OXFORD
INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL A-LEVEL PHYSICS

(9630) Paper 1
Report on the examination

January 2018

GENERAL

There were some strong performances but there were also students who struggled to come to terms with the demands of the paper.

The topics examined on the paper were accessible to most of the students but there was a marked disparity in performance depending on the skills needed within each question. Questions involving calculations were generally done much better than questions involving written explanations. Questions involving data analysis, such as the manipulation of data to produce a graph or the extraction of data from a graph were also poorly done by many students. Many students left questions involving data analysis and written explanations un-attempted. It seemed that written communication in English was a problem for some students but reading comprehension seemed to be good enough for students to understand contexts and information for questions of a mathematical nature.

Students tended to be more successful with single stage calculations but found greater difficulty with those that involved more than one stage. In several questions, calculations built on each other in subsequent parts. When calculations build through a question in this way, the structuring of the question is intended to be helpful to students: the direction of a calculation will often be a continuation of the ideas from the previous part of the question. Experienced students should be able to use the structuring to guide them into how to approach the next part of the question. Students did not seem to be aware that choice of numbers of significant figures is often important. It is good guidance to give final answers to the same number of significant figures as the data that is provided in the question. There are exceptions to this general rule but it works well for most of the time. Students may not be awarded the final mark for use of an inappropriate number of significant figures. In particular, students should be warned that giving answers to 1 significant figure is usually inappropriate. An exception to this may be when giving percentage uncertainties.

QUESTION 1

Most students identified that the particle involved was a β^- particle and went on to calculate the proton and nucleon numbers correctly. A few misidentified the nature of the decay, while others wrote an incorrect symbol for the beta decay. It should be noted that students are expected to know appropriate symbols and the substitution of a b or B instead of β was not considered to be worthy of a mark.

QUESTION 2

Most students thought that the normal reaction of the table was the action-reaction pair for the weight of the object. Students that correctly identified the gravitational attraction of the weight on the Earth always went on to give some relevant information about the nature of action-reaction pairs for example: the forces should be of the same nature; equal in magnitude but opposite in direction; act on different bodies and are collinear.

QUESTION 3

Many students made no attempt at either part 3.1, part 3.2 or both parts of this question. Few students understood the concept of rest energy. A few more managed to convert MeV into joules correctly. Missing the significance of the M in MeV was a common error.

QUESTION 4

In question 4 there were many careless drawings, often with no attempt to draw arrows of the correct length despite the question specifically asking for it. Freehand drawings were not uncommon. Most knew the right directions for lift and drag.

QUESTION 5

This was poorly done. When asked to find an instantaneous acceleration at a point on a curved velocity-time graph, students should realise that they should draw a tangent to the curve and find the gradient of the tangent. Finding the velocity from a small segment of the curve will not give an accurate answer. Most students opted to use an equation of motion, having extracted velocities from two widely separate points on the curve. Part 5.2 was done better by more students: many recognised that they should be finding the area under the curve. However, students should be advised to read the information on the axes of the graph: power of ten errors were very common.

QUESTION 6

This question was done well by the majority of students. Clearly, projectile motion is a topic that had been well learned. Some students used a wrong distance in their calculation in part 6.2. Rounding errors were common. For example, 0.585 should not be rounded to 0.58. Some students chose to use 9.8 m s^{-2} as their value for the acceleration due to gravity. This was not penalised on this occasion but students should expect to lose a mark if they use values other than those given in the formulae and data booklet. Most found the correct magnitude in part 6.3 but there were more errors in determining the direction. In particular, it was not uncommon to give the angle as a number of degrees “to the South East” rather than “below the horizontal”.

QUESTION 7

This question was not well done. Very few students attempted to find more than one value of half-life from the graph. Students who are experienced in practical work will realise that one could make three separate determinations of half-life and find a mean of those values. The fact that there were three marks for this part could be taken to indicate that more than a single straightforward determination is expected. Those students that did make a single determination often failed to draw construction lines on their graph to indicate how they were obtaining their data. Students should be aware that working of this sort is expected. In part 7.2, few students could give details of where to position a source and detector, which measurements would be made and how those measurements could be fed back to control the separation of the rollers. A large number of students made no attempt at this part.

QUESTION 8

Most students were successful with part 8.1 although a few chose the wrong trig function. Part 8.2 was also quite well done by many but a significant number simply gave the weight of the tower rather than adding in the sum of the vertical components of the tension in the cable. In part 8.3, students demonstrated that they were familiar with the Young modulus equation. The principal error of those who were not completely successful was to use an incorrect value of force. Parts 8.4 and 8.5 were not well done and there were many students who failed to attempt these parts. Students should be advised to attempt to define the whole of a phrase. Very few attempted to define stress. The idea of plastic deformation being permanent was quite well known. There were very few correct answers to part 8.5. Few had any idea of a margin for error or a margin to cope with unexpected loads or conditions.

QUESTION 9

Most of the students realised that the car was accelerating but most thought that the acceleration was constant or failed to mention that it increased. Constant speed or velocity was a common response. Part 9.2 was mostly well done but a significant number of students calculated the final acceleration or an average acceleration. In part 9.3 most of the students didn’t take the easy path of finding the area under the graph but chose to use a force × distance method. This would be fine if they had used average force. However most of these students chose a force which got them close to the expected answer, so success rate was not high. In part 9.4 most tried to use equations of motion but didn't use an average acceleration. The straightforward method would be to equate the work done on the car to its kinetic energy. Students should be advised that, when a previous part is a "show that", it is usually because they are expected to use the value in a subsequent calculation. Although there were 2 marks for part 9.5, students tended to give one simple response. Students tended not to identify the different resistive forces. They didn't distinguish between friction and air resistance or realise that one would be constant and the other increase. The usual response was a general statement that the resistive forces increased.

QUESTION 10

A very large number of students did not attempt many parts of this question. Students should be advised that there will always be a data analysis question in section B that will test skills associated with practical work. This will include the plotting of graphs and the analysis of data from graphs using gradients and intercepts. The use of error bars to determine a possible range of gradients is also expected. Students will be expected to be able to assess absolute and percentage uncertainties. They should also be able to comment on or propose good experimental practice in a range of contexts. Detailed guidance to centres is given in the practical handbook available on the website.

In part 10.1 few recognised that choosing the first and the last ball would yield the smallest percentage uncertainty in the measurement of s. Even among those who chose the first and last ball, many didn't chose sensible points on the ball from which to measure eg top of first ball to top of last ball. Often, measurements were not within the $\pm 1\text{mm}$ that was expected. Calculations of g were reasonably successful. Some seemed to work backwards from the expected answer, for which there was no credit. Students who didn't choose to measure from the first ball had a much more difficult calculation to perform but none of them realised that. In part 10.5 some students recognised that an uncertainty of $\pm 1\text{mm}$ was expected when using a rule and were easily able to find the percentage uncertainty. A few measured s several times, found a range and used the half range as the uncertainty. This was quite artificial in this context but on this occasion was condoned. There were some students that were familiar with the aggregation of percentage uncertainties and those usually went on to find the absolute uncertainty in g. Some forgot to use two times the uncertainty in t (necessary as t is squared) and some erroneously used twice the uncertainty in s (presumably because the equation features the term "$2s$").

QUESTION 11

Part 11.1 was answered correctly by most students although a few simply copied what was on the formulae sheet without further explanation. Parts 11.2 and 11.3 were also well done by many students. Students should be advised to give full explanations of their calculations questions particularly in "show that" questions where each necessary step is expected to be seen. A few students did not realise how to do part 11.3 after having been perfectly successful with part 11.2. Once again, students may be advised that calculations following a "show that" question frequently use the data from that part. The structuring of questions can be a useful guide to what comes next. Part 11.4 was not well done. Once again, there were many students who did not attempt to answer it. Of those students that attempted an answer, many gave only one response. Students should recognise that, when two marks are awarded, two factors often require explanation. Quite a few students mentioned the extended impact time for car B or the higher change in momentum for car A, but few mentioned both factors. Those students who seemed to understand the physics often struggled to provide clear explanations.

Section C: Multiple Choice Questions

Students' overall performance in the multiple choice questions tended to be slightly better than their performance in the rest of the paper but the difference was only small. Questions 12, 13 and 23 were found to be particularly difficult. This is consistent with the variation in student performance in the rest of the paper. Students do seem to experience difficulty with questions about units and questions that involve more than one stage of calculations.

GET HELP AND SUPPORT

Visit our website for information, guidance, support and resources at **oxfordaqaexams.org.uk**

OXFORD INTERNATIONAL AQA EXAMINATIONS
GREAT CLARENDON STREET, OXFORD, OX2 6DP
UNITED KINGDOM

enquiries@oxfordaqaexams.org.uk
oxfordaqaexams.org.uk