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Additional Science / Physics PH2HP

(Specification 4408 / 4403)

Unit: Physics 2

Report on the Examination

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General

Questions 1 and 3 were standard demand, targeting grades C and D. Question 4 was a mixture of standard and high demand. Questions 2, 5 and 6 were high demand, targeting grades A and B.

The paper was well attempted by the majority of students who were able to complete the examination with in the specified time. A disappointing number of students were not careful with regard to upper and lower case letters when using symbols to abbreviate the name of a unit.

Question 1 (Standard demand)

(a) Nearly all students gained this mark. However a few students did not as they referred to energy or potential rather than force.

(b) Just over half the students scored two marks, with many gaining all three marks. Those students gaining two marks failed to comment that the time between oil drops remained constant.

(c) (i) The majority of the students gained this mark. Those who did not failed to read / understand the question and answered in terms of thinking time / distance.

(c) (ii) Only a minority of students gained all three marks. A common mistake was where the student overlooked the k in kN and so gave the answer as 75. The unit for work done was not well known.

Question 2 (High demand)

(a) (i) Surprisingly only just over half of students gained this mark, with the popular answers being ‘nuclear power stations’ or ‘nuclear weapons testing’. ‘X-Rays’ was also a common response. The common incorrect responses were smoke detectors and vague answers referring to medical uses without being specific. A significant number of students failed to see that ‘man-made sources’ was in bold and responded with ‘cosmic rays’ and ‘rocks’.

(a) (ii) Several students gave the correct response in terms of background radiation varying but relatively few gave the answer in terms of decay being a random process. Common incorrect answers referred to the teacher moving the experiment around the lab to cause the differences or to other radioactive sources being present at the times of the three readings, including the introduction of radioactive materials into the room and the presence of different food being present when the readings were taken. Many did use ‘vary’ or ‘changes’ but too many gave responses showing a complete lack of understanding of this process.

(b) The most common correct response was ‘other factors’. When other factors were mentioned, it was usually smoking. Several students gave answers referring to the hereditary aspect of cancer. Very few answers talked about the validity of the evidence, or the sample size.

(c) (i) The majority of the students gained both marks.

(c) (ii) Just over half of the students gained both marks.

(d) Almost two thirds of the students gave the correct response of 3.8 days, with a few giving the answer as a fraction and one or two converting 0.8 days into hours and minutes. Nearly all correct answers used the counts of 800 and 400 to determine the half-life. A few misread the x axis scale and then answered 3.4 days and a few, after drawing correct lines then put down an incorrect answer. Common errors included believing the "222" of radon was important and so a line was drawn across from a count of 222 to give a half-life near 7 days.

Question 3 (Standard demand)

(a) This question was poorly answered. Only a minority of students were able to give a straightforward statement about the inward and outward forces being balanced. Others spoiled an otherwise sound answer by naming the forces incorrectly, and others only stated that the forces were equal, not balanced. Many incorrect answers were about the stars having a large supply of hydrogen for fusion so they last a long time.

(b) (i) The overwhelming majority of students deduced the inverse relationship between the two variables in the table and gave a clear correct answer. Some misunderstood the term 'main sequence period' and thought it meant how old the star is now e.g. 'low mass stars are very old'. Others stated a direct relationship between the two variables.

(b) (ii) This was not answered correctly by the majority. Correct answers usually had a clear explanation either in terms of not knowing the exact amount of hydrogen in a star or the main sequence life time being far longer than scientists are able to observe for. A lot of incorrect answers repeated ideas from the table in the question, saying that the main sequence life time depended on the star's mass, or that 'it is quicker for some than for others'.

(b) (iii) A small number of students gave well-constructed answers that gained full marks. About three-quarters of all the students gained the first mark point, but more than half of these failed to gain anything further from their explanation. A few students made a correct statement about mass and main sequence period, but did not link this in any way to the faster rate of fusion. Others stated that larger stars produce more energy, but not that they release energy *at a faster rate*. Those who did go on to score one further mark for their explanation most often gave a clear link between the shorter main sequence period and the larger mass of the star. Most of the students who scored zero for the question chose 'slower than' for their first answer.

(c) Marks across the whole range were scored for this question with the majority of students having a good knowledge of the stages but not giving enough description to always score highly. There were a significant number of excellent answers where students knowledge was accurate and beyond that expected from the specification. Weaker answers contained general statements which were not inaccurate but which did not score credit.

Question 4 (Standard and High demand)

(a) (i) Considering this question was asking for recall of standard symbols it is surprising and disappointing that over half of the students scored zero. Only a small minority of the students gained both marks. The variable resistor caused fewer problems than the diode.

(a) (ii) Again poorly answered with only about a third of the students gaining both marks and just less than half of the students scoring zero. Many of the students mentioned the switch and the direction of the diode as a reason for the circuit being incorrect. Others showed even less understanding of the circuit.

(b) (i) The majority of the students gained this mark.

(b) (ii) Just over half of the students got this question correct gaining the full three marks. A Significant number of students made errors by taking the numbers 0.08, 0.8 or 0.009 from the graph.

(c) (i) Just less than a quarter of students managed to achieve two marks on this question; with a further small number gaining one mark by obtaining the period, with a significant number believing this was the final answer.

(c) (ii) Very few students achieved both marks on this question – most made no mention of high resistance in the reverse direction. Less than half of the students achieved the second marking point with reference to current flowing only in one direction.

Question 5 (High demand)

(a) Most students scored at least one mark, for referring to the more streamlined profile of design Y, and many went on to talk about the effect of air resistance. Nearly half of the students then referred their answer back to the effect on the top speed to gain full marks.

(b) (i) The majority of students were able to make the calculation accurately but many lost a mark by failing to give their answer to 2 significant figures. Many students incorrectly rounded down or put 1.6 recurring, denoted by a dot, not appreciating that this was not 2 significant figures.

(b) (ii) This was poorly answered with the majority of the students scoring zero.

(b) (iii) Less than half of the students answered this correctly.

Question 6 (High demand)

(a) (i) This was poorly answered with about a 50/50 split between the numbers 50 and 230.

(a) (ii) Just over three quarters of the students failed to score any marks often confusing RCCBs saying they switched off the circuit when the (live) current was too high. Others thought that they worked like fuses with something in them melting at too high a current. Of the minority who scored one mark it was usually obtained by correctly stating that the current in the live and neutral wires differed, but then went on to describe the mechanics of how the device worked rather than giving a reason for the currents being different. The very few who achieved both marks obtained these by linking the current flowing to ground through the earth wire/copper braid but omitted the way the RCCB detected the fault.

(a) (iii) The majority of students scored this mark for the idea of quicker operation or the ability to reset/reuse RCCBs. Some students gave insufficient detail with answers such as ‘automatic operation’ or ‘safer’ with little exemplification.

(b) (i) Since the equation for this is given it was disappointing how few students managed to use the equation, transform it correctly or substitute values in correctly. Approximately half the students either did not manage to correctly change hours to seconds or did not realise this had to be done.

(b) (ii) A minority scored both marks on this and very few scored one mark – if students found the correct equation they could put the values in and do the arithmetic. Unfortunately too many students chose the incorrect equation trying to use E= P x t and using p.d. for power rather than E = V x Q. Some students tried to use E = V x I x t but again incorrectly converted hours to seconds. However it was pleasing to see that most students showed the working they used towards getting their answer even though it was often wrong.

(c) Most students did not appreciate that the thermistor increased in temperature but related the answer to heating the ground. The link between the thermistor and a decrease in resistance was well understood. Weaker students did not understand the way in which a thermistor works or the effect of temperature on its resistance.

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

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