Examiners' 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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General comments

Learners were generally well prepared for answering more sections of this paper than in papers from previous series. It is clear that learners continue to improve in their ability to draw graphs of various types and to interpret data from them. Learners are increasingly confident in taking data from tables and graphs and giving descriptions of what they contain or show. Many learners can give some of the aspects expected in a plan for an experiment. Simple calculations involving averages are generally completed correctly.

In this examination learners found the calculation of acceleration, in which they had to substitute into and then rearrange an equation, a challenge. Learners find explaining improvements to an experiment and any form of explanation of data difficult, particularly where an answer is looking for more than a simple trend. In this paper the candidates were able to demonstrate that they had some experience of tasks like burning fuels so were able to make a start on Q01(b). Q08 asked about improving a method and this remained a real challenge for many learners, despite this type of question being asked many times. In some cases answers to these questions were very general and missed the marking criteria.

A recurring theme in these reports is the difficulty many learners have in distinguishing between a description and an explanation. Many learners can give a description, but they then struggle with explaining the situation that has been presented to them. Centres must spend time on preparing learners for answering 'explain' questions. This is difficult, but it is limiting the marks of many learners. In both the six mark questions many learners did not give enough detail and hence had their marks limited. Learners must be given opportunities to practise the skills needed to answer such questions. In an 'explain' answer, there must be a statement and then some reasoning; it is frequently the case that the statement is given but not the reasoning. A good example of this type of question in this series was Q05(a).

Q01b was the planning question from section A of the unit 8 specification. The response to this type of question was slightly improved as it appeared the context was more familiar to learners than some previous practical tasks. Learners gained one to two marks, but then were not able to progress to higher marks as they started to move away from a plan and spent time on describing data analysis or risks and hazards. Learners must read the question carefully before attempting it and they should be aware that a plan asks for some information to be given on the variables and the range and controls and then means of ensuring reliability in the experiment.

In previous reports it has been made clear that this examination is based on practical activities. It is still apparent that many learners have a lack of some of the skills that are developed in the Unit 8 specification. Learners will greatly benefit from being exposed to as wide a range of practical scenarios and activities so that

they can develop the necessary skills to answer the questions set in this examination.

Feedback on specific questions

Q01a(i) and (ii)

This question focused on the identification of an item of laboratory equipment and hazards. Almost 70% of learners identified the test tube correctly; however some learners were not able to give the hazards and gave the risks as their answer. This question has been asked in many series and remains a source of confusion for learners. In addition some learners gave generic answers relating to broken glassware which were not creditworthy.

> (ii) State **two** hazards in this experiment.
> (2)
>
> 1 can burn yourself
>
> 2 can academy touch the hot glass

This response gives the risk in the first answer, which is incorrect, in the second answer 'the hot glass' gained a mark as a correct hazard.

Q01a(iii)

The identification of dependent or independent variables is regularly tested in the papers, in this series the question was about the independent variable. Fewer than 20% of learners were able to correctly identify the independent variable. Many responses related to the water, or the temperature.

Q01(b)

This part of Q01 was the first six mark item on the paper and tested planning an experiment. There was a slight improvement in performance in this item in this series, particularly in the 3 and 4 mark range. Many learners find this extended response question a challenge in terms of setting out an answer that will give marks.

Write a plan to test this hypothesis.

(6)

1. Set up equipment as shown in the labelled diagram at the top of page 2.

2. Set up a table to record the results as shown below.

Amount of water (mL)	Starting Temperature (°C)	Temperature after 5 minutes of burning (°C)	Temperature difference (°C)

3. Record results in table. Heat different volumes of water with similar burning crisps after recording the starting temperature, for 5 minutes and record results in the table.

4. Write an evaluation & conclusion after putting the results of the temperature difference for each amount of water into a line graph.

This example gained 4 marks. The table that is drawn out shows headings that include 'starting temperature', 'temperature after burning', '…5 minutes of burning' in the same column and 'temperature difference'. These four marks are from the mark scheme. Very few learners show how they would display data collected in this way, yet it can give many of the marking points that are available. It should be noted that the comment 'with similar burning crisps' is not sufficient for the 'same type of crisp' marking point. The lack of a clear 'same type' or equivalent was frequently seen.

In many cases it was clear that learners were not really sure of what dependent variables were and how these differed from control variables. This example then goes on to give information which is not relevant to answering the question, such as 'write and evaluation & conclusion'. Many learners wrote a good deal about processing data and drawing graphs, this is not part of the planning of the experimental procedure.

This example is more typical of the layout that learners use in answering this type of question.

Write a plan to test this hypothesis.

(6)

Fristly Catherine should get the first amount of water ~~and then heat it up~~ then she should have a certain time limit the burning chip should be under the ~~test~~ tubes. _(bolling tube)_ Then she should record the results in a table. Then she should get the same crisp but not burnt and light it on fire the put abit more water in the test tube and put the burning crisp under _(bolling tube)_ the ~~test tube~~ for the same time as the first one. Then she should record the results in the table. After Catherine should does this for a thrid time but with more water the wait the same amount of time then record the results in the table. Then she could look at the results and see ~~if which one was the lowest temprature~~ if she was right with the hypothesis.

This response was worth 3 marks. The learner has given a range of three amounts of water which has not been specified as a quantity but as a 'bit more each time'. The learner also states the 'same crisp but not burnt' implying that the same type

of crisp is used each time. This is subtly different to saying 'the same crisp' which would not score as you cannot burn the same crisp twice. The learner also states 'should have a certain time limit' and 'wait the same amount of time' these are the same marking point and is creditworthy.

These two examples of Q01b show the main aspects of what is required to score six marks in such questions. A suitable range of data, some controls and the measurements to be taken are the essential components. It should be noted that many of these marks can be obtained from a suitable, table as in the first example.

Q02a

Over 55% of learners scored both marks in this question. Some learners found the division by 5 a challenge.

Q02b

Nearly 64% of learners scored two or three marks on this question. The heading of the chart gave the greatest difficulty. Many learners were able to score at least one mark for putting the numbers and names in the correct columns. Ordering the data in an appropriate way remains the most difficult of the marks to obtain for this question.

Q03a(ii)

Many learners found this a challenge; fewer than 28% of learners gained a mark for this question. The idea that the first thermometer read to a decimal was not picked up by many. Many wrong answers were related to the thermometers being different rather than accuracy.

(ii) State why the measurement from thermometer 1 is more accurate than the measurement from thermometer 2.

(1)

Because it is to a decimel point

This response was just enough to meet the mark scheme requirement, the word 'it' implies thermometer 1 as the information about it is in the stem of the question.

(ii) State why the measurement from thermometer 1 is more accurate than the measurement from thermometer 2.

(1)

Because one thermometer might be more accurate than the other.

This response looks like a good answer, but the learner has repeated the stem of the question.

Q03b

Nearly 75% of learners were able to give at least one way in which anomalous data in the table should be dealt with. Learners answered mostly by stating that the reading should be repeated; many, though, also stated that the anomaly could be discarded and an average given from the two remaining values.

Q04b

Learners were able to produce good graphs. In many cases five or six marks were scored. Where marks were lost it was as a result of leaving the unit off the y axis label. Some learners were unable to scale the y axis appropriately this led to scales that were too small or had divisions that were not regular. Plotting was generally good, but in some cases learners did not produce bars, and ended up with a scatter graph. Learners need to read the instructions carefully.

(b) Plot a bar graph of Paul's results on the graph paper.

(6)
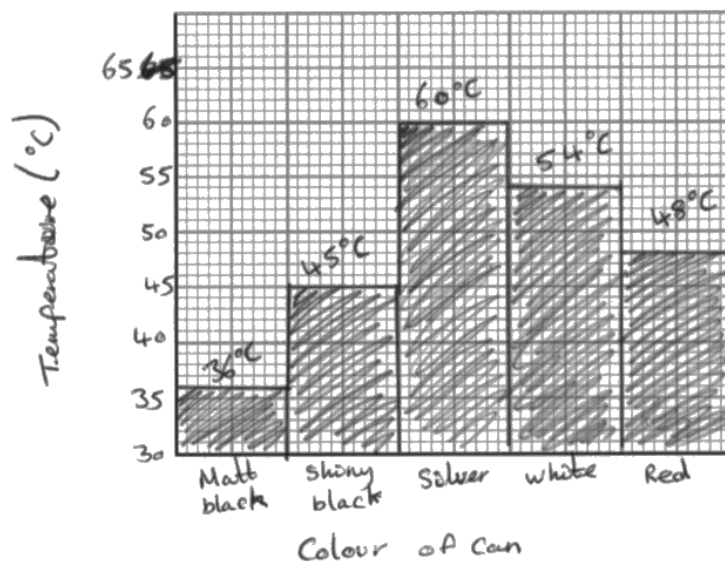
This graph obtained all six marks. It is a good example of appropriate scaling and labelling of axes. The y axis is labelled in what was considered the minimum information of the temperature and the unit.

Q05a

This question required an explanation for two reasons. In many cases where marks were scored it was for a reason without an explanation. Nearly 40% of learners gained one or two marks, but less than 5% gained any more than two marks.

(a) In test 3, there was an error at 3.0 N.

Explain **two** possible reasons for this error.

(4)

Reason 1 *the toy car could of been pushed giving it a faster start.*

Reason 2 *an extra weight extra weight could of been added to increase the speed.*

In this example the learner gains three marks. The comment about 'pushing' in Reason 1 together with an explanation, 'giving it a faster start', and 'adding extra weight' in Reason 2 are what has scored. The learner has given an explanation for Reason 2 but it is the same as the explanation in Reason 1, so cannot score again.

Q05b(i)

Drawing a curve of best fit remains a skill many learners have difficulty with.
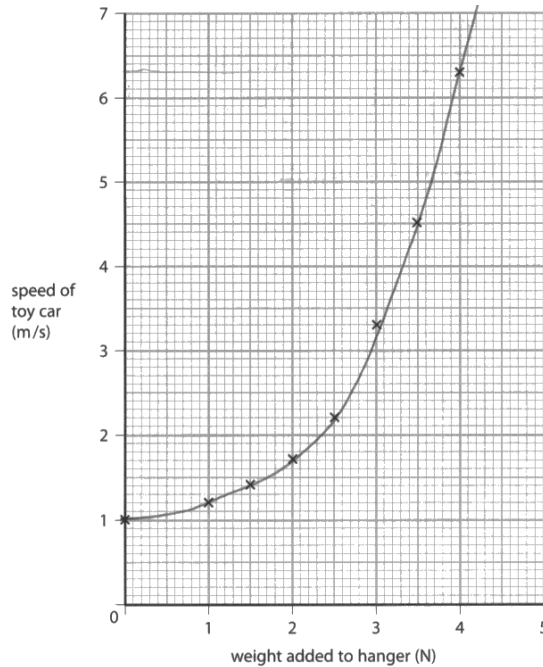
This is a good example of a curve that scored the mark. The line has to be a single smooth curve and needs to go from the first plotted point to the last. Many learners joined the points dot to dot, others started at 0,0 or attempted to force a straight line through the points.

Q05b(ii)

This two mark question generally scored one mark with almost 66% of learners gaining a mark for the trend. A tiny number of candidates were able to give a two mark explanation that related to changing gradient or the graph not being linear.

Q05c

The calculation was a challenge to many learners. Overall 56% of learners scored at least one mark but then only about 28% of learners scored more than that one mark. In most cases those scoring one mark were able to convert the mass to 10000kg.

Calculate the acceleration of the lorry.

force (N) = mass (kg) × acceleration (m/s²)

Show your working.

(3)

$1500N = 10000 \times$ _____

$1500 \div 10000 = 0.15$

$10000 \times 0.15 = 1500(N)$

acceleration = ...0..15.............. (m/s²)

The substitution of the quantities into the equation and the rearrangement were more of a challenge. The example gives a good example of what was required to gain all three marks. Many learners simply gave an answer on the answer line with no working, where this was correct full credit was given. It is important to remind learners that this is not good practice and that learners should show their working in order to gain some marks, if an arithmetical error is made at some point in the calculation.

Q06b

Many learners gained both marks for this simple calculation. It was pleasing to see that the learners could easily identify that 30 minutes what half an hour and this divide by two.

Q06c

Learners found this item a challenge particularly for the second mark. Less than 14% of learners scored two marks. Many learners repeated the stem of the question and made comments that on the surface appeared creditworthy, but failed to offer an explanation.

Explain if this conclusion is correct or incorrect, using the data from the table.

(2)

This conclusion is incorrect because he runs for twice as long on flat road as uphill so you would need to half the amount of energy to ~~that~~ what it would be at ten minutes which would be 800000 so there for he used more energy running uphill.

This response gained both marks as the learner has said that he runs twice as long on a flat road, which is the first marking point, and then goes on to say that 800000 (J) is used in 10 minutes which is the third marking point.

Explain if this conclusion is correct or incorrect, using the data from the table.

(2)

this is incorrect because he does not include all the information for example when he runs on a flat road he runs for 20 minutes and when he runs uphill he only runs for 10 minutes.

This example is quite typical of answers that scored no marks, where the learner restated the stem of the question, or data from the table directly.

Q07a

Approximately two thirds of learners gained this mark. For questions like this, learners need to be clear that the answer must have a comparative word given, so words like, 'largest' biggest' etc. scored the mark if the context was correct. Many learners did not do this and stated that the fraction was 'large' or 'big'.

Q07b

Nearly 60% of learners were unable to gain a mark for this item. It appeared to give many a challenge. Learners needed to answer in the context of the pie-chart

and state what would happen in the future. Many learners gave information that was irrelevant to the chart.

Q08

This was a six mark levelled question. Learners found this question difficult and scored few marks. The same issue as in previous series occurred. Learners did not explain improvements. Without explanations it is not possible to move beyond the Pass marks. In many cases learners restated the stem of the question and this did not score marks.

Firstly Tracy should also measure the starting temperature. Furthermore, if Tracy has the starting temperature, she can also record the temperature difference.

The amount of copper sulphate solution used should be a control variable and it must be the same

amount for all 4 of the metals. Furthermore, the same should be done for the amount of metal used. These controlled variables will ensure it is a fair test.

Finally, Tracy should also record her results in a table like the one below:

Metal	Starting temperature (°C)	Ending temperature (°C)	Temperature difference (°C)
~~(scribbled out)~~			
Zinc			
Iron			
Tin			
Magnesium			

Finally, Tracy should also write upon evaluation an conclusion just after putting the results of the temperature difference for each metal into a line graph.

This response is merit level. The learner has stated 'measure the starting temperature' and explained this in terms of being able to work out the temperature difference. This could also be credited from the table. The learner has gone on to state that the same amount of copper sulfate should be used and that the same amount of metal should be used. These are two improvements, but they are not explained. There are three improvements one of which was explained and this places it at merit level. If there had been a further improvement explained the learner would have been awarded a distinction level mark. In many cases one or two improvements with no explanation were mentioned at best and this greatly restricted marks.