AQA

AS LEVEL
PHYSICS

7407/2 Paper 2
Report on the Examination

7407
June 2022

Version: 1.0

Further copies of this Report are available from aqa.org.uk

General comments

Students should be aware that questions in Section A assess practical skills. Consideration of significant figures (sf) should apply to each relevant question. Answers without supporting evidence will rarely gain full credit.

Questions in Section B can cover all parts of the AS content. Students should expect that questions may begin addressing one topic and then switch to another, usually within one context. In this paper, students found the context of question 4 difficult at times. When attempting such questions, especially when many data are presented, students will help their understanding of the problem by setting out relevant available information before seeking a solution.

Section A

Question 1

01.1 The most common response was 0.08, with a large majority of students failing to appreciate that the *y*-axis was a plot of $2s$ and so the absolute uncertainty had been doubled.

01.2 Students were more successful in drawing the line for the minimum gradient than for the maximum gradient. A common mistake was to draw the line for the maximum gradient through the bottom of the error bar for the first plot and through the top of the error bar for the final plot. This bypassed the fifth plot and was, consequently, incorrect.

01.3 Examiners marked this question based on the student's values for **01.2**. A value to 2 sf was expected.

01.4 Very few students used their value for g from **01.3**, with many opting to make a comparison using 9.81.

01.5 About 60% of students gave the correct answer.

01.6 Just under half the cohort gave a correct description of how the graph would change. Those who simply stated what would happen to the values, rather than to the plotted points or line, did not get credit.

Question 2

02.1 Barely one-fifth of the cohort correctly determined the vernier scale reading. Some correctly determined the length but gave a final answer to 2 sf.

02.2 This question tested knowledge of unit prefixes. About half the cohort correctly determined a value for R_4 and divided by their length from **02.1**. A significant number of students successfully obtained a value for R_4 but did not go on to divide by their length. This had consequences for them in **02.4**.

02.3 This question was well answered by a majority of students. The second marking point was for the idea of repeating measurements along the wire or at different orientations. Statements such as "*repeat measurements at different locations*" were insufficient for

credit. Comments about considering a zero error were treated as neutral unless they explicitly referred to a way of reducing random error.

02.4 An allowance was made here for students who used their incorrect length and their incorrect R_4, but students who used their final answer to **02.2** as a value for R in the resistivity equation were penalised. Students should be aware that such "error carried forward" answers will be checked for correct rounding and are advised to use full calculator values or the values given in their working out.

02.5 Barely 5% of students processed the information provided to make a correct deduction about changing one of the values of the fixed resistors. This question may be useful to teachers to illustrate the several steps of reasoning that are required to arrive at an answer.

02.6 Similarly, this question shows how answers can be obtained quickly using proportionalities. Of the students who gained the correct answer, many explicitly worked out the value using the resistivity equation.

Section B

Question 3

03.1 This required students to make sense of data and this proved challenging to many, even though the data were presented in separate paragraphs. The most successful route was for students who calculated the total energy stored by the battery and then worked out the output power.

03.2 The most common differences given between microwaves and sound waves were in terms of transverse vs longitudinal, and polarisability. "*Microwaves are part of the electromagnetic spectrum, but sound waves aren't*" was a common response that contains insufficient detail.

03.3 About 50% of students could give one condition for coherence, with about 30% giving both. Statements about being "*in phase*" were not accepted as this is an instantaneous situation that can arise between incoherent waves.

03.4 Many students did not identify that the path difference could be obtained using the Pythagorean theorem. Students could have aided their understanding of the problem by drawing lines **AM** and **BM** on **Figure 5**. Some students failed to gain the second mark because they rounded their values of **AM** and **BM** to two significant figures before finding the difference. This gave a final answer of $0.3\ \mathrm{m}$. Students should expect to give their final answer to a numerical '*show that*' calculation to more significant figures than the target value.

03.5 Students should also appreciate that a '*show that*' question is usually followed by a question requiring use of the value given. Very few students made the connection between the path difference (leading to a minimum intensity) and the wavelength.

Question 4

04.1 A surprisingly large number of students struggled with this relatively simple '*show that*' question. This was used to establish that the motion down, and up, the rail occurred under the condition of constant acceleration.

04.2 About 40% of students gained full marks by realising that the answer could be obtained using a '*suvat*' equation or by considering the transfer from stored gravitational potential energy to kinetic energy. About 40% of the cohort made no relevant progress. Students are reminded not to give final answers in surd form as they will not gain the mark.

04.3 Most students knew that they needed to obtain the area of the graph between **B** and **C**. The graph was deliberately constructed without curves so that students could obtain this area by geometry. Crude attempts to count the squares were not rewarded. A significant number of students thought they could use $F\Delta t$, even though the value of F varies throughout the time period.

04.4 Only about 15% of students gained any credit in this question. The rest of the cohort failed to realise that this could be solved using '*suvat*' equations. Students who were successful commonly used $s = \frac{1}{2}at^2$ with half the duration from **C** to **D**, and then doubled their answer.

04.5 A large number of students did not attempt this question or made no valid point. The questions followed the sequence of the leg jump from **A** to **E**, and students were expected to use a reading from the graph beyond **E** to determine the mass.

Section C

Generally, students were more successful in answering questions 9, 21, 23 and 30 and less successful in answering 7, 8, 19, 20, 22, 24, 32 and 34.

Mark Ranges and Award of Grades

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