

Examiners' Report  
June 2013

GCSE Biology 5BI1H 01

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## Introduction

This paper is 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 genetic disorders, in particular sickle cell anaemia; parasites and mutualists as exemplified by worms; variation including classification and evolution; drugs by looking at stimulants and smoking tobacco; thermoregulation and pollution including water and air pollution.

Candidates accessed the majority of the paper well. Whilst it was pleasing to note that the completion of a Punnett square with limited help was completed correctly by the majority of the candidates, the subsequent probability percentage calculation caused a few problems. On the subject of parasites the candidates were able to select the relevant information on tapeworms in order to answer the question correctly but the higher demand topic regarding the mutualistic relationship between tube worms and chemosynthetic bacteria was often confused with a similar relationship between the Pompeii worm and bacteria. Clearly candidates are able to understand the classification of kingdoms with many able to give the features of the kingdom animalia and the features of chordates. Knowledge of evolution regarding the extinction of the Dodo caused a few problems as the candidates had to relate the answer to extinction where many gave a list of the stages in evolution.

Graph interpretation and calculations were generally completed well although there are still several students who have problems with percentage calculations. It was very pleasing to note that thermoregulation and homeostasis are being well understood whether related to the changes in cold or hot temperatures and candidates did particularly well on this 6 mark question. Finally candidates understanding of the effects of pollution on the environment was exceptionally well understood although some did not recognise that both water and air pollution were necessary for the maximum marks on this six mark question.

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.

## Question 1 (a) (ii)

This question was accessed well by the whole cohort but to varying degrees. Many candidates confused cystic fibrosis with sickle cell and gave the incorrect symptoms. It was also important to note here that the question was worth 3 marks so it is vital that 3 different symptoms were given in order to gain maximum marks.

(ii) Describe the main symptoms of sickle cell disease.

(3)

The blood cell changes shape and therefore it can block blood vessels leading to possible heart attacks and strokes



**ResultsPlus**

**Examiner Comments**

Only 1 mark can be awarded here as the symptoms are asked for. The candidate has explained what a sickle cell is but there is no credit for this.



**ResultsPlus**

**Examiner Tip**

Be very careful to focus your answer on the question that is being asked. Try not to just write down everything you know about a topic.

### Question 1 (b) (i)

Candidates are becoming very proficient in completing punnett square even when very little detail is given and a large percentage of the cohort gained both marks in the question. Some candidates did not read the question carefully and placed the male and female gametes in the wrong place thus losing a mark.

(b) (i) A female with the genotype (**Dd**) and a male with the genotype (**DD**) for sickle cell disease are about to start a family.

Complete the Punnett square to show the possible genotypes of their offspring for sickle cell disease.

(2)

		Female gametes	
		D	d
Male gametes	D	DD	Dd
	D	DD	Dd



#### ResultsPlus Examiner Comments

A correctly drawn Punnett square showing a clear correct method of writing the gametes and potential offspring.



#### ResultsPlus Examiner Tip

Always ensure that you check which gametes belong to the male and which to the female to avoid losing unnecessary marks.

### Question 1 (b) (ii)

Although many candidates managed to complete the correct Punnett square their interpretation of the probabilities was less well done. The most common mistake was giving 50% probability of being a carrier (correct) and then 50% of being a person with sickle cell (incorrect). None of the offspring were homozygous recessive so none were sufferers of sickle cell.

Complete the Punnett square to show the possible genotypes of their offspring for sickle cell disease.

(2)

		Female gametes	
		D	d
Male gametes	D	DD	Dd
	d	Dd	dd

(ii) State the percentage chance that a child from these individuals will be

(2)

1. a carrier of sickle cell disease ..... 50 ..... %
2. an individual with sickle cell disease ..... 50 ..... %



**ResultsPlus**

**Examiner Comments**

This was a common misconception; DD is not a sufferer of sickle cell as it is a recessive disorder so DD means they do not have the disorder and that they are not a carrier either. 0% in this genetic cross had sickle cell.



**ResultsPlus**

**Examiner Tip**

Be careful, the two genetic disorders in the specification both sickle cell and cystic fibrosis are caused by recessive alleles and so a sufferer would have both lower case alleles.

Complete the Punnett square to show the possible genotypes of their offspring for sickle cell disease.

(2)

		Female gametes	
		D	d
Male gametes	D	DD	Dd
	d	Dd	dd

(ii) State the percentage chance that a child from these individuals will be

(2)

1. a carrier of sickle cell disease ..... 50 ..... %

2. an individual with sickle cell disease ..... 0 ..... %



**ResultsPlus**  
Examiner Comments

A correct response given. 50% carriers of sickle cell and 0% have the disorder.

## Question 2 (a) (ii)

This question involved candidates having to interpret the information they are given about tapeworms in the diagram as specifics about the lifecycle of the tapeworm are not required by the specification. Candidates could answer in several ways but in each case the adaptation had to be related to how it was able to live in the human intestine. Some candidates went into the lifecycle of the tapeworm which was not what was required here.

The tapeworm is able to live in the human intestine because of the adaptations on its head enabling it to attach itself onto the small intestine taking/absorbing the food in the small intestine.



### ResultsPlus Examiner Comments

This candidate has used the information given in the diagram to answer the question effectively and has gained 2 marks. Also acceptable were interpretations of the round sucker like adaptations on the head for the marks.



### ResultsPlus Examiner Tip

Do not be afraid to use the information you have been given in your answer.

The adaptations of the tapeworm enables to live in a human intestine, because the diagram shows that it's an ongoing process so the tapeworm adapts to the human intestine because it's used to it.



### ResultsPlus Examiner Comments

This candidate has failed to give an adaptation that the tapeworm has to enable it to live in the intestine but has given a vague statement about the diagram. This question requires a specific response based on the information provided.



### Question 2 (a) (iii)

Most candidates managed to gain at least one mark for this by stating either that the person should not eat meat or that they should cook meat thoroughly; both of these are worthy of a mark. Several candidates talked about washing meat etc which is not indicated by the diagram at all and would be very unlikely to remove tapeworm cysts.

(iii) Using information in the diagram, suggest how humans could avoid becoming infected with tapeworms. (2)

Avoid eating uncooked meat and buy safely produced meat.



**ResultsPlus**  
Examiner Comments

2 marks awarded here for not eating uncooked meat as this also encompasses the not eating meat mark. 'Don't eat uncooked food' on the other hand was awarded 1 mark.

## Question 2 (b)

This question was answered very well by the better candidates and it is an emboldened topic on the specification so is higher tier content. As this is on the specification candidates should be able to recall this type of relationship as mutualism and give details of how this mutualism occurs. Several candidates confused the tube worm with a previously tested Pompeii worm or even the tape worm from an earlier part of the question. This highlights how important it is to ensure that the question is read carefully and understood before attempting to answer it.

Pompeii worms and hydrothermal vents are mutualistic organisms. The chemicals in hydrothermal vents enable the worms to produce chemosynthesis - so they have food to ~~survive~~ survive. The pompeii worms have a thick layer of bacteria to protect themselves from heat, which gives the chemosynthetic bacteria a place to live.



### ResultsPlus Examiner Comments

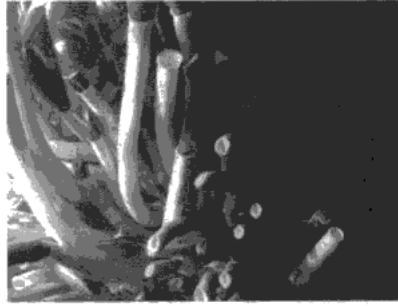
This is a classic example of the candidate confusing the tube worm with the Pompeii worm. The candidate still attained the mark for mutualism but chemosynthetic bacteria and tube worms are on the specification so their specific relationship should be taught. The Pompeii worm was in a previous paper and this is the danger of not reading questions correctly.



### ResultsPlus Examiner Tip

Always read the question correctly to ensure that you are answering the question that is being asked rather than one you would like to be asked.

0



Explain the relationship between these tube worms and chemosynthetic bacteria.

(3)

There is a lot of heat and pressure in hydrothermal vents. The bacteria and the tube worms have a mutualistic relationship. The tube worms protect the bacteria from the environment. Because there is <sup>no</sup> little light in hydrothermal vents chemosynthetic bacteria converts chemical energy into nutrients for the ~~plant~~ tube worm.



**ResultsPlus**

**Examiner Comments**

This answer exemplifies what is required by the mark scheme regarding the relationship between the tube worm and the bacteria, in that the chemosynthetic bacteria uses the hydrogen sulphide from the hydrothermal vents to produce food which the tube worm can survive on and that the tube worm provides the correct conditions for the bacteria to thrive e.g. oxygen.

### Question 3 (a) (i)

Generally candidates were able to gain one if not both of the marks for this question. Those candidates who did not confused the kingdom animalia with vertebrate groups and thus lost the marks.

because it has a backbone and etc.  
also it is able to walk on two feet.



#### ResultsPlus Examiner Comments

Unfortunately this question did not require candidates to use the image provided but rather to list those characteristics which cause an organism to be classified into the kingdom animalia. Answers such as heterotrophic feeder or multicellular were required. 0 marks.

(a) (i) Explain why the dodo was placed in the kingdom Animalia.

(2)

~~multicellular~~ The animalia kingdom means that the dodo must  
have fed ~~as~~ heterotrophically, ~~is~~ <sup>was</sup> multicellular and ~~has~~ <sup>had</sup> no  
cell walls or nucleus.



#### ResultsPlus Examiner Comments

This candidate has given a clear and concise answer to the question. 2 marks.



#### ResultsPlus Examiner Tip

Be careful not to list things which you are unsure of as if they are wrong you may lose a mark due to the list rule being applied.

### Question 3 (a) (ii)

It was pleasing to note that the majority of candidates were able to describe the phylum chordata as those with a supporting rod running the length of their body. Other acceptable answers included 'vertebrate' or 'have a backbone' which was well accessed. Candidates' most common errors were referring to an internal skeleton or a skeletal structure.

It has a supporting rod running down the length of its body  
(it is bony)



**ResultsPlus**  
Examiner Comments

An excellent response from a candidate who clearly understands the feature of chordata.

Scientists classified dodo into the phylum Chordata  
because the characteristics fitted into the category



**ResultsPlus**  
Examiner Comments

This is an example of where the candidate does not answer the question being asked. The question asks why the Dodo was classified in the phylum chordata so this vague response does not gain any marks.

### Question 3 (b)

The main issue with this question was that candidates often just tried to answer it by giving the rote learned response of how evolution by natural selection comes about. In this case the candidate has to relate this to the extinction of the Dodo to gain the marks. A good response would include competition for food or predators causing numbers to go down so that there was not enough left able to reproduce and pass on their genes.

The dodo may have become extinct due to the fact that it was a flightless bird so predators could have easily caught up with it and eaten it.



**ResultsPlus**

**Examiner Comments**

1 mark awarded here for the reference to predators but if the candidate had given the consequences of more being killed they could then have gained further credit.

(b) The dodo lived on the small island of Mauritius. It became extinct in 1681.

Using your knowledge of natural selection, suggest why the dodo may have become extinct.

(3)

within species there is variation. Between species there is competition for resources, and species with more advantageous characteristics, <sup>like wings</sup> are more likely to survive and breed, passing on their genes. Those without advantageous characteristics, such as the dodo, <sup>which is flightless</sup> will soon die out, unable to breed. This is also known as <sup>a survival of the fittest</sup>



**ResultsPlus**

**Examiner Comments**

This candidate has effectively answered the question including details of evolution by natural selection such as survival of the fittest but has related the answer to the extinction of the dodo due to competition for resources and the inability to pass on their genes to future offspring.

### Question 3 (d)

The question asks for the causes of variation and expected responses would be environmental changes or changes to genetic / inheritance. Marks were also awarded for sexual reproduction or mutations in the gene sequence, which were mentioned by some. Common mistakes included discontinuous and continuous variation which are outcomes rather than causes. Also some responses about geographical isolation leading to speciation which was not credited. References to the formation of hybrids by interbreeding were credited.

(d) Describe the causes of variation in a population.

(2)

Hybridisation can cause variation as when two closely related species reproduce, the hybrid has a mix of both their parents' characteristics. Mutation is also a cause, because the genes in the organism are changed which means the characteristics are too.



**ResultsPlus**  
Examiner Comments

2 marks awarded here, a clear response to the question outlining the causes of variation.

in population a variation of people in a place can either cause the number of population to increase or decrease.



**ResultsPlus**  
Examiner Comments

This is not worthy of a mark as the response is vague and nothing is creditable. Variation of people in a place can mean many things. The candidate needed to be more specific in the answer.

### Question 4 (a) (i)

Candidates generally lost marks here by not referring to the actual information on the graph. The graph is fairly straight forward and the answer must link the rise in cancer with the age the person stopped smoking not just the age of a person as the graph does not show this. Vague statements such as positive correlation did not give enough information for the mark.

the longer ~~some one~~ <sup>men</sup> take ~~take~~ until they stop smoking,  
the more risk of lung developing lung cancer



**ResultsPlus**  
Examiner Comments

Clear statement about what the graph is showing for 1 mark.

The trend is positive correlation  
because the graph is increasing each time.



**ResultsPlus**  
Examiner Comments

This is not enough detail for the mark. The question asks for the trend in data so you must ensure that you state what is going on and what the graph is showing. Generic statements such as positive correlation are not acceptable in this case.



### Question 4 (a) (ii)

Some candidates struggled with reading accurately from the graph and lost a valuable mark. At 50 years old the graph reads exactly 9%.

### Question 4 (a) (iii)

This calculation was not completed as well as some in the past. Many candidates seem to struggle with percentage calculations and this may be an area to focus on for the scientific maths skills, particularly in Biology. Both marks were given if the calculation was carried out correctly with an incorrect reading from the graph as candidates are not penalised twice for the same mistake.

$$\frac{500000}{100} = 5000 \quad (2)$$
$$5000 \times 50 = 250000 \text{ men}$$



#### ResultsPlus Examiner Comments

This is an incorrect calculation of a percentage from the data given. There is no substitution of data from the graph so no marks awarded.

(iii) For a population of 500 000 men, how many would be likely to develop lung cancer if they stopped smoking at the age of 50? (2)

$$500,000$$
$$50,000$$
$$5,000$$
$$50 = 9\%$$
$$\text{So } 9 = 45,000$$
$$45,000 \text{ men}$$



#### ResultsPlus Examiner Comments

The correct answer is given but it is always good to ensure that you don't lose the potential for marks by putting in your working as marks are available for correct working even if the wrong answer is given.



#### ResultsPlus Examiner Tip

Always show your working!

## Question 4 (b) (i)

For maximum marks candidates just had to recognise the carcinogen in cigarette smoke as tar and relate this to the fact that it is a carcinogen. 'Causes cancer' could not be awarded as this was in the stem of the question. 1 mark was also awarded for relating nicotine to being addictive causing you to smoke more. Several candidates were confused by the role of carbon monoxide in cigarette smoke as a carcinogen, for which there is currently no link.

Tobacco is a sticky substance which can cause lung cancer. The Tobacco damages all ~~to~~ organs increasing higher chances of developing lung cancer. ~~Smoking~~ Smoking tobacco can also reduce oxygen carrying ability of the blood.



**ResultsPlus**

**Examiner Comments**

No marks awarded here as no mention of the substance tar and also no mention of the role of nicotine. Some nice information about carbon monoxide but this does not answer the question.



**ResultsPlus**

**Examiner Tip**

Focus on what the question is asking rather than just putting down everything you know about a subject.

(b) (i) Explain why smoking tobacco increases the risk of developing lung cancer.

(2)

Tobacco has a substance called tar which contains carcinogens. These carcinogens can lead to ~~to~~ cancer especially, lung cancer ~~but~~ they ~~build~~ build up on a person's lungs.



**ResultsPlus**

**Examiner Comments**

A good clear response to the question including the role of tar as a carcinogen.

### Question 4 (c)

Most candidates were able to answer this question related to the effect of stimulants on brain activity or reaction time but only strong candidates were able to relate this happening at the synapse involving increased amounts of neurotransmitters.

Stimulants speed up the nervous system, so they increase reactions and slow down reaction time. This will make everything in the body work quicker. Nicotine in tobacco is an ~~stimulant~~ addictive substance which could also be a stimulant as it will make the body want more and more.



**ResultsPlus**  
Examiner Comments

This candidate has confused themselves by mixing up increased reaction times and faster reactions which negate each other, therefore no mark awarded here.



**ResultsPlus**  
Examiner Tip

Be careful not to say two opposite statements in the same answer.

### Question 5 (a) (i)

Several candidates struggled to calculate a range here and gave 37 degrees as the answer rather than a range calculation from 37 to 34.3 giving 2.7.

### Question 5 (a) (ii)

Most candidates managed 1 mark here either for the temperature of the finger decreasing, or for the brain remaining stable, but they missed the second mark by not reading the question carefully enough.

When the external temperature decreased, her finger temperature also decreased because the external temperature is making her colder.



**ResultsPlus**

**Examiner Comments**

This candidate gained 1 mark for recognising from the data that the temperature of the finger decreased but this is only half the question. The question asks about the brain and the finger so they should also have stated that the brain remains constant or fluctuates a little for the second mark.



**ResultsPlus**

**Examiner Tip**

Ensure you answer all parts of the question to maximise your marks.

As the external temperature decreased, the brain stayed at a similar temperature whereas the finger decreased in temperature.



**ResultsPlus**

**Examiner Comments**

Excellent response covering both marking points put clearly and concisely.

### Question 5 (a) (iii)

This question was not well accessed, it was an applied question where several candidates could not explain why. The response wanted was heat was lost from the finger to the surroundings so the body responded to stop this by using vasoconstriction stopping the warm blood flowing near the surface.

(iii) Explain why the temperature of Rebecca's finger showed this response to the decrease in the external temperature.

(3)

- There is less blood flow in the fingers so thermoregulation is less effective
- There is more heat loss so ~~the~~ the temperature is harder to maintain
- might not have gloves on.



#### ResultsPlus Examiner Comments

1 mark awarded here for more heat loss to surroundings from the fingers. Further marks could be awarded for an extension of this related to blood flow away from the fingers to retain temperature.

## Question 5 (b)

This was well accessed by all candidates although a few missed that this was a warm temperature and gave details of how the body responds to a cold temperature. The main responses expected included the role of the sweat glands releasing water and salts onto the skin surface which cools it down when it is evaporated off. The concept and explanation of vasodilation and the role of the erector muscle on the hairs causing them to lay flat thus reducing the insulation effect. Some references to the role of sebum in causing the sweat to spread were also seen.

\*(b) Explain how the human body responds to an external temperature of 40 °C.

(6)

The <sup>human</sup> body would react to an external temperature <sup>of 40°C</sup> through sweating which would release heat as the sweat evaporated. It would also cause ~~vaso constriction~~ vasodilation where blood flows to the ~~stop~~ surface of the skin to let the heat radiate away. ~~The~~ Erector muscles for hairs on the skin would ~~relax~~ relax so the hairs could lie flat and not trap ~~the~~ air but let heat radiate from the body.



**ResultsPlus**  
Examiner Comments

Despite the crossing out and slightly 'stop start' sentencing this response covers all the main areas required by the generic marking grid in sufficient detail. Level 3 given and no major issues with QWC so 6 marks are awarded.

When the human body detects a change, negative feedback brings it back to normal. Human body responds to an external temperature through homeostasis. When your body is too hot, the hypothalamus in your brain detects <sup>mis.</sup> ~~and~~ vasoconstriction happens, ~~the~~ less blood flows near the surface of your skin, keeping you cooler. When you're too cold the hypothalamus in your brain detects and ~~then~~ vasodilation happens. ~~by~~ your blood vessels dilate (widen) so more blood flows through near the surface of your skin keeping you warm.



### ResultsPlus Examiner Comments

This is a classic example of how a candidate can lose marks due to an incorrect reading of the question. They clearly have some knowledge of thermoregulation as illustrated by their comments on homeostasis but they have followed the wrong track and the remainder of the response is either incorrect or not relevant so 0 marks can be awarded.



### ResultsPlus Examiner Tip

Make sure you focus on the question being asked and not just write down all you know about a topic.

### Question 6 (a) (ii)

Most candidates managed to identify species 2 as the most likely lichen to be found near a coal fuel power station due to the fact that species 2 were tolerant to oxides of sulphur produced when burning coal. A few candidates referred to species B rather than 2 and a few thought that nitrogen was produced when coal was burned.

(ii) Explain which one of these species is most likely to be found near a coal-burning power station. (2)

Species ~~3/3/3~~<sup>2</sup> because it is tolerant to sulfur<sub>2</sub> which is released from powerstations after burning fossil fuels.



**ResultsPlus**  
Examiner Comments

Clear and concise answer for 2 marks.



## Question 6 (b)

The nitrogen cycle is notoriously difficult for candidates and this question only referred to how plants get nitrogen. Several candidates believed that nitrogen is used during photosynthesis and this needs to be addressed, others believed that nitrogen can be absorbed through roots. Answers required involved the bacteria involved in fixing nitrogen or even lightning. The reference to nitrates being absorbed through roots was also creditable.

(b) Plants cannot use nitrogen directly from the air but need it to make proteins.

Explain how plants get the nitrogen they need to make protein.

(3)

Plants root have a mutual relationship ~~is~~ between Nitrogen-fixing bacteria ~~and~~ and the roots. Bacteria fix ~~air~~ nitrogen to the plants roots which enables them to make protein.



**ResultsPlus**

**Examiner Comments**

This candidate was credited with 1 mark for the reference to nitrogen fixing bacteria. No further creditable content.

lighting can react with nitrogen and oxygen to form nitrates which fall in the soil. Also nitrifying bacteria turn nitrogen into nitrates also turning Ammonia into nitrates. Nitrofixing bacteria turns the nitrogen in the soil into nitrates so the plant can absorb them.



**ResultsPlus**

**Examiner Comments**

3 marks awarded for a clear and concise response.

### Question 6 (c)

This question was well accessed by all candidates. The problems encountered were that some candidates only referred to either air or water pollution and not both types. There were some very creditable responses involving eutrophication and nitrates and phosphate pollution as well as the role of sulphur dioxide in acid rain as well as carbon dioxide and its link to global warming or the greenhouse effect. Almost all candidates were able to score on this question.

(c) Explain how an increase in the production of pollutants can be due to an increase in human population.

Include both air and water pollution in your answer.

(6)

An increase in human population means there is a bigger need to burn fossil fuels. Fossil fuel is a pollutant. In power station chimneys sulfur is released and mixed with oxygen to form sulfur dioxide when with water vapour this creates acid rain which could pollute water. Fossil fuel also produce carbon dioxide and carbon monoxide which affect the composition of the atmosphere and pollutes the air. ~~From~~ Organisms living habitats may be disrupted by water pollution such as eutrophication. Pollutants such as air killing plants means low photosynthesis = oxygen levels decreasing.



**ResultsPlus**

**Examiner Comments**

4 marks are awarded for this response, both types of pollution are explained but only in limited detail and there was no mention of the compounds involved in this pollution.



**ResultsPlus**

**Examiner Tip**

Try to be as detailed as possible in these answers without rambling.

This is due to the amount of products  
~~we use to get around~~ we use.  
Such as cars cause air pollution, ferries  
cause water pollution these things lead  
to pollution also the amount of fossil  
fuels that are burnt ~~to get around~~  
will increase ~~due to the~~ because there  
are more people that need them.



**ResultsPlus**  
Examiner Comments

The candidate has only really made one comment about fossil fuels which is creditable so this candidate can access level 1 and was awarded 2 marks. The remainder of the response is a repeat of the stem or the same point.

## Paper summary

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

- 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 extinction of the Dodo
- check the number of marks associated with graphical or table of data questions when tackling them and ensure that if 2 marks are awarded then two separate points about the graph or table of data are included
- be sure that you are 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
- be careful to use the information you are given in answering the questions and use that information to exemplify your answer
- be very careful when answering questions about reactions that you do not contradict yourself in the answer e.g. 'increases reaction time' and 'faster reactions', as these are opposites.

## **Grade Boundaries**

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