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Science A / Physics PH1FP

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Unit: Physics 1

Report on the Examination

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General

Questions 1 to 7 were low demand, targeting grades E, F and G. Questions 8 and 9 were standard demand, targeting grades C and D.

The majority of students attempted all parts of the low demand questions, although, with the exception of Question 8(b), a significant number of students left several of the standard demand questions unattempted.

The standard of arithmetic in the calculation questions was generally good, although a significant number of students appeared to have no calculator, or did not know how to use it properly. Students should be encouraged to show substitution and working out.

In questions where students were asked to "explain", the answer given was often just a simple statement or description. Students should be reminded that if the question contains the word "explain" their answer should include the word "because". Several students either thought that the word “explain” meant “describe” or simply repeated information given in the stem of the question without giving any added value.

Question 1 (Low demand)

This question was well answered, with approximately two thirds of the students scoring all three marks. The most common wrong response was to say that a nuclear energy source is unpredictable.

Question 2 (Low demand)

(a) This was another well-answered question, with the majority of students gaining all three marks.

(b) Although the majority of students selected the correct equation and successfully completed the arithmetic, many of these added a unit, usually joules, after the number. Of those who calculated the answer as a percentage, many forgot to add the % sign. Many weaker students ended up with a figure of 4 even if they had correctly written down 50/200.

(c) Only about one third of the students chose the correct answer to this question. More than half of the students believed that a small number of solar cells produce a lot of electricity.

Question 3 (Low demand)

(a) (i) Nearly all students answered this correctly.

(a) (ii) Nearly all students answered this correctly.

(b) (i) Nearly all students answered this correctly.

(b) (ii) Nearly all students answered this correctly.

(c) (i) The majority of students correctly chose evaporation.

(c) (ii) Most students knew that if the weather became warmer or more windy the puddle of water would evaporate faster. A few students were unspecific and simply wrote “temperature” or “the Sun”.

Question 4 (Low demand)

(a) (i) Fewer than half of the students produced a correct response for this question. A common answer that gained no mark was simply "length".

(a) (ii) Again fewer than half of the students gained the mark for this question. A common answer that gained no mark was simply "height".

(a) (iii) Responses were divided almost equally between the correct answer "sound" and the incorrect answer "visible light".

(b) (i) Many students left this question unattempted. There were very many wrong answers, the most popular being "refraction" and "distillation".

(b) (ii) Most students were able to calculate the value of 0.12 correctly, but many either forgot to add the unit or chose the wrong unit. The abbreviation mps was also common, but did not gain any credit.

Question 5 (Low demand)

(a) Most students realised that a shiny surface would be a good reflector, but many used the word "bounce" instead of "reflect". The most common wrong response was to say that metals are good conductors.

(b) Although most students correctly chose black as the best colour to paint the outside of the metal cooking pot, there was much confusion as to the reason. Many students stated that black was the best colour to attract the Sun. Some students stated that black would absorb energy without making any comparison, e.g. by stating that black is a good absorber. As in previous papers there was much confusion between absorption and emission.

(c) The great majority of students could give a correct reason for having a lid: usually to keep the heat in or to stop the water evaporating.

(d) The majority of students could correctly complete the calculation. Some however, although they could correctly substitute the numbers into the appropriate equation, were unable to calculate the correct value. This may have been either because they did not have a calculator or they were unable to use the calculator correctly. Some students incorrectly chose to convert the mass in kilograms into grams before doing the calculation.

The correct numerical answer was 672000. Some students sensibly wrote this as 672,000 using a comma as a separator. Others wrote it as 672'000 using an apostrophe as a separator.

Question 6 (Low demand)

(a) Fewer than half of the students could correctly identify the angle of refraction. The most common mistake was to label the angle between the refracted ray and the plastic block. Some students chose to label a ray rather than an angle.

(b) (i) The great majority of students correctly identified the anomalous point. Of those who failed to score a mark the usual reason was because they had circled the point plotted at 30° as well as the point at 25°.

(b) (ii) Only about a quarter of the students were able to suggest a sensible reason for the anomalous result, usually related to the block or the ray box having moved. There were many cases where this question was not attempted.

(b) (iii) Most students chose the correct response that the angle of refraction is greater than the angle of incidence.

(c) Half of the students failed to score any marks on this question. Many students showed internal reflection rather than refraction. Of those who did show refraction, a large proportion showed the emergent ray on the wrong side of the normal.

(d) (i) About half of the students chose the correct answer that people will have enough light to work inside their homes. The other half mainly chose the incorrect answer that fewer plastic bottles will be thrown into rubbish tips.

(d) (ii) Most students realised that there would be no light at night using this system. A few were concerned about the holes in the roof. Others thought that evaporation of water from the bottle would be a problem.

Question 7 (Low demand)

(a) (i) About half of the students knew that this observation is called red-shift.

(a) (ii) The great majority of students knew that the observation gives scientists evidence that the Universe is expanding. The most popular incorrect answer was that light can be stretched.

(a) (iii) Most students correctly identified graph **N** as representing the relationship between observed increase in wavelength and distance from Earth.

(b) Most students knew that the question “Why was the Universe created?” is one that scientists are unable to answer. The most popular wrong choice was “How fast does light travel through the Universe?”

Question 8 (Standard demand)

(a) Two thirds of the students failed to score any marks on this question. Many students failed to gain marks due to the idea that this was the first day of generating electricity and nuclear needed a long start-up time so gas would be used until nuclear was ready. This misconception gave students little chance to gain any credit. Those who did score credit usually recognised the idea that gas could be turned on quickly and/or could be used to supply at peak demands. Many students thought that the gas power station provided gas to the home.

(b) Nearly all students attempted this question and most got some credit, usually for comparing the costs of the two methods. Many students gave vague statements where the science was weak and incomplete. Some of these students were the more able who wrote eloquently but failed to gain credit because of phrases such as “eco-friendly”, “environmentally friendly” or made statements which did not go far enough such as “cause pollution”, “harmful”. Many students wrote about visual pollution, noise, harming birds, smells on the farm, etc. In the future, they need to elaborate ideas, giving more exact details. Most students made a choice and gave sensible reasons for that choice. The more able students were able to compare the advantages and disadvantages of both systems, and provide an overall conclusion at the end. Many students simply listed advantages and disadvantages

of the two methods and did not attempt to fully answer the question by making a clear conclusion – as the question asked. Some students thought that the animal waste was dead animals or animals that need to be killed as the energy source. Other misconceptions included methane being non-renewable, the production of carbon dioxide being an advantage (helping the farmer's plants grow better) and that the major disadvantage of biogas was the smell. It was pleasing to see that more students were planning their answer before starting it.

Question 9 (Standard demand)

(a) (i) Many students left this part blank. Around half of the students obtained the correct answer of 5 (kW) and they were often able to go on and obtain both marks in part (ii).

(a) (ii) Many students left this part blank.

(a) (iii) Many students left this part blank. This part caused more difficulty with students commonly multiplying the cost per kWh by the days or by 24. Those failing to calculate part (i) correctly often went on to gain credit with the error carried forward into the other two parts although for part (iii), correct answers for part (ii) were sometimes ignored for another quantity. Perhaps this was due to the students not recognising how the parts were connected.

(a) (iv) Whilst many students scored the first mark for saying that the rate of energy transfer from the house decreases, only a handful gained the second. Most simply stated the temperature dropped over the time period in question. A sizeable minority chose the second option for the first marking point, saying that between 5.30 and 6.00 am the graph did not change.

(b) (i) Most students found this difficult. “Hot air being trapped in the cavity” or “heat being trapped in the air bubbles” were common incorrect responses. Many simply repeated that energy transfer by convection would be reduced, which they were told in the stem of the question.

(b) (ii) Many students were not able to give an indication that they understood the idea of U-value. Often they simply tried to substitute a word for U e.g. “ultimate value” or “ultra value”. Others were influenced by the word 'value' and related it to economics in some way.

(c) A major misconception of many students is that double-glazing is the best form of thermal insulation. Therefore many answered with statements like 'the rate would fall because glass is such a good insulator'. Others thought that 'heat would be trapped by the vacuum between the panes of glass'. Yet others obviously did not understand the term 'energy transfer'.

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA website

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