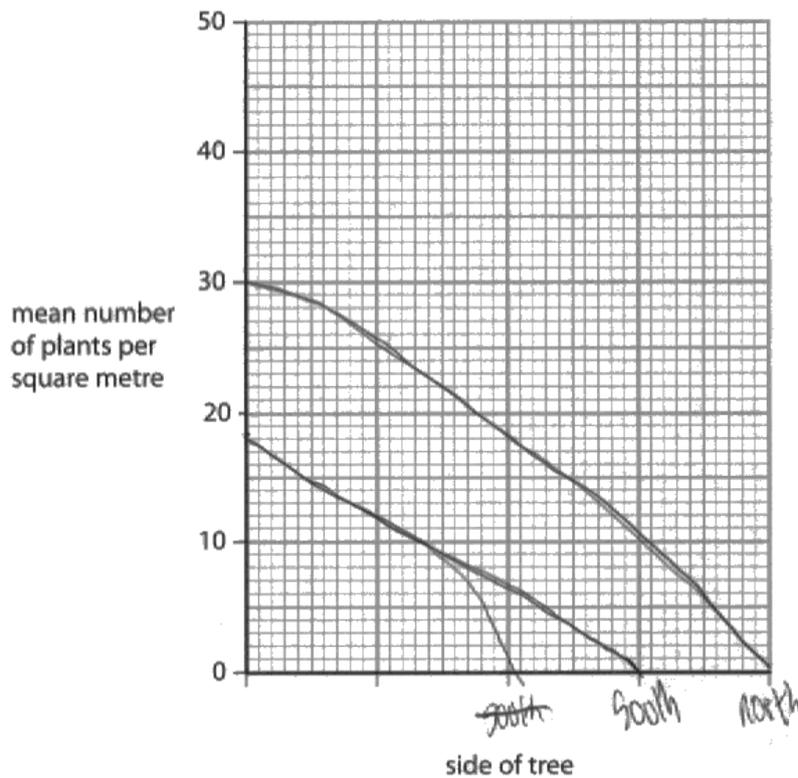


ResultsPlus Examiner Tip

Candidates often find it difficult to split data in tables and graphs. Allow candidates to practise this skill by giving them opportunities to do so through salient practical tasks.

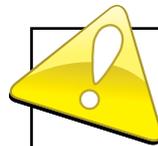
(i) Draw a bar chart to illustrate the data in this table.

(2)



ResultsPlus
Examiner Comments

It is disappointing that a higher grade GCSE science candidate has incorrectly drawn this bar chart. It is possible that they misread the question or are not able to draw graphs.



ResultsPlus
Examiner Tip

Ensure that candidates are familiar with drawing the different forms of graphs as outlined in point 9 of the mathematical skills section of the specification.

Question 02 (c) (iii)

Some candidates possibly did not have enough experience at analysing biological data to interpret the distribution of species A and B on the two sides of the tree in a creditable way. Some candidates did not understand what was required of them here as in the first 2 clips shown. Although a good number of candidates clearly understood the idea required here, too many lost one of the two available marks by giving the reverse argument as their second point, e.g. 1) the light intensity is brighter on the south side which is why there are more of species B there, and 2) there is less of species B on the North side because the light intensity there is lower. Most candidates gained their mark by stating that an abiotic factor, usually light, was higher on either the North or South side of the tree, although a significant number discussed competition from species A to gain credit. It was very disappointing to see answers that include the plants walking round to the other side to avoid the heat, species A being predators of species B on the North side and those that did not know what South / North meant with comments likely South means the bottom of the tree and North the top.

(iii) Suggest reasons for the distribution of species B on the north and south sides of the tree.

(2)

A leaf from the south side could have been transferred from the south to the north side. DNA ~~is~~ could have been transferred to produce a genetically identical species



ResultsPlus Examiner Comments

This candidate possibly did not refer back to the table of data here.



ResultsPlus Examiner Tip

When preparing for examinations using suitable questions, ensure that candidates refer back to parts of the stem that are relevant to the different parts of the question. All of the question parts may refer to the general introductory part of the stem and then each part, e.g. (c)(i), (c)(ii) and (c)(iii), can refer to the general introduction and also any that is in just part (c) as in this question.

There were more species of on the south side.
36 on the ~~at~~ south and only 12 on the north.
This could be because species B may ^{not} have wings or does ^{not} prefer heights, rather than be lower down on the south.
Species B may also be land animals. Species B may not also be that skilled on climbing very high on trees.



ResultsPlus Examiner Comments

This candidate has shown good practice by underlining species B in the question but has missed other important key words and concepts in the question. Their answer shows that they have not understood the question. They refer to animals, not plants as is stated in the stem of this question and refer to height up the tree for south and north.



ResultsPlus Examiner Tip

Underline all key words in the question so that you know what is required in the response. Remember that all of the information in the question is important. Here the introduction to part (c) relates to all the subsequent parts, (i), (ii) and (iii).

There could possibly be more sunlight on the South side, resulting in more plants ^{because} meaning of photosynthesis and this will mean more food is available on the South side rather than the North side.



ResultsPlus Examiner Comments

This candidate has made a good basic statement regarding more light on the south side to explain why there are more of species B on the south side of the tree. They then develop this idea, but unfortunately also needed to explain why there is less of species B on the North side as well as the South to gain both marks.



ResultsPlus Examiner Tip

When explaining experimental data it is good to develop an answer with good science, however you also need to explain all the data to which the question relates to ensure that all marks will be gained.

Question 03 (a) (i)

This question required candidates to compare data extracted from a graph of heart rate from a fit and an unfit person during and after exercise. The item was accessed effectively by the majority of candidates and discriminated well with higher grade candidates stating several basic comparisons referring to more than just either the fit person returning to their resting heart rate quicker, stating similarities in response to the exercise or the fit person having a lower heart rate than the unfit person as well as manipulating two parts of the heart rate data. Candidates gained no marks for just quoting numbers from the graph. Some candidates incorrectly interpreted the question to mean explain why the changes occurred, which were not credited here. Some of these realised this mistake when they reached item (3)(a)(iii) and asked the marker to mark this for (a)(iii) and then wrote a new answer to (c)(i) on additional lined paper.

(a) (i) Compare the heart rate of the fit person with the heart rate of the unfit person from 5 to 15 minutes.

(3)

at 5 minutes the unfit person already had a higher heart rate than the fit person but they both go up the same amount each minute of exercise but then when the fit the fit person's heart rate slows down to rest in 1 minute more as the unfit person takes 5 minutes.



ResultsPlus Examiner Comments

This was a good response putting two creditable points clearly. They gained marks for saying that the unfit person had a higher heart rate at the start of the prescribed time period and for the fit person returning to their resting heart rate quicker as they had correctly worked out the times for each recovery period. It was disappointing that many candidates read the times incorrectly, with 2 and 10 minutes commonly seen and occasionally 3 and 4 minutes being incorrectly read from the graph.



ResultsPlus Examiner Tip

Candidates should be encouraged to identify and state basic points as well as then developing them, for example through manipulating data.

Question 03 (a) (ii)

Two marks was the modal score here and it was pleasing to see that the vast majority of candidates at this level could substitute numerical data read from a graph into an equation and correctly calculate the cardiac output. A very few candidates left this item blank. A small, but significant number of candidates gained one mark for correctly using the equation although the substituted number was an incorrect but acceptable value from the graph.

(ii) Cardiac output = stroke volume \times heart rate.

The stroke volume of the fit person at 10 minutes is 0.20 dm³ per beat.

Calculate the cardiac output of the fit person at 10 minutes.

Use the graph to help you.

(2)

~~10 x 2~~
 $10 \times 0.20 = 2$

..... 2 dm³ per minute



ResultsPlus

Examiner Comments

There was no mark awarded here. The substituted value was outside of the tolerance of 56 to 140. This range was based on the graph. It is most probable that this candidate ignored the graph and substituted the 10 from the ten minutes stated in the question.



ResultsPlus

Examiner Tip

If a question states 'use the graph to help you', as it does here, take note that the examiner is giving you a strong hint that you need to extract information from a source earlier on in the question.

.....
 $110 \times 0.20 \text{ dm}^3 =$

(2)

..... 0.88 dm³ per minute



ResultsPlus

Examiner Comments

Here the candidate has correctly taken data from the graph and therefore is credited with the first marking point. Unfortunately, the candidate has then incorporated the dm³ in the equation and cubed the 0.20 as part of the calculation.



ResultsPlus

Examiner Tip

Always show your working as shown here as if you do not, a small mistake in calculating the final figure will result in no marks.

Do not include units when you substitute numerical values into an equation.

Question 03 (a) (iii)

This item required candidates to explain why the recovery period for the fit and unfit person was different. A candidate could score an easy mark by stating that the recovery period was quicker for the fit person and then needed to explain why. Some candidates could go no further because they just then described what the graph showed. The most common response seen to explain the quicker recovery time was that the cardiac system / respiratory system was more efficient at getting oxygen into / around the body. Most candidates scored one or two marks in these ways. This question was a good discriminator as there was usually a clear difference in the standard of answer in those that did explain the reasons for a quicker recovery in detail thereby justifying all three marks.

(iii) The recovery period is the time it takes for the heart rate to return to its rate at rest after exercise.

Explain why the recovery period for the fit person was different from the recovery period for the unfit person.

(3)

The stroke volume of the fit person is higher so more blood is pumped out each beat. This means that more oxygen will get around the body and to the muscles. Therefore, this person will recover quicker.



ResultsPlus Examiner Comments

The candidate has scored two marks here through stating that because the fit person has a larger stroke volume and so can recover quicker. They have qualified the difference in recovery period and given a reason for it. This is a reasonably good answer as the first point was often credited for the more simplistic statement that the heart was stronger. They have not extended the response to explain other reasons why the recovery period was shorter. This was a common way of getting two marks. To get more marks the candidate would have needed to be more scientific and, for example, relate the recovery period to anaerobic respiration or lactic acid.



ResultsPlus Examiner Tip

Where three marks are available at this level it is probable that a significant amount of detail will be expected to score full marks.

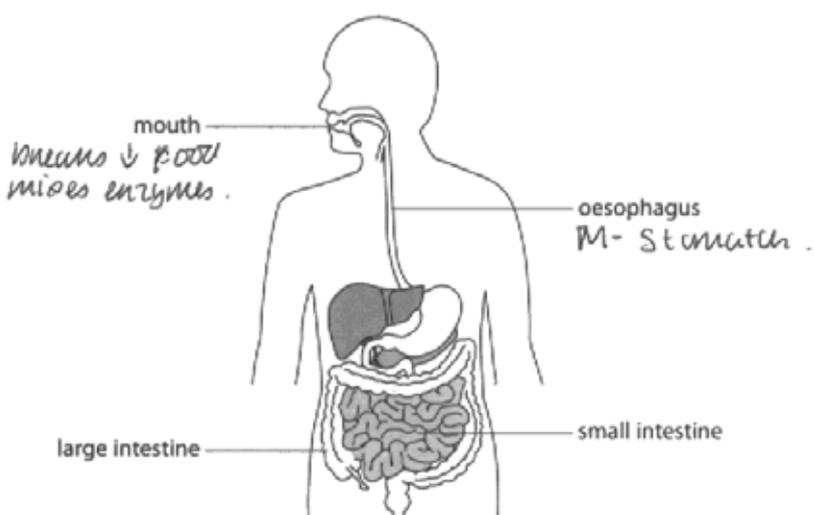
Question 03 (c)

All possible main parts of the blood were seen as responses to this question which asked candidates to name the part of the blood that carried carbon dioxide with red blood cells being as common as plasma. Slightly fewer candidates scored the available mark than those that scored nothing. This was unexpected as it was thought that candidates would know that red blood cells carried oxygen and that white blood cells are part of the immune system. It is possible that this had been the emphasis of teaching and instead of thinking what else is left candidates wrongly decided that if red blood cells carry oxygen, they probably carry carbon dioxide as well.

Question 04 (a)

The majority of candidates scored either one or two marks on this item which required candidates to describe the role of the mouth in digestion. This was a relatively easy question and as this is part of a higher GCSE paper a relevant degree of detail was required before responses were credited. Therefore answers such as the mouth chews food and then it is swallowed gained no marks. It was pleasing to see a high degree of detail regarding amylase and scientific terminology in many answers such as bolus and mastication. This item was a good discriminator at all levels considered.

4 The diagram shows the digestive system of a human.



(a) Describe the role of the mouth in digestion. (2)

The mouth breaks down the food when crushing it with teeth then mixing it with enzymes so you can digest it



ResultsPlus Examiner Comments

This item has just enough detail to be awarded both marks available. The marks were awarded for the linking of 'crushing' with 'teeth' and for the reference to enzymes. 'Break down' with teeth would not be credited without qualification as break down could refer to either physical or chemical digestion.



ResultsPlus Examiner Tip

When answering questions like this, state basic points, but ensure that they are extended to be specific enough to gain credit at GCSE level.

Question 04 (b) (ii)

This item was another good discriminator with significant numbers of candidates being awarded 0, 1, 2, and 3 marks with slightly more being credited with just 1 mark. This item required candidates to interpret data presented in a table about the lack of microvilli and surface area in people with coeliac disease and relate this information to the ability to carry out exercise. Some excellent answers were seen with quantified differences in surface area and a clear understanding of absorption and which substances are required for respiration. The most common creditable point made was that coeliacs have a reduced surface area. Candidates being awarded less than the three marks available failed to develop this in the detail required, often by just writing vague points such as the intestines can't absorb enough food for exercise. It was very disappointing that a significant number of candidates talked about the intestines absorbing oxygen for respiration as shown in the second clip and in a few cases, the lack of microvilli meant that not enough carbon dioxide could be absorbed for respiration.

A person with coeliac disease has no microvilli in their small intestine.

Explain why this person would find it hard to exercise.

Use information from the table to help you.

(3)

They would not take in as much glucose from their food because they have $\frac{1}{20}$ of the surface area and so less space for the glucose to be absorbed. Glucose is needed in exercise as it is used to ^{release} ~~create~~ energy.



ResultsPlus Examiner Comments

This is an example of a clear simple response that was awarded all three marks available. Full marks were awarded with possible marks being given for the correct manipulation of the data, the idea of less surface area, the specific reference to less glucose absorbed, and the linking of less glucose to less energy released. The reference to less space can be ignored as it is not so incorrect to contradict the statement re surface area.



ResultsPlus Examiner Tip

If numerical data is presented, manipulate the numbers rather than just quote figures. When writing complex linked ideas, be logical and write your answers in clear English.

(3)
A person with villi and microvilli would have 600 times the surface area of the small intestine, allowing much more oxygen to go into the capillary network. Someone with no microvilli would only have 20 times the surface area, meaning little oxygen would get into the capillary network.



ResultsPlus Examiner Comments

This candidate has made two mistakes. The first is that they have misread the question and are using the wrong data relating the usual intestine with the intestine as a tube, not that of someone with coeliac disease. They were, however, awarded one mark for the idea of less surface area. The candidate then talks about not being able to absorb enough oxygen in the intestines. It is possible that the candidate saw 'hard to do exercise' and then without enough thought about the respiration equation, related this to lack of oxygen which is an area of the specification taught well.



ResultsPlus Examiner Tip

Candidates need to read the question carefully and it is suggested that highlighting / underlining key words may help focus the mind on the key words. Candidates should review their answers quickly and ask the questions: have I answered the question set, and does my answer make sense?

Question 04 (c)

This item, which required candidates to link the amount of fibre in a diet to peristalsis in the small intestine, was not accessed by candidates well with roughly half of candidates being awarded no marks at all. These candidates tended to give vague reworded versions of the question. Those candidates that did score tended to either relate the problem to peristalsis and / or describe the problem of trying to push a liquid through a tube by muscle contraction. On reflection this question needed more scaffolding for candidates to access the question adequately.

Question 04 (d)

This item required candidates to describe how probiotics are thought to improve health. Many candidates confused probiotics and prebiotics in this question reflected in the low number of candidates scoring 2 marks although a reasonable number were awarded 1 mark, usually for the statement that probiotics contain beneficial bacteria. 'Friendly' bacteria was not credited as it was thought to be unscientific. It was pleasing to see many candidates stating that health benefits were as yet not proved showing that this part of the specification has been taught in the way intended.

(d) Describe how probiotics containing *Bifidobacteria* are thought to improve the health of the digestive system. (2)

Bifidobacteria help improve the health of the digestive system because they move non digestive food out and make the process faster and more regular.



ResultsPlus Examiner Comments

This candidate has given a vague answer. Many answers were seen like this, some saying that the bacteria will make the digestive system more healthy by making it healthier. This candidate also may have related it back to item 4(c) hence the reference to moving food through the intestines faster.



ResultsPlus Examiner Tip

When answering a question like this one, reread the response and ask 'have I answered the question?', and 'have I made the answer specific enough for credit?'

Question 05 (a) (i)

It was disappointing that so many candidates failed to calculate the percentage change required thereby scoring 0 marks. The ability to calculate a percentage is usually reasonably well carried out and so the problem here may well be extracting the correct information from the table of data. Indeed many incorrect answers had working that used different numerical data from the table. It was pleasing that out of the candidates that did score here, only a few dropped a mark by giving a positive answer.

(a) (i) Calculate the percentage change in the mass of the potato in the 20% salt solution.

$100 \cdot \left(\frac{9.3}{10.3} \times 100 \right) =$

$\frac{9.3}{10.3} = -4.854368032039834 (2)$

$\approx 4.85\%$



ResultsPlus Examiner Comments

This is a good answer showing how the percentage decrease was calculated and was reasonably rounded up to 2 decimal places.



ResultsPlus Examiner Tip

When answering calculation items show your working and round up your answers to a reasonable degree of accuracy.

Question 05 (a) (ii)

This item required candidates to explain why it was more useful to calculate the percentage change when analysing data based on the mass of potato 'chips' due to osmosis. Many candidates had problems expressing themselves here with a significant number falling back on 'to make it more accurate'. Those that were credited with the one mark available usually included the idea of percentages are easier to compare, often coupled to the fact that the potato chips had different starting masses.

Question 05 (b)

This item was well answered by the majority of candidates who described mitosis well reflecting how well this had been taught. The 2H specification only requires candidates to know that mitosis produces two genetically identical diploid cells. It was very pleasing therefore to see accurate descriptions of the process of mitosis which were credited and in some cases compensated for omitting 'genetically' from genetically identical. Many candidates could state in detail about chromosomes / DNA replicating with usually less detail about the other stages, e.g. the chromosomes are then pulled apart. A few candidates confused mitosis with meiosis.

Question 05 (c)

This item is the first of the six markers where quality of written communication is taken into account. Very few candidates lost a mark due to poor QWC with a higher proportion doing so in level 1 than level 2 which was less than level 3 as would be expected. Candidates were required to relate active transport and osmosis in relation to obtaining named substances by plants. Although the most common level was two, there were some excellent answers correctly stating the substances absorbed with detailed descriptions of the two processes. Candidates awarded level 1 often only talked about one of the processes which were not linked to named substances or long lists of both correct and incorrect substances in such an unordered way that credit could not be given. Level 2 responses were roughly evenly split between giving reasonable descriptions of one process or an excellent account of just one, more commonly active transport.

* (c) Explain how active transport and diffusion provide a plant with named substances it needs for growth. (6)

Transport can provide the cell with all the water and nutrients that a plant needs to survive and active diffusion provide anything that the plant needs to reproduce.



ResultsPlus Examiner Comments

This response gained no marks as it is jumbled and does not have the detail required. The one correct reference to water is insufficient to reach level 1. The candidate has even mixed up the two processes.



ResultsPlus Examiner Tip

When a question refers to two processes write about each one in turn. It may be good practice to write each one down in the answer space to ensure that both are included in the response.

mineral ion.

* (c) Explain how active transport and diffusion provide a plant with named substances it needs for growth.

(6)

Mineral ions is what active transport take to plants. Nature like to be balance. Active transport takes mineral ions from an area of ^{high} low concentration to an area of ^{low} high concentration. Diffusion is a way of getting nutrients from the soil.



ResultsPlus

Examiner Comments

This clip shows that the candidate has used the good practice of underlining key words although they should probably have underlined more of them. There is enough detail here to award level 1 for active transport. It is a pity that the candidate changed the high to low and vice versa as this may have then just scraped into level 2. The point about diffusion is not enough to raise the candidate to level 2.



ResultsPlus

Examiner Tip

When underlining key words in the question, include the command word, here it is explain and include all important points. Here if active transport is worth underlining, so is diffusion. Having done so, make sure that all areas are covered in a way that answers the question.

Question 06 (b)

Candidates were required to explain what happens to the mRNA once it had been transcribed. Candidates who did not score often misread the question and described how mRNA was made concentrating on the change of thymine to uracil or showed that they have little understanding of the process as they discussed completely wrong processes, for example protein synthesis or mitosis / meiosis. There were some very clear answers seen which is a reflection of how well this is taught.

(b) Describe what happens to the molecule produced by transcription before it is translated.

(2)

It moves out of the nucleus into the cytoplasm and attaches to the ribosome inside the cell.



ResultsPlus

Examiner Comments

An example of a commonly seen correct response gaining both marks available.



ResultsPlus

Examiner Tip

If you can write an answer simply with scientific terms, then do so as trying too hard may end up with you losing marks as you contradict yourself.

Question 06 (c)

This item required candidates to explain the lock and key theory of enzyme action. The majority of candidates scored well here with many 1, 2 or 3 mark responses being seen with more scoring 3 marks. This made this question a good discriminator. Good use of diagrams was made by many candidates although for credit, salient and germane annotations were required for anything beyond the mark for complimentary shapes. Some diagrams had vague arrows which did not point at anything specific. Candidates who did not use diagrams had problems explaining what they were trying to convey effectively and thereby tended to gain lower marks. Many candidates confused the names of the parts with chemical, molecule, amino acid, and substance for substrate and it was not uncommon for answers to state that the active site is part of the substrate or candidates discussing how enzyme and active site join to make the active site into a substrate or that this then broke the enzyme down.

(c) Explain how the lock and key hypothesis models how enzymes work.

You may use labelled diagrams in your answer.

(3)



The substrate has to fit in to the enzyme to join ~~are~~ or break the ~~subra~~ substrate to produce the product.



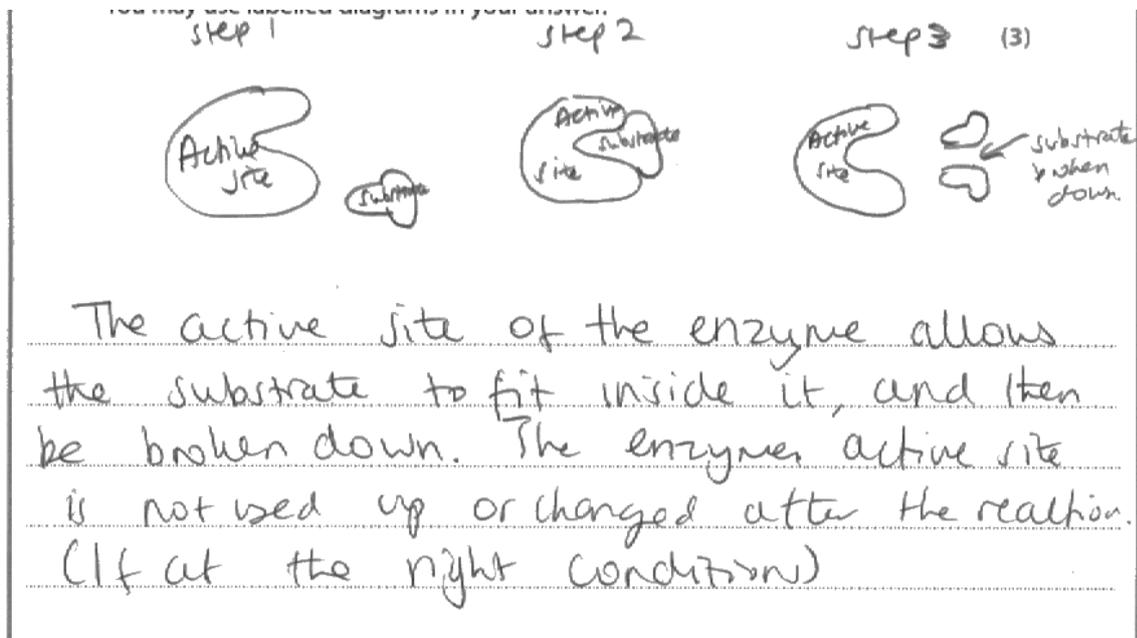
ResultsPlus Examiner Comments

Here the diagram is just sufficient to award the complimentary shape mark although the candidate would score all three marks for the other parts of their response anyway. Diagrams less accurate than this were not uncommon and without some annotation explaining that the two molecules have complimentary shapes, marks were often lost through careless drawing. Some candidates tried to draw three dimensional diagrams to show the complimentary shapes with varying success. The label to the active site is only just clear enough to credit.



ResultsPlus Examiner Tip

If you draw a diagram to illustrate a point, ensure that you take care so that features show what you want them to. Make label lines straight and reach the structure that you are labelling.



ResultsPlus Examiner Comments

Here good use of diagrams only gain the candidate full marks because they are backed up by the writing that clarifies some of the points, for example that the active site is part of the enzyme.



ResultsPlus Examiner Tip

If there is space left for a diagram, then take advantage of it and draw clear diagrams that answer as much of the question as possible. Make labels clear and then back them up by writing about the process in the space below to ensure that all points are covered as shown in this clip. To ensure that the process is clear, use descriptive, annotated labels to cover points like the enzyme / active site fits with the substrate.

Question 06 (d)

This item was the second of the two six mark questions and so QWC was taken into account again. As with 5(c), the standard of communication was good and few candidates had a mark deducted. The question asked candidates to explain how named factors affect enzyme action. Most candidates stated that temperature, pH and concentration were the main factors affecting the rate of enzyme controlled reactions although other factors such as bile increasing the surface area of lipids speeding up reactions being explained well. A few candidates confused this with any limiting factors and stated that light, carbon dioxide and even oxygen as factors that affect enzymes. Some excellent answers were seen with labelled graphs being used to illustrate points in many of the best answers seen. It was pleasing to see so many candidates state that lower than optimum temperatures meant that there was less energy for the enzymes to work and that the enzyme started to change shape above the optimum with them becoming denatured if they got hot enough. Many candidates stated human body temperature as the optimum for all enzymes. Many candidates stated that human body temperature was 37°C although there was a wide range, from 20 to 50°C, seen during marking. 4 marks was again the more usual mark gained although more candidates gained six marks on this item than on 5(c). Where 4 marks were gained most candidates described the effect of at least two of the factors with simple detail with a significant number giving a good description of one factor, usually temperature with more limited statements about pH. A few candidates tried to describe the effects of changing all three factors in one statement, for example, temperature, pH and concentration have all got to be at an optimum, any higher or lower will cause the enzyme to denature.

* (d) Describe how named factors affect the rate of enzyme-catalysed reactions.

(6)

There are many factors that affect the rate of enzyme activity. The first is temperature, all enzymes in our bodies work ^{best} at the optimum temperature of 35°C, if the temperature is lower, the enzymes will cease to work, if it is higher, the enzyme will denature. The next factor is pH level, the pH level is very important for enzymes as it determines the shape of the active site. If the pH is too high or low, the active site will change and the substrate will not be able to fit in. Eg. The optimum pH for pepsin is pH 1.4. Both factors affect the active site of the enzyme as if it changes, it will be useless ^{since} the substrate will not fit.

ResultsPlus Examiner Comments

This candidate scores full marks as they have given a reasonably detailed description of how temperature and pH affect the rate of enzyme controlled reactions, by naming a specific enzyme with pH shows that the candidate has a better understanding than just stating 'an optimum' pH.



ResultsPlus Examiner Tip

When answering the six mark questions try to include clear examples to elucidate your answers as this conveys a better understanding of the required response.

*(d) Describe how named factors affect the rate of enzyme-catalysed reactions.

(6)

enzyme catalysed reaction means that the rate of reaction is increased due to the catalyst. enzyme catalysed such as pepsin increase the rate of reaction because they speed up the time unit without adding any other substances to the enzyme.



ResultsPlus Examiner Comments

This candidate has scored no marks as they have failed to answer the question set.



ResultsPlus Examiner Tip

Ensure that you read the question carefully and review your response at the end to check that you have answered it. Highlighting / underlining key words can help focus your mind on what the question is asking and it is a recommended procedure for good practice.

*(d) Describe how named factors affect the rate of enzyme-catalysed reactions.

(6)

There are different factors to an enzyme reaction. If you heat it to high it will just kill them. If you heat it to low they will move too slow so that when they hit they are not going fast enough to create a reaction. Enzymes have an optimum temperature to work - human best which is about 38°C (body temp)



ResultsPlus Examiner Comments

This candidate has achieved a good level 1 response. They have only described one factor, temperature and cannot be credited for some statements such as if the heat is too high it will kill them. It is close to a level 2 response and it is a pity that they did not add even a little about pH or concentration.



ResultsPlus Examiner Tip

The question here states 'factors' indicating that more than one will be required to gain all marks and possibly access level 2. Try to ensure that you take note of plurals in the question and include more than one factor, for example, as in this case.

Paper Summary

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

Use the technique of underlining / highlighting key words in the question to ensure that you fully understand the requirements to gain full marks.

Reread the question and check back with the question to ensure that all areas required have been covered.

Make sure that you know what each command word means. For example know the difference between *state*, *compare*, *suggest*, *describe* and *explain*.

When drawing graphs / extracting data from graphs check the scale and double check that the numbers used are correct.

Where data is used, or manipulated, there is usually no mark for stating a number unless this is specifically asked for. Instead, take two numbers and either subtract one from the other, or divide one by the others so that you can state for example, X is three times more than Y.

On the six mark questions, write your answers clearly and develop any points made by adding details and examples.

Be specific. Although marks can be gained by stating general points, these are likely to be credited if your answer is more specific anyway and there is the possibility of hitting subsequent marking points as well.

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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