OXFORD
INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL A-LEVEL PHYSICS

(9630) PH05 – Physics in practice
Report on the examination

June 2022

REPORT ON EXAMINATION: INTERNATIONAL A-LEVEL 9630 PH05 – PHYSICS IN PRACTICE – JUNE 2022

The structure and demand of the questions were similar to previous series. Students had many opportunities to demonstrate their knowledge and understanding in many different areas of the specification.

A lack of essential detail prevented many students gaining credit in those questions requiring an explanation. Answers were often vague and not of A-level standard. Questions with a significant mathematical content were often answered well.

In most calculations partial credit can be given for incorrect answers that have some correct working. This is only possible when students set out their answers clearly so the steps can be identified. This report highlights several question parts where this was relevant.

QUESTION 01

This typical data-analysis question was answered very well by the majority of students.

One common error was in the treatment of significant figures, which is an important aspect of practical work that will continue to be assessed in this paper.

01.3 discriminated well. One problem seen was in the treatment of uncertainties.

01.4 was slightly more demanding. Some students struggled with the powers of ten, and therefore did not gain the unit mark when their answers did not match. Examiners were looking for J for the unit of energy. Although base units were condoned, alternatives such as the $\mathrm{N\ m}$ did not get credit.

QUESTION 02

The use of the error bars in 02.1 caused difficulties for some students who simply drew lines from the tops and bottoms of the extreme points. These lines did not go through all of the error bars and therefore the mark was not given. The use of a long transparent ruler probably helped some students gain full credit.

Most students are aware that gradients should be determined using more than half of the range on each axis. The reading of the points was part of the assessment in 02.2 and some students did not get credit because they misread the values from their graph.

Several valid approaches to 02.3 were seen and all were given credit. Many students were awarded full marks and this question discriminated well. For those who did not get the correct answer, partial credit was available where the steps taken by the students could be seen. It is important that students set out their answers clearly.

QUESTION 03

Most students were able to determine the turns ratio in 03.1, but many did not realise that a ‘reliable’ value required the use of several sets of data.

Part 03.2 was answered correctly by most students, with some others gaining one mark when the substitution of the incorrect data from the table was seen.

There are some common elements to an experimental method, and many were seen in the answers to 03.3. The best answers tended to follow the bullet points. Students who mentioned that the primary voltage had to be varied and measured in their method did not get credit unless they made it clear what apparatus was required to do this.

QUESTION 04

The 'show that' relationship was answered well by those students who put down their answers fully, one step at a time.

There were several aspects to 04.3 which produced a good range of marks. The best answers used scales that meant the points were spread across both axes, and had correctly plotted plots with a best-fit line passing through them.

In 04.4 students were expected to show that the gradient was approximately -1. Most of the students who did this went on to state that Boyle's Law was therefore supported.

Students who attempted to use the false intercept from their graph could not make progress in 04.5. One mark was available for the correct anti-logarithm.

QUESTION 05

Fully correct answers to 05.1 were rare. Other students who set out their answers clearly so that the steps could be identified were able to pick up intermediate marks.

When faced with a 'show that' question, like 0.5.2, students must make it clear what equation they are using and not just put down a string of numbers in order to gain full credit.

Although many students were aware that the equation for specific heat capacity was needed in 05.3, many showed a poor understanding of the situation and used the incorrect power in their answer. This received no credit.

Examiners expected to see references to the rate of temperature increase in 05.4. The mark was also awarded to answers that linked their discussion to the kinetic energy of the electrons when they reached the target.

The best answers to 05.6 made it clear which energy transfers were being discussed, and where these transfers occurred. Many answers referred to what was happening at the target, rather than the filament, and therefore failed to score.

QUESTION 06

In order to gain full marks for the 'show that' in 06.1, students had to demonstrate each step clearly. Many missed out the equation for the area under the graph explicitly. Students must make each step very clear in derivations of this kind.

Most students answered 06.2 by stating, in various ways, that the strain was 0.4 when it breaks. The answers that gained most credit went further and related the breaking point to the length of the piece of metal.

Several different approaches to determining the area under the graph were seen in 06.3. All were given credit if they came out with the expected answer. The simplest acceptable method was to count squares.

The best answers to 06.4 set out the relationship between the gravitational potential energy E_p and the kinetic energy E_k as the first step. Students who simply put numbers down on the page, and left it to the examiner to work out what they were doing, did not gain full credit.

In 06.5 students benefitted from setting out their work correctly. Full credit was not given for the correct answer unless it was clear that the change in E_p had been calculated.

Part 06.6 was one of the most demanding questions on the paper. Most students simply invoked conservation of momentum without realising that an external force was holding the sample when the hammer struck.

QUESTION 07

This question tested several different areas of the specification.

Most students found 07.1 and 07.3 very straightforward.

07.2 required students to set out what they were doing in order to gain full credit. Intermediate marks were given for incorrect answers, but only when the working was clear.

Many students did not get credit in 07.4 because they failed to take into account the fact that the antenna was accelerating, despite it being clearly stated in the question.

A common error in 07.5 was to miss out the 4π. This question was correctly answered by most students, however.

Question 07.6 required a ratio approach, and many students were able to make good progress with it. Those that made a start often went on to gain full marks.

Full answers to 07.7 were surprisingly rare. Many students missed out at least one aspect of coherence in their answer.

The calculation in 07.8 was usually completed correctly. Students who mixed up the separation and distance to the ship could get partial credit, provided their working was sufficiently clear.

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