

INTERNATIONAL A-LEVEL PHYSICS

PH01 Paper 1 Report on the examination

January 2019

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

GENERAL

This paper was accessible to the students, with no evidence of students running out of time. This cohort performed slightly better than in June 2018: few students left question parts unattempted, and students did particularly well in the multiple choice section.

Across the paper, students performed well in questions that required taking data from a graph, and more generally in calculation questions. The vast majority of students were able to access at least some partial credit in every calculation question, and few were left blank. There was more of a spread of results in the long- and short-answer worded questions. In general, students performed better in Mechanics and Materials (specification section 3.2) than in Particles, Radiation and Radioactivity (specification section 3.3), and this has previously been found to be the case. A particular area of weakness, as we have also seen previously, has been the questions involving practical ideas and descriptions of practical procedure. Students also sometimes lost marks in definition questions.

QUESTION 01

This question was generally not well answered, although few were left blank. Students tended to mix up beta-minus, beta-plus, neutrino and anti-neutrino.

In 1.1, only around half identified the beta-plus decay; in 1.2 fewer than half deduced the electron neutrino. More students did successfully identify the anti-particle, although a significant proportion did not attempt this part.

QUESTION 02

In part 2.1, the principle of moments was not well recalled by many students, with only about a tenth of students achieving full marks. As a general point, students are unable to gain some marks when recalling definitions.

Part 2.2, a calculation question, was better answered. Most students knew to equate the two moments, although some made errors with resolving the forces correctly.

QUESTION 03

Students found part 3.1, a kinetic energy calculation, fairly straightforward. The common error was to forget to convert to ms^{-1} .

Part 3.2 was also fairly well answered, although a large proportion of students used a roundabout suvat route. Students seem to be less familiar with applying conservation of energy rather than using the uniform acceleration equations.

QUESTION 04

Parts 4.1 and 4.2 were very well answered. Most students resolved the vectors correctly and applied the suvat equation correctly: this was found to be an area of strength with previous cohorts too.

Part 4.3 is a harder question and was more differentiating; many students found the final vertical velocity but did not find the horizontal component or the resultant, and therefore only accessed the first mark.

QUESTION 05

There was a wide variety in the quality of responses for this question. There were some very well-written responses, and around 15% scored full marks or four out of the maximum five. However, the majority of students scored less than three marks. The common marking points that were awarded were the idea of a background count, and 'repeats and averages'. Few students correctly described the straight-line graph, with most students suggesting plotting C versus r (which would yield a curve). This cohort, as previous cohorts, was found generally to be less confident with describing practical procedures. A significant proportion did not attempt this question at all.

QUESTION 06

Part 6.1, which required taking data from the graph, was well answered. Again, many students chose to use the suvat method, usually with success.

Part 6.2 yielded a mix of responses; for those students who realised to take the gradient of the bounce section of the graph, the question turned out to be straightforward; however many students incorrectly found the gradient of the section of the graph where the ball was falling, giving an answer close to 9.81 ms⁻¹.

Part 6.3 was a more difficult, differentiating question. Most students made use of F=ma but few distinguished between the resultant force and the contact force.

Part 6.4 was also differentiated well; although the modal average was two marks out of the maximum three, there was an equal spread in which marking points were awarded, with students equally either forgetting the curve, the maximum speed or the time.

QUESTION 07

Again, part 7.1 required taking data from the graph and was well answered. Well over half scored at least three marks out of the maximum four. Questions with the command 'show' should be answered to an extra significant figure. However, it is important to note that taking single point data from a graph rather than using the gradient is not good practice and may not always gain full credit.

Part 7.2 was also well answered, with most students writing the correct unit; the most common type of error was power of ten errors.

Parts 7.3, 7.4 and 7.5 were not generally well answered. It was apparent that many students were not clear about the difference between Young modulus and stiffness. However most answers were clearly worded and logically expressed. There were both algebraic and qualititative arguments seen.

QUESTION 08

This question was not generally well answered.

Firstly in part 8.1, not many students identified the area as the <u>change</u> in momentum; of those who did, not all followed through their argument by explaining why that quantity would be the same for both dummies.

Again in part 8.2, although many students did recall the work done equation, few linked work done to the loss in kinetic energy. A substantial proportion conflated the work done equation (force × distance) with the impulse equation (force × time).

Part 8.3 was also poorly answered, with fewer than half recalling Newton's first law correctly. This fits the apparent trend of students not answering straightforward definition questions well.

Part 8.4 was also not well answered, probably because the law itself had not been recalled correctly. A substantial proportion left this last part unattempted.

QUESTION 09

Question 9 was the practical skills question and was better answered by this cohort than in recent series.

Part 9.1 was well answered, with the common mistake being using the resolution rather than half the range for the absolute error.

Almost 30% of students scored at least three out of four marks in part 9.2, which was quite an involved uncertainty-manipulation question, which was a higher proportion than in similar questions in previous series. Some students however simply did demonstrate knowledge of the methodology, and tried for example to add absolute errors instead of adding percentage errors.

Parts 9.3 and 9.4 were poorly answered, with a substantial proportion leaving them unattempted; again, this fits the trend of students not accessing questions about practical procedures. In part 9.4, many students described impractical suggestions such as waxing or oiling the surface of the track, which are not standard procedure in this sort of experiment.

MULTIPLE CHOICE SECTION

Students scored highly in questions 12, 13, 14, 15 and 23. They seemed to do best in the questions about Mechanics.

Students scored poorly in questions 11, 20, 21 and 22. They seemed to find questions which required choosing a correct shape of graph difficult. Question 11 was about practical procedure and was found challenging by the students.

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