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Examiners' Report
March 2013

GCSE Biology 5B12H 01

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Introduction

Candidates performed well on this paper; the questions were accessible and allowed candidates to demonstrate their knowledge. There were very few blank responses and all our mark points were seen. The multiple-choice questions saw a range of responses, but overall the majority of candidates selected the correct response. The exception to this was Q3(a)(ii) where many incorrectly chose option A. The two six-mark questions saw a wide range of responses. We were very impressed with how thoroughly many candidates had learnt the names of enzymes and their substrates and products. We were also surprised at how much background knowledge candidates have on the lives of the scientists involved in discovering the structure of DNA.

This report will provide exemplification of candidates' work, together with tips and/or comments, for a selection of questions. The exemplification will come mainly from questions which required more complex responses from candidates.

Plant processes

Question 1(a)(i)–(ii)

Candidates did not seem to be phased by Q1 being about photosynthesis and some very good responses were seen. Very few blank responses were seen. The multiple-choice part (a)(i) was answered correctly by many candidates with the commonest incorrect response being C, the spongy mesophyll cell.

In part (a)(ii), many candidates mentioned that carbon dioxide entered through the stomata but did not extend their answers further.

(ii) Describe how carbon dioxide enters the leaf.

(2)

The carbon dioxide enters the leaf through the stomata, the oxygen diffuses out of the leaf via stomata and the carbon dioxide enters theough the stomata It moves from a high concentration to a low is called diffusion.

ResultsPlus
examiner comment

This candidate did score two marks but got side-tracked into giving information irrelevant to the question (which we can ignore). The last statement is a bit ambiguous as to what 'it' refers to, but we gave benefit of the doubt as the rest of the account was clear.

ResultsPlus
examiner tip

Try to avoid the use of words like 'it' and 'they'. It is safer to use the noun that you are referring to.

(ii) Describe how carbon dioxide enters the leaf.

(2)

Carbon dioxide enters the leaf through the Stomata which opens and closes to let gasses out and in. The guard cells may also let some CO_2 into the leaf.

ResultsPlus
examiner comment

This was a common one-mark response that we saw, even from the better candidates. This particular answer earned only one of the two marks available by omitting any reference to the process of diffusion.

ResultsPlus
examiner tip

Always look to see how many marks have been allocated to a question. Then make sure that you give the same number of scientific facts as there are marks. You will not be awarded two marks for one piece of information.

Question 1(a)(iii)

We saw some very good answers to this question on photosynthesis, although it is a topic that candidates typically have difficulty with. It is worth noting that we were prepared to award mark point 2 for chlorophyll/chloroplast and mark point 4 for light energy if included in an equation, provided that the terms 'chlorophyll' and 'light' were written on the arrow and not as a substrate.

(iii) Describe the process that takes place in the leaf to produce oxygen.

(3)

This process is photosynthesis where carbon dioxide reacts with water and the light energy to produce oxygen, glucose and energy. The CO_2 enters from diffusion at the stomata. The water enters from osmosis through roots and the products made are oxygen and glucose(energy) Photosynthesis is how the plant makes food. by using light energy.

ResultsPlus
examiner comment

This candidate was awarded all three marks. The descriptive response covered mark points 1, 3 and 5 by including photosynthesis, carbon dioxide, water and glucose. The candidate could have been awarded mark point 4 for talking about light energy at the end but had already gained the maximum marks available. It should be noted that we did not like the suggestion that carbon dioxide and water 'reacts with the light energy' at the beginning of this particular response.

(iii) Describe the process that takes place in the leaf to produce oxygen.

(3)

The process is called Photosynthesis.
This is when the leaf uses Sunlight to
make food for the Plant.
The equation is: Carbon dioxide + water → Oxygen + glucose
The plant uses glucose as its food supply.

ResultsPlus
examiner comment

Mark points 3 and 5 could be awarded from this equation for identifying that carbon dioxide and water are the reactants and glucose is also produced. Therefore this response gained two marks.

ResultsPlus
examiner tip

Food is too vague for glucose (or sugar).

If you are going to use chemical formulae, then they must be completely correct: upper and lower case letters must be correct and numbers must be subscript. It is safer to write out the chemical names in full, unless asked to do otherwise.

Question 1(b)

This question did not cause too many problems for the majority of candidates. As expected, the biggest confusion was in linking mineral uptake with transpiration. Surprisingly few candidates tried to hedge their bets and draw more than one line from each substance.

Growth

Question 2(a)(i)

We were please to see that candidates were not put off by the percentile chart and this suggests that centres are discussing charts of this nature with their candidates.

(i) Describe how the height of males changes from the age of 2 to 20 years.

(2)

From age 2 - 20 years the male heights increase along a positive correlation, as the age increases the height of males increase as well.

ResultsPlus
examiner comment

This response is typical of many that we saw, where the candidate has neglected to describe the later stage of the graph. This candidate was awarded one of the two marks available.

ResultsPlus
examiner tip

Remember that if there are two marks assigned to a question, you must give two pieces of information to gain both marks.

When you see the command word 'describe' and you have a graph or a table of data in front of you, look very carefully for changes in trends and comment on these, quoting values from the *x* axis. For example, in this graph there is a steep increase in height and then a less steep increase, occurring at about 15–18 years of age. Look at the changes in gradient of the lines and then describe these in terms of the variables.

(i) Describe how the height of males changes from the age of 2 to 20 years.

(2)

As you become older, your start Growing. This process happens by ~~mi~~ mitosis. The cells in your body start to divide to make you grow.

ResultsPlus
examiner comment

If candidates are asked to describe data, they should use the terms in the question. This question required candidates to describe height, so this must be what the answer is written about. This candidate was awarded no marks as their response did not answer the question asked. Although we saw very few responses like this, it is worth pointing out the importance of teaching candidates the meanings of the various command words that they might encounter and what they need to include in their response.

ResultsPlus
examiner tip

The command word 'describe' requires you to link together a series of facts or pieces of information in a logical order. In this question, the use of 'describe' means that you should say what the graph shows; a scientific explanation covering the reasons why something is happening is not required.

Question 2(a)(ii)

(ii) Calculate the difference in height of an 11 year old male in the 95th percentile and an 11 year old male in the 5th percentile.

(2)

11 year old 5th percentile = 132 cm
11 year old 95th Percentile = 155 cm

132 + 23 = 155

answer = 23 cm

ResultsPlus
examiner comment

This response illustrates a clearly laid out calculation and final answer. Although this is not necessary to score full marks, it is safer to encourage candidates to do this; if they make a mistake in their working and get the wrong answer, they may still pick up a mark due to error carried forward. Just a wrong answer with no working shown will score zero.

ResultsPlus
examiner tip

Always show your working, however simple the calculation might seem.

If you cannot do the calculation, always attempt it, especially if you need to read values from a graph or make measurements. You could make up the odd marks and one mark can make the difference of a grade.

Question 2(a)(iii)

This question did challenge candidates, not unexpectedly. It was encouraging that we saw very few blank responses; the majority made a good attempt at writing a response.

(iii) Explain what is meant by the 95th percentile on this graph.

(2)

95% of ~~all~~ men are below this height / 5% of men are taller than this height

ResultsPlus
examiner comment

Although not completely correct, we felt that a response of this quality was creditworthy at this level and gained one mark. The candidate failed to gain the second mark by not including the link to age, ie 5% will be taller at that age.

ResultsPlus
examiner tip

Be prepared to explain any of the terms used in the specification. It might be worth creating a glossary when you are revising. List all the terms used in your lessons and write a definition for each.

(iii) Explain what is meant by the 95th percentile on this graph.

(2)

95% of average males achieve this height

ResultsPlus
examiner comment

This was a common wrong answer, possibly illustrating a misconception that candidates have regarding percentile charts.

Question 2(b)(i)

Many candidates could correctly name the first stage of protein synthesis. As expected, there was confusion with translation; 'c' comes before 'l' so trans**c**ription comes before trans**l**ation. A number of references to transpiration were also seen.

Distance running

Question 3(a)(i)

This was a relatively complicated graph but did not seem to phase candidates too much. Very few blank responses were seen.

(i) When the running speed is 22 km h^{-1}, the stroke volume of the runner is 0.18 dm^3.

Calculate the cardiac output of the runner using the equation.

cardiac output = stroke volume × heart rate

(2)

22×0.18
$= 3.96$

answer = 3.96 dm^3 per minute

ResultsPlus
examiner comment

This was probably the commonest mistake seen, but the candidate still scored one mark due to error carried forward.

ResultsPlus
examiner tip

Always show your working. Even if you get the wrong answer, you may pick up some method marks.

(i) When the running speed is 22 km h^{-1}, the stroke volume of the runner is 0.18 dm^3.

Calculate the cardiac output of the runner using the equation.

cardiac output = stroke volume × heart rate

(2)

$0.18\ dm^3 \times$ ~~12~~ 200 = 32

answer = ~~4.68~~ 32 dm^3 per minute

ResultsPlus
examiner comment

This response illustrates the importance of showing working. This candidate has selected the correct value of 200, but has miscalculated. However, one mark has been awarded.

Question 3(a)(iv)

This question was similar to one in the previous sitting of this paper in November 2012. It was encouraging that centres are using the few past papers available to prepare their candidates for the exam. One common misconception is that aerobic respiration actually stops if insufficient oxygen is reaching the cells. Although we did not penalise this inaccuracy, we would advise centres to work with candidates to gain a better understanding of this area of Biology.

(iv) Explain why the concentration of lactic acid changes at running speeds greater than 18 km h^{-1}.

(3)

Before reaching 18 km h^{-1}, the person was using aerobic respiration which was using oxygen and glucose to produce ~~carb~~ CO_2 and water. However as the running increased by speed this caused the body to have impact so anaerobic respiration took place which uses glucose only to produce lactic acid. As use of anaerobic respiration increased so did the lactic acid which causes ~~the~~ the person to have cramps in muscles and higher rate of breathing to break down lactic acid.

ResultsPlus
examiner comment

This response was awarded all three marks available as the candidate gave a very clear explanation that went beyond the requirements of the question.

(iv) Explain why the concentration of lactic acid changes at running speeds greater than 18 km h^{-1}.

(3)

Lactic acid occurs when cells are forced to respire anaerobically after not receiving enough oxygen. This produces energy from the glucose in the body, but as a result lactic acid is produced. The lactic acid here therefore changes as the runner gets faster as more cells need the energy to function and aerobic isn't enough, and so anaerobic starts producing lactic acid and energy.

ResultsPlus
examiner comment

This is another example of the excellent quality of responses that we saw to this question. This candidate was awarded all three marks.

ResultsPlus
examiner tip

Use past papers and corresponding mark schemes to gain an understanding of what is expected in responses to different types of exam questions. This practice will help you prepare for your own exams.

(iv) Explain why the concentration of lactic acid changes at running speeds greater than 18 km h^{-1}.

(3)

The concentration changes because there would not be enough oxygen reaching the muscle cells for aerobic respiration therefore one of Anerobic respiration would take places The product of Anerobic respiration is Lactic Acid

ResultsPlus
examiner comment

This response was awarded all three marks available, but it is worth noting that an easy mark could have been missed as the candidate did not specify how the concentration of lactic acid changed.

ResultsPlus
examiner tip

If a question asks you to explain a change in something, always start your answer by saying what that change is. Is it increasing, decreasing or staying the same? This is a relatively easy mark to gain, yet one that candidates forget to include in their answers.

Question 3(b)

This part of the specification is clearly understood by many candidates.

(b) After running the person rested.

Explain why the concentration of lactic acid in the blood changes whilst resting.

(3)

Lactic acid requires oxygen to break it down into carbon dioxide and water. The requirement for the oxygen after exercise is known as excess post-exercise oxygen consumption This will cause the breating rate and heart rate to remain relatively high to ensure that enough oxygen is taken in the body and pumped around the body, to break down the lactic acid and slowly decrease its levels.

(Total for Question 3 = 10 marks)

ResultsPlus
examiner comment

This is an example of some of the high quality responses that we saw in response to this question. This candidate was awarded all three marks.

Herbicide-resistant weeds

Question 4(a)

A mixed bag of responses was seen for this question. Some candidates answered it exceedingly well, presumably given exam practice with last November's paper, where a similar question was asked. However common misconceptions and confusions associated with this topic were also seen.

4 Genetic engineering can be used to produce plants that are resistant to herbicide.

One herbicide works by preventing the activity of an enzyme.

Some bacteria have a form of this enzyme that is not affected by the herbicide.

(a) Suggest how genetic engineering can be used to produce plants resistant to this herbicide.

(3)

Remove the enzyme from the bactena and place it into the nucleus of the plant cell then place it in a ~~pla~~ container for it to grow faster.

ResultsPlus
examiner comment

We saw a number of responses where the 'enzyme' was being removed from the bacteria, not unexpectedly. Although this prevented our second mark from being awarded, it did not prevent other points from being credited.

ResultsPlus
examiner tip

Read the question very carefully. If genetic engineering is taking place, then it is always the gene that is being removed/changed, not its product.

4 Genetic engineering can be used to produce plants that are resistant to herbicide.

One herbicide works by preventing the activity of an enzyme.

Some bacteria have a form of this enzyme that is not affected by the herbicide.

(a) Suggest how genetic engineering can be used to produce plants resistant to this herbicide.

(3)

Using genetic engineering the gene from the bacteria that produces the enzyme can be located and using restriction enzymes can be removed from the bacteria. Then this gene can be put into the DNA of the plant. If it is successful, the plant now has the enzyme inside it, working, that is not affected by the herbicide.

ResultsPlus
examiner comment

This excellent response covered five marking points by including references to using enzymes to remove the relevant gene from the bacteria and inserting this into the plant's DNA enabling the plant to produce the same enzyme, all given in the correct order. The candidate was awarded all three marks available.

Question 4(b)

There was a mixed bag of responses to this question. Some candidates correctly said phloem, others incorrectly gave xylem as their answer. Furthermore, a proportion of candidates were less specific, stating veins.

Question 4(c)(i)

This 'describe' data question generated the range of responses that we saw in the previous question of this type: more able candidates described at least two of the trends, quoting values for the independent variable, and less able candidates referred to the slope of the line.

(i) Describe the effects of the herbicide on the yield of weeds.

(2)

When the concentration of herbicide is under 10 arbitary units, it has no effects on the crop or weeds. when the concentration is between 10 and 30 arbitary units, the yield of weeds drops from ~~between~~ 50, to 2 arbitary units. 30-40 arbitary units is the right concentration to use any more and it has negative effects on the crop.

ResultsPlus
examiner comment

This illustrates the type of response that we were hoping for by describing all three trends shown on the graph. This candidate was awarded both of the marks available.

(i) Describe the effects of the herbicide on the yield of weeds.

(2)

As the concentration of the herbicide increases, the yield of weeds decreases significantly.

ResultsPlus
examiner comment

This is an example of a typical response seen from many candidates who described only one trend. This candidate therefore only gained one of the two marks available.

ResultsPlus
examiner tip

Remember, for each mark allocated to a question, you must give a separate piece of information. This question was worth two marks, so two pieces of information were required. If you are describing data you must give values for the independent variable (*x* axis).

(i) Describe the effects of the herbicide on the yield of weeds.

(2)

The crops that weren't resistant to herbicide died and the more concentrated the spray was the more died. The crops that were resistant to herbicide lived.

ResultsPlus
examiner comment

This response did not answer the question as the candidate incorrectly describes the effect of herbicide on the weeds and not the yield of weeds as was required. No marks were awarded for this response.

ResultsPlus
examiner tip

Read the question carefully to help ensure that you write about what you have been asked in your answer.

Question 4(d)

Weaker candidates wrote about the number of weeds and not the number of species in part (d)(i) of this question and, in part (d)(ii), simply made reference to evolution. Even the more able candidates rarely gained both marks for part (d)(ii) by failing to include references to cross-pollination or mutation.

(d) The table shows the number of species of weeds resistant to this herbicide from 1996 to 2004.

	Year				
	1996	1998	2000	2002	2004
Number of species of weeds resistant to this herbicide	1	2	3	5	8

(i) Describe the trend shown in the data.

(1)

The number of weeds resistant increases every 2 years

(ii) Suggest reasons for this trend.

(2)

The weeds are slowly evoling ~~to~~ and becoming ammune to the herbicide, a new one needs to be created to kill off these stronger weeds

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examiner comment

This response was typical from the weaker candidates, with this candidate writing about the number of weeds and not the number of species in part (d)(i) and, in part (d)(ii), making only a basic reference to evolution.

ResultsPlus
examiner tip

Use the wording in the question, column heading or axis label to help you write about the correct variable. If you are asked to make suggestions, then you must suggest as many ideas as there are marks for the question.

Digestion

Question 5(b)

This question came up in the 5BI2H paper in November 2012. Although the question was reasonably well answered, similar mistakes were being made. There were candidates who thought bile broke down fat molecules into smaller fat molecules and there were others who thought fat is broken down into fatty acids and glycerol. A number of candidates implied, through their poor wording, that bile acted in the stomach. We also saw some very detailed responses for this question. Some candidates clearly have a good knowledge and understanding of this part of the specification.

Question 5(c)

Candidates on the whole coped well with this question; they had clearly been taught the specific examples given on the specification and many just listed these verbatim. The spelling of the names of the enzymes, substrates and products was surprisingly good. The better candidates extended their answers and gave details of enzyme action, such as enzymes being catalysts and the importance of the active site. Weaker candidates made mistakes in matching the enzyme with their correct substrate and product(s), but we marked positively and picked out as many correct points as we could. The poorest scoring responses were those that either discussed enzymes in general without making any reference to digestion or those that gave a vague overview of the digestive system.

*(c) Describe the roles of the enzymes involved in digestion.

(6)

~~There are~~ The enzymes involved in digestion are protease, amylase, lipase and carbohydrase. The protease breaks down proteins into amino acids and an example of protease is pepsin. Amylase breaks down starch into glucose and is found in the saliva, ~~and~~ pancrease and stomach. Lipase breaks down fats into fatty acids and glycerol and is ~~also~~ found in pancrease, small intestine and stomach. Carbohydrase ~~is found in~~ breaks down carbohydrates. The enzymes work as catalyst to break down food into molecules for cells.

ResultsPlus
examiner comment

This is an example of an excellent response to this question, gaining all six marks available.

ResultsPlus
examiner tip

Always use your specification when you are preparing for an exam. It will tell you exactly what you need to know and the specific examples that you need to learn.

Question 5(d)

To gain all three marks available for this question, responses needed to link descriptions of the villi structure to the scientific reasons how these features allow the villi to function efficiently.

(d) Explain how the structure of the villi allows efficient absorption in the small intestine.

(3)

Vill has a large surface area which allows it to have faster absorption • Villi has a good network of capillaries so there is faster rate of diffusion going on in small intestine. Villi is made of only one cell thick so the absorption and diffusion happens quickly as there is not much space to travel.

ResultsPlus
examiner comment

This is an example of a really good response where the candidate has provided a full explanation gaining all three marks available.

(d) Explain how the structure of the villi allows efficient absorption in the small intestine.

(3)

it has large ~~distance~~ surface area so more absorption can take place. Also it is 1 cell thick so diffusion can take less time, also has a big blood supple by cappillieries which flow through quickly taking the nutrients/glucose they need.

ResultsPlus
examiner tip

In questions of this type, you must explain how each feature is adapted for its function. Also, do not repeat the wording in the question as you will not get marks for this.

DNA

Question 6(a)

High quality responses were rarely seen for this question. We did see some very vague responses which really only repeated the question without extending it.

6 (a) Describe how a section of DNA determines the structure of a protein.

(4)

When DNA is transcribed and produces the mRNA strand that is sent to the ribosome, it is the translated by the tRNA. Each codon of bases determines which amino acids are chained together and in what order. This chain is called a polypeptide or protein.

ResultsPlus
examiner comment

This example illustrates the type of response that we had hoped to see for this question. This candidate was awarded four marks.

6 (a) Describe how a section of DNA determines the structure of a protein.

(4)

Gene is a section of DNA, they are made up of 4 bases, amino acids stringed together form a protein. The sequence of 3 amino acids, codes for 1 protein, the sequence of the 3 amino acids is called a codon, each ~~codon~~ codon codes for a specific protein.

ResultsPlus
examiner comment

This response illustrates the confusion that we frequently saw between bases and amino acids, DNA and proteins. Two marks were awarded.

6 (a) Describe how a section of DNA determines the structure of a protein.

(4)

The structure of DNA could determine the structure of a protein as with the information it carries. The could determine the size and shape of a protein or what information is put into that protein.

ResultsPlus
examiner comment

No mark was awarded for this question as the candidate has merely repeated the information given in the question.

Question 6(b)

Many candidates coped very well with this question. Some candidates wrote all sorts of detail about this part of the specification; it has clearly been thoroughly learnt and understood.

*(b) Describe the structure of DNA, including the roles of the scientists involved in its discovery.

(6)

Willcins and franklin discoverd that dna had a helical structure by directing beams of rays onto it and saw the patterns in the xrays it had created. - this showed thatt it had a helical structure.
watson and crick discovered how the bases paired, that Adenine and Thymine joint and added up together and Cytosine and Guanine addeed upe fitted together.
In conclusion, the Wilkins and franklin discovered that the DNA had a helical structure, and watson and crick discovered how the four bases of DNA paired together.

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examiner comment

This candidate gave a succinct answer and was awarded full marks.

*(b) Describe the structure of DNA, including the roles of the scientists involved in its discovery.

(6)

watson and krick first discovered DNA
~~&~~ they also discovered that it was
a double helix in shape, ~~then~~
DNA is made up of ~~a~~ two sugar phosphate backbones
held together by two sets of complementary
base pairs held together by weak
hydrogen bonds.

ResultsPlus
examiner comment

This is a typical Level 2 response where both parts of the question have been addressed but in insufficient detail. Four marks were awarded here.

*(b) Describe the structure of DNA, including the roles of the scientists involved in its discovery. to make different shape protein

(6)

The first two scientists found out that the DNA was shaped in a double helicks by bouncing xray waves of the DNA then piecing it together. The second two scientists using this information they gathered made a modle of DNA to find out what DNA looks like. All of them recived nobel prizes for working out this how DNA is formed.

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Although this is a good account of the contribution of scientists, the account does not address both parts of the question in sufficient detail to score more than a Level 1 mark. Two marks were awarded.

Question 6(c)

This question was relatively low scoring; candidates were clearly aware of the Human Genome Project but were unable to provide appropriately-worded responses. Many just wrote about diseases being discovered, doctors being able to make better diagnoses and better medicines being developed, without emphasising the genetic nature of these diseases and therefore the use of genetics in their diagnosis. Others wrote about the discovery of genes and little else.

Human DNA was sequenced during the Human Genome Project.

(c) Explain how the Human Genome Project has contributed to advances in medicine.

(2)

The project now allows scientists to identify what genes cause genetic disorders. It also allows genetically altering a genes that may have affected genes. Gene therapy is now possible that allows faulty genes to be replaced.

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This is a reasonable response that scored the candidate both marks.

Summary

Performance was good on this paper, but if candidates follow the advice below then an even higher standard of response will be seen in future.

- Learn definitions for all biological terms used in the specification, eg percentile (Q2(a)(ii)).
- Learn the specific examples given in the specification, eg names of enzymes, their substrates and the resulting products (Q5(c)).
- When describing data presented in graphs and tables, always use the wording for the dependent variable given, eg the number of species (Q4(d)(i)).
- When describing data presented in graphs and tables, always quote values for the independent variable, eg no change in yield between 0 and 10 arbitrary units (au), decrease between 10 and 29 au, no change higher than 29 au (Q4(c)(i)).
- Do not repeat the stem of the question in your answer. Extend it by giving more biological knowledge, eg Franklin and Wilkins showed the helical structure of DNA (Q6(b)).
- When doing calculations, show your working, eg 0.18 x 200 = 36 (Q3(a)(i)).

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