OXFORD
INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL A-LEVEL PHYSICS

PH04 Paper 4
Report on the examination

January 2019

REPORT ON EXAMINATION: INTERNATIONAL A-LEVEL PHYSICS PH04 UNIT 4 JANUARY 2019

GENERAL

This was the second occasion on which students sat PH04. The cohort was small so comments about typical responses should be weighed accordingly.

Students found the paper to be difficult. In particular, section A (structured questions) responses were less successful than section B (multiple choice questions). There were no indications that students had time related problems, merely that they found the content to be difficult. Some students left several part questions unattempted.

Some students found it to be difficult to identify the appropriate ideas to use, both in written answers and in calculations. Students generally did better in calculations. Here, they should be advised to set out their work systematically. Some students limit the number of marks they can achieve unnecessarily by not being explicit about what they are doing in mathematical work. Of course, when students are systematic, they tend to make fewer errors as well. Explanations, even when they were to the point, often lacked sufficient detail but some students struggled with clarity too.

QUESTION 01

Part 1.1 was not very well done. Some students knew that they should find the area under the line. Many of those that tried to do so but did not get an answer in the required range would have gained more marks if they had explained what they may have been trying to do.

In part 1.2, the large majority of the students were successful with the calculation. Good setting out of mathematical work was seen from some students but others presented rows of unexplained numbers together with, in this question, the correct answer.

The majority of students were also successful with part 1.3 but some used a value for change in pV that they had mistakenly used in 01.1. Students needed to make separate calculations for two separate values of temperature.

1.4 was not well answered. Few students seemed to be aware that the pressure exerted on the container is due to the change in momentum of the particles and that this rate of change in momentum increases as the molecules move faster and the collisions become more frequent. Some students described collisions between particles rather than with the container and others used inaccurate terminology such as “stronger motion” or “more active particles”.

QUESTION 02

In part 2.1 few students expressed the idea that the nuclei repel each other so it was difficult for them to make progress with this question.

In part 2.2 most of the students knew that they should add the two radii together but quite a few assumed that the two nuclei were identical in size. A minority of students worked through the idea of constant nuclear density or used the appropriate nuclear radius formula to come to a complete solution.

When answering 2.3, very few students realised that the kinetic energy required was equivalent to the electrostatic potential energy of the two nuclei at the separation calculated in part 2.2.

There were many good solutions to part 2.4. The most frequent error was to forget to convert from atomic mass units to kg.

In 2.5, few students mentioned superconductivity or why it is used in this situation.

QUESTION 03

In 3.1, although they had been asked to answer in terms of the masses of the nuclei, few students did. Without reference to the masses, students could not really discuss mass defect and the equivalence with binding energy.

There were some good solutions to the calculation in 3.2. Relatively frequent errors were to forget to multiply the binding energies per nucleon given in the table by the appropriate nucleon number and the use of $E = mc^2$ rather than $E_k = \frac{1}{2}mv^2$.

QUESTION 04

Most students got a start with 4.1 and some were completely successful. Some students forgot to add in the frictional torque.

The great majority of students did 4.2 correctly.

In 4.3, few students recognised that they should use the principle of conservation of angular momentum. Of those that did, many did not give their answer to an appropriate number of significant figures. A common error was to attempt to use angular kinetic energy rather than momentum.

4.4 was not well done and a significant minority of students did not attempt it. Students should have calculated the new angular acceleration and used the rotational equivalent of a “suvat” equation to find the angle through which the roundabout turns.

QUESTION 05

5.1 was correctly done by many students. Those that gained less than full marks may well have increased their score by explaining what they were trying to calculate. Partial credit was often missed by students that presented strings of unexplained numbers.

A significant minority of students were totally successful with 5.2. Quite a few students failed to attempt the part. Another group made some progress but did not manage to find the angle between the incident light and the solar panel.

MULTIPLE CHOICE SECTION

The following questions were found to be challenging: 8, 14, 17, 18, 21, 22, 24, 25, 32 and 34.

The following questions were found to be easy: 9, 13, 15, 16, 20, 26, 27, 29.

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