AQA

GCSE
PHYSICS

8463/2H Paper 2
Report on the Examination

8463/2H
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Higher Tier

Grade 4-5 calculation questions ask for students to recall an equation first before using it in a subsequent calculation, however in the 2023 series, students were given an Equations Sheet which had all the equations printed on it. Subsequently, the performance on straightforward calculations has improved on previous years.

Handwriting continues to be a problem for a large number of students, making it very difficult for examiners to read what has been written

01.1

72% scored a mark on this question. The most frequent incorrect response was ‘parallel’.

01.2

Most responses were levels 1 and 2. Many failed to gain marks because they did not think it was necessary to explain the need for additional equipment. Very few students explained the need to calculate the temperature change or to compare the readings on infrared detectors, which was a requirement to get into level 3. A number of students suggested using cold water, or even described a different practical. Students were not penalised for using tiny volumes of water, but it is clear that students have no concept of how much 50 ml is, for example. There was a lot of confusion relating to use of infra red detectors and what they measured.
Many students stated they would take readings every minute, and lots suggested repeating to get averages, or producing graphs. This was not required by the question.
There were some pleasing summaries referring to the evidence and the hypothesis.

01.3

80 % of students scored the first mark, but only 47% scored both marks. Some students simply reworded the stem. There was a small amount of confusion with radioactivity, because of the use of the word radiation, and a number who seemed to think a chemical reaction was taking place.

01.4

A majority of students gained this mark, but there seemed to be some confusion as to what is meant by the dependent variable.

01.5

The most common response related to the matt black surface and the shiny white surface. This was awarded 1 mark. Some did mention that black was the best absorber but failed to adequately describe the relative absorbance of matt versus shiny surfaces, as they did not explain this only applied for the same colour surface. In addition, some gave their response in terms of emission or reflection of IR radiation, both of which scored zero. Only 3% of students successfully gave both conclusions.

01.6

99% of students identified the equation for calculating pressure.

01.7

78% of students scored all 4 marks for this calculation. Some scored zero, as they calculated the total surface area, the volume or used the length of the cube.

02.1

58% of students calculated the displacement correctly. Those who did not gain the mark simply measured the route taken by the aircraft and scaled that distance up, showing that many students do not appreciate the difference between displacement and distance.

02.2

82% of students successfully calculated the resultant force to be zero.

02.3

Having successfully calculated the resultant force to be zero, few students stated that the plane was moving at a constant speed. Many said it was stationary or accelerating, not appreciating the lack of resultant force.

02.4

Students did not appear to understand the concept of a contact force, often quoting gravity as one. In addition, they gave forces already quoted in the question as answers.

02.5

This was successfully done by the majority of students, with 64% correctly linking distance and velocity and drawing correct graphs.

02.6

The minority attempted to draw a smooth curve and extrapolate this to the 10km line. Those who did generally used the graph correctly, with 44% of students gaining both marks. A number of students misread the scale on the graph and quoted incorrect values from their line. It was common to see a straight line, which often allowed the award of 1 mark for a correct reading of the value.

02.7

84% of students knew that as the height of the aeroplane above the ground increased, the average density of the air decreased.

03.1

32% of students gained this mark. Common mistakes included physically changing the length of the lever, increasing the distance from the pivot without any reference to force, and increasing the distance of the lever to the pivot.

03.2

87% of students gained all 4 marks on this question. There were not many incorrect readings of velocity from the graph, and the most common error was usually 14.5 m/s. Those who did not score all the marks had made mathematical errors, such as incorrect rearranging.

03.3

55% of students gained all 3 marks. Those not scoring full marks, were often awarded the second marking point for calculating the distance travelled when the velocity was constant, and the third mark for adding up their two values.

34% scored zero because they had not appreciated that the area under the graph represented the distance travelled. A large number of students used distance = speed × time, not recognising that speed was not constant.

03.4

This question demonstrated that incorrect use, or lack of use, of scientific terminology has a negative effect. Students frequently confuse distance and time when answering this type of question. In addition, many talk about reaction times being slower, which implies time can slow down. Credit was given for slower reaction times, as was the use of ‘thinking time’ or descriptions of a greater response time. Only 17% gained full marks, as the link between stopping distance and thinking distance was often not made.

03.5

The majority of students did not answer this question in terms of work done. Most mentioned friction which on its own was not creditworthy. The second mark point was expressed correctly as kinetic energy being transferred to thermal energy. Unspecific answers about the release of energy were not credited, but the use heat energy instead of thermal was accepted.. Only 4% of students scored both marks, with 35% scoring one mark.

04.1

31% of students gained this mark. Many students responded with a selection of random Physics terms.

04.2

74% of students recognised the direction of the magnetic field.

04.3

51% of students knew what an induced magnet is. Responses sometimes confused magnets and magnetic materials. Most correct answers were to do with placing a material into a field to become a magnet, compared with removing the material from the field.

04.4

88% of students knew that it is the motor effect that causes the coil to move..

04.5

46% of students scored all 4 marks for this calculation. There were a wide variety of incorrect conversions of mA, which gained 3 out of the 4 marks.

04.6

Most students were able to make generic statements about how age and environment affect hearing. 35% of students were able to use the data in the graph to support their statements. Some responses just gave information about person A, B and C, without any comparisons. Students did not use the patterns in the graph to back up conclusions. There was some confusion over sensitivity, and a number tried to explain the variables to the extent that the response became incorrect. Examples of this included saying that a higher minimum sound level shows better hearing.
A proportion of the responses mentioned ideas about being "used to a loud sound" so "could hear loud sounds better" and younger people not having had the experience of a full range of frequencies due to their age. Alternatively, the idea that being in a quiet environment means you can only hear quiet sounds was another misunderstanding which was often seen.

05.1

41% of students were awarded this mark. There were a lot of good answers in terms of both conservation of energy and momentum. Answers in terms of no external forces were also credited. Some answers were too vague to score or were answered outside of the context of the question, for example, in terms of a Chemistry approach.

05.2

30% of students answered the question correctly. Those who did not, tended to just state Newton's 3rd Law, rather than stating how it applied in this context.

05.3

96% of students scored both mars for calculating the force.

05.4

10% of students were given all three marks for this explanation. Most responses were creditworthy. Reducing force was the most common 1 mark awarded. Many students also gained the first marking point, about increasing the time for the collision to occur.

05.5

Students find it difficult to use this equation of motion. This was where not showing the substitution of the data in the equation had the biggest impact. Many students were unable to rearrange the equation with some dividing the two expressions instead of subtracting them. 68% gained all 3 marks, recognising that they had to square root their value to obtain the velocity.

06.1

88% of students scored this mark. The vast majority of responses seen said ‘satellite’, with a small number giving the alternative ‘moon’.

06.2

61% of students were able to achieve full marks for this calculation. Those that did not, didn't convert the wavelength into metres, or converted incorrectly. Most students were able to give their answer in standard form.

06.3

Many students only scored the compensation mark and it was rare to see answers where acceleration towards Earth was included. Few students linked a change in direction to a change in velocity, with some describing the converse.

06.4

6% of students gained full marks for this explanation. students scored a mark for the 2^{nd} or 3^{rd} marking point, and it was unusual to have to consider the award of the compensation mark. A significant number of students thought that galaxies A and B were emitting radiation with a greater wavelength than that emitted by the Sun.

07.1

28% of students were able to identify this as specular reflection.

07.2

64% of students gave the correct conclusion regarding the angle of incidence and the angle of reflection. There were a number of students who did not analyse the data in detail and failed to consider the magnitude of the angles. These students looked only for a trend and gave increasing angle of incidence resulted in an increase in the angle of reflection, or similar, as their conclusion.

07.3

11% of students gained both marks. Some students are not aware that 'human error' is not an acceptable answer. Others are unable to classify errors correctly. Many responses identifying the cause of the error were not consistent with the error given. Misreading the protractor was a common, but insufficient response.

07.4

36% of students gained this mark. Responses often referred to irrelevant factors, such asdensity, transparency of glass and the thickness of the block. 'Not hitting at an angle' was a popular response and a significant number of students seemed to have an idea of the reason but were unable to express themselves with clarity.

07.5

11% of students scored both marks. A significant number of students thought that the results were for angles of reflection, not refraction. There were many students who considered the construction of the protractor and offered various reasons for there being issues with the results.

07.6

8% of students scored all 3 marks on this question. Very few answers recognised the significance of parts of the wavefront reaching the boundary at different times and hence changing speed at different times. Students, generally, only gained credit for appreciating that the velocity/speed of light was less in glass than in air and these students were in a minority. Some students were aware that change in speed was involved but were unable to put together a coherent argument that matched the second marking point. There were many simplistic answers that referred to variation in optical density and light rays rather than wavefronts.

08.1

Most students knew that iron is used for the core of a transformer and most of those were able to give an explanation. A significant number of students thought that iron was used because it is a good conductor of electricity, which demonstrates a misunderstanding of how transformers work.

08.2

55% of students gainiedall5 marks Most of the other students scored at least 3 marks for a partially correct answer. There were alternative ways of calculating the correct answer using the transformer and power equations, and it was pleasing to see so many students having the confidence to use them appropriately.

09.1

The topic of how motors, dynamos, generators and transformers work has always proved a challenging one, with 2% of students gaining 5 marks for this explanation. There were a number of excellent responses showing clear understanding. Many students scored some marks for describing how the coil cuts the field lines, inducing a potential difference and causing current to flow in a complete circuit. ,Only a few could clearly describe the action of the commutator and brushes swapping the connections every half-turn so the current to the lamp is only in one direction. Some students confused the dynamo for a motor or wrote answers that combined elements of both motor and dynamo. 75% of students scored at least one mark.

09.2

17% of students could correctly draw four half-cycles to represent the output of two complete turns of the dynamo. Most drew a sine wave or an incorrect number of half-cycles.

09.3

A small number of students were able to write that without a current in the coil, there would be no magnetic field in the coil; fewer were able to state that this would remove the opposing force. Some thought there would still be a current in the coil , or that the current would increase creating an attractive force between the coil and magnets. Some students thought that friction at the brushes or the resistance of the lamp were the factors that had been reduced. 15% of students scored at least one mark on this question, with 3% getting full marks.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.