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Examiners' Report
March 2013

GCSE Biology 5BI1H 01

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March 2013

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Introduction

This paper is the last March series paper for the Science 2011 specification: from now on this can only be assessed in the Summer series as a linear course. The paper consists of 60 marks assessed by a variety of questions including multiple choice, short answer and extended answer questions worth 6 marks each. Candidates should answer all questions in a time period of 1 hour. The extended answer questions are also marked on their quality of written communication (QWC) so candidates should ensure that their answer includes good use of spelling and grammar and also that the answer is written with clarity.

The paper covers the topic areas of the nervous system, classification and evolution, the nitrogen cycle and mutualism, diabetes and blood glucose regulation, plant hormones and pedigree analysis. This covers all three topics of the specification questioning the full range of topic areas.

Candidates accessed the calculation questions well: both the calculation of the mean and the application of the equation for BMI, but must be encouraged to always show their working to ensure that they maximise their marks. The extended answer questions were also well accessed by candidates, showing that they are improving their technique in answering this style of question. Candidates were generally able to label the sensory neurone although they often mixed up axons and dendrons. In the nitrogen cycle the topic of eutrophication was well answered but only a few candidates were able to gain all 4 marks in this section. Some candidate confused parasitism and mutualism and thus lost marks. Candidates clearly have a good knowledge of glucose regulation to reduce blood glucose levels but in this instance they were asked **how** to raise blood glucose levels. In this case they had to give details of the effect of glucagon and this revealed considerable confusion between the roles of the pancreas and the liver. Although most candidates were aware of the role of auxin in phototropism, candidates were less aware of the role of other hormones in crop production such as selective weed-killing and the production of seedless grapes. Finally the interpretation of a pedigree diagram caused some candidates problems, with many believing that sickle cell disease was a dominant genetic disorder rather than a recessive one.

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.

Nervous system

Question 1(a)(i)

The correct response for structure A was the nucleus, although an acceptable response was cell body. The majority of candidates either managed the correct answer or made the simple mistake of referring to the whole neurone rather than the specific part of the neurone.

The correct response accepted for structure B was the myelin sheath for the insulation of the neurone, although myelin alone was enough to gain the marks. Schwann cell or fatty layer were acceptable responses too. Again, candidates generally responded well to this although there were vague responses that talked in general about neurones rather than the specific part of the neurone required.

The correct response for structure C was the axon, and although there was some confusion between axons and dendrons, many candidates were able to answer this correctly.

Question 1(b)(i)

This question was accessed well by most of the candidates. The majority who showed their working managed to attain 1 of the 2 marks due to allowing for an error carried forward in the mark scheme. The candidates had to calculate a simple mean from a section of data and if candidates struggled, there were other results within the question which may have helped them to work out how to answer it. The most common mistake was where candidates divided by 4.5 rather than 3 because they confused the number of units of alcohol drunk with the number of attempts at a reaction time.

(i) Calculate the mean reaction time for volunteer D.

(2)

$67 + 60 + 62 = 189$

$\frac{189}{3} =$

Answer 63 ms

ResultsPlus
examiner comment

This is an excellent example of how the candidate should lay out their answer for a mathematically based question or calculation. All working should be shown and the answer written on the answer line. Note as the units are on the line there is no need to include these in the response. This response was awarded 2 marks.

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examiner tip

Always show your workings when dealing with calculations.

(i) Calculate the mean reaction time for volunteer D.

(2)

Answer 63 ms

ResultsPlus
examiner comment

In this example the correct answer has been given and so full marks were awarded even though the candidate did not show their working.

ResultsPlus
examiner tip

Note that full marks can be awarded for a correct response that does not show the method, but this is not advisable in case of a simple mathematical error. If the calculation has an error but the correct working was shown then a mark could be awarded even if the candidate did not achieve the correct answer.

(i) Calculate the mean reaction time for volunteer D.

$67+60+62 \div 4.5 = 42$ ms

(2)

Answer 42 ms

ResultsPlus
examiner comment

In this case the candidate has used some of the correct data but has divided the answer by the incorrect number. As they managed to carry out that calculation correctly they have been awarded 1 mark for successfully carrying out the calculation of a mean but using incorrect data. This is a clear example where if the candidate had just written the answer 42 no marks would be awarded.

Question 1(b)(ii)

The question asks candidates to explain why there is a change in the reaction time of a person once they have drunk alcohol. This is an **explain** question so it is not enough for the candidate to merely state what the change is, although many candidates gained 1 mark by stating that reaction times were slower. A common misconception here is that slower reaction times mean a decrease in reaction times; this is clearly incorrect as a decrease in reaction time would make the reaction faster.

The second issue with this question was that several candidates were under the misconception that alcohol is a stimulant rather than a depressant and this could not be credited on the mark scheme.

The answer required by the mark scheme was that the reaction times were increased **because** the neurotransmitters at the synapse were slower or neurotransmission was reduced. Having said that, the question was generally well accessed with most candidates attaining 1 or 2 marks.

Darwin's finches

Question 2(a)(i)

This was an interpretation question from the diagram. Candidates had to look at the branching tree diagram and identify the large cactus ground finch. They then had to correctly identify its genus as *Geospiza* and its species as *conirostris*. All the information was available in the diagram. Most candidates were able to identify the species but the genus was often written as finch or even bird. There was also some incorrect reading of the tree, where candidates looked at the cactus ground finch rather than the large cactus ground finch.

Question 2(a)(ii)

Candidates found this question quite challenging. Many candidates gave vague responses about adapting to the habitat but the question is about survival of the finches and therefore the response must be specific to this. Candidates needed to relate this to evolution and state that the different beak sizes and shapes enabled the finches to eat specific food types, which resulted in less competition between species for resources.

This question relies on candidates being able to apply their knowledge to new situations and is therefore a higher order skill level than the recall style questions. Many candidates were able to gain 1 mark on this question but fewer managed the 2 marks.

(ii) Suggest how the size and shape of their beaks enabled all of these types of finches to survive.

(2)

The Size of theer beaks determen what kind of food they can catch, the smaller one or the medium tree finch has a smaller beak so it feeds on

ResultsPlus
examiner comment

In this case the candidate has made the correct link between the size and shape of the beak and the food it eats. This was enough for the first marking point. If candidates referred to two different types of beaks and the food they selected as a result of their beaks this also gained credit.

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examiner tip

The question asks the candidate to link beak size and shape to **survival**. To survive birds need food primarily and so this should be given as the main reason for the adaptation.

(ii) Suggest how the size and shape of their beaks enabled all of these types of finches to survive.

(2)

All the beaks have adapted to the habitat So Some have small beaks because they need small beaks and Some have big beaks because they need big beaks

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This answer is too vague for the mark. It does not mention the need for adaptation to habitat or competition for food.

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In a question such as this, try to think laterally. What would the birds need to survive that would mean they would have different shaped beaks? Then try to be specific in your answer: 'big beaks because they need big beaks' is not enough. What advantage do big beaks offer the birds?

Question 2(b)

Several candidates were able to gain 1 or 2 marks here but many became very confused. The question asks the candidates to suggest how all these species of finches could have evolved. In response to this the candidates need to talk about how the finches' adaptations enabled them to survive in an environment; there could have been a reference to a favourable mutation in the gene. In addition to this they need to relate these adaptations to survival of the fittest resulting in natural selection. Many candidates became confused with speciation, but the question specifically asked about evolution and so the answer must also relate to evolution of the finches.

(b) Suggest how these species of finches could have evolved.

(3)

The finches would have competed for food, better adapted finches would have been successful and survived and pass on their advantageous characteristics to offsprings. poorly adapted finches would have been unsuccessful competing and would not live to reproduce these disadvantaged finches would dissappear over time. only the better adapted ones lived.

(Total for Question 2 = 8 marks)

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This is a very good response from the candidate and gained all 3 marks. Note they have talked about competition for resources which is 1 mark; they then refer to finches being better adapted and this is very different to adapting to the environment. The adaptations allow the finches to survive and those better adapted to survive to reproduce. Finches cannot grow a different beak over one generation and this is where a lot of candidates' confusion stemmed from.

ResultsPlus
examiner tip

Make sure you read the question carefully and do not link one question with a previous one as this can lead to confusion and incorrect responses.

(b) Suggest how these species of finches could have evolved.

(3)

they could have evolved by characteristics being passed onto their young. This means that they would have similar/same characteristics as the parents. In the ring species they would be related to other type of birds such as the small ground finch

(Total for Question 2 = 8 marks)

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examiner comment

This candidate was awarded 1 mark for the idea of passing on characteristics that are beneficial to their offspring. This would have been fine if the candidate had referred to genes, alleles, etc. being passed on. The candidate then moved on to talk about ring species which was not part of the question here and therefore could not be credited.

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examiner tip

Where 3 marks are available it is often worth re-reading your answer to see if you have made three specific points in response to the question.

Nitrogen

Question 3(a)(ii)

This question was very well accessed by candidates for the first marking point with most able to link the uptake of nitrates with need for growth. Fewer candidates were able to make the link between needing nitrates to make proteins to enable growth, which would have accessed 2 marking points. It was pleasing to note how many candidates were able to make the link between nitrates and growth.

Question 3(a)(iii)

Candidates have a good knowledge of the process of eutrophication but often lose marks because they are too vague. Comments such as ‘algae grows’ is not sufficient for the mark; it is important to state that that algae grows more!

Candidates sometimes went off on the wrong tangent about fertilisers killing plants or plants being poisoned by too much fertiliser, neither of which answers the question.

Finally candidates rarely linked the oxygen use by bacteria through respiration, which was the required detail for the final mark point.

Question 3(b)

This question had a number of mixed responses, with several candidates confusing mutualism and parasitism. In this case the relationship was a mutual one. If the candidate recognised the bacteria as nitrogen fixing they usually went on to gain all 3 marks.

Note that it was not enough to say they both benefit, the term mutualist or equivalent was needed for the mark point; this is because it is a specific term laid out in the specification as is the relationship between the two organisms.

Explain the relationship between this bean plant and the bacteria growing in the root nodules.

(3)

The bacteria on the root has a parasitic relationship with the roots because it depends on the root for survival but does not benefit the root, it harms the root as the root can not ~~being~~ absorb water as easily due to the bacteria growing. This bacteria acts as a parasite to the root as it affects its job rather than ~~better effect~~ benefit it.

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This candidate has missed the idea that nitrogen-fixing bacteria have a mutualistic relationship with the plant. 'Parasitic' is an incorrect answer so no marks could be awarded here.

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examiner tip

Make sure you know the specifics of the parasites and mutualists named in the specification.

Explain the relationship between this bean plant and the bacteria growing in the root nodules.

(3)

The bean plant and bacteria have a mutualistic relationship. The bacteria converts ammonia into nitrates in the soil, which the plant can use. The ~~plants~~ leaving ~~g~~ sucrose in the soil which the bacteria can use to survive.

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An excellent response to the question gaining all 3 marks. The candidate has recognised the relationship as mutualistic and also that nitrogen-fixing bacteria provide the plant with nitrates whereas the bacteria get protection and chemical substances from the plant. Note that a response stating bacteria feeding on the plant would not be sufficient.

Diabetes

Question 4(a)(i)

This question was accessed fairly well by a large number of the candidates. Many recognised that there was a positive correlation between the two graphs and stated this in their answer. Several candidates did just try to describe each of the graphs without actually making a comment on the fact that as one rose so did the other. The second mark point, which was a specific reading off the graph to explain the point, was generally given for candidates recognising that there were two points on the graph which did not show a positive correlation between diabetes and body mass.

(a) (i) Use information from the graph to describe the correlation between type 2 diabetes and body mass shown from 1993 to 2000.

(2)

The correlation is positive because as the mean body mass increased, the % of the population with type 2 diabetes increased. In 1993 the mean body was 73.4kg and % was 4.7% but in

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Positive correlation is enough for the first mark, or if the candidate states that as average body mass increases so does the percentage of people with type 2 diabetes. This candidate also points out the years where the type 2 diabetes dropped to gain the second mark.

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Always try and keep your answers concise and use the information available to be as specific as possible. In this case there are two graphs plotted so there can be a positive correlation between them. As one rises so does the other.

(a) (i) Use information from the graph to describe the correlation between type 2 diabetes and body mass shown from 1993 to 2000.

(2)

FROM 1993 IT HAS BEGUN TO SHOW A STEADY INCREASE FROM ITS LOWEST POINT IN 1993, ALL THE WAY TO ITS PEAK IN 2000.

ResultsPlus
examiner comment

This candidate did not get the marks as he has only described a trend of one of the graphs, whereas the question asks for the relationship between them.

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examiner tip

When describing correlation, use specific readings to back up your point.

Question 4(a)(ii)

Candidates did less well with this question but most marks were awarded for candidates recognising that people develop a resistance to insulin or that they do not respond to the insulin any more. The second mark was given for linking the increase in body mass to an increase in obesity. Again this is an applied question which needs thinking through before the candidate responds.

Question 4(b)(i)

Many candidates were able to access this calculation for 1 or 2 marks. The equation to calculate this is given and the candidate just had to apply the data to the equation. Common mistakes were failing to square the height on the bottom of the equation. If the working was shown and the candidate successfully managed the calculation with the incorrect data, the error carried forward mark could still be applied for 1 mark. In this case we ignored the number of decimal places that were written as long as the number was correct, but the answer should have been rounded to the correct whole number for accuracy.

Question 4(c)

Although the candidates managed to score quite highly on this question there were many misconceptions about glucose regulation to raise blood glucose levels. Many candidates thought insulin caused blood glucose levels to be raised as well as lowered. In many case candidates believed the hormones were released from the liver rather than the pancreas. The misspelling of glucagon and glycogen caused some marks to be lost as it was not clear which one the candidate was referring to.

Several candidates did not answer the question on raising blood glucose levels but gave an excellent response on lowering blood glucose levels. However, this was not worthy of credit.

Plant hormones

Question 5(a)(ii)

There was an even spread here between candidates who clearly knew the role of auxins in the plant and those that did not. Many candidates lost marks as they talked about the auxins elongating rather than the plant cells. Many candidates also lost marks as they stated the auxins were in the growing tip and promoted growth. Whilst that is true it does not answer the question about phototropic responses.

Question 5(b)(i)

This was answered well by many of the candidates where they correctly linked an increase in ethylene concentration to an increase in the percentage of bananas that ripened. There were some misconceptions whereby candidates linked this to faster ripening, which the graph does not show. Several candidates were confused by the graph and thought the axis showing concentration of ethylene was actually the time in days and so did not gain the mark as they linked the increased ripening to time. It is vital when commenting on data either in tables or graphs that this data is read carefully.

Question 5(b)(ii)

The important part of this question is that the candidates needed to suggest the best concentration to be most cost effective. The candidates needed to make the link that most bananas ripened at 3% and that after this point the increased concentration had no more effect on the ripening. Many candidates lost marks due to the fact that they gave a **range** of concentrations, which does not answer the question as to which is **most** cost effective.

Question 5(c)

In general candidates managed this question well with a fair number falling into the mid-band with 2 marks. Some candidates were unable to give any other uses for plant hormones and therefore could not be awarded all of the marks available. In the 6-mark questions the answers are marked against a generic marking grid, which puts the candidates work into a level. Level 1 included one use of plant hormones to commercial growers. Level 2 was two or more uses of plant hormones and Level 3 was two or more uses in detail with a correct link between at least 1 hormone and its role in crop production.

*(c) Fruit ripening is one use of plant hormones.

Describe the other uses of plant hormones in crop production.

(6)

Plant hormones can be used to deal with weeds in fields by spraying the field with the ~~hormone~~ growth hormone which affects the broad leaved weeds and not the other plants with thinner leaves, this causes the weeds to die, but the crops survive. Hormones can be used to stop the fruit falling from the trees, meaning more can be picked. Hormones can also be used to make seedless fruit such as seedless grapes.

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This candidate has successfully given several other uses of plant hormones and given some detail of how the hormones work. This is enough to put them into Level 2 of the mark scheme. Spelling, grammar and quality of writing are acceptable for a Level 2 answer so the candidate is awarded 4 marks. To move up to the next level the candidate should have given a little more detail, including the names of at least one hormone linked to its use.

ResultsPlus
examiner tip

With the 6-mark questions ensure that you take time with spelling, grammar and quality of writing in order to gain the maximum marks.

*(c) Fruit ripening is one use of plant hormones.

Describe the other uses of plant hormones in crop production.

(6)

The other use of plant hormones is to grow plants ~~to tow~~ towards the light which is called positive phototropism *Another use of plant hormoes is a weed killer where it will kill selective plant but not the crop that we eat for food this is also done by the hormone ~~which~~ is called an auxin. Another use of plant hormone is to make ~~root~~ root nodules (you want get to make a identical plant) grow faster so you could get the plant you want in a shorter amount of time.

* ~~The~~ The hormone used too do this is called an auxin

(Total for Question 5 = 12 marks)

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This candidate has managed to give one use of plant hormones as selective weed-killers, which puts them into Level 1 on the mark scheme. At this level the spelling and grammar do not have to be as high quality as at the higher levels and this response was considered sufficient to award the QWC mark. This answer was awarded 2 marks.

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examiner tip

Try to make sure you answer the question being asked and do not inadvertently move onto other subjects which are irrelevant to the question and therefore cannot be credited.

*(c) Fruit ripening is one use of plant hormones.

Describe the other uses of plant hormones in crop production.

(6)

Auxins can be used for killing weeds. The auxins hormone attacts the weeds with wide leaves such as daisys and causes them to grow out of control and they end up dying. This process does not effect the narrow leaved crops. Rooting powder uses auxins. ~~Plant cuttings are~~ The bottom of plant cuttings are dipped into rooting powder and the auxins trigger positive geotropism making roots grow faster from the cutting then they would from a seed. Hormones are also sprayed onto ~~plat~~ fruits that contain seeds to allow the fruit to grow without the seeds inside to produce seedless fruit. And lastly a ready seedless fruit is ~~are~~ small so hormones are used to make them larger.

(Total for Question 5 = 12 marks)

AUXINS
- rooting powder on cuttings
- kills large leaf weeds
- doesn't kill narrow leaved crops

Seeds
- develop without seeds.
- grow bigger.

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This candidate has written well, using good spelling, grammar and sentence construction. They have detailed the uses of plant hormones and linked the use of auxins and gibberellins to their role in the plant. This candidate has been awarded Level 3 for 6 marks.

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Always try to tailor your response to the space available on the exam paper as it should guide you about how much should be written.

Genetic inheritance

Question 6(a)(i)

The pedigree diagram shows the offspring of generation one and their partners. To gain the mark candidates had to count the four offspring and then work out how many of them were heterozygous for sickle cell, which worked out to be 75%. Many candidates gave 50% as the answer as they included the spouses of the offspring in their calculation. Others tried to do a Punnett square to calculate but this gave a different percentage outcome of 50% also.

Question 6(a)(ii)

Candidates struggled a little with this question and many gave responses that were not detailed enough to be worthy of credit. They needed to calculate the number of offspring that were carriers using a Punnett square and relate that to the reality that 75% of the offspring were carriers rather than the 50% predicted by the Punnett square. Many candidates gave vague responses about Punnett squares only being a probability but they did not go on to explain this in relation to this question, so were not credited with the marks.

(ii) Explain why the offspring produced by the first generation parents are not the same as those predicted in a Punnett square.

(2)

~~the punnet square says that there~~
~~is a 50% chance of heterozygous however~~
~~63.5% is more than 50% this shows~~
~~that punnet squares just a predictions.~~
3 out of 4 of the first generation are heterozygous the punnet square says 50% should be heterozygous this shows that punnet squares are a prediction.

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This answer correctly identifies that in the pedigree diagram 75% of the offspring are carriers for sickle cell but the outcomes of a Punnett square would only give a 50% probability. This response is worth 2 marks. They could have gone on to say that the Punnett square is the probable outcome for each child each time, not the overall probability.

(ii) Explain why the offspring produced by the first generation parents are not the same as those predicted in a Punnett square.

(2)

The punnett square predicts that only half of the offspring (50%) will be carriers. However, each conception is a random and individual process, so the punnett square is not always correct

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This candidate has managed to gain 2 marks for the outcome of the Punnett square and also for explaining that this is an individual probability Punnett square.

(ii) Explain why the offspring produced by the first generation parents are not the same as those predicted in a Punnett square.

(2)

Because a punnet square shows all the possibilities and the most likely outcomes. It is not certainty, it just shows the most likely offspring.

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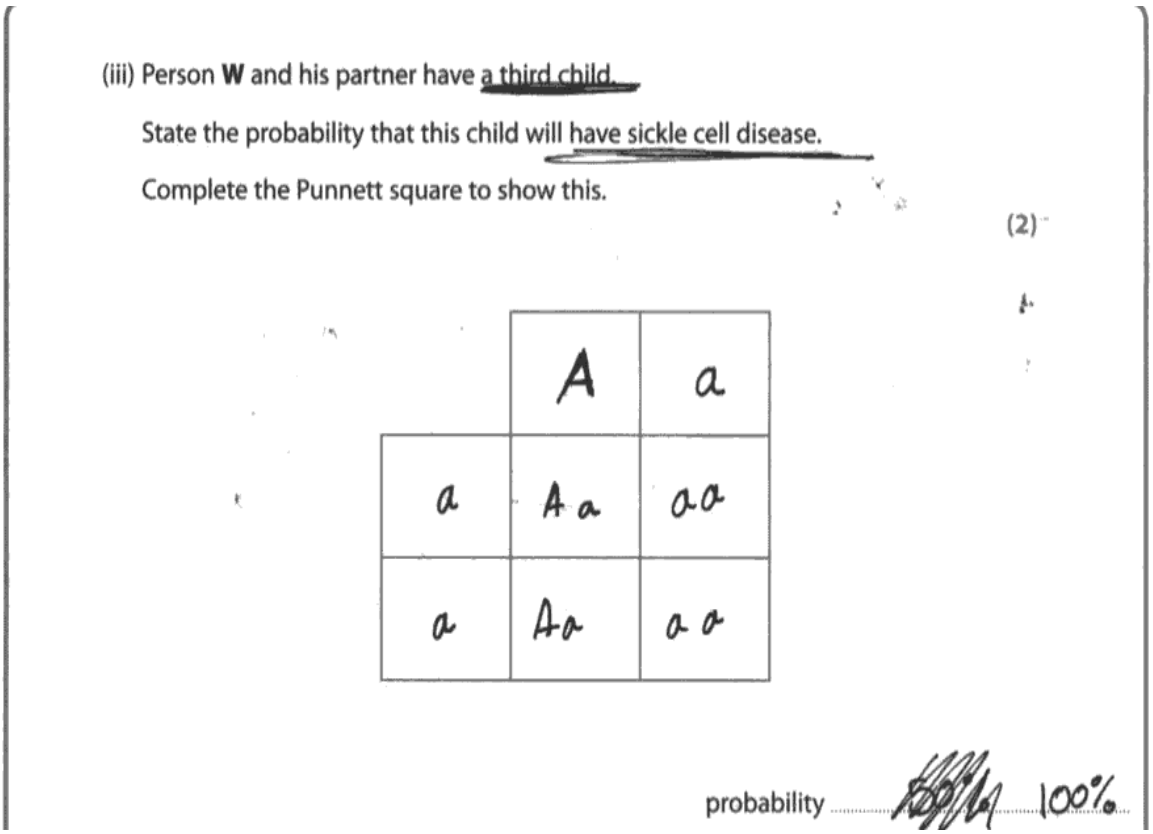
This candidate has not one into quite enough detail for a response worthy of credit. In order to gain 1 mark here they would have needed to link the fact that probability given by the Punnett square relates to each child rather than an overall probability in numbers of offspring.

Question 6(a)(iii)

Candidates struggled with this question, with many doing a Punnett square with incorrect gametes, meaning that they read these off the diagram incorrectly. Several had the correct gametes but calculated the potential percentage outcomes incorrectly. Several candidates used letters that were indistinguishable from one another, meaning the Punnett square could not effectively be marked as there was no differentiation.



(iii) Person **W** and his partner have a third child.

State the probability that this child will have sickle cell disease.

Complete the Punnett square to show this.

(2)

	A	a
a	A a	a a
a	A a	a a

probability 100%

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This response had a correctly drawn Punnett square. The first mark for this question is awarded for getting the correct gametes and the second mark is for the correct offspring and percentage outcome. In this case the candidate has given the incorrect percentage outcome, it should be 50%, and therefore is only awarded 1 mark.

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Always check over your answers at the end of the examination to ensure that you do not make silly errors.

(iii) Person **W** and his partner have a third child.

State the probability that this child will have sickle cell disease.

Complete the Punnett square to show this.

(2)

probability 3/4

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No marks can be awarded here as both the gametes and the percentage are incorrect.

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It is also worth noting that a letter was not allocated to use in the Punnett square. Candidates would find it easier to use letters that have a distinct difference between the upper and lower case, such as Bb.

Question 6(b)

Most candidates managed to attain Level 1 or 2 in this question although there were many very good responses involving a Punnett square of potential offspring and/or inheritance patterns. To attain Level 1 the candidates either had to correctly describe the genotypes or penotypes of X,Y and Z or give an outline of why they should have pedigree analysis. For Level 2, both of these were required and for Level 3 some mention of inheritance patterns or potential outcomes calculated and explained were also required.

*(b) Explain why it is important that individuals **X**, **Y** and **Z** have pedigree analysis completed before they consider having children.

You should use diagrams and mathematical calculations to illustrate your answer.

(6)

X = homozygous dominant. Y = Heterozygous Z = heterozygous.

X → Both carrier parents Y = One carrier One affected Z = One carrier One unaffected.

H H

H

h

It is important X, Y and Z have pedigree analysis completed before they consider having children, because individual X have both carrier parents but is a homozygous dominant, one of his sister is affected and ~~can produce~~ individual Y is a heterozygous whose mother is affected and father is carrier. There is a high chance that his child would be affected and have sickle cell disease. Individual Z is a heterozygous who mother is a carrier and father is unaffected. There is a chance that individual Z will produce children that have sickle cell diseases. All these individuals parents have at least one carrier.

other is carrier.

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This response is worthy of Level 2. The candidate has correctly identified the genotype and phenotype of X, Y and Z and has also explained the need for pedigree analysis. There is not enough evidence of thought on possible inheritance patterns of offspring to justify Level 3. QWC mark is given so 4 marks in total.

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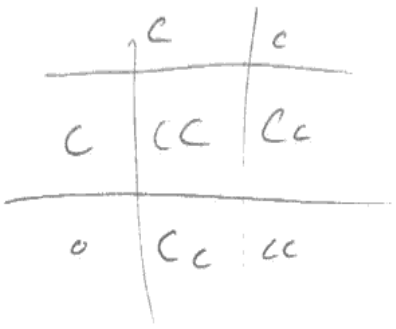
On the 6-mark questions try to organise your thoughts before starting to write. This will help with the clarity of your writing and ensure you gain the QWC marks available.

*(b) Explain why it is important that individuals **X**, **Y** and **Z** have pedigree analysis completed before they consider having children.

You should use diagrams and mathematical calculations to illustrate your answer.

(6)



both 'Y' and 'Z' are carriers of the disease and there is a 75% chance there offspring will have the disease or be a carrie of it, this leaves only 25% that both genes are ressesive.
'X' however is double ressesive but is his or hers partner is also a carrier it may leave there offspring with the disease or be a dominat

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The candidate displays a knowledge of inheritance and the need for pedigree analysis. However, there is a mistake in the identification of the genotype of person X so this candidate is put into Level 1 with 2 marks awarded.

Summary

Based on their performance on this paper, candidates should:

- always show the working when doing calculations as a mark can be awarded for errors carried forward in this case
- ensure that they read the questions carefully and ensure that they are not linking a previous question to the next one as was the case with the evolution of finches and speciation
- check the number of marks associated with graphical questions when tackling them and ensure that if 2 marks are awarded then two separate points about the graph are included
- know both the role of glucagon and insulin when looking at blood glucose regulation and know the correct spelling of glucagon and glycogen to avoid confusion in their answers
- be giving scientific information and not a vague statement, which may not be worthy of credit when a question asks candidates to **explain** as the command word
- think about the structure of the answer before starting to write when tackling the extended answers to ensure that the answer shows clarity of writing and flows, while remembering that accurate spelling and grammar in these questions is also important
- recognise that the direct lines down from the parents are to the **offspring** while the horizontal lines show their respective **partners** when reading pedigree diagrams.

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