



A Level **Physics**

7408/3BC

Report on the examination

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Question 1

Question 1.1 was answered correctly by more than 75% of students. To gain full credit, students needed to make use of a consistent sign convention. Many students only received one mark because they did not set out their answer clearly, or because their answer would have led to a negative value for time.

Just over half of students obtained both marks in question 1.2. Answers that made use of a single step rotational motion equation were most likely to gain full credit. Some students lost the mark for incorrect rounding or for using the incorrect change in angular velocity.

The calculation in 1.3 was very accessible, with over 60% of students getting the mark. The mark scheme allowed credit for the various steps in the calculation, and this meant that it discriminated well.

Question 1.4 was much more demanding, with less than 20% of students gaining full marks. The most common difficulty was determining the distance between the centre of rotation and the line of action of the frictional force. Many students also failed to recognise that there were two brake pads acting on the disc and that the force had to be doubled. The mark scheme rewarded intermediate steps, provided students made it clear what they were doing.

Question 2

Students who missed out the rotational kinetic energy in 2.1 could make no progress with this question. Partial credit was given to students who included the rotational kinetic energy but missed out the translational kinetic energy. Many of these students were prevented from gaining a second mark because they incorrectly arrived at the required equation, despite this being inconsistent with their working. The best answers set out each step very clearly so that each mark could be rewarded.

About 65% of students gained the mark for Question 2.2. Those who missed out often suggested that the mass or the radius of Q was greater than that of P. It was difficult to see whether this was due to a lack of understanding or a failure to express the answer clearly.

Many students were able to suggest the correct order in Question 2.3. Far fewer were able to support their answer with correct physics. To obtain full credit, students had to make the relationship between the moment of inertia and the linear speed clear. Some students tried to arrive at an answer in terms of angular speed or angular acceleration, and this rarely gained full marks.

Question 3

In 3.1, many students stated that an isothermal change involved no change in internal energy. Whilst this is true for an ideal gas, it does not take into account a change of state, for example. The required answer was that an isothermal change involves no change in temperature. More than half of the students gained this mark.

To gain full marks for the calculation in 3.2, students had to match a temperature with a point on Figure 6. Students who used the incorrect temperature could still gain partial credit. Using the differences in temperature, volume or pressure meant a student gained no marks.

Question 3.3 was the easiest one on the paper. Although a substituted equation was sufficient on this occasion, students should be made aware that in the future the correct equation followed by substitution may be required for the mark.

Question 3.4 discriminated well and produced a good spread of marks. About half of students obtained all three marks. It was clear, however, that many students did not know how to apply the first law of thermodynamics in this situation. This was also evident in later question parts.

Question 3.5 was one of the hardest on the paper. Many students did not understand which process was isothermal and which adiabatic. Others did not realise in which process energy was being transferred to or from the gas by heat transfer.

Question 3.6 was the level of response question. Despite there being many marking points available, very few students obtained full marks. This was usually due to a failure to address the third bullet point sufficiently well. Often answers were restricted to those seen in previous papers without any attempt to apply it to this particular situation. A surprisingly large number of students obtained a theoretical efficiency of 100% for the cycle. This prevented much progress in the first bullet point. The best answered section was the second bullet point, with students making comments similar to those seen in previous mark schemes on this topic.

Question 4

Only about 20% of students obtained the mark for Question 4.1. Answers were often vague statements about efficiency. Many of those who made some attempt at the ratio were not sufficiently clear about the direction of the heat transfer or incorrectly stated that it was to the cold space.

Question 4.2 discriminated reasonably well. A common error was to fail to link the answer to the salesperson's claims. It was judged that these did not answer the question and therefore the mark was limited to one. Several students left both temperatures in °C and therefore could not be given the first marking point.

Question 4.3 was answered correctly by about 60% of students.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results Statistics](#) page of the AQA Website.