Questions matter

GCSE
Physics
8463/1F

Report on the examination

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General

Grade 1-3 calculation questions were well answered, where the equation is always given and students will not be required to rearrange the equation. Grade 4-5 calculation questions were answered successfully this year as the Physics Equations Sheet had all the necessary equations printed on it. Some students attempted to answer questions using equations from paper 2, which in most cases scores them no marks. At grade 4-5 students are expected to be able to either rearrange an equation or convert a unit, so it is beneficial for students to be able to quickly identify if the units given in a question are correct for the use in the equation. Question 08.5 and 09.2 discriminated well between students of different abilities and were generally well attempted.

Handwriting continues to be a problem for a number of students, making it very difficult for examiners to read what has been written. An increasing number of students are using computers to word process their answers for extended response questions, which is helpful for examiners in awarding credit for student responses. However, students must use the question number as printed in the question paper e.g. 4.3 rather than 4(c) to ensure that their work is matched and marked with the corresponding question part.

Many students did not cross out work they don't want to be marked. This results in the 'list principle' being applied which means if there are two sets of working or answers and they conflict, the student scores zero.

Levels of demand

Questions are set at two levels of demand on this paper:

- Low demand questions are targeted at students working at grades 1–3.
- Standard demand questions are targeted at students working at grades 4–5.

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

01.1

Just over 80 % of the students chose global warming as the environmental problem.

01.2

Just over half of the students read the correct value of '6000 kg' from the graph. The most common incorrect answer was 38 000 kg.

01.3

Almost 90 % of the students correctly identified that the amount of carbon dioxide increased as distance travelled increased.

01.4

Most of the students understood that electric cars are powered by a battery.

01.5

This question discriminated well between students matching method to generate electricity with an environmental issue. Students were more likely to score the radioactive waste mark than the other two. Overall 62 % of the students scored 3 marks, with 9 % of the students scoring 2 marks and 23 % of the students scoring 1 mark.

02.1

Most of the students scored 2 marks for plotting the bars correctly. Students scored 1 mark if they plotted points rather than bars. Many students did not label the x-axis. Students who labelled it but did not score usually labelled the x-axis and the y-axis 'x' and 'y'. Almost 60 % of the students scored all 3 marks.

02.2

Just under half of the students scored 2 marks for choosing copper and giving a valid reason, while 10 % of the students scored only 1 mark with a reason that was insufficient or incorrect. Many students chose steel as it took the greatest time to melt the wax.

02.3

Almost 90 % of the students scored 2 marks on this SHC calculation. Students who scored only the substitution mark usually did not put the denominator in brackets when entering the calculation in their calculator.

02.4

Nearly all of the students chose the correct equation from the equations sheet. A mixture of quantities and symbols scored the mark. Upper case or lower-case letters scored the mark. Equation triangles were insufficient to score the mark.

02.5

About 5 % of the students scored the substitution mark but then failed to rearrange correctly.

03.1

Almost 70% of the students chose the correct nuclear equation for alpha decay.

03.2

The vast majority of the students scored a mark for correctly reading the value on the graph for 50 %.

03.3

Just fewer than 40 % of the students scored this mark for identifying the half-life of uranium. Most students did not realise that the two questions, 03.2 and 03.3 were asking for the same value in slightly different ways.

03.4

A surprisingly large number of the students chose isotope B, scoring no marks. 13 % of the students scored 1 mark for choosing isotope A with an incorrect reason, while 27 % of the students scored 2 marks. A comparison was needed to score the second mark. 'A steep graph' was insufficient, but 'a steeper graph' would have scored the reason mark.

03.5

The vast majority of the students chose the nucleus with the smallest mass number correctly.

03.6

Just over half of the students chose the correct nucleus with an atomic number of 4.

03.7

Students who realised that the nuclei should have the same number of protons generally scored both marks. 'Same amount of protons' was equivalent to 'same number of protons'.

03.8

Just over half of the students chose the correct model of the atom.

03.9

Nearly 70 % of the students knew that the mass of an atom is concentrated in the nucleus.

04.1

Just over 90 % of the students knew that the speed of the gas particles increased.

04.2

Nearly 80 % of the students knew that the kinetic energy of the gas particles increased.

04.3

Nearly 90 % of the students knew that the number of collisions each second increased.

04.4

Just over 70 % of the students knew that the force exerted by the gas particles increased.

04.5

When completing a matching type questions students should be encouraged to draw straight lines only.

04.6

Just fewer than 50 % of the students identified the state as liquid.

04.7

Just over 50 % of the students identified the state as solid.

04.8

Students found this question about internal energy difficult. Only about 11 % of the students scored 2 marks, while a further 33 % of the students scored 1 mark.

05.1

This question discriminated well with 44% of the students scoring 3 marks, 10 % of the students scoring 2 marks and 28 % of the students scoring 1 mark.

05.2

Nearly 70 % of the students scored the mark for identifying the circuit symbol for a fuse.

05.3

Most of the students scored 2 marks on this grade 1-3 calculation.

05.4

About 94 % of the students scored both marks on this calculation of resistance. Students who scored 0 marks usually rearranged the equation and multiplied the current^2 by the power. When students are provided with the equation at the point they need it in the exam, there is no need to rearrange the equation before using it as it is a grade 1-3 question.

05.5

Just over 60 % of the students scored 2 marks for correct comparisons between kettle A and kettle B. Many students did not read the instructions for the question and only ticked one box.

06.1

Nearly 90 % of the students scored 2 marks on this calculation of elastic potential energy.

06.2

The vast majority of the students identified the correct equation for gravitational potential energy.

06.3

Just over half of the students scored 3 marks on this calculation of mass using the gravitational potential energy equation.

06.4

About 65 % of the students understood that the elastic potential energy of the spring decreased.

06.5

About 80 % of the students understood that the kinetic energy of the toy decreased.

06.6

Just over 60 % of the students understood that the gravitational potential energy of the toy increased.

06.7

Just over 30 % of the students chose two correct reasons for the toy eventually stopping. About 50% of the students scored 1 mark. Many students did not read the instructions for the question and only ticked one box.

07.1

This was a grade 1-3 calculation of current with just over 90 % of the students scoring 2 marks.

07.2

A grade 1-3 calculation of energy transferred with 95 % of the students scoring 2 marks.

07.3

About 94 % of the students identified the correct equation for efficiency.

07.4

Just over half of the students scored 3 marks on this calculation using the efficiency equation. Many students struggled to rearrange the equation correctly scoring just one mark for the substitution. Students should be encouraged to substitute first then rearrange, as many students did both actions in one go using an incorrect rearrangement and so scored no marks.

07.5

Nearly 60 % of the students scored 1 mark for predicting the efficiency of the motor.

07.6

Just fewer than 50 % of the students scored this mark. Students who tried to describe the relationship were less successful than students who just described the shape of the line. Students who stated that the gradient changes also scored the mark, as a better description than the line is curved.

08.1

The idea that energy resources can or cannot be used again still persists and does not score any marks. The idea of ‘running out’ and ‘not running out’ was insufficient to score. Very few students used the word stated in the specification which is ‘replenished’. ‘Replaced’ was allowed and ‘produced’ was the least creditworthy answer for the renewable energy definition. About 4 % of the students scored 2 marks and a further 30 % scored 1 mark.

08.2

Almost all of the students scored this mark for writing down the equation which links density, mass and volume.

08.3

Almost 70 % of the students scored 3 marks. Students who did not get the correct final answer could have scored 1 mark if they had substituted into the equation first before rearranging their equation, which was usually the reason their final answer was incorrect.

08.4

Almost none of the students scored 2 marks, while about 9 % of the students scored 1 mark. Students who wrote that tidal power output was greater than wind power did not score a mark without reference to a particular flow speed. If wind flow speed was a consistent 2 m/s and tidal flow speed never reached 0.75 m/s the wind turbine's power output would be greater.

08.5

Some students didn't understand the term 'environmental impact' and focussed their answers on reliability, efficiency and cost, scoring no marks. To score within level 2, students needed to make at least one comparative statement about a factor for both turbines. The simplest way of doing this was to compare relative size.
An answer;
'The wind turbine is larger, but harms birds. The tidal turbine harms fish but does not cause visual pollution' would have scored 4 marks.
Just fewer than 20 % of the students scored 3 or 4 marks, while almost 60 % of the students scored 1 or 2 marks.

09.1

Electrical devices near water were insufficient, as was wires in the water. A low p.d. power supply also is not a hazard, unless water was spilled on it, in which case it would score for the 'spilled water' which is a hazard by itself in a typical Science lab. Risks by themselves like electrocution, electric shock or burns did not score but were ignored if given with an appropriate hazard. Nearly 50 % of the students scored this mark.

09.2

This question is asking about one of the required practical's given in the specification. So it is perhaps surprising that about 11 % of the students did not attempt the question. Only about 3 % of the students gave a good description and scored 5 or 6 marks
Many students read the equation from the equations sheet, but couldn't identify which equipment measured which quantity, so did not score in Level 2. To score 5 or 6 marks, students needed to be clear how the mass of the water should be determined. It was possible for a student to score 6 marks for measuring the energy needed to increase the temperature of a suitable volume of water by just 1°C as the method would work, even if the temperature change is not as large as may be needed to obtain an accurate value.

09.3

Any named insulation was allowed for this question. Aluminium / tin foil was also allowed as it would reduce energy transfer by infrared radiation. Place the beaker on a 'heatproof' mat was

also creditworthy as it would decrease energy transfer through the base of the beaker by conduction. The vast majority of answers seen referred to adding a lid or adding insulation to the beaker. A small number of students thought that removing the joulemeter would solve the problem. Just over 70 % of the students scored the mark.

09.4

This question discriminated well between the students with many knowing how to work out a percentage difference. The most common mistake was to calculate the percentage difference between 4200 and 4410 which didn't score marks, unless they had set out the top of the equation correctly, (4410 – 4200) or (4200 – 4410) or calculated the difference of 210.

Many students calculated 105 or 1.05, which scored no marks unless the working out was shown. An answer of 4.76% or working showing a calculation of this figure, rounded to 5% scored no marks. Just over 30 % of the students scored 2 marks, while nearly 20 % of the students scored 1 mark.

10.1

Just fewer than 20 % of the students scored this mark. Some students wrote 'Increase the resistance' without specifying how, so did not score the mark. 'Closing the switch' was another common incorrect answer. A common answer was 'reversing the connections to the power supply', copying the stem of 10.4 and not understanding that the two phrases were not related to each other.

10.2

Just over 90 % of the students chose the correct equation linking V, I and R.

10.3

About half of the students scored 4 marks, while almost 10 % of the students scored 3 marks. Reading the correct value of current from the graph proved difficult for some the students, so a large tolerance was allowed for mark points 2, 3 and 4.

10.4

Many of the students thought the ammeter was broken, or the switch was open, or misread the question and thought the ammeter was being used to measure potential difference. Very few of the students scored 2 marks, while only about 3 % of the students scored 1 mark.

Mark Ranges and Award of Grades

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