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GCSE

**PHYSICS**

8463/2H Paper 2 (Higher)

Report on the Examination

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8463

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## General

Questions 1 and 2 are common with questions 8 and 9 in the GCSE Physics Paper 2 Foundation tier.

## Levels of demand

Questions were set at three levels of demand on this paper:

- **standard demand** questions were targeted at students working at grades 4-5
- **standard/high demand** questions were targeted at students working at grades 6-7
- **high demand questions** were targeted at students working at grades 8-9.

A student's final grade is based on their attainment across the qualification as a whole, not just on questions that may have been targeted at the level at which they are working.

## Question 1 (Standard demand)

- 01.1 Most of the students were able to give one relevant factor with about 40% of the students giving two. Probably the most common correct answers were the speed of the car, the battery capacity and the terrain.
- 01.2 Virtually all of the students were able to give the correct equation.
- 01.3 Almost all of the students scored 3 marks. Those that did not generally divided 20 by 28. Those that initially showed a correct substitution were still able to score 1 mark.
- 01.4 Most of the students were able to identify the correct equation and use it to give the required answer.
- 01.5 Virtually all of the students were able to give the correct equation.
- 01.6 Almost all of the students scored either 2 or 3 marks. Those scoring 2 marks omitted to convert the distance to metres.

## Question 2 (Standard demand)

- 02.1 Approximately 80% of students gave a level 2 or level 3 answer. The best answers usually had a clearly labelled diagram with a written explanation. Many of the students tried to draw a 3D picture of the apparatus, in general these were not helpful. Points often missed from the description included:
- removing the glass block to mark the path of the ray through the block;
  - marking or describing the positions of the angles of incidence and refraction;
  - the full range and interval for the angle of incidence.

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- 02.2 This was well answered although some of the students omitted to label the axes or drew a straight line of best fit when a curve was required.
- 02.3 About three quarters of the students scored both marks, although there was little evidence of protractors being used. Those scoring 1 mark generally omitted the normal line.
- 02.4 This question was poorly answered with few of the students scoring either 3 or 4 marks. Answers were often imprecise. The most common mark scored was for the idea that Method A would give more accurate results often accompanied by the ray from the laser being thinner. Few of the students related this to it being easier to mark the centre of the ray. Those students that explained what they meant by 'human error' often scored a mark but on its own 'human error' did not score a mark. 'Easier to read' was often given but this is not the same as 'likely to record the correct angles'.

### **Question 3 (Standard and standard/high demand)**

- 03.1 Many of the students gave factors that affect braking distance but did not specify factors that would increase braking distance. So, for example, whilst 'worn tyres' was acceptable 'condition of tyres' was not. As a consequence half of the students scored zero.
- 03.2 Very few students mentioned the direct link between distance and time and so mark point one was rarely scored. However about half of the students were successful in scoring mark point two. Those students that scored zero often just described what is meant by reaction time or linked reaction time to braking distance.
- 03.3 Nearly all of the students scored 1 mark with about half of the students scoring both marks. The third option was a common wrong answer.
- 03.4 The vast majority of the students scored full marks. Where this was not the case it was usually due to leaving the distance in kilometres.
- 03.5 This question was poorly answered with about one quarter of the students scoring zero. Those students scoring 1 mark were able to state the difference between speed and velocity in terms of scalar and vector quantities. However few went on to relate their answers to the specific situation shown in the diagram.

### **Question 4 (Standard and standard/high demand)**

- 04.1 Most of the students failed to score the mark as they did not consider the effect of air resistance. Resultant force was rarely mentioned. A common misconception was that gravity increased causing the acceleration.
- 04.2 This was poorly answered with nearly half of the students scoring zero. Those students scoring two marks generally omitted to mention that the air resistance increases with velocity. A few of the students did not state that the resultant force becomes equal to zero. Some of the students scoring zero only described what is meant by terminal velocity.
- 04.3 About 80% of the students scored this mark.

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- 04.4 This was poorly answered with half of the students scoring zero. Most of the rest scored 1 mark, usually for quoting the kinetic energy equation.. Many of the students did realise the link between kinetic energy and mass but failed to realise that changing the mass also changed the maximum / terminal velocity of the hailstone.
- 04.5 Just under half of the students chose the correct option.
- 04.6 There were many examples of clearly laid out, easy to follow answers. A large number of the students scored 2 marks rather than 3 as they omitted to convert the mass to kilograms. A significant proportion of the students did not use the graph and so calculated acceleration and not force

### **Question 5 (Standard/high demand)**

- 05.1 Only about one quarter of the students were able to give a correct definition of 'centre of mass'. Common incorrect answers were 'the centre of an object' and 'where most mass is'.
- 05.2 About 20% of students scored all 3 marks. Common errors were misreading the balance, not dividing by 5 and not converting to kilograms.
- 05.3 Nearly half of the students scored 2 marks and did so by using a correct method but failing to convert centimetres to metres. Those students scoring zero either used an incorrect value for extension (often 5 cm or 3.5 cm) or the wrong equation.
- 05.4 About half of the students knew that the spring would go back to its original length / shape but few stated that the spring deformed elastically. Describing the spring as 'elastic' is not the same as 'elastically deformed'.

### **Question 6 (Standard, standard/high and high demand)**

- 06.1 There were many excellent answers that compared the two lifecycles in great detail. Other students clearly knew the names of the stages and the correct sequences but failed to provide any detail about why a star moved from one stage to another.
- 06.2 The idea of 'red shift' seemed to be known but was often poorly explained. Light moving to the red end of the light spectrum was insufficient to score a mark.
- 06.3 About half of the students scored zero - while they were often able to write about the Big Bang Theory they did not answer the question asked. Those scoring 1 mark often gave the second marking point but very few used the given diagram to score the first marking point.
- 06.4 Less than half of the students scored this mark. Many stated that there are new observations / discoveries without linking this to the idea of the new evidence not supporting current theories.

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**Question 7 (Standard, standard/high and high demand)**

- 07.1 About one quarter of the students scored zero. Those students scoring 1 mark generally did so for naming the two coils correctly.
- 07.2 Nearly three quarters of the students scored all 3 marks. Those scoring 1 mark were able to show a correct substitution but were then unable to rearrange the numbers correctly.
- 07.3 As in previous examinations, an ‘explain’ question from this part of the specification proved challenging for virtually all of the students. Only about 10% of the students scored any marks at all and 14% did not attempt the question. Many of the answers included attempts to explain the working of a dynamo or of a motor.
- 07.4 Just under half of the students were able to use Fleming’s Left Hand Rule and to then choose the correct answer.
- 07.5 About three quarters of the students scored either 3 or 4 marks. Very few of the students attempted to convert  $60\mu\text{T}$  to Tesla. Those that did often multiplied by a wrong factor but were able to go on to score 3 marks.
- 07.6 Just over half of the students gave a correct answer.

**Question 8 (High demand)**

- 08.1 Few of the students gave sufficient detail to score any marks. Whilst ‘upthrust’ was sometimes given, normal reaction force and its direction were very rare. Many of the students knew that the resultant force would be zero but failed to mention all three forces and so did not score this marking point.
- 08.2 Many of the answers were clearly set out, showing all of the students working out. This often allowed students not scoring full marks to score 4 or 5 marks for a partially correct method. Common errors leading to 4 or 5 marks being scored were the incorrect conversion of area to metres squared and the use of 2.6 m for the final calculation of pressure. Common errors leading to a mark of zero were using 637 as the pressure value or calculating the density of the brick rather than the water.
- 08.3 Most of the students scoring 3 marks used the ratio method to calculate the force. A few calculated the density of the water and then calculated the force. Those students scoring 1 mark usually did so by incorrectly calculating force but then correctly rounding to 3 significant figures. A small but significant number of the students were unable to round their answer to 3 significant figures.

### **Use of statistics**

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

### **Mark Ranges and Award of Grades**

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