GCSE
COMBINED SCIENCE: TRILOGY

8464/P/2H
Report on the Examination

8464
June 2018

Version: 1.0

General

This was the first session for this reformed specification, which is assessed by two terminal examinations in each science. This paper was out of seventy marks and the students had 75 minutes in which to complete it. There were seven questions on this paper. Questions one and two were common to foundation and higher tiers.

There are three assessment objectives. Approximately 40% of the marks (28/70) on the paper are for demonstrating knowledge and understanding of: scientific ideas, scientific techniques and procedures (AO1), another 40% (28/70) on application of knowledge and understanding of: scientific ideas; scientific enquiry, techniques and procedures (AO2) and 20% (14/70) for analysing information and ideas to: interpret and evaluate; make judgements and draw conclusions; develop and improve experimental procedures (AO3).

Students should be prepared to expect that they will be given unfamiliar contexts and information that assess these objectives. Familiar contexts are those mentioned in the specification and assess recall, selection and communication of students' knowledge and understanding.

The mark scheme was designed to allow students to gain marks for showing knowledge, understanding and application of physics. The majority of students appeared to have sufficient time to complete the paper. This paper tested a wide range of mathematical skills. Students were also required to recall a number of physics equations.

Levels of demand

Questions are set at three levels of demand on this paper:

- **Standard demand** questions are targeted at students working at grades 4–5
- **Standard / high demand** questions are targeted at students working at grades 6–7
- **High demand** questions are targeted at students working at grades 8–9.

A student's final grade, however, is based on their attainment across the qualification as a whole, not just on questions that may have been targeted at the level at which they are working.

Question 1 (standard demand)

01.1 This was generally well answered with nearly 40% scoring both marks. The most common incorrect responses were that acceleration and the resultant force would increase.

01.2 Many students did not realise that it was distance that was important and a significant number spoke of needing to have less weight so that the glider moved more slowly. About 40% scored this mark. Correct responses of raising the table and shortening the string were given fairly equally.

01.3 Many students were not clear about how means were calculated and spoke of the mode being used instead at 0.59 N. There was widespread misunderstanding about accuracy with many stating that the more decimal places, the more accurate a result.

There were many references to recurring decimals. Those who scored in this question often did so by the 'decimal point' route rather than the 'significant figure' route.

Nearly 40% scored 2 marks, with a fairly even spread between those who identified one error and corrected it, or for identifying the 2 errors but not adequately describing how they would correct them.

01.4 This was well done with over 80% scoring the mark, but common errors were to refer to 'faster' or 'quicker' acceleration. A few made reference to the investigation not being a fair test.

01.5 46% scored all 3 marks. The quality of the plotting was generally good, but lines of best fit were often mistakenly given as straight lines, 50% gaining 2 marks. Where a curve was drawn these were generally of a credit worthy standard.

01.6 This was well done, with 73% gaining the mark, but a common error was to refer to “slower” acceleration. There were a number of answers which were insufficient, for example “negative correlation”.

Question 2 (standard demand)

02.1 60% scored this mark. The most common incorrect response was where the direction of the magnetic field lines ran from south to north.

02.2 Many students did not appreciate that they needed to identify all three blocks. Many identified iron and aluminium and not the second permanent magnet.

There appeared to be widespread confusion as to which of iron and aluminium were magnetic and a significant minority simply said that a material was magnetic without indicating how they would identify it.

As a result, 40% scored zero for this question, and 17% scored scored all three marks.

02.3 There were many very vague responses to this question, with few inclusions of the level of detail expected. Many made reference to the ability to turn the electromagnet on and off but there were few descriptions of how the electromagnet worked with many incorrect references to 'electricity' passing through the core.

Many believed that the magnetic blocks were, in fact, magnets themselves and talked about the attraction and repulsion between the blocks and the electromagnet. As a result, only about 8% gave answers worthy of level three and a further 32% gave answers worthy of level two.

Question 3 (standard & standard / high demand)

03.1 82% scored this mark, with many giving the equation in the form mass = momentum ÷ velocity.

03.2 86% were able to gain 3 marks in this question and only a very small number multiplied the two numerical values.

03.3 Fewer than 2% scored full marks for this question. Very few attempted to describe what happened to the velocity of the skaters, in spite of the very clear lead in the stem of the question. Whilst many realised that the velocity of the two skaters was the same after collision, they talked of velocity being 'shared' rather than saying what had happened to each skater.

A significant number did gain a mark for saying that the momentum before the collision was equal to that after, although many missed this mark, simply repeating the stem of the question.

Question 4 (standard / high & high demand)

04.1 Nearly 70% identified the correct newtonmeter but very few stated that it was the extension being the same for all of the newtonmeters that was the key factor.

04.2 Fewer than 10% could correctly identify the type of error, with many giving descriptions rather than stating zero error or systematic error. Terms used incorrectly with some frequency included human error.

Over 50% were then able to say how the error could be corrected. Some suggested that the newtonmeter might just be 'sticky' and need to be pulled down and released which, whilst showing practical experience, would not be a solution in all cases.

04.3 Whilst only just over 5% gained all 6 marks, correct solutions, when seen, were clear and well set out. A significant number, nearly 17%, calculated the initial extension, but did not complete the calculation to determine the total extension.

Those managing to do the second part of the question opted in about equal numbers for each of the two expected methods.

Typical errors in the first part included not finding the square root of the answer for the extension and in dividing by 2 twice.

A few candidates realised there were two parts but worked out incorrect values. They were able to gain the final mark by adding the two incorrect extensions correctly.

Question 5 (standard & standard / high demand)

05.1 Nearly 13% gave accurate answers to score both marks. A further 20% were able to score a compensation mark by vague references to parallel and perpendicular, but it was clear that many students do not realise the importance of what is oscillating and the direction of energy transfer. There were many vague incorrect descriptions of 'up and down' and 'side to side'.

05.2 25% gained full marks, and a further 18% gained two marks, usually not giving the answer to two significant figures. There were a large number of responses using an incorrect rearrangement of the equation and generally the use of standard form was not the cause of the errors.

05.3 This was very poorly done, with just over 1% gaining full marks. There were many vague responses and a significant number of candidates wrote about transverse and longitudinal waves. There was also considerable reference to radio waves being reflected off the ionosphere.

A significant minority of students did not attempt this question which might suggest that they were unfamiliar with the material.

Question 6 (standard / high & high demand)

06.1 About 30% gained both marks, with fewer than 1% gaining just one mark. There was widespread misreading of the graph, in some cases misreading the scale but in a very large proportion there was little attempt to read between the grid lines.

Those who were successful adopted one of three routes: reading the distance off the graph between the given times; finding the time interval from the data given and reading that off the graph from the origin; using the data from the graph along with distance = speed x time to find the extra distance.

06.2 This was not answered well, with many students simply talking about heat energy, and many of those who referred to kinetic energy talking about kinetic energy in the brakes.

Many students overcomplicated their responses to this question. Over three quarters of students gained no marks.

06.3 This calculation was fairly well done with just over 42% gaining full marks. There were not many able to score compensation marks and so 40% scored zero.

The major problem was the inability to rearrange the equation, and substitution marks were rare as students were trying to substitute into an incorrect equation. A significant minority divided rather than subtracted when moving v^2 from one side of the equation to the other.

06.4 Many students did not grasp that a specific requirement of the question was to include factors that would affect the gradient and only a minority talked about the gradient being altered by factors rather than simply describing the graphs presented.

Lower attaining students described the graphs, often saying that “everyone has stopped by 112 km/h” as this was seen as an end point. Many mentioned factors that would affect each of the distances but the factors were not always attributed to the correct distance. A significant number of students cited factors that affected the stopping distance in their own right.

Fewer than 6% of responses achieved level three.

Question 7 (standard / high & high demand)

07.1 Only 27% gained this mark, with many referring to the swimmer being pulled down by gravity and/or sinking. A large number referred to the swimmer being stationary, although this was permissible providing a constant speed was also given as an option.

07.2 Over 75% were able to score on this question although very few gained more than two marks as they did not give sufficient detail.

Answers scoring three of the four marks often did not say that the final constant speed was higher than the initial speed.

07.3 This appeared to be an accessible question for those who had drawn vector diagrams, with one mark being allocated for the very basic scale diagram. However, nearly 10% did not attempt this question.

There were a number of responses where students had used calculation rather than a diagram to determine the resultant and this was given some credit. Many incorrect responses simply stated the difference in the two forces, suggesting that students were familiar with forces acting in a straight line.

07.4 Over 50% scored on this question, usually noting that the force increased, although the error in question **07.3** reappeared as some students used the same method, incorrectly stating that the resultant force was smaller as the difference between the two components was now smaller.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.