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# GCSE PHYSICS

8463/2F

Report on the Examination

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## General

It appeared that most students had sufficient time to complete this paper.

The writing of some students was extremely difficult to read, which made marking their responses challenging, particularly in the longer questions.

In the low demand calculation questions, the equation is given to students in the form they will need to use it. A large percentage of students were able to substitute the given values correctly into the given equation, and in most cases, to perform the calculation correctly.

In the standard demand calculations many students were unable to recall the required equation despite being given the quantities. Some students wrote the quantities out in the alphabetical order given in the question.

## Levels of demand

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

- **Low demand** questions are designed to broadly target grades 1–3.
- **Standard demand** questions are designed to broadly target 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** Just over half of the students scored this mark.
- 01.2** Only 3% of the students scored zero with nearly 85% of the students identifying the description of the motion to score both marks.
- 01.3** Most of the students did not appreciate that the race was over 100m, although it was stated in the information given. Many students gave the total distance the athlete travelled ie 125m.
- 01.4** Although the distance of the race was repeated in the question, many of the students simply calculated the total distance over the total time. Those students who did select the correct distance often read the time axis incorrectly.
- 01.5** Only 35% of the students correctly identified the average running speed of a person.

**Question 2 (Low demand)**

- 02.1** Just over 50% of the students gave the correct answer, wavelength. Most of the other students wrote frequency.
- 02.2** Just under 60% of the students gave the correct answer.
- 02.3** Nearly 73% of the students made the correct choice.
- 02.4** Only just over half of the students scored this mark. The most common incorrect answers included the idea of the universe being very big when it began.
- 02.5** Just over 85% of the students appreciated that scientific evidence supports the Big Bang theory.
- 02.6** Although 57% of the students scored both marks the idea that graph Z is the only one to show the universe expanding was often not well expressed.

**Question 3 (Low demand)**

- 03.1** Only 11% of the students scored this mark. Although the arrows were generally in the circles as requested, the majority of incorrect answers had arrows pointing towards each pole of the magnet or both arrows pointing away from the magnet.
- 03.2** Students were asked to explain why the coat must not have two south poles facing each other. The first mark was for stating that two south poles would repel and the second mark was for stating what that would mean for the coat e.g. it would not fasten. 85 % of the students did score the first marking point.
- 03.3** Just under half of the students recognised that the arrows should point in the same direction and made the correct choice.
- 03.4** Most of the students knew that steel is a magnetic material, with 95% scoring this mark.
- 03.5** This was well answered with students explaining that the iron bar was attracted to the electromagnet causing the spring to stretch. A number of students who did not score the mark described the electromagnet stretching the spring.
- 03.6** Students were expected to use the graph to calculate the spring extension between the currents of 0.6 A to 1.2 A. While 65% of the students scored the mark, most of the others simply subtracted the two current values.
- 03.7** Just over 77% of the students scored both marks. However this was sometimes due to error carried forward from part 03.6.
- 03.8** Very few of the students scored both marks. Approximately 50% scored 1 mark. A significant number of the students gave an answer in terms of the spring reaching its elastic limit. Some students appeared to misinterpret the graph, saw the gradient decrease, and stated incorrectly that the electromagnet was decreasing in strength. For the second mark students were expected to state that the electromagnet reached a maximum strength or that the strength levelled off - only 4% of the students did this.

**Question 4 (Low demand)**

- 04.1** Just over 50% of the students scored this mark.
- 04.2** Only 40% of the students knew that infrared is used for electrical heating. The incorrect answers were equally represented.
- 04.3** Nearly 90% of the students picked the correct colour.
- 04.4** About 75% of the students answered this correctly. Common incorrect answers indicated a colour change to yellow with some changes to blue or green.
- 04.5** Just over half of the students identified the type of surface as the independent variable.
- 04.6** Nearly 9% of the students did not attempt this question with only 10% of the students scoring three marks. About 60% of the students realised that the first thing to do was pour the hot water into the cube. However beyond this, the procedure was often inaccurately described eg the ruler being used to measure the height of the hot water in the cube or used to measure the area of each side of the cube. Most of the students did not realise that the distance from each side of the cube to the infra-red detector needed to be the same. Many students incorrectly completed their answer by describing the amount of radiation given off from each of the different surfaces, possibly having looked at **04.7**.
- 04.7** About 50% of the students correctly identified the resolution.
- 04.8** This question was well answered with nearly 85% of the students scoring full marks. Students not gaining full marks usually did not label one of the bars.
- 04.9** About half of the students gave an acceptable conclusion. Common errors were to give answers in terms of conduction of heat or absorption of radiation, however, the question needed an explanation of emission.

**Question 5 (Low demand)**

- 05.1** Nearly 7% of the students did not attempt this question. Whilst angles were often incorrectly labelled 'r' a significant number of students labelled the refracted ray 'r' rather than the angle of refraction.
- 05.2** Over half of the students were unable to use a protractor to measure the angle of incidence.
- 05.3** Just over 8% of students did not attempt this question. About 67% of the students scored at least one mark for continuing the ray through the block with about 30% drawing the refracted ray in the correct direction.
- 05.4** About 57% of the students made the correct choice.
- 05.5** About 87% of the students were able to correctly calculate the value of **X**.
- 05.6** About three quarters of the students gave the correct answer.
- 05.7** 58% of the students scored zero. A further 10% did not attempt the question. Correct answers were usually well expressed.
- 05.8** Answers were often too vague to gain credit. The easiest way to score the mark was to state that light would not go through an opaque block.
- 05.9** Just over 50% of the students scored this mark.

**Question 6 (Low and standard demand)**

- 06.1** Many of the students did not make the link between zero resultant force and constant velocity and so did not choose answer B.
- 06.2** This was well done with nearly half of the students scoring all three marks. Common errors were to have section B less than 260 s and / or the time for deceleration in part C to be 50 s.
- 06.3** 67% of students correctly recalled the equation.
- 06.4** Virtually all of the students that scored a mark in part **06.3** went on to score both marks for the calculation.

**Question 7 (Low and standard demand)**

- 07.1** Just over 80% of the students correctly identified the crate as the object not likely to rotate.
- 07.2** About 48% of the students scored this mark.
- 07.3** Answers to this question were poorly expressed, with few students writing that the pointer is behind the hanging arm. The most popular answer to gain credit was the idea that each side of the device was level. The word 'horizontal' was rarely seen.
- 07.4** Only 46% of the students scored this mark.
- 07.5** Just under a half of the students could recall this equation.
- 07.6** 57% of the students could manipulate the figures and arrive at the correct answer.
- 07.7** 36% of the students could give the equation correctly.
- 07.8** 95% of students either scored zero or did not attempt the question.

**Question 8 (Standard demand)**

- 08.1** About 10% of the students did not attempt this question with a further 84% giving an incorrect answer.
- 08.2** Nearly 13% of the students did not attempt this question. Few of the students drew a second ray to produce the image position. Rays started from all positions in front or behind the lens, not passing through the focus or incorrectly refracting at the lens. Even when a correct ray was drawn the image was often not drawn in, or if drawn had the wrong size or orientation.
- 08.3** Most of students scored zero or did not attempt this question. Answers for similarity included 'both produce an image' and 'the images are the same size'. Answers for difference often did not include a comparison and gave only one part of the required answer.
- 08.4** About 57% of the students picked the correct equation and completed the calculation to score all 3 marks. However, a significant number of students that identified the equation then substituted incorrectly or simply multiplied 9 and 6 to give an answer of 54.



**Question 9 (Standard demand)**

- 09.1** This question was successfully completed by 29% of the students. Both 'ruler' and 'metre stick' were common unacceptable answers. There were numerous other answers such as ammeter, oscilloscope and timer.
- 09.2** This equation was not well known with only 33% of the students scoring the mark.
- 09.3** Just over 60% of the students scored zero or did not attempt this question. A mark was awarded for converting the distance into metres, however this was rarely done.
- 09.4** Students could answer this in one of two ways, either with reference to the wooden bridge or with altering the mass hanging from string. Just over 23% of the students scored both marks, mainly for adding more masses as opposed to indicating which way the wooden bridge should be moved.
- 09.5** Nearly 20% of the students did not attempt this question. Many of those that did attempt the question gave a detailed written description of the apparatus shown in the diagram; this was not worth any marks. Those students that scored some marks identified the need to alter the mass on the string to adjust the tension. Some students correctly identified the need to measure the wavelength and then multiply this by the frequency as the way to determine the wave speed. However many students simply stated they would 'measure' the wave speed which was not creditworthy. Less than 1% of the students identified the need to move the bridge or adjust the frequency in order to see a wave pattern.

**Question 10 (Standard demand)**

- 10.1** Although there was no need to do this, most students divided their answer into a consideration of thinking distance and a consideration of braking distance. Factors often given were to do with alcohol or drugs but rarely were they related to the effect on reaction time. A common error was to describe reaction time as being reduced and that leading to an increase in the thinking / stopping distance. Condition of the roads / tyres was common as was icy / wet roads. However these factors were rarely linked to a reduction in friction. A description in terms of less grip or traction was not acceptable. Weaker answers tended to describe what is meant by thinking distance and stopping distance without stating what changes either of these two distances.
- 10.2** This equation was well known, with 70% of students scoring the mark.
- 10.3** Just over 83% of the students scored all three marks.
- 10.4** There were few answers in terms of brakes overheating and the driver losing control of the car. Answers which did not score generally referred to the danger to passengers of whiplash, of hitting the windscreen or of cars behind crashing into the back of the car.

**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.