L2 Lead Examiner Report 1806

June 2018

Level 2 BTEC First in Applied Science
Unit 8: Scientific Skills (20474E)

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Grade Boundaries

What is a grade boundary?

A grade boundary is where we set the level of achievement required to obtain a certain grade for the externally assessed unit. We set grade boundaries for each grade, at Distinction, Merit and Pass.

Setting grade boundaries

When we set grade boundaries, we look at the performance of every learner who took the external assessment. When we can see the full picture of performance, our experts are then able to decide where best to place the grade boundaries – this means that they decide what the lowest possible mark is for a particular grade.

When our experts set the grade boundaries, they make sure that learners receive grades which reflect their ability. Awarding grade boundaries is conducted to ensure learners achieve the grade they deserve to achieve, irrespective of variation in the external assessment.

Variations in external assessments

Each external assessment we set asks different questions and may assess different parts of the unit content outlined in the specification. It would be unfair to learners if we set the same grade boundaries for each assessment, because then it would not take accessibility into account.

Grade boundaries for this, and all other papers, are on the website via this link:
http://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html

Unit 8: Scientific Skills 20474E

Grade	Unclassified	Level 1 Pass	Level 2		
			Pass	Merit	Distinction
Boundary Mark	0	12	20	28	36

Introduction to the Overall Performance of the Unit

Learners were able to demonstrate many of the skills tested in the paper. They were able to: identify items of equipment and their use, risks, plan an experiment, tabulate data with appropriate headings, draw a line graph, read values from a graph, describe trends in data from a graph and tables of data, identify anomalies, calculate averages, use a formula, make simple inferences based on data provided and suggest improvements to practical techniques.

The graph for this paper was a line graph, learners found this more challenging compared to the bar chart in the 1803 series, and comparable in difficulty to the line graph in the 1706 series. Learners were able to show greater confidence in the calculation, with more learners accessing at least a mark or two of the four available. The first six mark question on the paper asked learners to produce a plan based on the information given. The plan related to the contents of a bag that generates heat when it is squeezed. Some learners found accessing this question quite difficult, as the plan produced related to the heating bag, rather than the contents. Learners found this question in this series harder than in previous series. The basic aspects of a plan, such as variables, method and controls were not given by many learners, despite there being significant information as to what to include in the stem of the question. Learner responses tended to consider risk assessments and data processing rather than the aspects highlighted in the stem of the question. The final question related to improving an experiment on extending an elastic band by adding weights to it. Learners found this even more challenging than in previous series. The practical chosen was a very simple experiment that was in the specification for the unit and required quite simple apparatus. It appeared to be quite unfamiliar to many of the learners. The command line asked learners to explain improvements, as in previous series. When an improvement was identified it was rarely explained. Learners may find it useful if centres gave them practice in a range of questions using the command words in the specification.

There were two calculations in the paper. The question on averaging was well answered by nearly all learners. There was also a four mark calculation that required learners to substitute values into an equation, rearrange it and give the answer to three significant figures. In addition, a conversion of units was required. Many learners were able to gain at least a mark from this calculation. Learners were in many cases able to evaluate their answers, although this is not strictly required, it did indicate that there were many more learners using calculators with confidence compared to previous series. Learners in most cases showed working and so gained partial credit in situations where they had made an error in the later stages of a calculation.

As in previous series, all questions were set in a context, in many cases it was evident that learners were able to make use of the data in the context and relate their answer to it. In questions where a trend between variables is being looked for, this is particularly important. In many cases learners did not fully use the information provided, for example in Q4b, learners were asked to provide a description of a trend, which was given three marks, many learners did not give the full description, so lost one or two marks. Centres should advise their learners to use the mark allocation given in each question to ensure that as full

an answer as possible is given. In q5aii, worth four marks, learners were expected to give two explanations to account for an experimental anomaly. This question did not perform well, as most learners did not give any explanation cases.

Learners were asked to take data off a graph in a number of questions and in different contexts, learners were able to show this skill with confidence. Many more learners are quoting data from the graphs and charts presented in the questions to support their answers.

Individual Questions

Q1a the first question on the paper related to equipment selection. This was well answered with most learners gaining both the marks. Learners find line match diagrams a good way to access the start of the paper, and the question was designed to test identification of simple laboratory equipment.

Q1bi, this question, on this occasion, was about independent variables. Many learners did not answer correctly. The answer of 'concentration' being found in less than half the learners. The common wrong answer was the name of the acid. The answer below scores the mark for the word, 'concentration'.

(i) Give the independent variable in this investigation.

(1)

The concentration of Hydrochloric Acid

Q1bii asked learners to consider the control variables in the scenario. A considerable number of learners were able to give at least one and many two. This response gave the two most common answers seen.

(ii) State **two** variables that Lily should control.

(2)

variable 1 Volume of ~~HCl~~ Hydrochloric acid

variable 2 length of the magnesium ribbon

Q1c was about risks. Learners remain unclear as to the difference between risks and hazards. A risk relates to the actual harm to the person, such as a burn, or cut. Hazards are the things that will result in a risk, like chemicals, Bunsen burners, etc. Risks must always relate to the person. Many learners confuse these two ideas. In this question the learners were asked to explain a risk. Answers had to relate to an actual risk in the experiment, such as a burn and then explain where it came from, such as the acid getting into the eye, or splashing on the skin.
This is a typical two mark response. Many learners were able to gain at least one mark from this question.

(c) Explain **one** risk in this investigation.

(2)

possible ~~spillage~~ spillage of hydrochloric acid this may cause irritation on the skin.

Q2 was the first six mark question on the paper and was found to be challenging by many learners. The question related to planning an experiment. Learners were given a scenario relating to hot packs and asked to plan an experiment about testing a given hypothesis. Many learners thought that the question was about the hot packs rather than the planning task.
Learners should have written a brief method and then identified some controls. The response below scored 5 marks.

Write a plan for an investigation to test this hypothesis.

(6)

- Put a volume of water in a beaker (e.g 100 ml) and then add a certen amount of Calcium chloride. (e.g 10g)
- Measure the temperature.
- Add anothe amount of calcium chloride and waite until it is dissolved in the water.
- Measure the temperature
- Keep doing the same steps for several times.
- The amount (volume) of water should be the same for all different Concentration of Calcium chloride.
- use a thermometer to measure the temperature.
- use the same beaker.

This learner has identified a fixed volume of water, a given value of calcium chloride, identified that several different amounts of calcium chloride are needed, identified that the temperature is to be measured and identified controls. Such full answers were rarely seen.
The answer below was a more typical response, just one aspect was creditworthy, the comment on the control variable. Many learners spent time considering risks in detail. There are no marks awarded in this question for this, as the idea has already been assessed elsewhere. Learners could have spent a greater amount of time, in expanding some of the points made rather than consider the risk assessment.

Write a plan for an investigation to test this hypothesis.

(6)

Equipment - 2 Hot packs,

Method - 1) Gather all your equipment
2) Squeeze the first hot pack

Independent Variable = amount of Calcium Chloride

Dependable Variable = Amount of heat

Control Variable = Amount of water

Risks - Burning yourself (calcium chloride)

Q3 ai and ii required learners to take data from a graph. Learners were able to do this with little difficulty and both items were accessible to the whole ability range.

Q3b was about taking data and tabulating it in an appropriate way. This question has been asked on many occasions and in this series was worth three marks. Learners are confident in identifying the quantity, that should be placed into a column, and ensuring it was in a sensible order, two marks was therefore the most common. Learners had greater difficulty in correctly identifying the column headings.
The answer below gives the fully correct answer.

Complete the table using this data.

(3)

Age (Years)	Resting Heart Rate (bpm)
0.5	140
2	110
4	90
10	80
16	70

This table scored two marks as the first column heading is incorrect, it should be 'age'. In order to score the column heading mark learners must get both right. This was the most common reason for learners dropping a mark in this question.

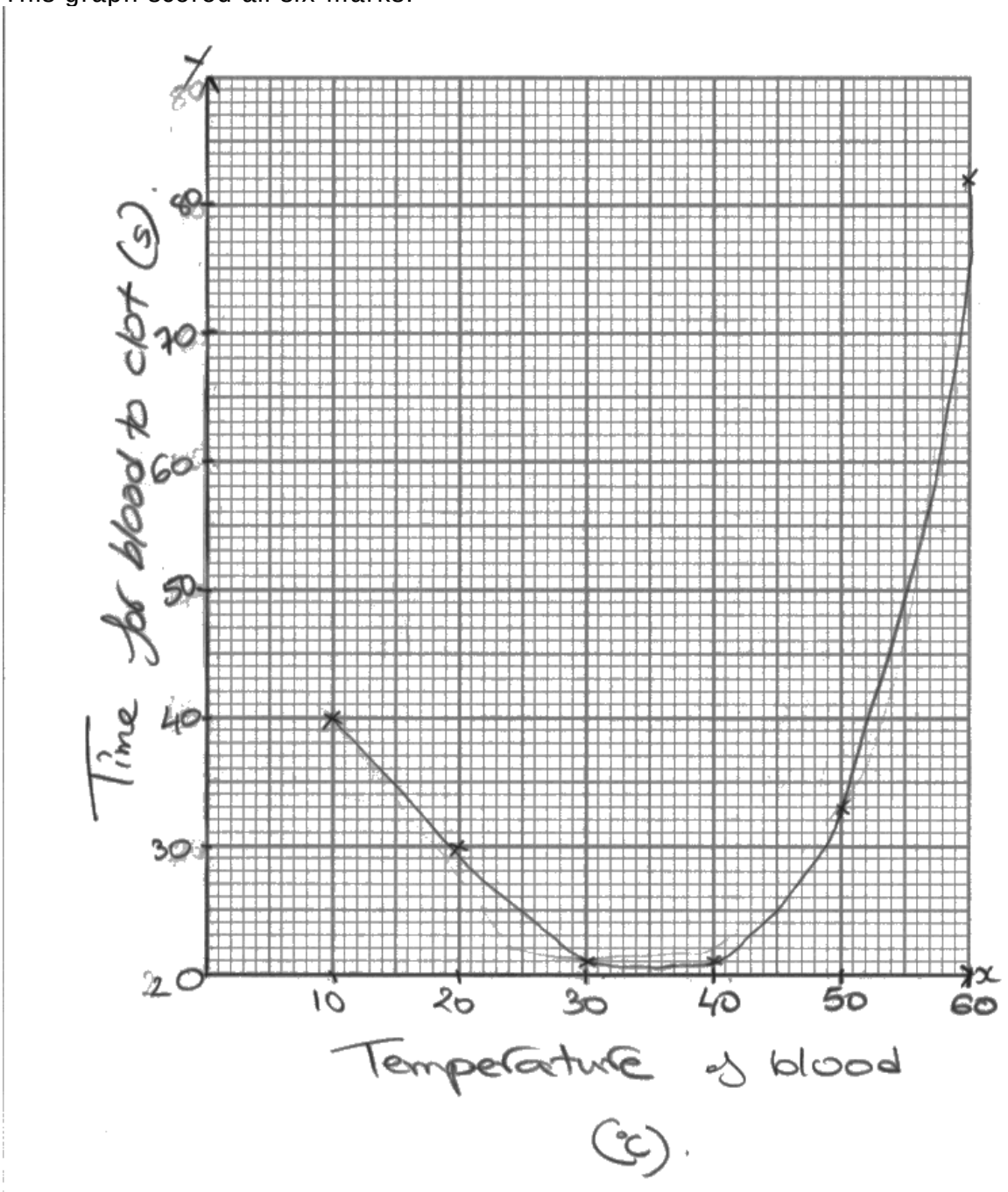
Complete the table using this data.

(3)

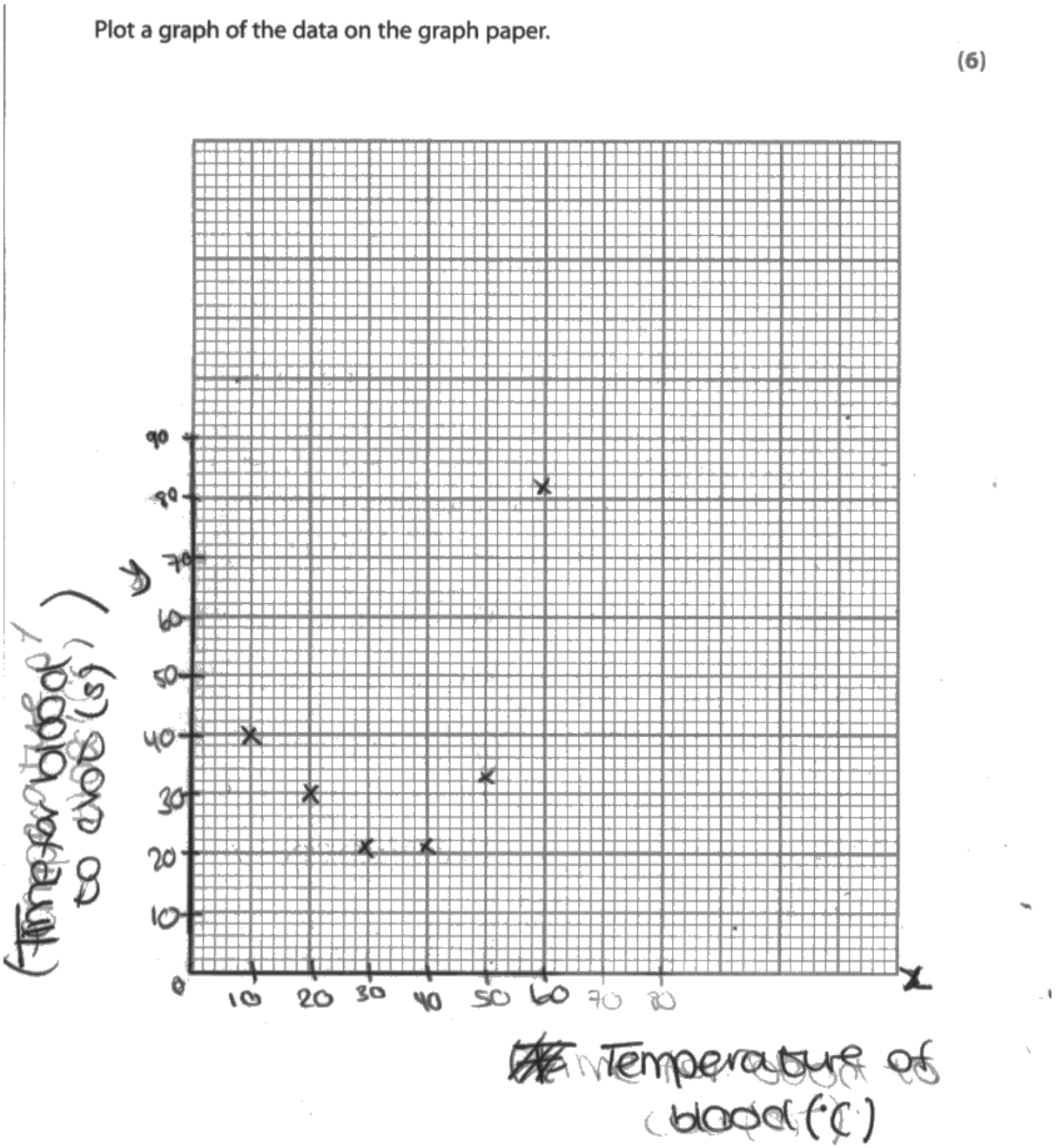
Infants & young people	~~Beats per~~ heart rate (BPM)
0.5 years old	140 bpm
2 years old	110 bpm
4 years old	90 bpm
10 years old	80 bpm
16 years old	70 bpm

Q4a was the graph question on this paper. On this occasion the graph was a line graph with a curve of best fit to be drawn in. Learners were expected to label axes with the correct units, produce a scale that was linear and were able to allow the data spread to fill at least half the graph paper. Learners were then expected to accurately plot points and then draw in a good curve of best fit. This question therefore expects quite a range of skills from the learner. Of the six marks available most learners were able to score more than two. The marks

that were most commonly scored were the label mark and either one of the plotting marks, or the linear scale mark. The most challenging marks to score were the mark for a sensible use of the graph paper and the curve of best fit. Overall the question discriminated well.
This graph scored all six marks.

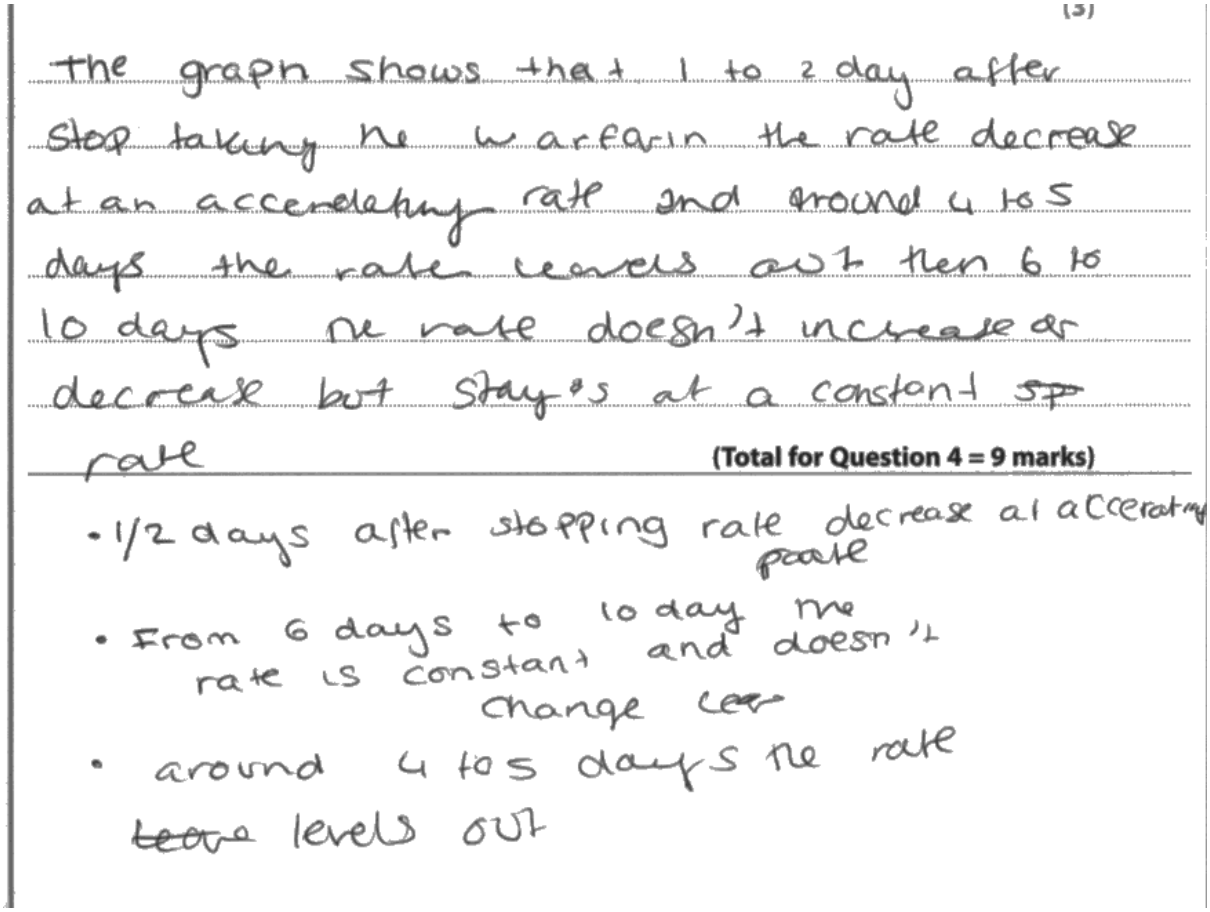


This graph scored four marks. The lack of coverage of the graph paper and a curve of best fit were the marks lost.
This graph clearly shows the difference in data spread if compared to the previous example. Learners should use as much of the graph paper as possible when deciding on a scale.



Some learners drew bar charts, and this limited the marks available, as did graphs with non-linear scales. The learners in both the examples given here used sensible scales. Scales going up in threes should be avoided.
Some learners provided a graph drawn of a full sized sheet of graph paper, rather than the size of the sheet given in the question. In cases where a learner needs to redraw their graph, the paper provided should be of the same size as that in the original question.

Q4b, this question asked learners to describe the trend in data. Learners needed to identify three things from the graph, firstly the drop in clotting time, secondly that the rate of drop changes and finally that it levels off. This answer shows these three marks.



(3)

the graph shows that 1 to 2 day after stop taking he warfarin the rate decrease at an accenelating rate and around 4 to 5 days the rate levels out then 6 to 10 days he rate doesn't increase or decrease but stays at a constant ~~sp~~ rate

(Total for Question 4 = 9 marks)

- 1/2 days after stopping rate decrease at accerating rate
- From 6 days to 10 day the rate is constant and doesn't change ~~cer~~
- around 4 to 5 days the rate ~~leave~~ levels out

Many learners wrote no more than one or maybe two aspects of the graph, usually the initial drop and the levelling out of the time. The change in rate, was very rarely seen. Learners used numbers from the graph to support their assertions, which was pleasing to see. This one mark answer illustrates this.

The graph shows that as the days increase from the patient not taking warfarin, the time taken for blood to clot decreases. For example on Day 2 when patient stopped taking warfarin the time taken was 50 seconds, whereas in Day 10 the time taken was 11 seconds. This shows that when a patient stop taking warfarin, over time, the time taken for blood to clot doesn't require alot of time.

(Total for Question 4 = 9 marks)

Learners should be encouraged to look at the mark allocation when answering the question to check that they have made enough points.

Q5ai was a very well answered question. Almost all learners were able to gain a mark for answers from the mark scheme.

Q5aii was a question targeted at Merit/Distinction learners, it did not score well. Learners were expected to identify a reason for an anomaly in a very familiar experiment from the specification, and then say what the effect was. Many learners found difficulty in identifying anomalies relating to the experiment and even greater difficulty in then giving the effect.
The answer below is a full mark answer. The learner has identified two reasons relating to the mass of the fuel and the volume of water, and the effect of each.

(ii) Explain **two** possible reasons for the anomaly.

(4)

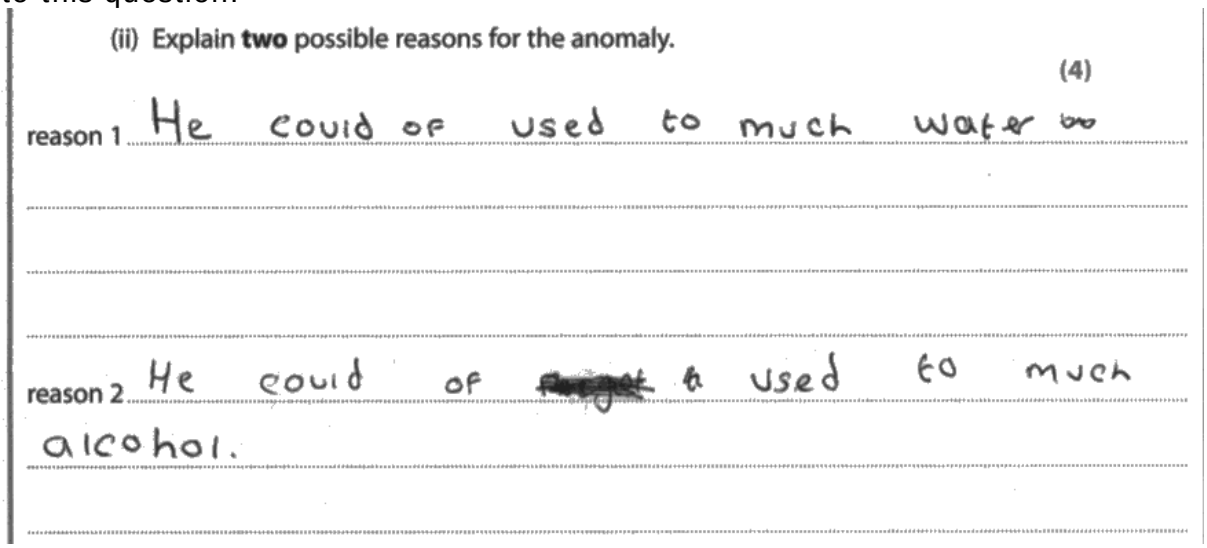
reason 1 he might have burnt a smaller mass of Butanol, so the water did not get the same amount of heat to raise its temperature.

reason 2 he might have used a bigger amount of water, so it couldn't get too hot because it needed more amount of alcohol to be burnt.

The command word 'Explain' requires both an assertion and a supporting

statement about the assertion. This example shows what is needed very clearly.

This answer scored one mark and typifies the greater number of responses seen to this question.


(ii) Explain **two** possible reasons for the anomaly.

(4)

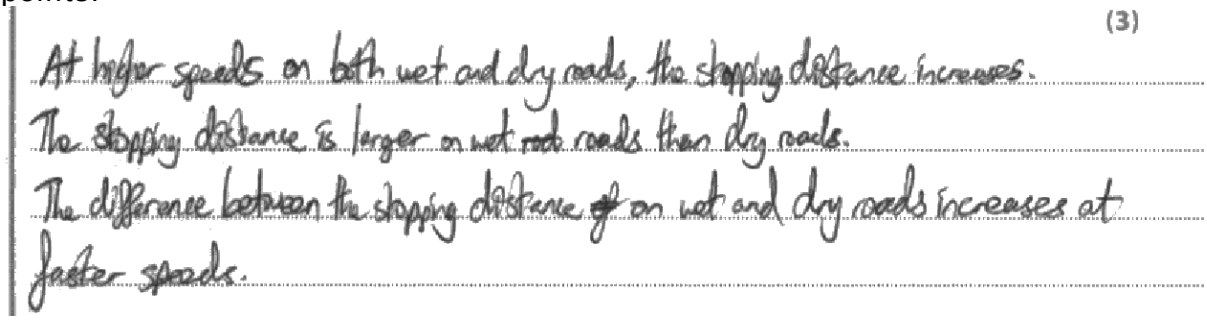
reason 1 He could of used to much water to

reason 2 He could of [illegible] to used to much alcohol.

The learner scores a mark for the first reason but does not then go onto say anything more about it. The second reason is incorrect, and in many cases where this question was attempted, learners wrote reasons like the one here.

Q5b asked learners to average data presented in a table. Learners are now confident in this skill and full marks was commonly seen. Over 80% of the entry scored at least one mark.

Q6a asked learners to produce a conclusion based from data given in a chart. Many learners were able to score at least one mark, with a good number scoring two, however it was very rare to see the third mark scored. Learners were able to clearly see the difference between stopping distances on wet and dry roads, and the link to speed. Learners missed the mark allocated to stating that the difference increases as the speed rises.
This answer scored three marks. The learner clearly makes all three mark points.


(3)

At higher speeds on both wet and dry roads, the stopping distance increases.
The stopping distance is longer on wet ~~road~~ roads than dry roads.
The difference between the stopping distance of on wet and dry roads increases at faster speeds.

This answer score one mark for the difference in stopping on wet and dry roads. The learner then goes on to give an explanation relating to the surfaces. Many learners did this, unfortunately this aspect of the specification is not tested in this paper. Clearly many learners did have a good understanding of friction.

(3)

The stopping distance is larger because its harder to stop on a wet road due to it being slippery.

Q6b was a four mark calculation that required learners to substitute values into an equation, rearrange the values and then after a conversion, give an answer to three significant figures. Learners were able to substitute into the equation, but after that point, learners found difficulties. The rearrangements were frequently the wrong way around, identifying issues with algebra. The conversion from km to m gave difficulties even for more able learners, as was the use of significant figures.

A four mark answer is given here.

(b) A car is travelling at a steady speed of 25.0 m/s.

Calculate the time taken for the car to travel 3.644 km.

distance (m) = speed (m/s) × time (s)

Give your answer to three significant figures.

Show your working.

Km

$3.644 \times 1000 = 3644$ (m)

(4)

$3644 = 25 \times \text{time}$

$\text{time} = \frac{3644}{25} = 145.76$ (s)

time = 146 s

All aspects of the calculation are shown.

In this example the substitution and rearrangement are correct, but the conversion to m from km is not given and the answer is not to three significant figures. This answer scored two marks.

Show your working.

Distance (m) = Speed (m/s) × time (s) (4)

2.5.0

0.146

Time = Distance (m) ÷ Speed (m/s)

3.644 ÷ 25.0 = 0.14576

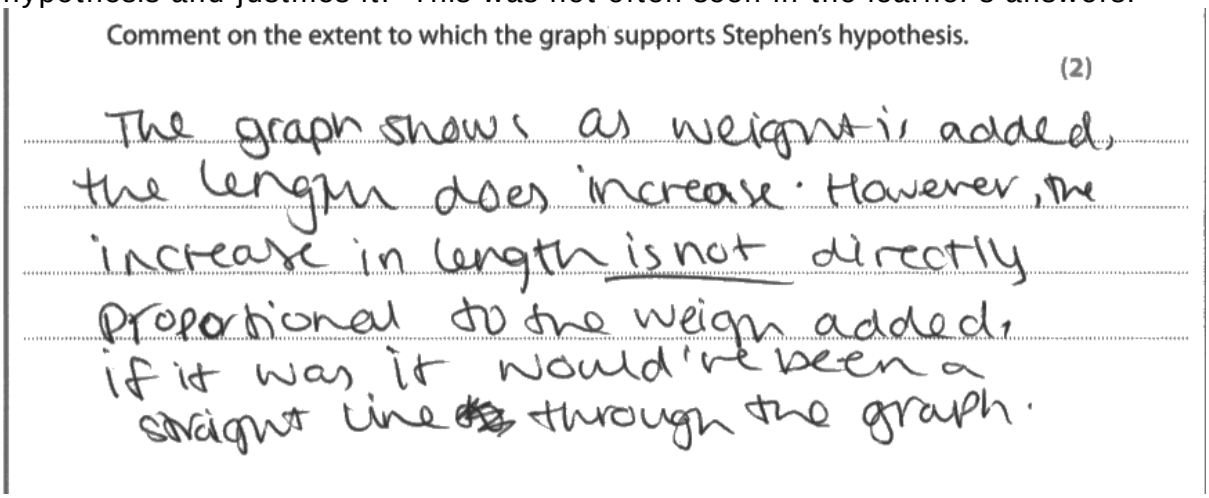
0.1457

time = 0.1457 s

Q7a related to making an inference from data provided, in this case to draw a second line on the graph. Many learners were able to score this mark.

Q7b is a question that asks learners to look at how data collected by a learner supports a hypothesis. Learners are expected to look at what the data shows and then decide if the hypothesis is correct and then justify it in some way.

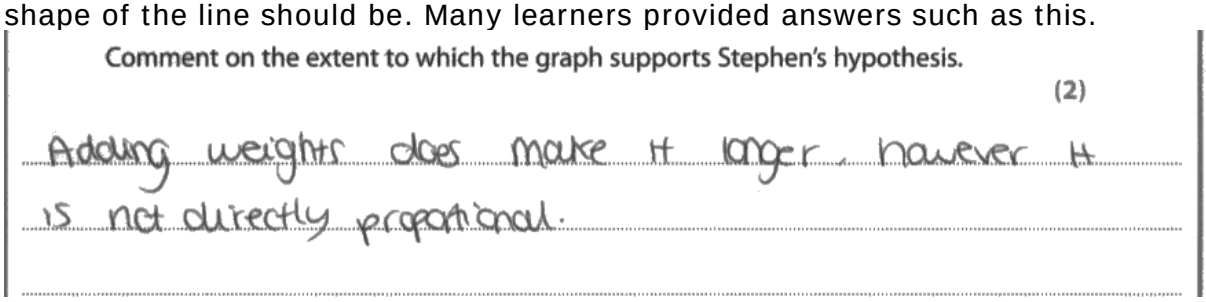
In this example that scored both marks, the learner comments on the hypothesis and justifies it. This was not often seen in the learner's answers.


Comment on the extent to which the graph supports Stephen's hypothesis.

(2)

The graph shows as weight is added, the length does increase. However, the increase in length is not directly proportional to the weigh added, if it was it would've been a straight line through the graph.

This response scored one mark for the comment about the hypothesis, the second marking point is not scored because the learner has not said what the shape of the line should be. Many learners provided answers such as this.


Comment on the extent to which the graph supports Stephen's hypothesis.

(2)

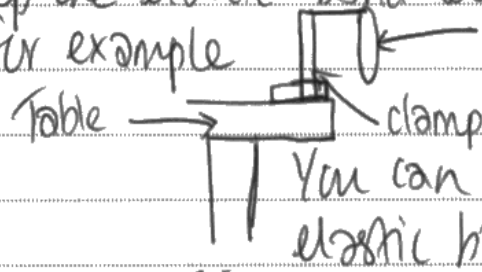
Adding weights does make it longer, however it is not directly proportional.

Q7c was the final question on the paper and proved to be the most challenging to learners of all abilities. Learners were asked to suggest improvements to a method. This type of question has been asked on a number of occasions, but on this occasion, answers were particularly weak.
Learners were given a rough method, that needed further elaboration. In many cases learners went on to consider health and safety and data processing, neither of which were relevant to the question.
The question asks for an explanation of how the method could be improved, this requires an improvement to be identified and then it needed elaborating upon. This was missing in many answers.

A Merit level four mark answer is given below.

(6)

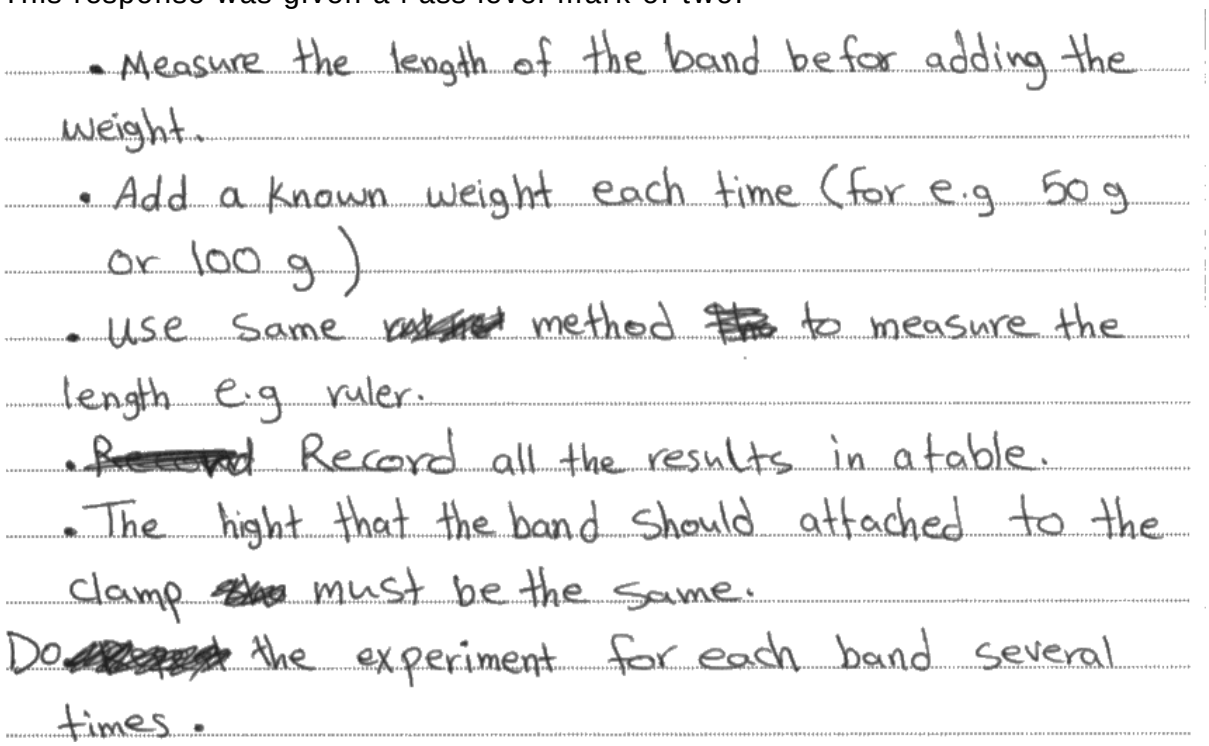
(1) Measure the original length before any weights are added
(2) weight measure the mass of the weight
(3) Measure the elastic band in centre meters for a more accurate approach.
(4) Add the same amount of weights on each time so for example each time you're adding 1kg.
(5) Keep the elastic band at the same height



You can do this by hanging the elastic band off the edge of the ~~the clamp a 30cm~~ clamp to be consistent in the key height so that youre able to measure the length change.

The learner has stated that the original length of elastic band should be measured. They go on to give a good means of measuring the extension accurately and at the end of the answer, this improvement is explained, and is the equivalent to using a reference mark as in the indicative content. The learner has explained one improvement and has some unexplained improvements.

This response was given a Pass level mark of two.



The learner gives a series of improvements, but none are explained. The key to accessing higher marks was the explanation aspect of the answer.

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