
GCSE PHYSICS

8463/1H

Report on the Examination

8463

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General

Questions 1 to 3 were standard demand. Questions 4 to 8 were a mixture of standard and standard / high demand. Questions 9 to 10 were high demand.

The paper was well attempted by the majority of students who were able to complete the examination within the specified time. Calculations were generally well done and students wrote extensively on the prose questions.

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** Just over 50% of students scored 2 marks on this question. Most students understood that it was electron transfer that caused the student to become charged. Some students didn't describe the direction of transfer in enough detail to score the second mark. Mention of positive electrons or proton movement negated both marks.
- 01.2** 76% of students answered this question correctly. Most students who answered incorrectly either added fewer than three arrows, or drew field lines that resembled those of a bar magnet.
- 01.3** Many students scored no marks, 51% of students scored at least 1 mark. There were, however, some very good answers linking all mark scheme ideas. Many stated that the tap was charged and usually made statements that negated the first two marking points.
- 01.4** 54% of students scored 1 or more marks. The mark for a 'lower build up of charge' was seen more frequently than the property of copper. Some students stated, incorrectly, that the copper wires were positively charged.

Question 2 (standard demand)

- 02.1** 54% of students scored all 3 marks. Common mistakes were to add the value of 0.30 or multiply or divide by 0.30. These students scored 2 marks. Some students calculated 801 (counts per minute) but without changing the unit on the answer line, so only scored 2 marks.
- 02.2** 92% of students scored 2 marks for this question. Incorrect answers usually resulted from dividing the two figures given in the question.
- 02.3** 58% of students scored 2 marks. Students failing to score both marks usually did the calculation, but related it to the yearly dose rather than the dose linked with causing cancer.
- 02.4** 20% of students answered this question correctly. ‘Everyone knows what a banana is’, was a common answer, which was insufficient. The idea that a radiation dose could be compared with a number of bananas was enough to be creditworthy, although this could also be related to a risk or hazard.

Question 3 (standard demand)

- 03.1** 65% of students scored 3 marks. A very common mistake was to switch the positions of the ammeter and voltmeter or put them both in series. A large number redrew the circuit in the space below Figure 3. In this case, students needed to indicate which circuit was the one to mark, otherwise the list principle applied.
- 03.2** 56% of students scored 4 or more marks in this question. The question rewarded students who had clearly prepared methods for the required practical activity. Students had a circuit diagram to refer to, but many did not mention varying the length of the wire, which limited them to Level 1. The three quantities that need to be measured to ensure a valid outcome were length, potential difference and current. In addition to this students needed to state how the resistance would be calculated and include an appropriate hazard to reach Level 3. Risk of electric shock was judged to be insufficient for a hazard as low voltage supplies are likely to be used in schools. Quite a few students stated that the resistance of the wire could be measured using the variable resistor, which limited them to Level 1.
- 03.3** 73% of students answered this question correctly.
- 03.4** 43% scored 2 marks on this question, 94% of students scored at least 1 mark.

Question 4 (standard / high demand)

- 04.1** 48% of students scored 2 marks for this question, with 40% scoring 1 mark. Those who scored 1 mark usually did so for the second blank.
- 04.2** 94% of students recalled this equation correctly.
- 04.3** 87% of students scored 3 marks for this question. The first two marks in the question were for the substitution into, and rearrangement of, the equation. The third mark was for a correct final answer.
- 04.4** 31% of students scored 2 marks for this question. Many students read the change in speed correctly from the graph and a range of values, between 1.2 and 1.5 m/s, were accepted. The percentage increase in speed proved more challenging as students were often unsure whether they should have divided by the 9.5 (m/s) or the 11 (m/s). Students who did $[(11.5/9.5) - 1] \times 100$ calculated correctly, scored both marks.
- 04.5** This question differentiated well, with 44% of students scoring 2 or more marks and 49% of students scoring at least 1 mark. Very few students scored 3 marks. The decrease in speed due to additional work done or the increased gravitational potential energy were often seen. Many students thought that the cyclist should increase their power output when cycling uphill, although the question was asking about their maximum speed.

Question 5 (standard / high demand)

- 05.1** 57% of students scored 2 marks for this question, with 32% scoring 1 mark. The most common mistake was not stating which quantity should remain constant, 'charge' being a commonly seen incorrect answer.
- 05.2** This question discriminated well between students with 13% of students scoring 3 marks, 30% scoring 2 marks and 40% scoring 1 mark. Some students incorrectly stated that the current decreased or the resistance decreased. Contradictory statements often negated marks, e.g. pd increases causing current to increase but then decrease.
- 05.3** 24% of students answered this question correctly. Students needed to answer in terms of amount / proportion / percentage input compared to useful output in order to score the mark.
- 05.4** This question differentiated well, with 26% of students scoring 2 marks, while 39% of students scored 1 mark.
- 05.5** 13% of students scored 2 marks on this question. Very few correct answers of 1000 ohms were seen. When 1000 ohms was given, the reason usually justified the award of 2 marks, so very few 1 mark answers were seen.
- 05.6** 12% of students scored 4 marks on this question. Many students failed to add the resistance of the two series resistors together. The most common incorrect answer was 0.0024 (A), which scored 2 marks. Most students who calculated the correct current also correctly showed their answer to 2 significant figures.

Question 6 (standard / high demand)

- 06.1** 57% of students scored a mark for this question. However, many students thought that the smoke itself was detected by the smoke detector, rather than it being about the alpha radiation not being detected. Alpha radiation being blocked / stopped / absorbed by the smoke particles was needed for the mark.
- 06.2** 74% of students scored a mark for this question, usually for the idea of low penetrating ability. 'Doesn't penetrate skin' was creditworthy, 'doesn't penetrate paper' was insufficient. 'Doesn't penetrate the case' was allowed.
- 06.3** 53% of students scored 1 mark for this question but very few scored 2 marks. Most students answered in terms of beta and gamma radiation being able to penetrate the smoke, but didn't link this idea to the need for a change in the radiation reaching the detector for the alarm to sound.
- 06.4** Very few 2 mark answers were seen. Most students scored zero, with insufficient responses having to do with saving money, or not having to replace the source very often. Very few linked the graph to the question, and realised that 1.3 half-lives could be any amount of time depending on the radioisotope used.
- 06.5** Well answered by many students, 36% scoring 3 or 4 marks. Those who didn't usually gave opposite statements to the ideal properties, such as low penetrating ability but highly ionising, which will have limited their overall score. The minimum required for a 4 mark answer would have been two properties with explanations, or four simple statements. Many students gave much fuller answers than this, however.

Question 7 (standard / high demand)

- 07.1** 64% of students scored 2 marks for this question. Some students scored both marking points in the first two answer lines. As long as their answer wasn't followed by an incorrect answer in the second set of answer lines, this was ok. Calculate means and identify anomalies were commonly seen correct answers. Improve accuracy was insufficient.
- 07.2** Only 3% of students scored 2 marks, with 15% of students scoring 1 mark. Lots of students stated human error, which is always insufficient for a description of the error type. A number of students stated parallax error, which was worth a mark.
- 07.3** 49% of students scored 2 marks, while 42% of students scored 1 mark. Many students related higher E_k or higher speed to higher pressure. Some students only discussed collision frequency instead of pressure, scoring only 1 mark if they said the particles' speed increased.
- 07.4** 60% of students scored 3 marks. The most common mistake was to wrongly calculate the constant, which prevented any further marks from scoring.
- 07.5** 5% of students scored 2 marks, while 34% scored 1 mark. Students more often scored a mark for increased kinetic energy of particles. Increased kinetic energy of the air was insufficient. Most students thought that the internal energy increased because there are more air particles in total. The question was deliberately worded so that the increase in mass of air was not the focus of the question. The internal energy of the air increased because of the work done on the air, which raised the temperature of the air.

Question 8 (standard / high demand)

- 08.1** 11% of students scored 3 marks, 27% of students scored 2 marks. Lots of thorough answers were seen, but they needed to state the advantages of nuclear, rather than disadvantages of shale gas. 'Shale gas releases CO₂' did not score a mark, but 'nuclear does not release CO₂' did score a mark. Information about shale gas was given in the question, which is why these answers were insufficient for a mark.
- 08.2** 66% answered this question correctly. The most common correct answer was uranium. A common incorrect answer seen was oil.
- 08.3** Many good answers seen with 12% scoring 4 marks and 20% scoring 3 marks. Some students didn't mention the nucleus absorbing the neutron or the nucleus splitting in two, so they didn't score the first two marking points. The first marking point was the least likely to score. The third marking point was scored by most students.

Question 9 (High demand)

- 09.1** 48% of students answered this question correctly. The danger would be, if a person touched the case, they would receive an electric shock or be electrocuted. The case becoming live was insufficient for the mark.
- 09.2** 73% of students scored 3 marks. Most students who didn't score 3 marks either didn't convert the power or converted it incorrectly, scoring 2 marks if the rest of their calculations were correct.
- 09.3** This question was a challenging two-step calculation. 50% of the students scored all 5 marks. Many students failed to calculate the energy transferred using $E=Pt$, but if they attempted to calculate an energy, even if incorrect, they could score the last 3 marking points in the calculation. Some students calculated the mass of water that could be heated per second and then multiplied by 14 (seconds).

Question 10 (High demand)

- 10.1** 87% of students scored 3 marks. Some students rearranged the equation incorrectly and then substituted, scoring 0 marks.
- 10.2** This was a conceptually demanding question. 13% of students scored 1 mark, usually for the idea that halving the wind speed decreased the output by a factor of 4.
- 10.3** A challenging grade 8-9 calculation. 30% of students scored 3 marks. A few students scored 1 mark for the substitution, whether they converted the power to watts or not.

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.