Examiners' Report/
Lead Examiner Feedback

Summer 2017

NQF BTEC Level 1/Level 2 Firsts in Applied Science

Unit 8: Scientific Skills (20474E)

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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 (Distinction, Merit, Pass and Level 1 fallback). The grade awarded for each unit contributes proportionately to the overall qualification grade and each unit should always be viewed in the context of its impact on the whole qualification.

Setting grade boundaries
When we set grade boundaries, we look at the performance of every learner who took the 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 should be for a particular grade.

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Each test 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 test, because then it would not take into account that a test might be slightly easier or more difficult than any other.

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Unit 8: Scientific Skills 20474E

Grade	Unclassified	Level 1 Pass	Level 2		
			Pass	Merit	Distinction
undary Mark	0	12	20	28	37

BTEC NG 20474E Unit 8 Report

June 2017

General Comments

As in previous examination series, learners were able to demonstrate effectively some of the skills that were tested in the paper. Many were able to; identify items of equipment and their use, risks, tabulate data with appropriate headings, read values from a graph, describe simple trends in data from a graph and tables of data, identify anomalies, calculate averages and make simple inferences based on data provided.

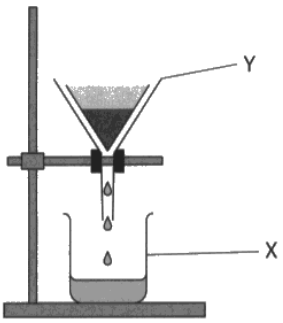
The graph question was based on a scatter graph and a curve of best fit as the line to be drawn. The plotting of points proved a little easier compared to the March 2017 paper for learners as the scale was easier to deal with and the points were located at easier intervals. The calculation in this paper was on the work done relationship, and asked learners to give an answer to two significant figures, fully correct answers were seen, but most learners found the use of significant figures difficult. As in previous series the rearrangement of a formula remains difficult and an area where learners need practice. The first six mark question in the paper which asked learners to produce a plan was more poorly answered than in the March series. Learners appeared to have had little experience of this experiment. Many learners went off track and spent time discussing how data should be presented and processed, rather than consider what measurements should be taken and with what instruments and how variables should be controlled. Learners also appeared to dwell on the health and safety aspects of the plan, there were no marks awarded for this. These aspects are tested elsewhere in the paper. On this paper Q2a asked about making a hypothesis, in this examination learners were expected to suggest on the basis of information given, where a line on a graph should be, based on the information given. Learners were able to access this way of testing the ability to make a hypothesis better than in previous series. In later parts of the paper learners were asked to give reasons as to why a hypothesis could or could not be supported learners found difficulty in connecting the given hypothesis to the data. The final question in the paper, which was a levelled question asked learners to discuss the extent to which data supported some conclusions made by a student. This was not well answered and the move away from a familiar command word like ‘explain’ to ‘discuss’ may have caused some learners difficulty. Learners should be given the opportunity to engage with a wide range of command words so that they are clear as to what is required in answering the question. If the command word in the question is ‘discuss’ learners should identify the argument being assessed in the question, in this case the conclusions’ and consider all the information before deciding on if the conclusions are valid. Learners should also be able to understand the difference between the command word ‘explain’ and ‘describe’. Explanations require a justification. In many cases learner do not provide the justification as so they lose many marks. This is particularly the case in a question such as 7b where the question asked learners to explain improvements for four marks. If two improvements suggested, but not justified a maximum of two marks could be scored.

It was evident in this series that some learners did not have access to a calculator for this paper. This has been identified as an issue before, but the message does not seem to be getting through that a calculator is essential. There were two calculations where learners would have been at a disadvantage without access to a calculator. It should also be noted that if an answer to a calculation is given on the answer line and no working is shown, then full marks are scored if the answer is correct. This is a risk prone strategy that some learners use, as there were numerous instances where the correct calculation had been done but the wrong answer transcribed to the answer line. If a learner showed their working, all marks would still be scored in such a situation, however without the working no marks would be scored. Centres should practice their learners in always showing working to calculations.

Feedback on specific questions

The first question in the paper proved to be yet another good start to the paper. The question was about equipment, controls and risks.

Q1ai) was generally well answered with the vast majority of learners identifying the funnel as the item of equipment.



(a) (i) Name the piece of equipment labelled Y.

funnel

Some learners wrongly identified the funnel as a beaker or as the filter paper.

Learners should look carefully to where the line points to ensure that they identify the correct item.

Q1aii) asked for the purpose of the beaker, which was labelled X. Learners were not always so clear that they could link to item of equipment to its purpose.

(ii) State the purpose of the piece of equipment labelled X.

(1)

To contain liquid, solution.

This answer scored the mark, however the following answer indicated confusion between the purpose of the filter paper and the beaker.

(ii) State the purpose of the piece of equipment labelled X.

(1)

Collect the insoluble solid.

Q1b) asks for what should be controlled in the task. Many learners were able to identify these correctly.

1 The Same amount of Sodium hydroxide

2 Same amount of Salt Solutions

We were happy with amount for volume, but were insistent on salt solution, not just salt. So the answer here scored two marks. Ideally we would like to see concentration or volume rather than amount.

Q1c) asked learner to state one precaution. Most learners were able to score this mark with an answer such as the one shown here.

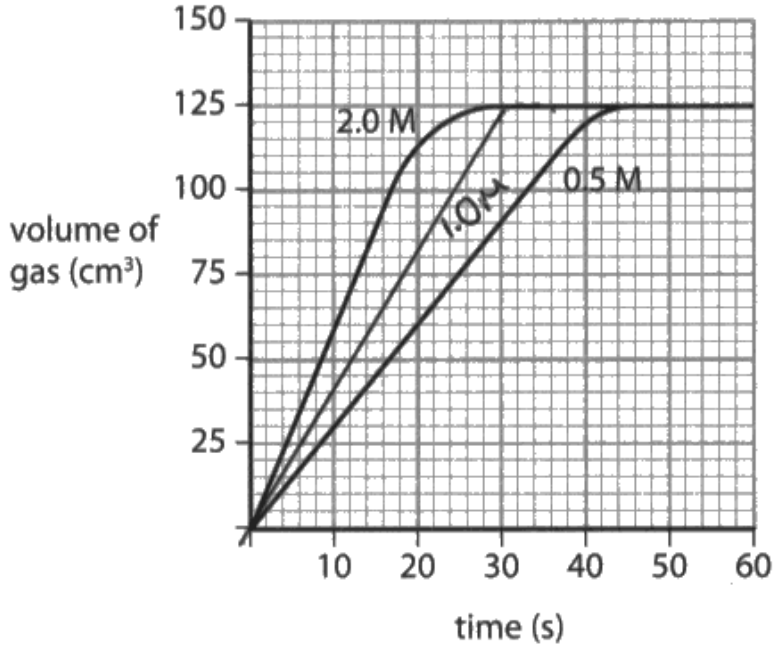
must wear gloves and protective goggles to protect his eyes and hands (1)

(Total for Question 1 = 5 marks)

This answer response gives multiple correct answers; there is only one mark here to be awarded.

The second question on the paper was about formulating a hypothesis and then producing a plan for an experiment.

Q2a) was a less challenging question than in previous series, learners were clearer as to what they had to do in terms of making the prediction, however some learners were still not able to access the marks due to placing the line in the wrong place.



This response scored both marks as the line was between the two lines already drawn and levelled off at the correct volume. In some cases learners scored one mark in a situation where the volume was correct, but the line was drawn above or below the lines on the graph.

Q2b) gave the first opportunity to learners to use extended writing. Many learners were able to access this question at the one and two mark range; however at the upper end of the mark range performance was poor. The best answers were given by splitting the plan into sections, where measurements to be taken were identified and details given of how this was going to be done, then explaining the sample type and size and finally controls. The questions asks for a plan of an investigation, it is not appropriate to consider how collected data is displayed or processed, or health and safety factors considered, many learners spent a good deal of their answer on these aspects. It would be helpful to learners f they could set out an answer to a question such as this in sections and to avoid going further than planning the actual task.

This answer was given six marks

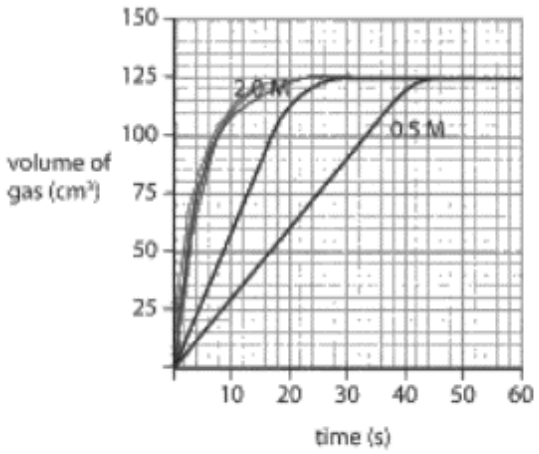
2 (a) Clare investigates how changing the concentration of an acid affects the volume of gas released in a reaction.

She adds a piece of magnesium ribbon to a flask containing 2.0 M hydrochloric acid.

She records the volume of gas produced every 5 seconds for 60 seconds.

She repeats the same experiment, but uses 0.5 M hydrochloric acid.

Clare draws a graph of her results.



Draw a line on the graph to show the expected results for the same reaction when using 1.0 M hydrochloric acid.

(2)

(b) Clare wants to investigate how temperature affects the rate of reaction.

When hydrochloric acid reacts with sodium thiosulfate, the solution changes from clear to cloudy.

Clare places a flask on a cross drawn on a piece of paper.

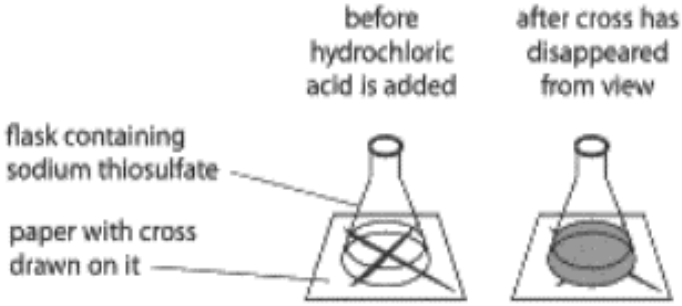
She adds hydrochloric acid to sodium thiosulfate in the flask.

She records the time it takes the cross to disappear from view.

timer (seconds)

same
* 50ml hydrochloric acid (volume) X
* 50ml sodium thiosulphate (volume)
* same cross
variable (s)
* 50°, 60°, 70°, 80°, 90°

'As you increase the temperature of the sodium thiosulfate solution the cross will disappear from view more quickly.'



Write a plan to test this hypothesis.

Your plan should include:

- (measurements to record)
- (variables that should be controlled.)

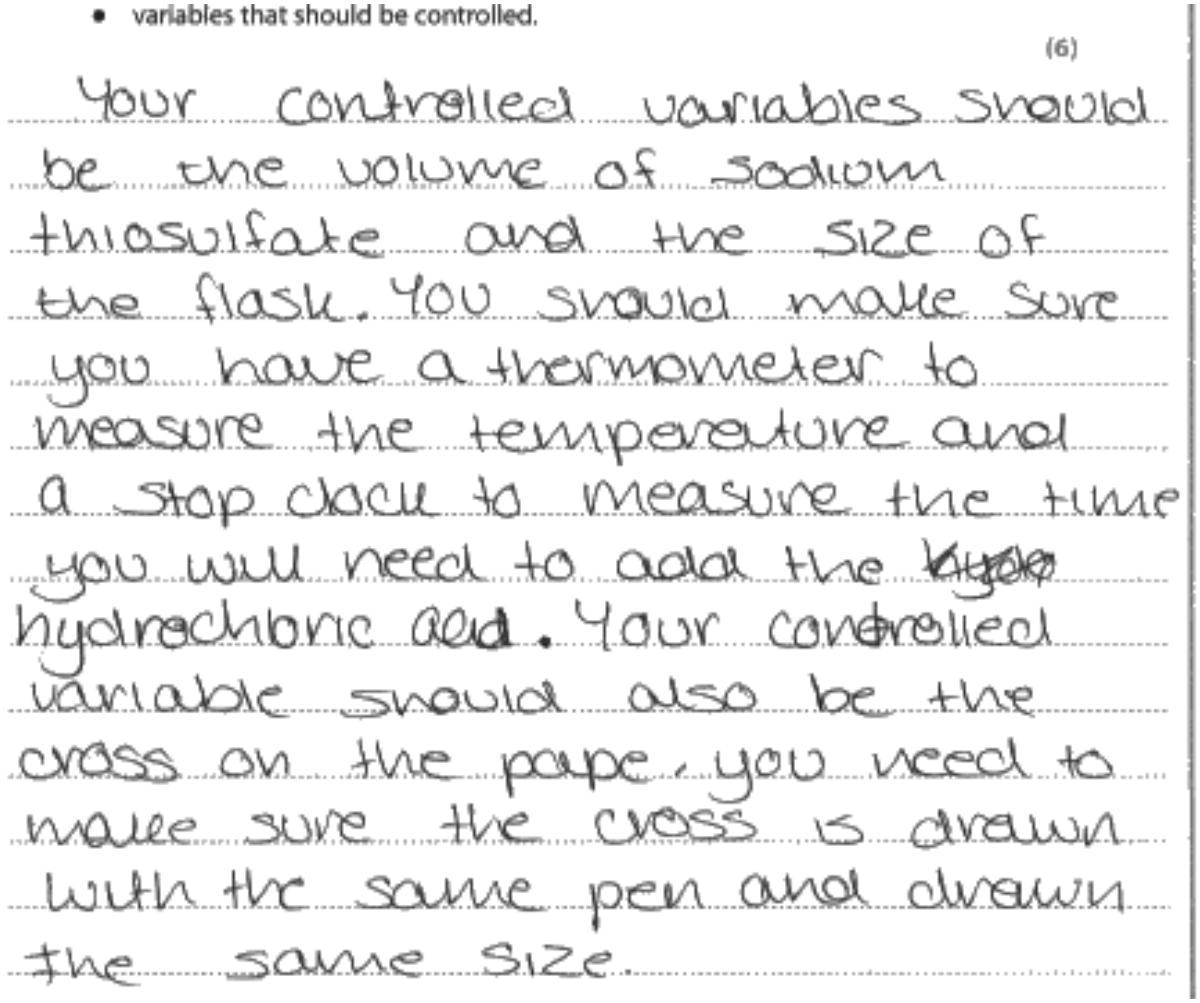
(6)

First add sodium thiosulphate to a flask, the volume of sodium thiosulphate should be 50ml each time. Measure 50ml of hydrochloric acid into a seperate flask staying the same for each experiment. Draw a large cross on paper, then boil water and put flash with sodium thiosulphate into the water path. Wait for the liquid to drop to 90°C use a thermomet once you have the required temperature place the flash onto the cross. Press the timer as soon as you pour the hydro-chloric acid into the sodium thiosulphate Record in seconds each time and stop the timer when the cross disapears. Repeat each experiment for 80°C, 70°C, 60°C and 50°C. Record results for anomolies. **(Total for Question 2 = 8 marks)**

The temperature of which the cross disapears first is the most effective

The answer specifies on the first page fixed volumes of the solutions. A range of temperatures are identified, the procedure is explained including when to start and stop timing. This covers a number of the marking points on the mark scheme in a coherent way.

This answer scored three marks and was more typical of what was seen across the entry for the paper.



- variables that should be controlled.

(6)

Your controlled variables should be the volume of sodium thiosulfate and the size of the flask. You should make sure you have a thermometer to measure the temperature and a stop clock to measure the time you will need to add the ~~hydro~~ hydrochloric acid. Your controlled variable should also be the cross on the pape, you need to make sure the cross is drawn with the same pen and drawn the same size.

The learner identifies the size of the flask as a control, and the size /type of cross. In addition the learner states that the temperature should be measured.

Question three was about presenting data and using data from a table in a calculation of an average. The final part of the question was about anomalies.

Q3a) has been asked many times before indifferent formats. In this paper there was a change of format and a reduction in the marks awarded for this item from three to two. The table was given, but the headings were was incomplete and the data was poorly ordered. Learners had to suggest two improvements to the given table. Many learners thought that the first column was

fine and thought that the unit was the heading. The answers that were being looked for are given in this answer.

(a) Suggest **two** improvements that George should make to the table.

(2)

Improvement 1 Put every value and result into an order

Improvement 2 Put the name (nerve fibre diameter) on top of volumn 1.

Other learners thought that an additional column was required or suggested additions to the layout.

Q3bi) was an averaging calculation. Learners are now quite confident in answering this type of question and there were many correct answers. This answer scored zero, but had working been added there may have been a mark available as it is likely that the incorrect answer is a slip from correct working. Without the working it was impossible to award any marks.

average time = 3.4 **ms**

Learners should always show working to ensure that the opportunities to gain marks are maximised.

Q3bii) scored well. Many learners were able to identify two means of dealing with an anomaly. A typical two mark answer is given here.

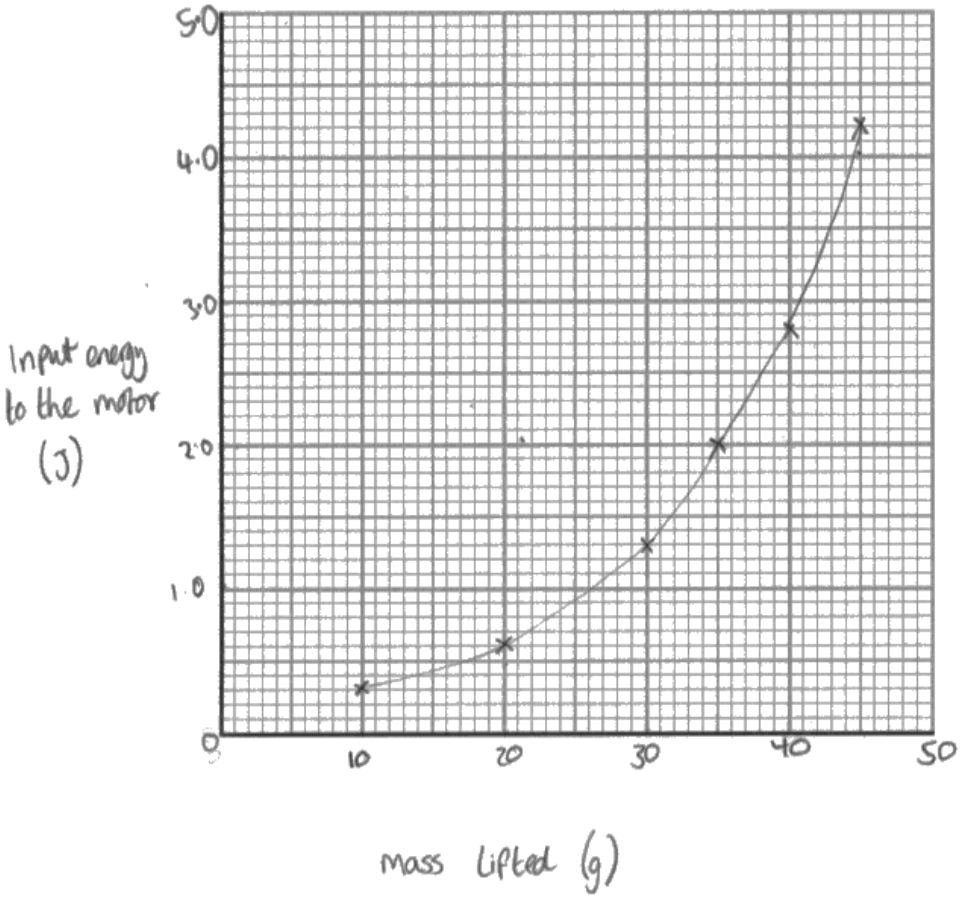
1 Sally could re do the length of nerve fibre of 20cm to find a correct time

2 Sally could ignore the anomaly and not add it the her calculations

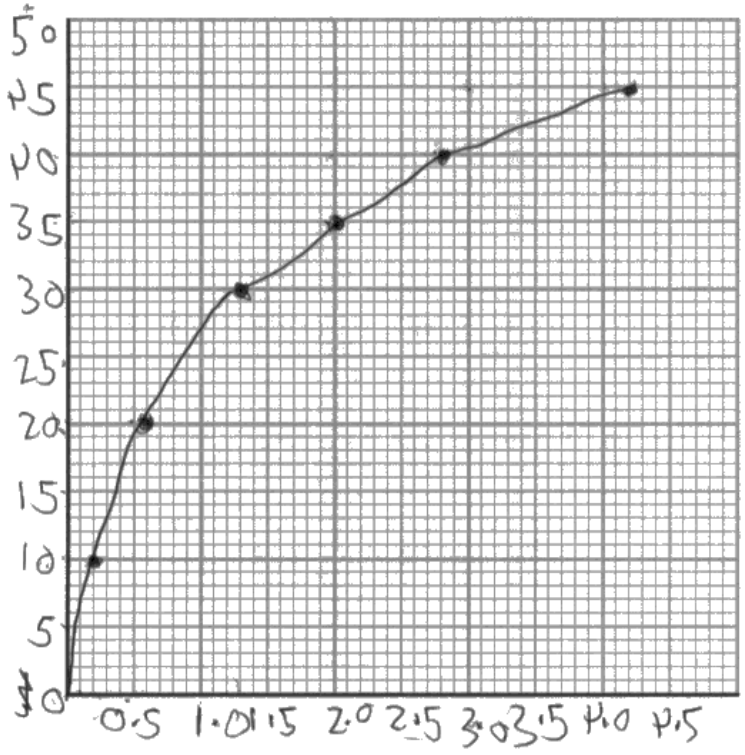
Question four was about using data to draw a graph and then to calculate a value from a formula to two significant figures.

Q4a) was a graph question which asked learners to plot a scatter graph and draw a line of best fit, which in this case was a curve. Most learners were able to label the axes, and many were able to use linear scales, however the choice of some scales meant that the data spread covered less than half the graph paper. Some choices of scales also lead to problems with plotting points on the graph, however in most cases the '+/- one small square' rule for error enabled marks to be gained. The final mark was for drawing a line/curve of best fit.

This graph scored all six marks and is indicative of the type of response that more able learners produced. Axes labelled, the graph correctly scaled and of appropriate data spread for the paper, the points were correctly plotted and there was a good curve of best fit.

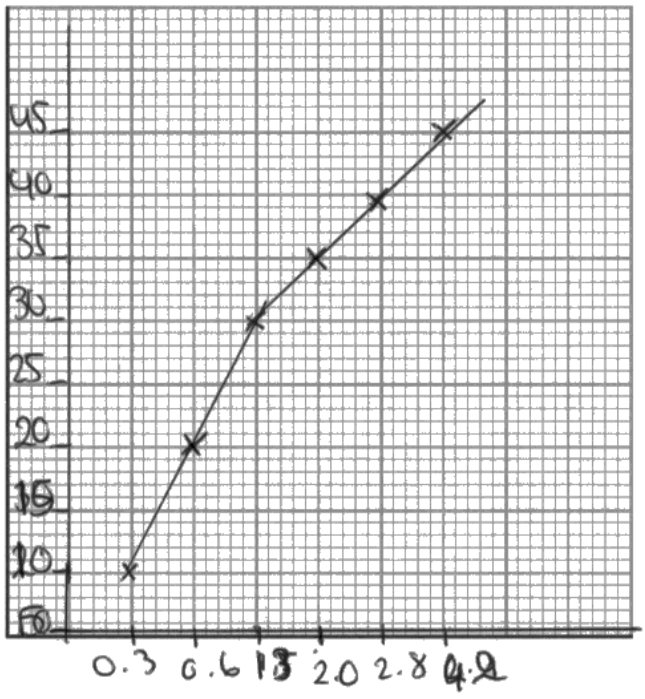


This learner gained four marks.



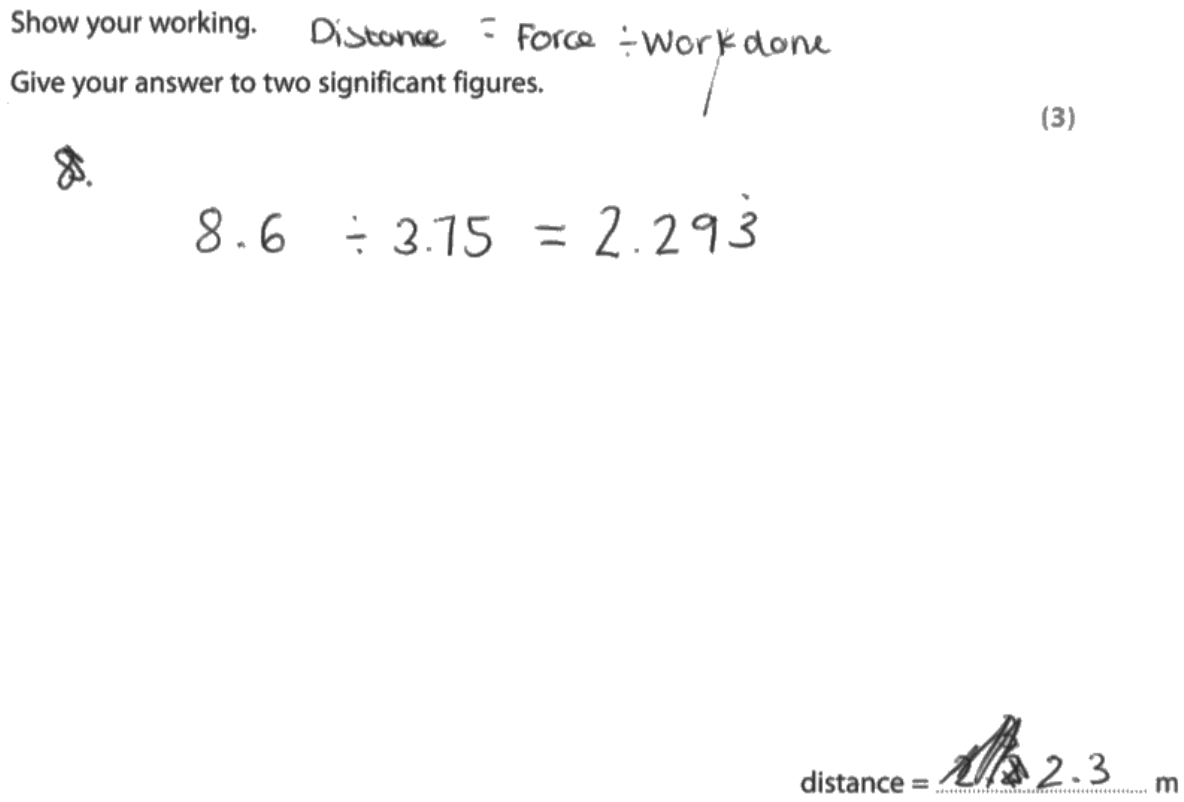
The learner gained the scale marks and the plotting marks. The lack of labels on the axes and the poor line of best fit lost the other two marks.

Many learners were unable to scale the graph correctly and simply used the numbers from the table, this example scored no marks as as there were no labels on the graph, and the x scaling was incirrect so that the points and data spread were not able to be given marks.



Q4b) was a question on calculating the work done in lifting a load. The answer had to be given to two significant figures.

The answer below calculated the value and used the correct number of significant figures on the answer line.



Many learners were unable to convert the calculator answer of 2.29 to 2.3 and therefore give the answer to two significant figures. These learners scored two marks.

Question five was about looking at data in a graph and then describing the trends

Q5a) asked learners to read a point off the graph. Nearly all learners were able to do this.

Q5b) asked for a description of the pattern of decay. This was a four mark question and a good number of learners were able to describe the initial fall/rise and the cross over point. Learners did not then go onto describe the rest of the graph. A complete answer required learners to describe the start, the middle and the end of the graph.

This learner has identified that it took two days for the elements to have decayed to 50% and that initially that x had decreased and y had increased at the same rate. This scores three marks.

Had the learner gone on to say something about the graphs levelling off at the end and that x was near zero and y near 100% the final mark would have been scored.

Describe the pattern of decay of element X into element Y.

(4)

the Percentage of radiation take both two days for it to decrease ~~for~~ or increase by 50% and then everyday element x has decreased the exact same amout element Y had increased so the amount of days it take element Y to increase to 100%. it take the exact same amount of days for element x to decrease to 0%.

(Total for Question 5 = 5 marks)

This was a typical two mark answer

Element x starts of as 100% radioactive and the gradually falls, whereas element y begins with no radioactive decay and the its percentage of decay rises gradually until element x and element Y cross over at 50% after the same number of days (2 days)

The learner has stated that x falls and y rises for one mark and that both are at 50% at two days. There was nothing about the end of the graph and the rate of rise and fall.

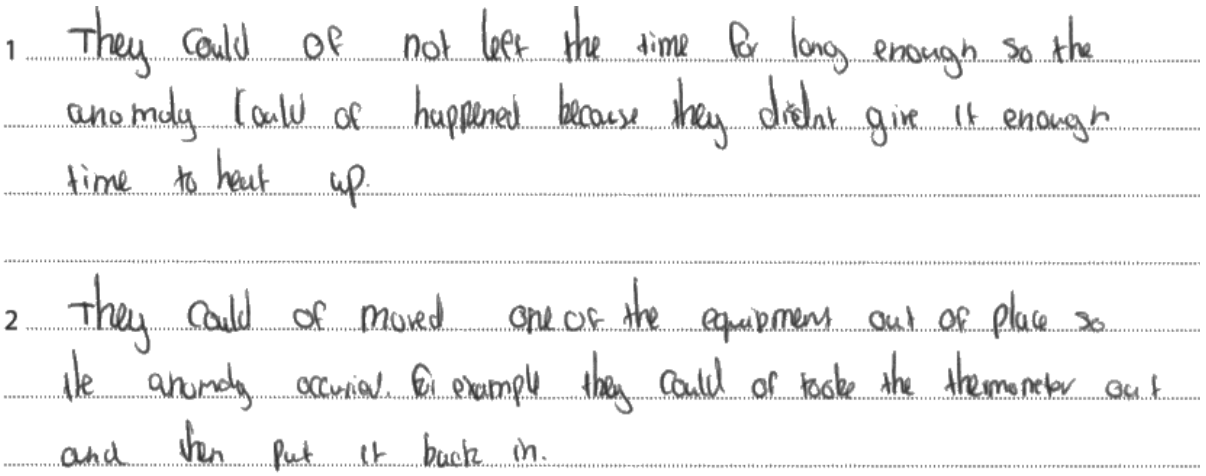
Learners do need practice in identifying all the features in the graphs.

The last two questions on the paper dealt with evaluating evidence, making supported conclusions and improvements to investigative methods.

Q6a) asked for a line to be drawn on the graph. Most learners were able to do this and so scored a straight forward mark.

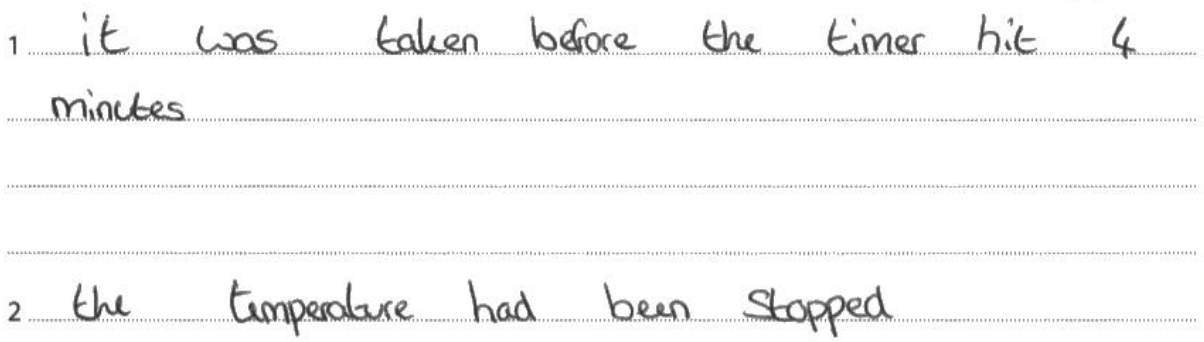
Q6b) asked about why there was an anomaly in the data on the graph. Many learners gave stock answers that related to more generalised issues with practical work. They did not answer the question, which was about a data point off the line. The water had been heated continuously, so the number of possible reasons for the anomaly was quite limited. The question also asked learners to explain the anomaly; this made the demand harder, as identifying the anomaly only gave a partial answer.

This was a good three mark answer.



The learner has given an idea and justified it in the first response and in the second response there is another idea, but it is not justified, so they had the idea of reading the thermometer out of the water, but not then what would have happened to the thermometer reading.

This is a more typical answer; learners stated most often that the reading was taken too early. This answer scores one mark. The other answer scores no points.



Q7a) asked a question that learners find difficulty dealing with. Learners had to identify trends in the data and link this to a given hypothesis. The question was worth two marks, but many could not score any on this item.

This good response scored both marks.

Give **two** reasons why the data in the table does not support Anyi's hypothesis.

(2)

1 The decreased risk in heart disease is higher for 6-7 or higher than it is for 5

2 If you have 7+ there is a much higher chance you wont get a heart disease.

The learner has scored the second two marking points for the decreased risk is greater for 6-7 portions and then they go on to state that 7+ portions gives a much higher chance of decreasing the risk. This is enough for the third marking point.

This learner scored just one mark as they have given the same marking point twice. Learners do this quite often and it can be avoided by them reading carefully what they have written before moving on.

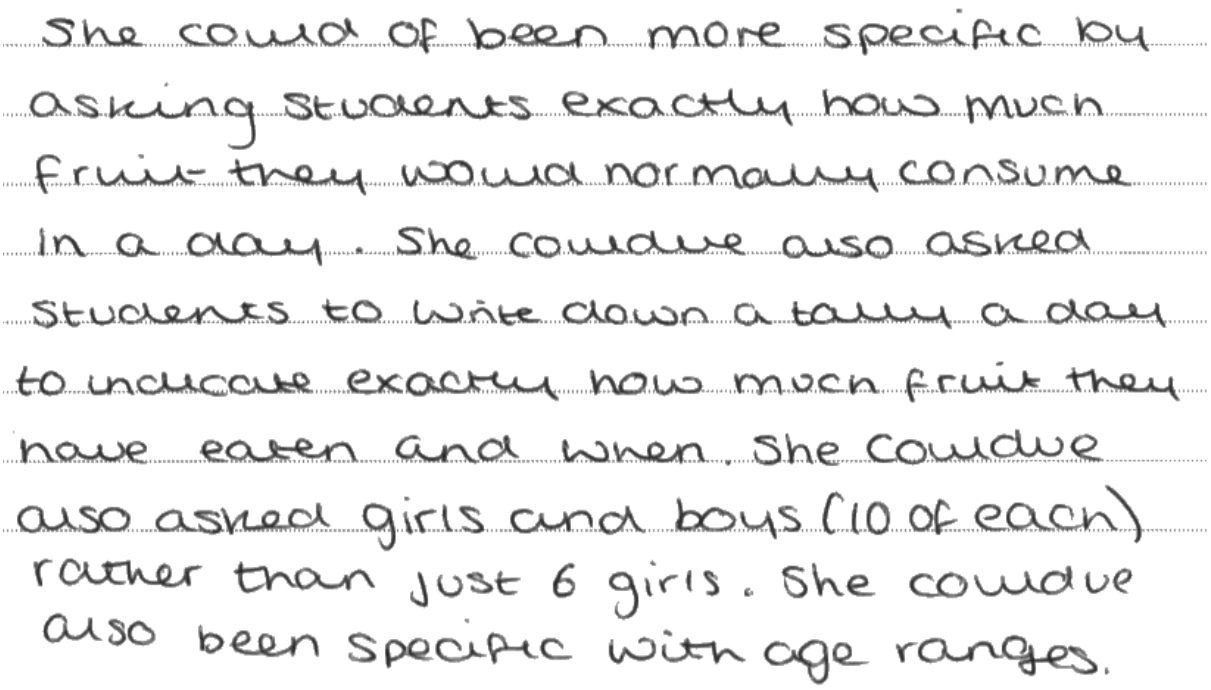
1 because the more fruit that was eaten shows that its less likley to get heart disease.

2 The more portions that where eaten shows the healthier you get. Anyi said it wont make you healthier but the table says otherwise.

Q7b) asked for improvements to an experiment. Learners have had questions in this form in many papers, in this paper the question was awarded four marks, sometimes such questions are used for the levelled six mark question.

Learners were asked to explain improvements, not state improvements. Many learners did not justify the improvement suggested and this limited marks for the question.

This learner's response is worth two marks.



This learner has given three improvements, however none are explained so the mark is limited to two marks. This was seen quite often by the marking team. Good answers lacking a justification. Learners need to be practiced in answering explain questions so that their marks are maximised.

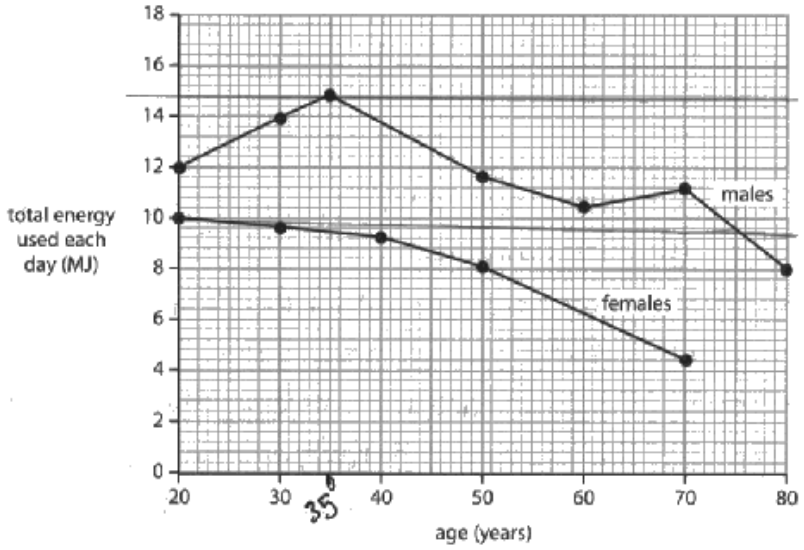
Q7b) this was the final question on the paper and was a six mark levelled question. In a levelled question learners have to link ideas together in order to gain marks above Pass. This remains a challenge for many learners. The question asked learners to discuss the extent to which data presented about total energy usage was supported by some given conclusions. In a number of cases learners copied the stem without further addition of information, in other cases one or two marks were scored for random statements related to the graphs, but not linked in any way; this limited the marks to Pass level. It was rare to see answers beyond pass level.

The response gained a distinction (6 marks)

(c) Males and females use energy provided by their food.

Anyi researches the total energy used each day by males and females of different ages in the UK.

Anyi produces a graph of her findings.



Anyi makes two conclusions based on her graph.

'All males need more energy throughout their lives than females.'

'The older you get the less energy you use at a steadily decreasing rate.'

Discuss the extent to which Anyi's graph supports her conclusions.

(6)

All though the hypothsis may look true, their is reasons why it may not be true. Firstly their is no data for people below 20 years old and also no data for femals ageed 70-80 so that age group may need more energy than a 70-80 male does. However from the results that the table shows, Anyi is correct, males need more energy than femals.

The second hypothsis is not excatly correc This is because in males the most energy needed is at 35 years old however the graph starts a 20 years old, however after 35 years old the Hypothsis is true up untill 70 years old, where it once again increases. however the femal support this hypothsis, As the energy needed at every age decreases.

The learner has scored full marks because they have discussed both conclusions, stating for the first conclusion that there is no data for people below 20 years old, or data for females aged 70 to 80 and then stated that females may need more energy than males.

The learner then discussed the second conclusion. They state that the conclusion may not be exactly correct, they state that the female data supports the conclusion and then states that energy required decreases at every age.

This is a well-balanced response. Sadly there were very few such as this.

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