Examiners' Report

June 2015

GCSE Biology 5BI1H 01

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Introduction

The inclusion of the 6 mark questions to test the quality of written communication, and the ability of candidates to communicate science effectively is steadily improving.

The aim of the paper is to test the candidates' knowledge across the specification. The paper is designed to enable as many specification points as possible to be assessed, thus enabling the candidates to be able to communicate their scientific knowledge across a range of topic areas.

In addition, the candidates are also expected to be able to apply the knowledge they have gained to new situations.

Both quantitative and qualitative data is included for candidates to interpret and evaluate, and mathematical skills such as the calculation of means are included to ensure that candidates are able to deal with data effectively. Approximately 35 - 40% of the marks are awarded for assessment objectives, including the recall and communication of candidates' knowledge of science.

Approximately 35 - 40% of marks are awarded for the application of scientific concepts and skills, including those in practical and other contexts.

Approximately 25-28% of marks are awarded for the ability of the candidates to analyse and evaluate evidence, and make reasoned judgements based on scientific evidence.

The paper was designed to test this range of skills, and it is pleasing to note that candidates are improving in their ability to communicate science effectively. This was particularly evident in the 6 mark questions, which are now attempted well, with the vast majority of candidates scoring marks on this style of question.

The genetics question on the paper was answered extremely well, with the majority of candidates able to draw a correct Punnett square. The candidates have to apply this to a disease caused by a dominant allele which caused a few candidates some issues. It was pleasing to note that many candidates were able to apply their knowledge of the symptoms of cystic fibrosis to incorporate the reproductive system as well.

I was also particularly impressed with the candidates' knowledge of the reflex arc but there are still issues with vasodilation and vasoconstriction where misconceptions about blood vessels moving were seen regularly.

The paper was well accessed across all of the mark ranges, showing that candidates were well prepared for the paper. Marks were often lost due to the candidate misreading the question and therefore going down the wrong path. This could be addressed by candidates highlighting the key words in the question, to focus their attention.

The command words also are important and, in particular, if a candidate is asked to explain something they need to give a scientific reason in their explanation and when asked for a description they need to take a step by step approach to answering the question.

Question 1 (a) (i)

This question was a very straightforward reading from the graph with a simple calculation for 1 mark. Mistakes were made where candidates read the wrong data or tried to manipulate data in the incorrect way.

This involved a simple reading of the graph and very simple calculation. The range allowed was 9-10%.

(a) (i) Calculate the decrease in the percentage of females who smoked tobacco from 1990 to 2010.

(1)

10 %

ResultsPlus
Examiner Comments

10% correct response for 1 mark.

This question involved 2 readings from the graph and a very straightforward calculation for 1 mark. There was some confusion with the reading of males and females and therefore some candidates got the incorrect reading. Others tried to make a percentage when the percentage reading was actually on the graph.

(a) (i) Calculate the decrease in the percentage of females who smoked tobacco from 1990 to 2010.

(1)

1990 = 50%
2010 = 33.3%

50 - 33.3 = 16.7

16.7 %

ResultsPlus
Examiner Comments

The correct response should be 9 - 10%.

ResultsPlus
Examiner Tip

It is important not to overthink an item. This question is the first question on the paper and is therefore designed to be accessed by all candidates taking this paper. It is therefore straightforward.
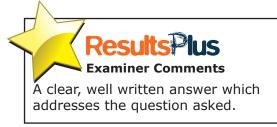
Question 1 (a) (ii)

This was a very open question, as is the nature of the 'suggest' style of questions. The question was designed to enable the candidates to apply their knowledge rather than regurgitate learned information. There were several ways in which the candidates could access marks including the fact that people are more aware of the dangers involved in smoking for advertising or health campaigns. The idea that there are more alternatives to smoking tobacco out there such as the use of e-cigarettes, nicotine replacement therapy etc. Some responses quite rightly stated that changes in legislation such as the banning of smoking in public places has impacted on the numbers of people smoking. A large number of responses were able to state that the increase in the cost of tobacco due to tax has also had an impact on the numbers of people smoking. Marks were lost due to not reading the question carefully and just writing down everything they knew about the effects of tobacco smoke on humans rather than answering the question.

This candidate scored 2 marks. The first mark was awarded for being aware of the dangers of smoking and the second mark for the increase in alternative methods of nicotine replacement such as e-cigarettes.

> (ii) Suggest **two** reasons why smoking tobacco has decreased in the UK.
>
> (2)
>
> smoking tobacco has decreased in the UK because there are many other drugs you can smoke now. electronic cigarettes are also available now too. Smoking has also become less attractive now as people have found out the medical implications it can cause.

ResultsPlus
Examiner Comments

A clear, well written answer which addresses the question asked.

ResultsPlus
Examiner Tip

Look to the number of marks awarded for a question and make sure you have that number of points to be marked.

Unfortunately this response is too vague for the question. "It is illegal" is not true for those people over the age of 18 and thus cannot be awarded the mark. It also does not answer the question. You can get lung cancer is a fact rather than the fact that people are now more aware that you can get cancer. It is addictive is a correct statement but would be likely to cause more people to continue smoking rather than give up.

(ii) Suggest **two** reasons why smoking tobacco has decreased in the UK.

(2)

because it is illegal and you can
get a. lung cancer and if your it
is very addcitve

ResultsPlus
Examiner Comments

If the response had expanded on the response regarding lung cancer, to state that more people are aware of the dangers of lung cancer from smoking they could have been awarded the mark, but in this case it is just too vague.

ResultsPlus
Examiner Tip

Be careful to read the question carefully and answer that question rather than 'tell me everything you know about tobacco smoking'. It may help to highlight the command word, in this case suggest, to help with this.

Question 1 (b) (ii)

This is an area of the specification that candidates are very familiar with and as a result they scored well on this question. Marks were awarded for the fact that tobacco smoke contains tar for 1 mark, that tar is a carcinogen for 1 mark. Note here that the mark is given here for the specific term carcinogen as the fact that smoking causes lung cancer is in the question and therefore is not credited in the response. Finally, a mark was awarded for the idea of the effect of a carcinogen causing DNA mutation.

(ii) Research shows that there is a link between smoking tobacco and the development of lung cancer.

Explain why smoking tobacco can cause lung cancer.

(2)

Tobacco contains Carcinogenic substances and tar. The tar builds up in the lungs and the body absorbs the carcinogens.

ResultsPlus
Examiner Comments

Two marks were awarded here; they have correctly identified tar as the cancer causing substance and have used the technical term carcinogen.

Two marks awarded here which shows that it is not always essential to write extended prose in these early questions to attain the marks.

1 mark is awarded for the fact that tobacco smoke contains tar.

(ii) Research shows that there is a link between smoking tobacco and the development of lung cancer.

Explain why smoking tobacco can cause lung cancer.

(2)

Smoking tobacco may lead to lung cancer as the nicotine is addictive, and will make it harder to stop, and the tar builds up in the lungs and does not allow as much oxygen in the body.

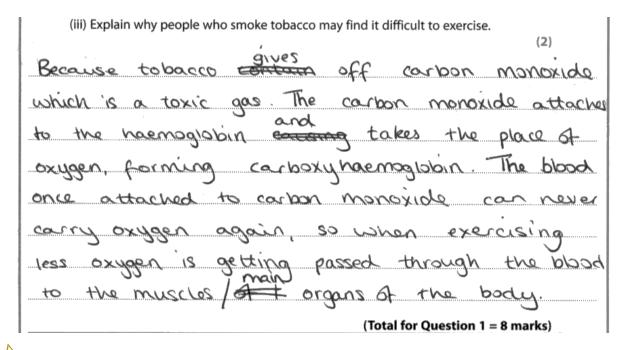### ResultsPlus
Examiner Comments

Unfortunately no marks can be given for the fact that tar causes lung cancer as this is given in the stem of the question.

Question 1 (b) (iii)

This question could be answered by going down one of two routes, but it is important here that the points are linked within either route as this is an explain question.
Most responses were regarding the role of carbon monoxide which binds to red blood cells/ haemoglobin and reduces the oxygen carrying capacity of the red blood cells; thus resulting in less oxygen supplied to respiring muscles. Very few responses included details of the reduced surface area of the lungs due to the buildup of tar or smoke particles (carbon deposits) causing reduced gas exchange at the alveoli. There were a few misconceptions highlighted with white blood cells being given instead of red, or the fact that the tar sticks to red blood cells.

This is a very comprehensive response with an explanation linking the carbon monoxide binding to haemoglobin with this reducing the amount of oxygen carried for 2 marks.

(iii) Explain why people who smoke tobacco may find it difficult to exercise.

(2)

Because tobacco ~~contain~~ gives off carbon monoxide which is a toxic gas. The carbon monoxide attaches to the haemoglobin ~~causing~~ and takes the place of oxygen, forming carboxyhaemoglobin. The blood once attached to carbon monoxide can never carry oxygen again, so when exercising less oxygen is getting passed through the blood to the muscles / ~~of~~ main organs of the body.

(Total for Question 1 = 8 marks)

ResultsPlus
Examiner Comments

I was very impressed by the number of responses referring to oxyhaemoglobin and carboxyhaemoglobin correctly.

It is essential to try to put thoughts in order before committing pen to paper. In this case the response started well by referring to carbon monoxide but then gave the alternative of tar. Unsure what 'air waves' are but if the candidate had referred to tar and air sacs reducing surface area they would be getting into scoring marks.

(iii) Explain why people who smoke tobacco may find it difficult to exercise.

(2)

The carbon monoxide or tar could be blocking air waves. Also they're putting more carbon dioxide into the blood, not allowing as much oxygen to be pumped around the body. They find it harder to respire / breathe.

ResultsPlus
Examiner Comments

It is essential to think a response through before committing pen to paper. This response clearly shows that without thinking something through the response can become not only incorrect but nonsensical.

Question 2 (a) (i)

This question involved the candidates having to interpret the data in the graph to describe the effect of pH on the variety of organisms in the lakes. Many responses referred to a number of organisms which cannot be interpreted from the graph. The response must refer to types of organism/species. Most marks were awarded for a specific reading from the graph such as 'only frogs survive at a pH of 4/lowest pH'. An ideal response was one which referred to all the variety of organisms being present at a pH of 6.0 or 6.5 and the fact that, as the pH decreases so does the number of species in each lake. Several responses were not specific enough for the marks, referring to 'as pH gets stronger' which is not at the level of detail needed.

Very few marks were awarded for this question mainly due to vague responses being given rather than specific one.

(i) Describe how pH affects the variety of organisms in these lakes.

(2)

Most organisms can't survive in lower (more acidic) pHs, so a majority of organisms need to live in more neutral conditions. There aren't as many different organisms as the pH lowers.

ResultsPlus
Examiner Comments

The first statement is too vague to gain any marks. It is vital to describe the types of organisms not just numbers of organisms.

ResultsPlus
Examiner Tip

When answering a question if you run out of space please use an extra sheet rather than writing below the lines as this cannot always be seen.

Question 2 (b)

This question refers to the overuse of fertilisers containing nitrates and phosphates on lakes and rivers. The ability to recognise that the buildup of nitrates in the environment as eutrophication was worth a mark, following on from this the excessive growth of algae on the top of the lake. Marks were lost here due to them just stating that algae grows, which it does without excess nitrates so is not worth the mark. Vague statements like 'encouraging the growth of algae' were not accepted.

The idea that the algae blocks the light so plants underneath the lake were not able to photosynthesise is worthy of a mark but again marks were lost by failing to identify where the plants were. The idea that microorganisms respire when breaking down this plant matter thus reducing the oxygen in the lake or causing anoxic conditions, was also worthy of a mark but it was essential to link the oxygen being used up in respiration for this mark to be awarded. Vague statements such as 'fish die' were not credited but a reduction in the biodiversity in the lake was credited for a mark.

This candidate has given a clear outline of eutrophication and has gained all three marking points.

(b) Water pollution can be caused by an increase in nitrates and phosphates.

Explain the problems associated with an increase of nitrates and phosphates levels in a lake.

(3)

Nitrates cause algae to grow rapidly on lakes. This algae blocks sun light from plants at the bottom so they can't photosynthesise, causing them to die. Fish may also die as the decomposers breaking down the plants take all of the oxygen, so fish also die. This is eutrophocation.

ResultsPlus
Examiner Comments

This answer flows and links the points together effectively to explain the effects of the buildup of nitrates in an aquatic environment.

ResultsPlus
Examiner Tip

When a question asks for an explanation you need to be careful to link the points together effectively in order to maximise marks.

Question 2 (c)

For this question it was necessary to correctly identify the living indicators present in clean water and polluted water. The organisms quoted on the specification were credited as were generally accepted living indicators for the mark. A few candidates mixed the indicators up and it is important that they check their work after completing it, to make sure they haven't put the answer in the incorrect box.
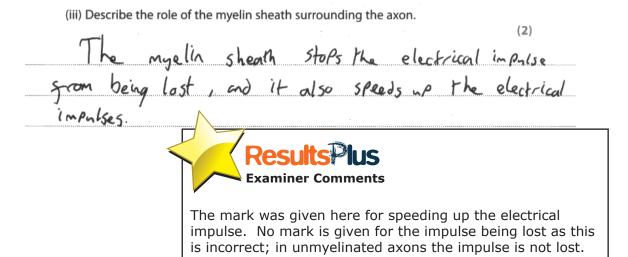
Question 3 (a) (i)

To attain both marks for this response candidates needed to correctly identify the dendrites / dendrons and also the nucleus of the nerve cell.

Question 3 (a) (iii)

It was very pleasing to note that many candidates were able to accurately note that the myelin sheath insulates the neurone and allows quicker electrical conductance. Some responses incorrectly identified the myelin sheath as a protection mechanism. Another way in which marks were lost was by referring to the impulse speeding up as a message rather than impulse or signals.

1 mark given here for the idea of quicker conductance.

(iii) Describe the role of the myelin sheath surrounding the axon.

(2)

The myelin sheath stops the electrical impulse from being lost, and it also speeds up the electrical impulses.

ResultsPlus
Examiner Comments

The mark was given here for speeding up the electrical impulse. No mark is given for the impulse being lost as this is incorrect; in unmyelinated axons the impulse is not lost.

Protection is not enough; the response needs to refer to insulating the axon rather than just protection. The idea of helping it through is also too vague.

(iii) Describe the role of the myelin sheath surrounding the axon.

(2)

The myelin Sheath is a jelly like substance that protects the axon and helps it move. It also helps the electrical impulse get through the nerve.

ResultsPlus
Examiner Comments

Try to be specific in responses to this type of question using biological terms such as insulation and transmission/conductance in your response.

Question 3 (b)

A description of the pathway involved in the reflex arc was needed to gain full credit here. It is vital in this response to get the order correct to describe the whole system. Receptor cells detect the stimulus - receptors are the important point here with no credit given for vague body organs such as skin. Sensory neurone to relay neurone is worthy of credit as is the location of the relay neurone in the spinal cord. Relay neurone to motor neurone causing an effector to initiate a response completes the story. Some responses mixed up the order of sensory, relay and motor.

This response was awarded all 4 marks available by managing to link the system in a logical order.

(b) Humans have reflexes.

Describe the route of an impulse through a reflex arc.

(4)

Electrical impulses travel through the Stimulus to the receptors then to the Sensory neurone then to the relay neurone then the motor neurone then the ~~effor~~ effectors then you will quickly respond and back away from the danger. Impulses do not go through the Synapse. A chemical transmitter goes through the Synapse.

ResultsPlus
Examiner Comments

This is a clear description of the reflex arc in a logical order for 4 marks.

ResultsPlus
Examiner Tip

Be careful, the name of the system is the reflex arc but the neurone in the spinal cord is not a reflex neurone it is a relay neurone.

Question 4 (a) (ii)

This question involved completing a Punnett square for two parents heterozygous for Huntington's disease. Marks were awarded for the correct gametes and the correct offspring. Common mistakes made in answering this question were writing incorrect gametes most often a homozygous recessive with a heterozygous - resulting in the incorrect outcome. Occasionally, candidates used a different letter than H despite being given this to use. If the cross was correct this was still awarded the marks but candidates should be reminded that it is better to use the information given rather than changing it.

Question 4 (a) (iii)

This question required an interpretation of the Punnett square as a probability. Most candidates gave this as a percentage of 75% but ratios, decimals and fractions were also accepted for the mark. If the candidates completed an incorrect Punnett square - an error carried forward was applied to stop the candidate being penalised twice.

Question 4 (b) (i)

In this case, many responses included the fact that Huntington's was caused by the dominant allele and cystic fibrosis by the recessive allele - but more detail about why that would result in more of the offspring inheriting the disease was necessary in order to fully answer the question. Only 1 dominant allele as opposed to two recessive alleles. Many responses included percentages here, often incorrectly, but these did not explain why inheritance of Huntington's was greater so were not credited.

(i) Explain why, if both sets of parents are heterozygous, the chance of inheriting Huntington's disease is greater than the chance of inheriting cystic fibrosis.

(2)

Because the Huntigton't causes by dominut allele And systic fibrosis causes by ~~resiesive~~ ~~recessive~~ recessive allele.

ResultsPlus
Examiner Comments

One mark was awarded here. For the second mark, they would also need to state that Huntington's disease only requires 1 dominant allele to be inherited - whereas cystic fibrosis needs to have 2 recessive alleles to be inherited.

ResultsPlus
Examiner Tip

Always look at the number of marks allocated to the question in order to make sure that your answer is detailed enough to gain all the marks.

Question 4 (b) (iii)

This question involved application of knowledge from the expected question about mucus in the lungs. The candidates should know that cystic fibrosis is caused by a buildup of thick sticky mucus in the body organs and some of the consequences of this. In this case, they were asked why this may cause infertility and some of the candidates were able to do this correctly by writing that the mucus blocked the sperm / stopped the release of the sperm or even in some cases clogged the sperm duct.

Question 5 (a) (ii)

This question required the candidates to do a percentage calculation for 3 marks. They had to work out the percentage of energy lost from the food chain between the producer and first consumer. Candidates should know that less than 10% is passed on so the answer must be around the 90% mark. Several responses included the correct calculation and found the amount of energy passed on (which was 8%) and attained 2 marks for this if they showed their working. There was evidence of incorrect calculations, completed caused by reversing the numbers. Other responses involved completing the percentage calculation between first and secondary consumer which was not what was required by the question.

Question 5 (a) (iii)

This question was well answered by the majority of candidates and they were able to give many different ways in which energy was lost. Incorrect answers included photosynthesis which is the opposite. Popular correct answers were respiration and movement, as well as not all the organism being eaten.

(iii) Suggest how energy is lost between trophic levels in this food chain.

(2)

> In different seasons and especially in spring having to bud again if a tree. Also growing.

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Examiner Comments

The question asks how energy is lost between trophic levels. If the plant is growing it is not losing energy.

Question 5 (b)

This question was accessed well giving excellent descriptions of three mutualistic relationships. The most popular correct responses were of the oxpecker and buffalo and the cleaner fish and sharks with good descriptions of how these were beneficial to both organisms. There was some confusion between tube worms and tape worms and chemosynthetic bacteria and also some confusion as to the role of the chemosynthetic bacteria making food for the tube worms using hydrogen sulfide; with many candidates thinking the tube worms fed the bacteria. Nitrogen fixing bacteria and their relationship with leguminous plants also showed some misconceptions about the conversion of ammonia rather than nitrogen gas and also that nitrogen fixing bacteria make protein.

Question 6 (a) (ii)

This question caused some candidates a little trouble. Whilst the majority were able to gain 2 marks for vasodilation when hot and vasoconstriction when cold, the candidates could not correctly describe the dilation of the blood vessels so more blood flows closer to the skin or the constriction of blood vessels so less blood flows closer to the skin. There is still a major misconception that blood vessels in the skin move up and down - which is not the case.

> (ii) The thermoregulatory centre controls internal body temperature.
>
> Explain how the blood vessels in the skin help to control internal body temperature.
>
> (4)
>
> The blood vessels vasodilate when the person is too hot This means blood flows closer to the surface of the skin and the heat is lost through the skin. when it too cold the blood vessels vasoclet~~s~~ vasoconstrict ~~et~~ ~~much~~ meaning no heat is lost through the skin

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Examiner Comments

This response scored 3 marks as they did not state what was happening during vasoconstriction.

Question 6 (c)

It is pleasing to note that many responses included a good account of both the effect of insulin and the effect of glucagon on blood glucose concentrations. There were some issues with the selling of both glucagon and glycogen as some candidates confused the two.

*(c) The human body prevents blood glucose levels from becoming too high or too low.

Explain how the human body maintains blood glucose levels within a narrow range.

(6)

When the glucose level is too high in our body our pancreas releases insulin to change the glucose into glycogen to store in the liver for later which lowers the amount in the blood. However when the glucose level starts to become too low we release a hormone called glycogen which travels through the blood to the liver. When at the liver in turns changes the Previously stored glycogen into glucose to then go around our body raising the amount in our blood. This is called glucose regulation.

ResultsPlus
Examiner Comments

This is a clear description of the regulation of blood glucose concentrations for top marks.

ResultsPlus
Examiner Tip

Try to think how to structure your answer to a six mark question before writing it, as the answer will become more coherent and be more likely to gain credit.

Paper Summary

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

- Ensure they have a clear understanding of vasodilation and vasoconstriction and do not refer to blood vessels moving.

- Work on their maths skills, particularly when calculating percentages. In addition to this they must always show their working in order to maximise marks.

- Ensure that they have a detailed understanding of the higher tier topics, as these tend to be the areas where the higher marks are allocated, and are often discriminators for the higher grades; in this case the topic of the reflex arc and the mutualistic relationships of chemosynthetic and nitrogen fixing bacteria.

- It is essential that candidates look to the number of marks allocated to the question, and answer the question with the relevant number of points. If the question is allocated 3 marks, then the candidate needs to make 3 separate points.

- Candidates should work on the way in which they answer the 6 mark questions. If the question asks for three mutualistic relationships, then to gain full credit, three must be given correctly in detail.

- Be careful to look to the command words on the paper especially with the command word 'explain' - here, you must base your answer on scientific principals and not just a list.

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