



GCSE **Physics**

8463/1F Paper 1 Foundation Tier

Report on the Examination

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General

Grade 1-3 calculation questions were well answered, where the equation is always given and students will not be required to rearrange the equation. Grade 4-5 calculation questions were answered more successfully this year as all students had an Physics Equations Sheet with all the equations printed on it. At grade 4-5 students are expected to rearrange equations convert units, so it is beneficial for students to be able to quickly identify if the units given in a question are correct for use in the equation. Question 09.3 and 09.4 discriminated well between students of different abilities and were generally well attempted.

Handwriting continues to be a problem for a number of students, making it very difficult for examiners to read what has been written. An increasing number of students are using computers to word process their answers for extended response questions, which is helpful for examiners in awarding credit for student responses. However, students must use the question number as printed in the question paper eg 4.3 rather than 4(c) to ensure that their work is marked with the corresponding question part.

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** Only 38% of students scored a mark for knowing that when a person touches a negatively charged metal dome they also become negatively charged.
- 01.2** 55% of students scored a mark for this question about the force of repulsion between like charges.
- 01.3** Only 29% of students scored a mark for this question. The majority of wrong answers chose the diagram for the electric field around a positively charged dome.
- 01.4** 62% of students chose the correct answer, knowing that an insulator has a high resistance. The most common incorrect answer was temperature.
- 01.5** 67% of students answered this question correctly, knowing that a spark jumps when the air is ionised.
- 01.6** 78% of students answered this question correctly, identifying electrons as the particle transferred when a spark jumps between two objects.
- 01.7** 93% of students calculated the energy transferred correctly.

Question 2 (Low demand)

- 02.1** 48% of students were able to recall the frequency of the UK mains electricity supply.
- 02.2** 75% of students were able to recall the potential difference of the UK mains electricity supply.
- 02.3** 94% of students scored 2 marks for this calculation question. For low demand calculations the equation is provided in the rearrangement needed to answer the question.
- 02.4** 91% of students correctly identified the circuit symbol for a thermistor.
- 02.5** Only 24% of students chose the correct answer for this question, which tested how the potential difference is shared between components in a series circuit.
- 02.6** The question discriminated well between students. 12% of students scored 2 marks, while 33% scored 1 mark. The question tested whether students knew how the potential difference was shared between components with equal resistance. 'Because it's a series circuit' was insufficient to score the 2nd marking point.
- 02.7** 80% of students scored 2 marks for this question, by calculating the change in resistance between two values of temperature.

Question 3 (Low / Standard demand)

- 03.1** 53% of students scored a mark for this question showing how the extension of a bungee cord should be calculated.
- 03.2** 90% of students scored both marks for correctly calculating the elastic potential energy.
- 03.3** 90% of students scored both marks for correctly calculating the maximum kinetic energy.
- 03.4** 95% of students chose the correct equation. However, in this exam series students were provided with a Physics Equations Sheet.
- 03.5** 56% of students scored all 3 marks for this standard demand calculation question.
For 3 mark calculations, these general principles apply:
The 1st mark is for the substitution.
The 2nd mark is for the rearrangement.
The 3rd mark is for the answer.
In straightforward calculations, no working needs to be shown, but students should be encouraged to do so just in case the final answer is incorrect.
If the answer is correct, 3 marks can score.
- 03.6** 27% of students scored 2 marks for this question, while 59% scored 1 mark. This question tested understanding of energy dissipation in energy transfers. A lot of students only ticked one box, ignoring the rubric of the question.

Question 4 (Low / Standard demand)

- 04.1** 85% of students correctly identified the range of the measuring cylinder.
- 04.2** 75% of students identified that the measured volume of the ring would be larger if thicker string were used.
- 04.3** 78% of students completed the calculation successfully, showing how the difference between two values of volume could be used to determine the volume of a ring. The most common incorrect answer was to calculate the mean of the 2 values, which scored zero. A common incorrect answer by students was to multiply all the numbers together, which scored zero.
- 04.4** 89% of students answered the question correctly, understanding that when repeated results are the same or similar, the experiment can be described as 'repeatable'.
- 04.5** 90% of students understood how to deal with the zero error on the balance.
- 04.6** 96% of students wrote down the correct equation. However, in this exam series students were provided with a Physics Equations Sheet containing all the Physics equations.
- 04.7** 79% of students scored all 3 marks for this standard demand calculation of mass.

Question 5 (Low / Standard demand)

- 05.1** 48% of students understood that the volume of air in the syringe decreased.
- 05.2** 83% of students understood that the distance between the particles decreased.
- 05.3** 85% of students understood that the frequency of collisions increased.
- 05.4** 86% of students understood that the air pressure increased.
- 05.5** 85% of students answered this question correctly, linking temperature increase to the mean speed of gas particles.
- 05.6** A standard demand calculation of temperature change, which was a good discriminator between students who could or could not rearrange an equation. 35% of students scored 3 marks, while 45% of students scored no marks.

Question 6 (Low / Standard demand)

- 06.1** Students were more successful at identifying cosmic rays as natural and medical X-rays as man-made. Students were less confident about nuclear accidents and radon gas and often got these the wrong way round. 70% of students scored 2 marks, while 27% of students scored 1 mark.
- 06.2** A question that discriminated well, with 27% of students scoring 2 marks and 24%

scoring 1 mark. A number of students stated that alpha is stopped by paper but had ticked the wrong box, so scored no marks. Many students were unable to draw the correct conclusion from the given data, perhaps they had learned the fact but not observed the practical demonstration.

- 06.3** A question that discriminated well, with 27% of students scoring 2 marks and 44% scoring 1 mark. A number of students stated that beta is stopped by aluminium but had ticked the wrong box, so scored no marks. Many students were unable to draw the correct conclusion from the given data, perhaps they had learned the fact but not observed the practical demonstration.
- 06.4** 94% of students correctly identified a precaution to prevent contamination.
- 06.5** 81% of students correctly identified the activity after one half-life.
- 06.6** 86% of students correctly linked activity to risk of harm.

Question 7 (Low / Standard demand)

- 07.1** 42% of students answered this question correctly, identifying the colour of the insulation around the live wire.
- 07.2** Students were slightly more successful answering this question, with 48% correctly identifying the colour of the insulation around the neutral wire.
- 07.3** 64% of students were able to identify the circuit symbol for a fuse.
- 07.4** 92% of students scored 2 marks for this question. For low demand calculations the equation is provided in the rearrangement needed to answer the question.
- 07.5** 72% of students multiplied numbers given in this standard demand calculation and scored 2 marks. Very few students attempted the unit conversion. Only 8% of students scored 3 marks for the correct final answer.
- 07.6** 43% of students realised that the total energy would be greater.

Question 8 (Low / Standard demand)

- 08.1** A small number of students added 6 to the values of current and calculated the mean of all 4 numbers, scoring zero. Some students thought the value of 0.21 was an anomaly and omitted it from the calculation, these were still able to score 2 marks for correct evaluation of the mean. However, this wasn't the intention with this third value. 81% of students scored 2 marks for the question.
- 08.2** The question discriminated well with 81% of students scoring 3 marks and 6% of students scoring 2 marks, while 10% of students scored no marks. Students who misread the value of current were allowed to score the 2nd and 3rd mark provided it was within a generous range. Students who ignored the scale and thought 17 units of current should be multiplied by 3 and arrived at an answer of 51 also scored 2 marks.

08.3 Students found this question difficult, with only 23% of students scoring the mark for identifying how the gradient changed as the potential difference increased.

08.4 33% of students correctly identified the filament lamp as the component.

Question 9 (Standard demand)

09.1 74% of students scored this mark. Common incorrect answers were ‘method A’ or ‘method B’, students thinking they were linking a method to the energy transfer.

09.2 63% of students scored this mark. Common incorrect answers were ‘method A’ or ‘method B’ students thinking they were linking a method to the energy transfer. Another common answer was ‘hydroelectric energy’ which didn’t score. The word ‘potential’ was needed for an answer of ‘gravitational potential’. As the question was worded it seemed reasonable to credit ‘kinetic’ since the water moving uphill would have kinetic energy before it reached its destination and stored only gravitational potential energy.

09.3 Many students failed to realise that the calculations needed were to show the amount of stored energy wasted or the amount of stored energy usefully transferred. Simple subtractions were insufficient to score the calculation marks. To score 4 marks, two comparisons were needed in addition to a comparative calculation. Although the comparative calculation performed by a minority of students involved dividing 33 600 kJ by 490 kJ and getting an answer of 68.6, which is the number of times more energy stored by method A compared to B. This single calculation was enough to score 4 marks with the two simple comparisons. The installation comparison only scored if value was added to the information eg Method A is easier to install or is likely to cost less money. 21% of students scored 3 or 4 marks, while 65% of students scored 1 or 2 marks.

09.4 A straightforward question that students found easy to answer with 40% of students scoring 3 or 4 marks, while 40% of students scored 1 or 2 marks. A lot of students gave an alternative solution without saying what activity should be reduced or stopped. An example would be ‘use electric cars’ without saying ‘instead of using petrol/diesel cars’. As the majority of cars on the road are still petrol/diesel if a student said ‘don’t use cars’ it was taken to be a petrol/diesel car and scored a mark. Some students discussed the reduction of ‘food miles’ by forcing people to shop locally, which was also creditworthy. 10% of students didn’t attempt answer this question part.

Question 10 (Standard demand)

10.1 15 % of students scored 3 marks, 39% scored 2 marks and 30% scored 1 mark. The most common mark to score was either ‘nuclei’ or ‘gamma rays’.

10.2 In this exam series all equations were provided for the students on the Physics Equations Sheet. 94% of students scored the mark.

10.3 67% of students scored 2 marks for multiplying the power by the time, whether they had converted the power or not. Most attempts to convert the power were incorrect. Only 3% of students scored all 3 marks for this calculation of energy.

- 10.4** 13% of students scored a mark. ‘Wear protective clothing’ or ‘hazmat suits’ were common incorrect answers. Any idea of burying the radioactive waste was credited, so ‘bury it in a field’ was ok, as was ‘bury it in landfill’, which from a student’s perspective is equivalent to burying it underground. ‘Keeping it away from people’ was insufficient.
- 10.5** 74% of students scored 2 marks, while 3% scored 1 mark. The answer of 29.2 days was worth 1 mark as this could only have been calculated by doing the correct calculation and then subtracting the result from 365.

Question 11 (Standard demand)

- 11.1** Students struggled to answer this question, and many failed to say how the resistance should be measured despite the apparatus set-up being shown in a photo. Students made statements like ‘measure the resistance’ without saying how, taking measurements from the ammeter and voltmeter were exceptions rather than the norm. Most students scored marks in Level 1 and 17% did not attempt the question. Only 3% of students scored in Level 3, while 16% of students scored in Level 2.
- 11.2** 64% of students identified the graph showing the relationship between length of wire and resistance.
- 11.3** Many students said ‘low potential difference (or pd)’ or ‘low voltage’ scoring a mark. Lots said so ‘no risk’, without clarifying so didn’t score the second mark. 7% scored 2 marks, while 45% scored 1 mark. 9% of students did not attempt this question part.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results Statistics](#) page of the AQA Website.