

Examiners' Report/ Lead Examiner Feedback

March 2017

NQF BTEC Level 1/Level 2 Firsts 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 (Distinction, Merit, Pass and Level 1 fallback).

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.

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 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 wouldn't take into account that a test might be slightly easier or more difficult than any other.

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>

Unit: Scientific Skills

March 2017

Grade	Unclassified	Level 1 Pass	Level 2		
			Pass	Merit	Distinction
Boundary Mark	0	11	20	29	38

Introduction

This report for March 2017 has been written to help you understand how learners have performed in the external assessment. It has been written by the lead examiner for the BTEC Unit 8: Scientific Skills

It is designed to help you understand how learners performed overall in the external assessment. For each question there is a brief analysis of learner responses. You will also find example learner answers where these help to provide additional guidance.

We hope this will help you to prepare your learners for future external assessments.

Summary

As in previous examination series, learners were able to demonstrate effectively some of the skills that were tested in the paper. They 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 harder for learners as the scale was harder to deal with.

The calculation in this paper was on the electrical power relationship, and asked learners to convert a unit in the calculation and then to give an answer to two significant figures, fully correct answers were seen, but most learners found the conversion and use of significant figures difficult. As in previous series the rearrangement of a formulae and conversion of a unit 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 better answered than in previous series. Learners were able give greater detail and have a real attempt at a plan, which was encouraging. Many learners still 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 continue to find difficulties with working with a hypothesis, in any way that questions are asked. In the first part of the paper learners were asked to write a hypothesis and many learners found this very challenging. In later parts of the paper learners were asked to consider the validity of a hypothesis that was given and again learners found great difficulty in connecting the given hypothesis to the data.

The final question in the paper, which was a levelled question, again showed that learners are reluctant to make the jump from giving ideas to explanations of how or why these ideas will improve the task. Many learners were able to suggest improvements to the task, but could not offer any explanation as to how or why these improvements made the experiment valid. The responses indicated that the experiment was better known than in previous series, marks were low as a result of learners being unable to explain improvements.

It was evident that some learners did not have access to a calculator for this paper. 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.

It was pleasing to see that all the practical scenarios used in the paper were able to be engaged with by learners. In some previous examinations this was less evident; however in this examination learners appeared to understand the context that the questions used far better.

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

Q01a Targeted Specification Area: Learning Aim A1

This question was very well answered with the vast majority of learners scoring this mark.

Q01bi Targeted Specification Area: Learning Aim A1

Learners were asked to give the dependent variable in the task. Many gave answers which were control variables.

The correct answer is shown below, which many gave in some appropriate form or other.

(i) State the dependent variable in this investigation.

(1)

the time it takes

Some learners incorrectly gave the following answer.

(i) State the dependent variable in this investigation.

(1)

The dependent variable is the speed the salt dissolves

The stem of the question talks about 'how quickly' the process happens and this may have prompted some learners to consider this, however further on in the question stem the question states the time is measured. Learners do need to read the question carefully to ensure there is no confusion.

Q01bii Targeted Specification Area: Learning Aim A1

Learners were asked to consider variables in the experiment. This response shows a good answer that gained both marks.

(ii) State **two** variables that Rachel controls.

(2)

1. same amount of water in each beaker (100ml)

2. same amount of salt added to each beaker (20g)

The response below gained no mark.

(ii) State **two** variables that Rachel controls.

(2)

1. water
2. salt

The omission of quantity lost both marks, some learners left out the relevant details and so lost marks. There is no indication as to what it is about the salt and water that has to be controlled.

Q01c Targeted Specification Area: Learning Aim A1

This question asked about a relevant risk, not a hazard, therefore there needed to be mention of a risk to the person. A good two mark answer is given here.

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

(2)

When doing this experiment you could spill the hot water on yourself and it could damage your body by scalding you.

The learner mentions the risk, scalding, and what it is that will do that, the hot water.

In this example the learner gives the risk, but has not mentioned what it is about that the water that is the risk. The omission of the word 'hot' has lost the mark. This answer scored one mark.

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

(2)

The water will call and it wont be a fer test. I burn you self

This answer scored no marks as there is no mention of any risk.

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

(2)

Water may boil over

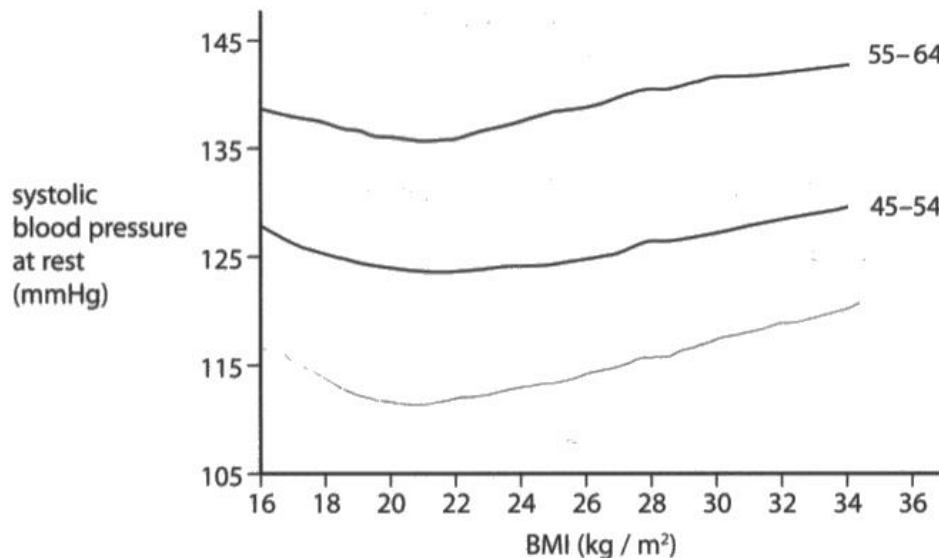
The second question on the paper was about formulating a hypothesis and then producing a plan for an experiment.

Q02a Targeted Specification Area: Learning Aim A2

This was a very challenging question, learners found difficulty in taking the data presented and formulating a hypothesis. The best answers actually used the graph as a means of giving the hypothesis.

This answer scored all three marks. The learner has drawn a line which gains all three marks as it exemplifies three marking points, it is below the other two, which is the third marking point and the value of blood pressure falls at first in the correct range, which is the first marking point and then rises at the end in the correct range which is the second marking point.

The learner would have gained fewer marks if the answer on the answer line was given without the line being drawn on the graph, as key elements of some marking points were missing from the written answer.



Tanya could not find the data for adults aged 35–44, but she can make a hypothesis using this graph.

- (a) Give a hypothesis for how BMI affects the systolic blood pressure at rest for a group of adults aged 35–44.

(3)

The younger you are, less blood pressure at rest will be.
As the BMI (kg/m^2) increases the mmHg goes down for the first 20/22 BMI then constantly increase.

In many cases learners did not connect the three marks to the three things being looked for in the mark scheme. A hypothesis was needed to fit all

aspects of the line for a group of 35 – 44 year olds. In most cases where a mark was scored it was for saying that the line would be lower.

Q02b Targeted Specification Area: Learning Aim A1

This gave the first opportunity to learners to use extended writing. Many learners were able to access this question. This has not always been the case. 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, many learners spent a good deal of their answer on these aspects. It would be helpful to learners if 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 five marks

using a weighing scale, tape measure and a blood pressure gauge, measure the weight, height and blood pressure of 5 males and 5 females after 30 minutes of rest. Rest can be defined as having been sat down ~~while~~ while doing something calm and relaxing.

The answer identifies the equipment to be used, weighing scale and tape measure, and what they are to be used for, the group size is given and it is large enough to score a mark as indicated on the mark scheme and both males and females are identified. In addition the learner states the blood pressure should be taken at rest.

This is five points from the mark scheme. It should be noted that the answer is quite short. Often the best marks were score with succinct answers such as this.

This answer scored three marks

Measure different age group people
 in this graph it is 45-54
 and 55-64. Split women and
 men at different age group
 Measure systolic blood pressure for
 at rest for each group. using a
 blood pressure gauge.

age of female and male should be
 different

* blood pressure gauge should be same

* Measure BMI for each person

* Repeat the results

Compare the results for female and male.

(Total for Question 2 = 9 marks)

The learner has written about males and females, measuring the blood pressure at rest and using the same instrument to measure blood pressure. The comment about repeating at the end of the answer was commonly seen, but did not gain a mark.

Q03a Targeted Specification Area: Learning Aim B1

Question three was about presenting data and using data in a calculation and then giving the answer to the correct number of significant figures.

This question has been asked many times before in different formats. The headings to the two columns are still a problem to learners. The stem of the question states 'the power (W) of different electrical appliances'. This is the clue as to what to use in the column headings. Some learners simply used 'watts' for the power heading, this is not acceptable as it is a unit and not a name of a physical quantity. Where less than three marks were scored it was for giving an incorrect heading and/or not putting the values in a sensible order.

Q03b

Targeted Specification Area: Learning Aim B4

This gave some good discrimination across the ability range. The question was designed to target the top end of the range as it required a rearrangement of an equation, a conversion from kW to W and giving the answer to two significant figures.

A fully correct answer is given here.

Calculate the current in the iron.

$$\text{Power (W)} = \text{Voltage (V)} \times \text{Current (A)}$$

Give your answer to two significant figures.

Show your working.

(4)

$$\frac{1500}{240} = 6.25 = 6.3$$

It should be noted that this answer which gained all four marks is succinct. In the answer below, the learner used kW instead of W and did not give an answer to two significant figures. This answer gained two marks.

Calculate the current in the iron.

$$\text{Power (W)} = \text{Voltage (V)} \times \text{Current (A)}$$

Give your answer to two significant figures.

Show your working.

$$1.5 = 240 \times \text{current} \quad (4)$$

$$\text{Current } 0.00625$$

Many learners gave an answer of 6.25A which gained three marks, this showed that they were able to do the calculation, but not then give an answer to two significant figures. The use of significant figures is still a weakness in learner's responses and some work by centres on giving practice on this should be considered.

Question four was about using data to draw a graph and then to consider anomalies in data in a table and ways of dealing with it, and finally considering a level of accuracy in data.

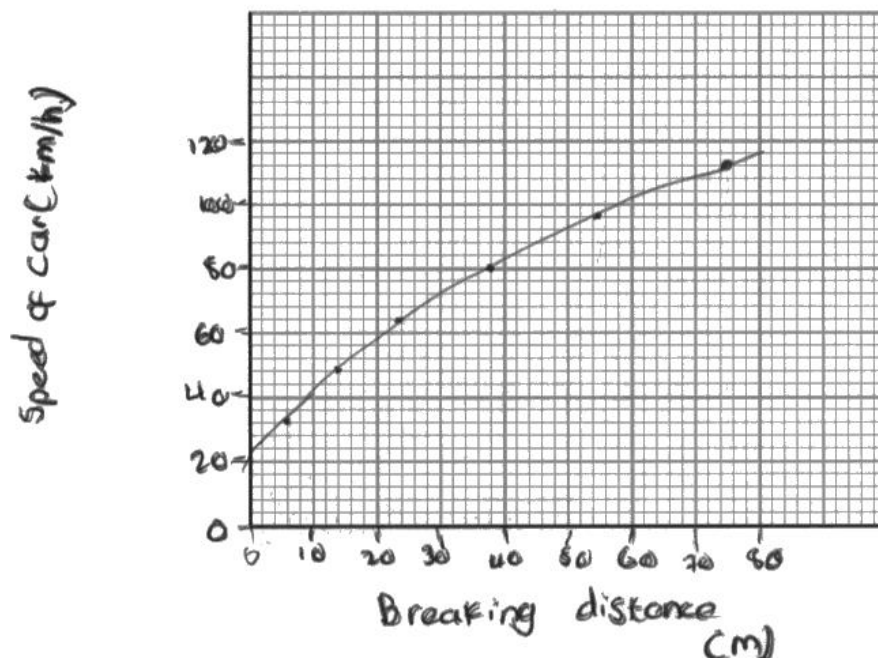
Q04a Targeted Specification Area: Learning Aim B6

This question 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 strong learners produced.

Plot a line graph of these results on the graph paper.

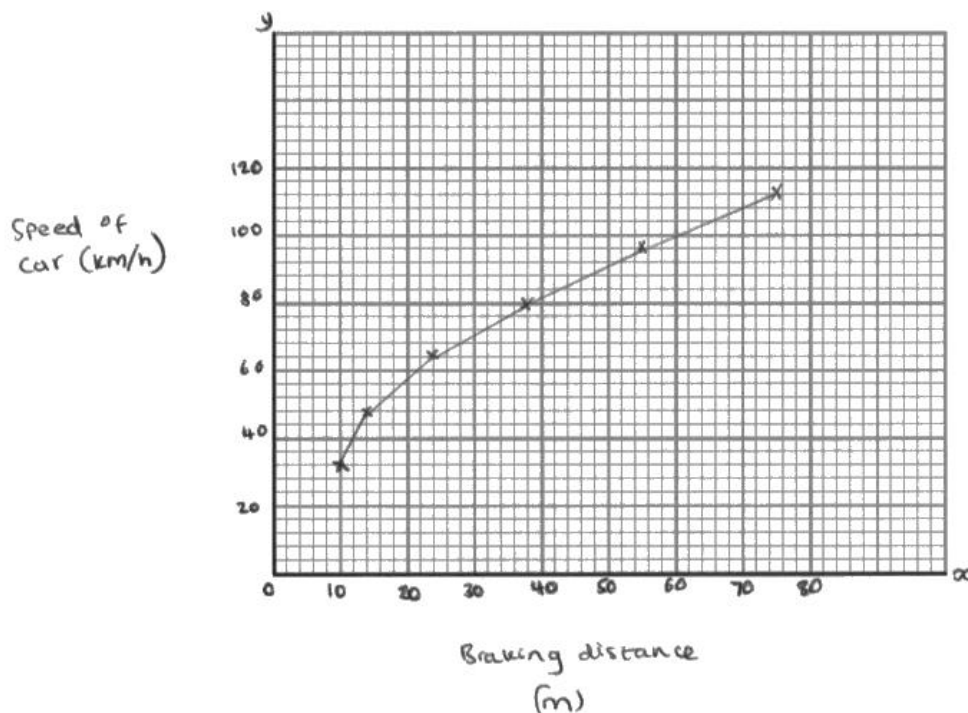
(6)



This learner gained four marks.

Plot a line graph of these results on the graph paper.

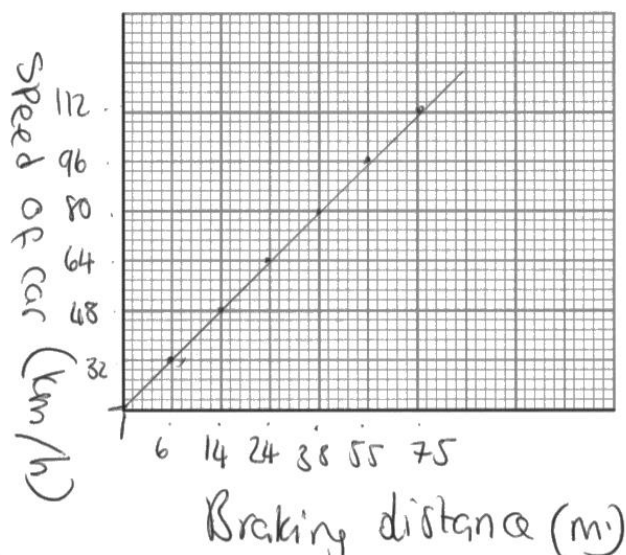
(6)



At first sight it looks like it is not much different to the previous example, however the first and last points are plotted incorrectly, so only one mark was given for plotting and the line consists of a series of straight lines joined together, so the 'line' mark is not given.

Many learners were unable to scale the graph correctly and simply used the numbers from the table, this example scored just one mark for giving the axes with units correctly.

Plot a line graph of these results on the graph paper.



Q04bi **Targeted Specification Area: Learning Aim B3**

This is a question that has been asked on several occasions in different contexts and has been answered well. Learners were able to provide one and many two responses. A typical response is given below.

(i) Adam circles an anomalous result in the table.

Give **two** ways Adam can deal with this anomalous result.

(2)

1. He can repeat test two
2. can cross out the result and find the mean of test 1 and 3

It is pleasing to see that learners are able to consider anomalies and know of ways to deal with them.

Q04bii **Targeted Specification Area: Learning Aim B5**

This was a challenge to all but the most able learners, giving an answer to the correct level of accuracy from the data provided is weak. Many learners gave an answer of 8.53, simply removing the surplus 3's. Rather fewer gave the value to 8.5, which was then consistent with the number of decimals in the table from which the average was calculated.

Question five was about calculating averages from data in a table and then using the table to look at patterns in the data. The second part of the question considered data and trends in graphs.

Q05ai Targeted Specification Area: Learning Aim B4

Learners were asked to calculate an average. This type of question has been asked on many occasions in different contexts and most learners are able to do this. Where learners were unable to do this, it was evident that the lack of a calculator may have been an issue to some learners.

- (a) (i) Calculate the weekly average of recycled cans for class 11LW.

Show your working.

$$150 + 158 + 180 + 200 = 688 \quad (2)$$
$$688 \div 4 = 172 \text{ cans } \text{as is the weekly average.}$$

172 cans

This is a correct fully worked answer and would be a good example to share with learners.

Q05aii Targeted Specification Area: Learning Aim B12

This was generally well answered. Most learners were able to identify the trend and add detail from the data. There were four marking points for two marks, so learners putting answers in a variety of ways could score marks. This was a typical two mark response.

- (ii) Describe the pattern shown in the table for class 11SC.

Week 2 and 3 they ^{recycled} ~~collected~~ the same number of cans, on week 4 they got 100 recycled double of that amount. Their trend increases. (2)

The candidate has given three points, however there is a maximum of two. Some learners simply quoted numbers from the table without mentioning the trend, this did not score marks.

Q05bi Targeted Specification Area: Learning Aim B9

Nearly every learner gained this mark.

Q05bii Targeted Specification Area: Learning Aim B13

Learners had to consider the evidence from the graph. Many learners could see that the data in the last two years was the same and so gained a mark, however the idea that the rate of increase was not enough to reach the target as it was too small, was rarely seen, and a much harder mark to gain.

This response gained both marks.

Explain why the evidence in the graph does not support the student's conclusion.

(2)

Every year the percentage of household waste recycled increased by between 1-4% in the years from 2000 to 2011. From this percentage isn't high enough to reach 70%. Also from 2011 to 2012, the percentage stayed the same.

The learner states that the increase isn't high enough to reach 70% (in the time) and the last few words gain the second mark.

The last two questions on the paper dealt with evaluating evidence and investigative methods.

Q06a Targeted Specification Area: Learning Aim B11

This asked for reasons why the data was incorrect, and this was well answered.

Q06b Targeted Specification Area: Learning Aim B13

This was an inference to be made from the table and again most learners identified that in week 6 the rowing time was 24 minutes.

Q07a

Targeted Specification Area: Learning Aim C3

This was the most difficult question on the paper, it was aimed at merit/distinction learners and hence it was not well answered by many of the learners, however there were some very good answers seen that showed a high level of performance in this aspect of the specification. This response gained three marks.

The atomic number increases from 3-55 and in that the density doesn't decrease but instead it increases, so that Part of Richard's hypothesis is wrong but the second part is right. As the atomic number and density (g/cm^3) increases the boiling point decreases ($^{\circ}\text{C}$) and even though the table isn't finished for that part, you know it won't increase otherwise his data is unreliable.

The learner makes a comment on the density and rightly points out that it increases, contrary to the hypothesis, the learner then goes on to say that the other part is correct and finally that the data is not sufficient for the boiling point.

Many learners simply quoted data from the table without any link to the hypothesis; no marks were scored in these cases. An example is given here.

(a) Discuss the extent to which the data in the table supports Richard's hypothesis.
on lithium

At ^(AN) 3 the density is 0.53 g/cm^3 and at boiling point is 1347°C On sodium ^(AN) 11 the density = 0.97 g/cm^3 and boiling point is 883°C . The data the stops for boiling point but for density it keeps going. For potassium ^(AN) 19 the density is 0.86 g/cm^3 Rubidium ^(AN) 37 density = 1.48 g/cm^3 and for Caesium ^(AN) 55 density = 1.87 g/cm^3 .

AN = Atomic Number

This was typical of the response from weaker learners; the learner did not address the question.

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 explain the improvements to a method. In a number of cases learners copied the stem without further addition of information, in other cases one or two marks were scored for improvements to the method given, but without any explanations being given, this limited the marks to Pass level. It was rare to see answers beyond pass level. The response gained a distinction (5 marks)

- Measure the HCl and then add it to the beaker this ~~will~~ would allow for fair test. The HCl needs to be same amount for both.
- Weigh the calcium carbonate (CaCO_3), in both test it needs to be same amount (g)
- The Beaker needs to be same type because ~~one can~~ if there are 2 types of Beaker then 1 would have a large surface area than the other which would affect the rate of reaction.
- Record the results
- ~~Be~~ I Record the temperature before and after of HCl.
- Repeat the test
- Use a stopwatch for timing the experiment.

The learner has given an improvement 'measure the HCl and this is explained. The learner has also suggested that the calcium carbonate should be weighed and be the same amount in both tests. This is a further explanation. The learner goes on to state that a stopwatch is to be used, but has not explained it sufficiently, as the learner has not mentioned why, (to measure time accurately). The comment on recording the temperature before and after is not creditworthy as the learner needs to state that the temperature should be measured. At this level there is an expectation that the difference between measuring and recording is understood.

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