OXFORD
INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL A-LEVEL PHYSICS

(PH01) Paper 1
Report on the examination

June 2019

REPORT ON EXAMINATION: INTERNATIONAL A-LEVEL PHYSICS PH01 UNIT 1 JUNE 2019

The paper was accessible as students attempted all parts of the paper and appeared to have sufficient time to complete it.

Student performance in both mathematical work and in written answers is improving.

Mathematical work was set out more effectively and logically than in earlier sittings of PH01, even for extended calculations. As usual, there was a strong correlation between care taken to set work out and eventual success in a calculation. Student are advised to quote any equation they use in full before making a substitution or re-arrangement. Many students lost marks for giving answers to one significant figure: such answers are rarely acceptable. Students should also round their answers correctly and not simply ignore the unwanted significant figures.

Data analysis skills seem to be improving, in particular with graphical work. Nevertheless, students should remember to indicate their working clearly on graphs. Gradients should be determined using a large triangle or other equivalent visible method. Such triangles should occupy at least half of the available space.

Written work was reasonably well organised and successful.

Question 1

Students who recognised that the question dealt with the vector nature of velocity answered the question well. However, few mentioned the word vector in their explanation.

Question 2

This was well answered by nearly every student although a few failed to give the answer in fundamental (base) units, opting instead for alternative S.I. units.

Question 3

Many students got this completely correct but a significant number made at least one error. A fairly frequent error was to give the charge of the positron as 1 or +1 despite the fact that the heading in the table gave the unit as coulomb. There was some confusion between neutron and neutrino.

Question 4

This was generally well answered. The most common omission was that the two photons produced, would, under the given circumstances, travel in opposite directions, conserving momentum.

Question 5

5.1 was well done although a few students tried to involve more than three terms in their expression of the Pythagoras equation. 5.2 was less well done. A large minority of students recognised that the smallest resultant velocity occurs when the swimmer swims in a westerly direction near to one of the banks.

Question 6

There were many complete and successful answers to this question. Where students failed to arrive at the correct answer, mistaking the distances involved was the most common error while others omitted a term in the moment equation.

Question 7

Part 1 was well answered by most students. Almost all mentioned the increase in proton number associated with the decay although some were not specific about the magnitude of the increase. Some students omitted to mention that the nucleon number is unchanged and a few assumed that it decreased. In 7.2, many students mentioned the very low or zero mass of the neutrino and the lack of charge but fewer mentioned the weak interactions of neutrinos with other matter. There were many complete and correct solutions to 7.4. Of those who did not achieve full marks for the part, most managed to give an expression for the total charge or for the mass of the nucleus.

Question 8

8.1 was well done. A small number of students used sin instead of tan which lost them one of the marks. There were many correct solutions to 8.2 but a significant number of students tried to use an inappropriate equation of motion. Other students calculated the magnitude of the displacement correctly but forgot that displacement is a vector and omitted to say that the arrow hit above C. Students are advised to read the command lines of all questions carefully.

Question 9

9.1 was generally well done but errors included inaccurate extraction of data from the tangent of the graph and giving the final answer to only one significant figure. A few students did not draw a tangent but tried to calculate the acceleration just from the data point at 16 s. 9.2 was also correctly done by many although many students did not explain what they were doing well enough. Unsupported answers outside the permitted range lose process marks. There were some very good solutions to 9.3 from students who added accurate detail into their graphs. The most common error was for students to start their graph at zero rather than at the displacement that they had calculated in question 09.2. Another fairly common error was to have the initial curved section bending the wrong direction.

Question 10

10.1 was not well answered. Many students mentioned that the magnitudes of the momenta are different but often failed to say which was greater. A significant number of students mentioned the different directions of the two momenta but complete, correct answers were rare. Many students answered 10.2 correctly but a significant number failed to take account of all of the forces acting. 10.3 was done correctly by nearly all students. Most students did the calculation in 10.4 correctly but some selected the wrong trigonometric function. Students tended to find 10.5 difficult. Many struggled to find the resultant force. Most opted for a route via equations of motion when an energy transfer approach was easier. Most students gained some credit for their answers and a significant number produced complete solutions. A significant number of students struggled with the setting out of their work because they were unsure of the direction their calculation should take.

Question 11

Most of the students gained full marks for 11.1. Few made plotting errors but more chose poor best fit lines. Some students did not draw straight lines with a ruler and others tried to force the line through the origin. Students are reminded to use a sharp pencil, make their plotted points small, and generally work neatly when drawing graphs. 11.2 was correctly done by most students but some thought that the fact that not all of the points were exactly on the line indicated that the graph did not support the equation. In 11.3, many students could identify a possible systematic error, for example, ignoring the weight of the pan or a zero error on the ruler. However, a significant number showed that they did not appreciate the difference between a systematic and a random error. 11.4 was generally well done. Although quite a large range of answers was accepted, student who drew very poor best fit lines tended to fall outside the acceptable range. 11.5 was not answered well by most students. Student were expected to appreciate that the stiffness was still the gradient of the graph and that the gradient was unaffected by the systematic error.

Question 12

Parts 12.1 and 12.2 were answered correctly by most students. Many students calculated the correct answer to 12.3 but a large number chose to leave the answer to only one significant figure and this was penalised. Other students could not operate the inverse-square law equation or became confused about the distances involved. 12.4 was answered correctly by many who solved the problem by calculating the time before the intensity would drop below the acceptable level. This is not expected at AS level. The alternative was to make the simple calculation of what the intensity would be after 1, 2 and 3 half lives. Some students chose to base their calculations on an intensity of 0.090 W m^{-2} whereas it was appropriate to use 0.090 W m^{-2} as a baseline. These students lost only one mark. Most of the students had the right idea in 12.5 but some did not manage to express their ideas clearly.

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