Examiner's Report/
Lead Examiner Feedback

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NQF BTEC Level 1/Level 2 Firsts in
Applied Science

Unit 8: Scientific Skills (20474E)

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Introduction

This report has been written by the lead examiner for the BTEC Principles of Science unit. It is designed to help you understand how learners performed overall in the exam. For each question there is a brief analysis of learner responses. You will also find example learner responses from Level 2 Pass and Distinction learners. We hope this will help you to prepare your learners for future examination series.

Overall comments

Learners appeared to be well prepared in answering most aspects of this paper. Learners have been able to identify appropriate items to make measurements, and are generally aware of variables and how these can be controlled. They can order data appropriately in tables with increasing confidence. Learners were generally able to calculate averages and identify anomalous data. In this series learners struggled with calculations that required algebraic transposition of the terms and with plotting a curved line of best fit on a graph. Learners also struggled with graphical interpretation that led to explaining the relationship between the variables. Learners still find the analysis of data and formulating detailed improvements to an experimental method a challenge as well as how to use evidence from data to support conclusions.

Learners remain uncertain as to the response that should be made to certain command words. The term 'Explain' is a good example. This command word requires the learner to provide a justification of a point. The answer must contain some reasoning as an explanation. In many cases the response to such a question becomes a description. An example of this is Q5, this required learners to explain two ways the speed of a train changed. Most learners simply described the shape of the graph without providing an explanation for each of the statements made. Centres are advised that as part of the preparation for this paper learners should be given practice in answering such questions so that they are clear as to what is required for a full mark answer.

In calculations an increasing number of learners show their working in order to give an answer, but the number remains small in comparison to the total entry. In addition in many cases the numerical work that is shown indicates that a calculator has not been used to arrive at an answer. The use of a calculator would greatly speed up arriving at the answer and would in many cases reduce the likelihood of arithmetical errors. The rubric clearly indicates that learners must have a calculator.

Learners are generally able to take information from the stem of questions and use it. Weaker learners still tend to use the stem to answer the question without adding anything further. In this series Q8b gave difficulty. In Q1d which asked learners to plan an experiment many learners spent considerable time in providing information that had been given in previous sections.

Grade boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link: http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

Grade	Unclassified	Level 1 Pass	Level 2		
			Pass	Merit	Distinction
Boundary Mark	0	13	21	29	38

Feedback on Specific Questions

Q1b

This question gave some learners a considerable challenge. Many learners gave a very short answer such as 'protractor' and 'mirror'. In order to score the marks the key idea to be included is the mirror/protractor position. The example scores one mark for the second response.

(b) State **two** other variables that will need to be controlled.

1   light   ray

2   plane   Mirror   position.

The first response 'light ray' does not mention the idea of keeping the same width/thickness which is needed to score the mark for this part.

Q1ci

This question is about 'risk' and as such it should refer to this, being cut by the sharp edges of the mirror is correct. Glare from the mirror is another possible risk. Many learners gave responses that related to the hazard alone, such as stating that the mirror could be dropped and break. A typical correct response is:

(i) State **one** risk when using the mirror.

(1)

could   cut   your self   if   the
mirror   breaks   or   get   in   your
eye

Q1cii

Learners should have focussed on precautions rather than the risk itself for this answer. An answer relating to the means of preventing a hazard was needed such as the one given by the learner in this answer.

(ii) Give **one** precaution to reduce the risk.

(1)

Make Sure that the mirror is Stable on Something and not at the edge of a table so it doesn't fall off.

Q1d

This six mark question was a challenge for many learners. In some cases learners used earlier parts of the question to answer this part, to no effect. The question was about changing the angle of the mirror and not the raybox. Many learners wrote about moving the raybox and hence were repeating what they had been given in Q1ai and ii. It was possible to score some further marks despite this error, however most candidates did not give appropriate details as asked for in the stem. In general 1-2 marks were scored. It was rare to see more than three marks, mainly due to learners not being precise about the method. Many learners focussed on the equipment needed and the control varibles which are not what the question is about. This was a two mark answer which typifies the most common response.

(6)

Step 1: set up equipment used in previous experiment
Step 2: Change the angle of the mirror by 5 degrees
each time 10 times,
Range = 5°, 10°, 15°, 20°, 25°, 30°, 35°, 40°, 45°, 50°

Independent Variable = Angle of the mirror
Dependent Variable = Angle of reflection
Control variables = Same mirror

If any anomalies appear repeat the experiment
or avoid it when calculating averages.

The learner has identified changing the angle of the mirror giving a range and then repeating the experiment.

Learners should have added details such as shining the light from the raybox onto the mirror, towards a specified point on the mirror, marking the path of the light ray and measuring the angle of incidence and reflection. This additional information would have allowed the learner to access six marks. In many cases it was evident that this task was not familiar to them despite it being part of the specification for this unit.

Q2a

Learners generally answered this question well; however a significant number lost a mark. Some learners did not give a label at the top of the table and just gave the units (kg) and (m). In other cases learners did not order the values in ascending or descending order of value.

Q2b

This question scored 1 mark for the vast majority of learners. Where two marks were not scored it was usually due to not specifying an age range from where the BMI reduced. In some cases learners thought that BMI was a form of medical condition that afflicted certain groups of the population that then went away in later life. It was clear that some learners had not read the question carefully before attempting an answer. This was a typical two mark response.

(b) Describe what the graph shows about how BMI changes with age.

(2)

The graph shows that when you're young you have a low BMI and it starts to increase as you get older. However when you get around the age 65-74 it starts decreasing.

Q2c

Some learners still do not show their working in such calculations. This is an aspect that centres would find a useful exercise as examination practice. A correct answer without working will gain full marks, however small arithmetical slips can deny a learner a mark if no working is shown. Good practice would always be to show working.

Q3b

In this examination learners were asked to draw a line graph and this was a challenge for some. Pass level learners find this task difficult and generally scored two marks at most, usually for a scale and some points plotted correctly. Merit/Distinction learners were able to produce a graph that accessed the full mark range. It should be noted that there are no marks for giving the graph a title. Marks are awarded for labelling each axis and giving the correct unit. Some learners are unclear about using a suitable scale and it was not uncommon to see the values from the table directly transferred to the graph, thus giving non-linear scales. In such situations the number of marks that could be allocated was greatly limited. This is an example of a full six mark answer showing correct labelling of axes, correct linear scales and points plotted and a good curve of best fit. In addition the scale chose used the majority of the graph paper.
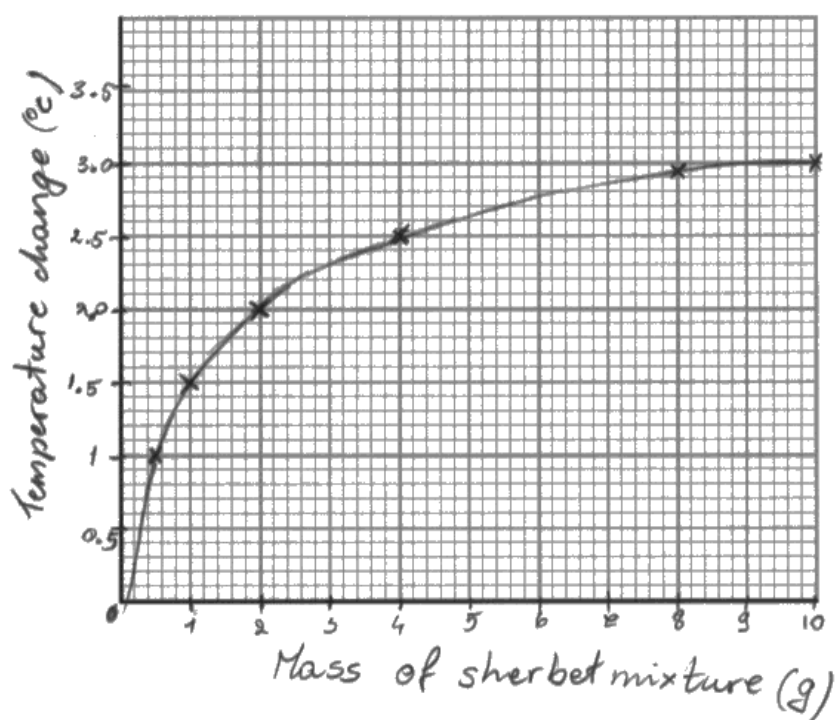
Centres should ensure that learners are given as much opportunity as possible to draw a wide variety of graphs in order to practice the necessary skills. In particular learners need to practice lines of best fit. In this question the data shows a clear curve and this is what was expected. In many cases learners tried to force a straight line through the points. In some cases dot to dot lines were drawn which gained no mark for the line of best fit.

Q3c

As in previous series this question proved to be a challenge to learners. A significant number of learners were able to indicate that the results were only measured to one decimal place and thereby gain a mark. It was very rare to see the second marking point. A two mark answer is indicated here.

Reason _Holly Rounded the average to 1 decimal place, because the information given has to be the same decimal place as the answer_

In many cases learners did not go on to expand their answer to offer the explanation. Many learners need to be clear that in an 'explain' question a reason needs to be given, as is the case here.

Q4aii

In many cases learners gained both marks for this question. However there is a significant number where this answer was incorrect. In some cases this was due to the lack of a calculator as there were a number of addition errors seen, in other cases it was due to the learner not understanding what an average was. As in a previous answer, large numbers of learners showed no working and gave an incorrect answer, yet may have been able to have scored a mark if working had been shown.

Q4bii

In many cases learners gained one mark for stating that the higher the volume of fruit juice the greater the mass of sugar. It was rarer to see the second mark scored for identifying the trend. Those that did usually described a positive correlation between the two variables. It was extremely rare to see the variables being described as directly proportional. This was a typical two mark response.

(ii) Describe the trend in the graph.

(2)

as the volume of fruit Juice increases so does the mass of Sugar in Orange Juice. the graph Shows positive correlation with No anomalys

Q5

This four mark question was very challenging to the learners. In order to gain four marks learners needed to link the speed and the line on the graph for two sections of the graph. In many cases the learners described what was happening to the line or the speed, but did not relate these to each other. To answer this question an explanation was required and in many cases a description was given. Many learners interpreted the graph incorrectly by considering the section between 45 seconds and 75 seconds as the train having stopped. Many learners ignored the quantity being shown on the y axis of the graph. A good example of a four mark response is given here.

At 40-50 seconds the speed of a train rapidly increases from what it was going at from 0-20 seconds. I know this because on the graph the line gets alot steeper. Also, the speed of the train changes when it gets to 70-90 seconds. This time the train speed^quickly decreases. I know this happens because the line goes down back towards not moving. I can figure this out because on the y axis it says that the speed is increased as you go higher up the graph.

The learner identifies sections of the graph and links the speed change with the shape of the line. The learner does this for several parts of the graph. The maximum mark for this question is four which is comfortably scored.

Q6

In order to gain both marks in this question the learners needed to select one improvement and explain it. Many learners gained a mark for stating an improvement, but then did not go on to explain it. An example of a two mark answer is given here:

Explain one improvement that could be made to their method.

(2)

have a range of different hight ed objects so you could then draw a graph of the results

In this answer the learner suggests having a range of different height objects and gained both marks as there was an improvement and the reason it was an improvement was given.

Q8b

This question was a challenge to many learners. Many learners repeated the stem of the question for which no mark was gained. In many cases where marks were gained it was from taking an idea or two from one table. It was rarer to see both tables used to answer the question. In order to gain a distinction level mark the learner needed to take ideas from both parts of the question, reactivity and number of electron shells and link these to data from both tables. Most learners restated information that they had been given without doing this.

> It supports her conclusion because lithuum has 2 number of electron shells and when it reacts it is just fizzing, But sodium has 3 electron shells and when it reacts with water it produces rapid fizzing with some sparks seen sometimes, But the highest one with the number of electrons is pottasuum, it has 4 electron shells and when it reacts with water it produces very rapid fizzing, it may even blow up and the gas burns with a lilac flame. Thits, so this shows that group 1 Alkalic metals become more reactive as the number of electron shells increase.

This answer gained four marks as the learner has statements about electron shells and fizzing. The learner has used terms to compare these i.e. 'just fizzing' and 'highest one'. These ideas are linked in the last sentence to the second part of the conclusion which is about electron shells. In order gain six marks the learner would have to have given a linked statement about the first part of the conclusion, relating to reactivity.