

# **L2 Lead Examiner Report 1906**

June 2019

**L2 Qualification 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:

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### Unit 8: Scientific Skills (20474E)

Grade	Unclassified	Level 1 Pass	Level 2		
			Pass	Merit	Distinction
Boundary Mark	0	11	19	27	36

## Introduction to the Overall Performance of the Unit

Learners were able to demonstrate many of the skills that were tested in the paper. They were able to; identify items of equipment and their use, risks involved in given laboratory procedures, plan an experiment, tabulate data with appropriate headings, draw a bar chart, 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 and comment on graphical data to evaluate conclusions.

The graph for this paper was a bar chart, learners found this more accessible than in the previous series, and comparable in difficulty to bar charts in previous series. Learners were able to show greater confidence in the calculation, with more learners accessing at least a mark of the three available.

The first six mark question on the paper asked learners to produce a plan based on information given. The plan related to investigating how the pH of soil affected the growth of a plant. As in the previous series some learners found accessing this question quite difficult. The basic aspects of a plan remain difficult for learners to draw on, such as variables, method and controls. 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 considering two conclusions on the basis of given graphical data was better answered than in previous series. Many learners were able to use data from the graph to support the points they made.

There were two calculations in the paper. The question on averaging was again very well answered by nearly all learners. There was also a three mark calculation that required learners to substitute values into an equation and rearrange it. 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. Many learners 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.

Centres should continue to advise their learners to use the mark allocation given in each question to ensure that as full an answer as possible is given. This remains a problem for some learners, particularly in the four mark explain questions such as Q5a<sub>ii</sub> and Q6. In both questions there was a clear indication that two things were needed. In both of these questions the initial statements has to be supported by a justification and this was not given by many learners.

Learners were asked to take data off a graph in a number of questions and in different contexts, it is 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

Q1 considered, the purpose of items of equipment as well as experimental risks and their management .

Q1a was a well answered with most learners able to score at least a mark, and most gaining full marks. This is a well established question, however there were a significant number who thought that an electronic balance measured volume.

Q1bi was also very well answered, learners were able to identify that the risk was a burn to the skin, very few did not score this mark.

Q1bii was found to be more of a challenge. Some learners suggested quite dangerous procedures such as the use of tongs to pick up hot glassware. In many cases generic answers such as using a lab coat or personal protective equipment (PPE) was mentioned, this was not answering the question in this case.

Q1biii was designed to be a straightforward question about stirring the liquid. The question started with the command word 'state' however many learners attempted to explain why a glass rod was used. Many learners placed their emphasis on the material the rod was made from, rather than its purpose. A significant number of learners thought that the glass rod was in the beaker to measure the temperature of the water.

Q2a was answered correctly by many learners. The question was about the independent variable in an experiment. Many learners still confuse the independent and dependent variable in an experiment.

Q2b required learners to write a plan for an experiment. This kind of question is asked in every series, and the quality of learner response is variable. In this series, learners struggled to give good answers. A good answer would have included some details for a method, and some factors to be controlled. There are a significant number of learners who spend a good deal of time writing a risk assessment or commenting on health and safety. There are no marks for this in the plan. This is tested elsewhere in the questions already asked on risks.

This response scored 5 marks:

Independent variable will be ~~soil type~~ <sup>the pH</sup>.  
dependent variable will be ~~the pH of the soil~~ the growth of the plant.  
Control will be the amount of sunlight and water the plant receives and soil type.

Plant 3 plants into 3 different containers, label A, B and C. All 3 plants must have the same soil type. In plant's A's pot place Hydrochloric Acid (HCL) in plant B's pot place water and plant C place an alkaline then measure growth over 3 weeks.

(Total for Question 2 = 7 marks)

The learner has given three control variables and identified two aspects of the method. The comments on independent and dependent variables were ignored.

Many learners appeared unfamiliar with this experiment, some failed to read the question fully, which asked "write a plan for an experiment to find out how the pH of the soil affects the growth of plants." Many did not read to the end of the command line and wrote a plan to test the pH of soil. Many learners wasted time in giving unnecessary information about the pH scale and how to change the pH of different types of soil. Learners need to have practice in a wide range of practicals not only to become familiar with techniques, but also with a range of different experiments. Some of the best answers showed signs of being planned out before writing of the main answer. There were very few answers seen of the quality of the example.

Q3a has been asked in many series and many learners are now able to score well in this kind of question. The headings for the table caused the greatest difficulty to learners. Many wrote 'days' rather than 'half-life' as one of the column headings. Most were able to place the data in an appropriate order.

Q3bi was very well answered, most learners scored both marks and it is very clear that learners are able to average data correctly.

Q3bii was about the use of significant figures and appropriate rounding, this was targeted at the merit/distinction learners, and for those the question was answered well. Many learners thought that the way to deal with the trailing decimals, was to truncate them or give answers to a smaller number of decimal points, this did not score. Many learners find writing a number to a given number of significant figures a challenge.

Q4a was a bar graph, this was well answered, and many learners were able to score a good number of marks. There were however some common errors, including, missing the unit from the boiling point axis, using a scale for the boiling point axis that was too small, so that all the bars were squashed into a small number of squares, inappropriate scales, going up in three's for example, and also poor plotting of the tops of the bars. The most frequent error was that of using a scale for the boiling point axis that was too small. Many learners started the axis at 0. Starting at 70 would have meant that the data range would have covered more than half of the graph paper, which was expected to display the data effectively. Some graphs resembled sketches. Learners should be aware that a pencil and a ruler should be used to plot the graph. Some learners used very difficult scales, which were hard for them then to use. In many cases where the learner used a poor scaling number, some or even all of the plots were wrong. This question asked for a bar chart, not a line graph. Some learners plotted line graphs, which for a categoric variable were not appropriate and marks were lost.

Q4bi was correctly answered by nearly 90% of learners. It is pleasing to see that the skill of reading data off a graph is well understood.

Q4bii asked for a description in the trend of data. Many learners were able to give either the description or suggest it was a negative correlation etc, but rather fewer were able to give both marking points. Learners should be mindful of the mark allocation for each question and ensure that a complete answer is given.



Q5ai asked about anomalies, this kind of question has been asked many times, however there are a significant number of learners who did not score either available mark. Learners generally gained the 'repeat' mark, however the idea of leaving out an anomalous result was less often given.

Q5aii went on to ask learners to explain factors that may have caused the anomaly. The anomaly was given in the stem of the question in a table of data, the value of the speed was rather less than the others. The explanation therefore had to identify why this number was smaller. The distance between the rubber bands was fixed, many learners suggested that this distance had changed at some point in the experiment, if it had changed then all the speeds after the anomaly would also have changed. The anomaly was caused by the time being too small, so the stopwatch/timer was started too late or stopped too early. To answer this question, learners not only had to identify the factor but then justify it. The mark scheme gave other alternative ways that the time could have been less. Very few learners could provide any kind of answer to this question. A very small number score more than two marks.

This response score 4 marks,

1 he could have dropped the ball from  
to high ~~height~~ so which means that  
the speed will be faster

2 he could have start recording late which  
means the time will be less

The learner has given two factors and then justified the outcome. Many answers that scored a single mark gave a correct factor, but then did not go on to give the effect on the speed.

Q5b was a calculation. This was a challenge to many learners, however there were a number who were able to arrive at a full mark answer. In many cases learners did not square the velocity, so used 10m/s rather than 100m/s in the equation, this scored partial marks. For many learners algebraic manipulation of an equation remains challenging.

Q5c asked learners to analyse a graph for evidence to conclude which ball reached the highest steady speed. Many learners identified the correct ball but could not go on to score the second mark. Some learners read the graph incorrectly and considered that it was ball C, as it was the first to reach a steady speed. The question proved challenging and indicated that interpretation of graphical data was an aspect of this paper that centres need to work with learners on.

Q6 asked learners to provide an improvement to a given method. Learners found this question challenging and very few were able to score marks. This question asked for an explanation, so a good answer required an improvement and a justification. The example here gained 4 marks.

(4)

- 1 She should have precise measurement of ribbon (magnesium) she cuts. Different sizes could affect the time it takes for the ribbon to dissolve.
- 2 She should have the same amount of acid to as this can affect the speed at which the ribbon dissolves

The learner has given two improvements, same size of ribbon, and same amount of acid. In both cases this was justified.

Q7 was the final question on the paper and was answered well in comparison to previous series. The question asked learners to consider a graph from which two conclusions were made. Learners were asked to discuss whether the information supported the conclusions.

This response score a Distinction level mark:

initially the graph would agree that the higher the persons body mass index the greater chance of them getting type 2 diabetes. This is for both genders male and female.

However, Sanjay is incorrect when saying the risk is the same for male and females. As even from a low body mass index the male is almost twice as likely of getting type 2 diabetes. This trend continues through the graph until the body mass index is around 26-28 where after that the males chance is a significant amount more.

The answer considers both conclusions and gives some detail for each. A range of points were described, and they were relevant to the graph. Some learners did not answer the question, instead focusing on the causes of type 2 diabetes or other medical issues. Some learners did not look at the graphs closely enough and mixed up the two lines in their answers.

## Summary

Based on their performance on this paper, learners should:

- have opportunities to engage in a wide range of different practical activities to ensure that they have used a range of equipment, considered risks and means of avoiding them.
- read the questions set carefully and ensure that they are providing an answer to the question set, in some cases learners spent a good deal of time in giving details of risk assessments or equipment lists, when these were not asked for
- when drawing a graph ensure that all of the graph paper is used, by choosing a suitable scale for the data set and plot the graph asked for.
- make sure that when asked to explain an idea that there is a statement and a justification.
- When given a graph to analyse, to ensure that the data is referred to correctly in terms of the question, making appropriate reference to the labelled axes in answering the question.

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