

GCSE
COMBINED SCIENCE:
TRILOGY

8464/P/2F

Report on the Examination

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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 eight questions on this paper. Questions seven and eight were common to foundation and higher tiers and were targeted at grades 4-5.

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 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 was more demanding than previously and tested a wider range of mathematical skills. Students were also required to recall a number of physics equations.

The paper appeared to differentiate well but there were questions where students found it difficult to gain credit; there were a number where only the higher attaining students were able to access the marks.

It was noticeable the number of students who selected more than the required number of responses on closed questions therefore negating possible correct answers.

There were a number of questions where students gave incomplete answers, for example: 2.3; 6.2; 8.2.

In several questions it appeared that too little reference had been made to mark allocation when students were structuring their response for example: 5.2; 5.3; 6.2; 8.2.

There was a significant minority of students who did not engage with questions requiring extended prose responses; 2.3, 6.2, 8.2 and 8.3 had an average of nearly 11% who did not attempt these parts. On average nearly 6% across all questions were not attempted.

Levels of demand

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

- **Low demand** questions are targeted at students working at grades 1–3
- **Standard demand** questions are targeted at students working at grades 4–5.

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 (low demand)

- 01.1** Nearly 34% scored this mark. The most common incorrect response was velocity.
- 01.2** Almost 74% of students were able to identify the part of the graph that showed the woman moving at a constant velocity.
- 01.3** 68% of students selected the correct response for the part of the graph where the woman was stationary. The most common incorrect response was BC.
- 01.4** The most common response was to misread the scale with incorrect values of 2.5 or 4 often given. Nearly 45% gave the correct answer. A significant minority tried to use various equations of motion, producing incorrect answers.
- 01.5** This required a more straightforward graph reading and almost 72% gave the correct answer.
- 01.6** 66% gained two marks, with students either using the correct values read from the graph or correctly calculating using their previously incorrect values. A small number multiplied instead of dividing, despite the equation being shown.
- 01.7** Almost 53% correctly stated that typical cycling speed would be about four times faster than the typical walking speed. The most common wrong answer was about twice as fast.

Question 2 (low demand)

- 02.1** 88% of students gained at least one mark with only 19% scoring all three. Most students were able to correctly label wavelength however many confused rarefaction and compression with amplitude and frequency.
- 02.2** Only 55% of students correctly identified a sound wave as being longitudinal; many of those that did not score selected transverse.
- 02.3** Level two required students to produce a plan that would lead to a valid outcome. Key steps are needed for this including measuring time, distance and how to calculate speed from these measurements.

Only 9% of students were able to achieve level 2 with many just writing a clear account of how to measure the correct time for sound to travel to and from the wall. Many of those that did mention distance failed to give any account of what would be done with the measured values.

Nearly 27% did not gain any marks, with a significant number stating that the bricks should be thrown at the wall despite the stem of the question indicating that they would be banged together.

Question 3 (low demand)

- 03.1** Only 21% identified the downwards force of the man on the bar as being equal to the upwards force of the bar on the man. Many believed it to be more than.
- 03.2** Nearly 90% of students were able to substitute the correct numbers into the given equation and calculate the correct value of weight.
- 03.3** 68% took their answer from question **03.2** and multiplied by 0.63 m to obtain the correct answer for work done. Many incorrect answers were given when students used $9.8 \text{ N/kg} \times 0.63 \text{ m}$ and a significant minority multiplied the question number **03.2** by 0.32 m.
- 03.4** Just over 40% demonstrated they understood that when the man was not moving the work done would be 0 J. Many put in their calculated values from other parts of the question.
- 03.5** 85% gained two marks with most students able to substitute the correct numbers into the equation given.

Question 4 (low demand)

- 04.1** Just over 50% of students were able to identify the position of ultraviolet light within the electromagnetic spectrum. Many believed it came between microwaves and visible light.
- 04.2** Only 15% gained both marks with a further 52% gaining one mark. It was noticeable the number of students who ticked more than the required number on this question. In this situation the list principle is applied. The most common error was that they would have a longer wavelength than microwaves.
- 04.3** 41% of students gained one mark on this question, however only 15% managed to score both marks. Many of those failing to gain marks gave weaker responses of “cancer” or “burning” without further qualification.
- 04.4** Many students failed to read the question carefully and so gave examples of medical imaging or other applications. 32% did gain two marks and a further 35%, one mark. Other incorrect responses of note were longitudinal, transverse and ultrasound.

Question 5 (low & standard demand)

- 05.1** Just over 42% gave correct descriptions such as “increases” or “gets bigger”. Some students gave responses of “stronger” which did not gain credit.
- 05.2** Although 55% gained one mark for describing what happened to the resistance band, only 1% gained two marks for a complete explanation. Explain questions always require more than a one-mark response.
- 05.3** Similarly, 58% gained one mark for describing the extension increasing as the force increased. References to the start of the graph at which the band did not stretch even though a force was applied, or the overall relationship being non-linear were much less common with only 5% scoring two marks.

Lower attaining students often referred to just one variable or to the shape of the graph.

- 05.4** Only 16% scored both marks with a further 13% scoring one mark. Many copied the sketch graph from the previous page rather than sketching the graph for a spring. Others produced various curves and squiggles which indicated they were unfamiliar with the extension of a spring.

- 05.5** 24% of the students correctly recalled this equation. Many quoted the equation for elastic potential energy having referred to the Physics Equations Sheet.
- 05.6** Of those that gave the correct equation, most failed to convert the centimetres to metres. Only 2% gained three marks with a further 30% scoring two marks.

Question 6 (low and standard demand)

- 06.1** Only 11% scored both marks with a further 29% gaining one mark. There was a persistent misinterpretation that because the brakes were poor, the driver would have to start his/her thinking time earlier, giving a larger thinking distance. Many referred to time rather than distance. Those that did score were more likely to recognise that the braking distance would increase.
- 06.2** Less than 2% gained three or four marks with a further 37% gaining one or two marks. Most students attempted this question but many gave weak responses using their knowledge of mobile phone operation for texting etc.
- Few referred to “thinking distance”, “reaction time” or “stopping distance” and many did not use the data in the table to answer the question.

Question 7 (standard demand)

07.1 25% of students gained both marks with a further 30% scoring one mark. The most common incorrect responses were where students thought acceleration and the resultant force would increase.

07.2 Only 19% scored this mark, with many suggesting that altering the weight/mass on the holder would solve the problem. Others suggested that catching the holder before it hit the ground would be sufficient.

Most correct responses came from raising the table, with fewer suggesting shortening the string.

07.3 Over 50% of students scored at least two marks, with a further 19% gaining three or four marks. Most were able to identify the mean calculated at 0.20 N as having too many significant figures and correctly suggesting that this should be rounded to 1 decimal place. The anomalous reading of 7.2 m/s^2 was less commonly spotted and few stated what to do about it.

07.4 54% of students were able to identify a correct pattern between the variables in order to make a conclusion. Those that failed to score often referred to 'faster' or 'quicker' acceleration.

07.5 28% scored all 3 marks. The quality of the plotting was generally good, but lines of best fit were often mistakenly given as straight lines giving rise to 53% gaining 2 marks.

Those that struggled to plot points found the second, fourth and fifth points the most difficult. A minority of students used large 'blobs' rather than crosses to plot points resulting in these points going out of tolerance.

Where a curve was drawn these were generally of a creditworthy standard although some did have a 'feathered' appearance with multiple lines.

07.6 Just under 50% of students gained the mark, but few stated the relationship as being inversely proportional, rather stating that as mass increases acceleration decreases.

Common errors were to refer to "slower" acceleration. There were a number of answers which were insufficient, for example "negative correlation".

Question 8 (standard demand)

08.1 Only 38% scored this mark. The most common incorrect response was where the direction of the magnetic field lines ran from south to north, although a number of students selected the third and fourth options.

08.2 This question was not well understood, because 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 was 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.

A significant number of students believed the attractive force varied in strength between the two blocks. Others referred to the colour/shade or weight of the block.

As a result, 60% scored zero for this question, and only 4% scored full marks. 16% did not attempt this question.

08.3 There were many very vague responses to this question, with few inclusions of the level of detail expected. Many students simply stated that the electromagnet could be switched on, moved to a different position and then switched off. There were few descriptions of how the electromagnet worked.

Many believed that the magnetic blocks were themselves magnets and talked about attraction and repulsion between the blocks and the electromagnet. As a result, only 2% gave answers worthy of level three and only a further 10% gave answers worthy of level two. 13% did not attempt this question with 28% scoring no marks.

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.