OXFORD
INTERNATIONAL
AQA EXAMINATIONS

INTERNATIONAL A-LEVEL PHYSICS

PH03 Paper 3

Report on the examination

January 2019

REPORT ON EXAMINATION: INTERNATIONAL A-LEVEL PHYSICS PH03 UNIT 3 JANUARY 2019

GENERAL

This was the second examination for this module and the cohort of students was small.

The paper seemed to be accessible to most of the students. There were no indications that students faced significant time constraints. Students found section B to be very slightly easier than section A but the difference was marginal. Among the extended questions (section A), students were, on average, most successful with question 5 (the movement of charged particles in fields). The other questions in the section had broadly similar success rates.

Students find written explanations to be more difficult than mathematical work. Standards of explanations were a little better than in the previous exam sitting but students sometimes struggle with the specific detail: answers are sometimes too general. Students found particular difficulty when questions called upon ideas from previous units. Students could be usefully reminded that questions in this unit will always be firmly based in the subject content for this unit but that questions "may draw upon physics principles specified for Units 1 – 3".

Mathematical work was well done when it was direct and straightforward but multi-stage calculations proved to be more difficult for the less well prepared students. Poor setting out is still an issue, particularly in proofs and "show that" type questions. Students who may know what they are doing lose marks because they do not communicate that to the examiner. For example, if an equation is used in a proof, students should be recommended to make a direct and clear statement of that equation before using it in the proof. Students should also recognise that they need to take care with graphical work and drawings. If a field is radial, the field lines are best drawn with a ruler and they should be symmetrically placed.

QUESTION 01

Most students did part 1 correctly but some used cosθ where they should have used sinθ.

In part 2, students were generally successful with the calculation although some attempted to use circular motion or pendulum equations. Many students used 9.8 for the acceleration due to gravity. Students should be aware that they may not be able to access full marks if they use values other than those given in the Data and Formulae Booklet.

A significant number of students did not attempt part 3. A few others tried to use entirely inappropriate equations but the majority gained some credit for their attempts. Where students failed to get full credit, clear setting out was an issue. Students should be advised to start with clear statements of the equations they use and to then combine them or make substitutions in a way that is clear to the reader.

Most of the students succeeded with part 1.4. Some still tried to use pendulum equations and others failed to get maximum credit because their final answer was not close enough to the expected answer. Students should be warned against crude rounding of data in the intermediate steps of a calculation.

Some students produced good explanations for part 1.5 but the majority did not. Key ideas are that the angular velocities for both seats are the same but the radius for A is greater than the radius for B. Many students mentioned one or other of these features but few mentioned both. It is also necessary to link those values to valid expression for theta.

QUESTION 02

In part 2.1, students found it difficult to express ideas about current and potential difference in the circuit. One significant reason was that most students failed to clearly identify which current or pd they were writing about.

Part 2.2 was generally well done. However, students should be encouraged to explain their working, especially in “show that” type questions. Students who do not risk losing marks although they may know what they are doing.

Part 2.3 was also well done by the many student who chose the appropriate exponential equation.

There were many correct answers to part 2.4. The most convincing explanations were with respect to the time constant but some students referred back to the exponential equation and others talked about the effect of increasing the resistance on the discharge current. There were also a significant number of students that did not attempt this part.

QUESTION 03

Part 3.1 was well done by most of the students.

Most were also able to calculate the period of the variation correctly in 3.2 and to sketch satisfactory graphs. Only a minority calculated the peak voltage correctly.

3.3 was well done but 3.4 proved to be one of the most difficult part questions on the paper. Most of the students could not deduce the effect of the diode on the peak voltage and on the waveform. A large number did not attempt this question.

There were some good answers to 3.5 but many students struggled to express their ideas clearly. Some students could have improved their answers by stating where the eddy currents were induced and how. Good answers also explained how the use of a laminated core reduces the energy “losses”.

QUESTION 04

Most of the students knew how to draw the required field in part 4.1 but a significant number of drawings were not precise enough, not showing the symmetry and radial nature of the field, and so could not gain the mark. A smaller number identified the wrong direction for the field and so could not gain credit.

In 4.2, many students knew the appropriate definition. Among those who had clearly recalled the definition, some failed to specify that it was the work done per unit charge and others failed to mention that the test charge was moved from infinity.

The large majority of students performed the calculation in 4.3 correctly.

Students found 4.4 to be difficult. A common error was to show only one force despite the fact that the drop was labelled as stationary. Other students did not label their arrows. Sketches should be done carefully enough to convey meaning. For example, in this part the arrows should be of equal length and clearly vertical. The use of a ruler would be recommended.

In part 4.5 many students noticed that the acceleration should be $2g$ but fewer were able to give a sufficient explanation why.

4.6 proved to be challenging. Some students did mention that the downward force(s) on the drop would remain constant but fewer stated that increasing air resistance would play a part.

QUESTION 05

5.1 was done correctly by the great majority of students. It was difficult to follow the work of some students. Students should be advised to set out their mathematical work in a systematic manner.

Students were also quite successful with 5.2 with most gaining some credit. The most common mistake was to forget to take account of one of the three factors (energy mass and charge). Some students made power of ten errors.

MULTIPLE CHOICE SECTION

Questions 6, 7, 11, 12, 18 and 25 were found to be relatively easy.

Students found questions 16, 17, 22, 26, 31, 33 and 34 to be difficult.

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