GCSE
ADDITIONAL SCIENCE / PHYSICS

PH2HP
Report on the Examination

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General

Questions 1 to 3 (and part of Q4) were standard demand, targeting grades C and D. Questions 5 to 7 (and part of Q4) were high demand targeting grades A* to B.

The paper was well attempted by the majority of students who were able to complete the examination within the specified time. Calculations were generally well done and students wrote extensively on the prose questions, even when they did not score highly, suggesting that they found the questions accessible.

Question 1 (Standard Demand)

(a) The vast majority of the students were able to complete this calculation without difficulty.

(b)(i) Over three quarters of the students scored on this question, but a lack of precision led to only about a third of the students scoring both marks. Friction was mentioned without clarity as to where this occurred. Some of the weaker answers were negated by reference to positive electrons.

(b)(ii) A substantial number of the students were able to score a mark by writing that the hair was charged positively or negatively; however only a minority of the students scored both marks identifying that the hairs repelled from each other due to them all having the same charge. Common errors included writing that the hair was repelled or attracted by the slide and that the charge was trying to escape to the air.

(b)(iii) About half of the students realised that this was because the metal was a conductor, although few mentioned earthing. A significant number of the students stated that metal was not a conductor.

Question 2 (Standard Demand)

(a) Most of the students scored very well here, with nearly three quarters gaining both marks. ‘J’ was usually seen with ‘it is the smallest’. Some students tried to elaborate further and ended up by confusing their answer. Another popular answer was ‘(only) small stars become Black Dwarfs’.

(b)(i) Both ‘become a supernova’ and ‘it will explode’ were seen here although only one response was needed. About a quarter of the students scored zero and those that did often had either a subsequent incorrect stage written down or ‘it will implode’.

(b)(ii) This was not done very well with over four fifths of the students scoring zero. Most of the students mentioned the lack of weighing machines or another method for measuring the mass. Another popular response was the idea that we cannot visit Betelgeuse.

(b)(iii) This was generally done very well with half of the students giving one of the responses involving advances in measuring, scientific knowledge, or technology. Unfortunately a few of the students continued with the idea of technology extending to the building of spaceships enabling people to visit Betelgeuse.

(c) This was usually done well, with two fifths of the students scoring 3 or more marks. Some of the students were very unsure of the different stages and just wrote down Red Giant and White Dwarf and this enabled them to obtain two marks. The last stage was a little confusing to some of the students as they wrote about the star losing all of its energy or running out of energy rather than the star stopping emitting energy.

Question 3 (Standard Demand)

(a)(i) Less than two thirds of the students were able to correctly identify force A. This was disappointing as students should have realised that gravity and weight could not be correct due to the direction in which they act.

(a)(ii) Nearly four fifths of the students scored this mark. Some of the students gave acceptable descriptions of the friction with the air rather than naming the quantity. Drag was not often seen as a correct response.

(a)(iii) This question was a good discriminator. About a fifth of the students wrote a level 3 answer and a further two fifths of the students a level 2 answer.

The weakest students often only gave answers in terms of the change in velocity and/or made fundamental errors in their answer. Many students at level 1 did not read the question carefully and so gave generic answers about velocity being a vector quantity and the change being due to a different direction of travel or, more commonly that the bike was travelling up/down inclines. It was quite common to see answers which had acceleration increasing but velocity decreasing or comments that the air resistance in XY was decreasing so the bike was able to travel faster. There were also many suggestions that the speed reduced over time as the cyclist had been able to cycle faster when he first started out. The weaker responses also suggested that resultant force was the name of the larger force acting, i.e. the forward force is the resultant force.

Mid-range responses often made correct comments about both forces and velocity but didn't always correctly relate the two. Many gave a narrative response which didn't clearly identify which section they were referring to and/or included incorrect forces. Most had an appreciation of balanced and unbalanced forces but incorrect responses in terms of 'balanced resultant force' were seen.

Y- Z was often better described both in terms of forces and velocity. A good number of the students used the idea of air resistance increasing until forces were the same, often using ‘balanced’. However ‘resultant force being zero’ was seen less frequently but most knew that acceleration was zero (perhaps not fully understanding why). Terminal velocity was correctly used to describe the motion Y – Z.

A significant minority of the students stated that the bike was slowing down or stopping in YZ so whilst they gained credit for an understanding of XY they had significant errors for YZ. There was often some confusion over the role of friction in the scenario.

The best responses were those which used the idea of acceleration throughout the explanation. These correctly explained the increase in velocity due to the correct forces in XY and made the link between air resistance and velocity and then between the decreasing resultant force and the acceleration. These level 3 answers were often succinct and structured so that the candidate was able to use the correct ideas for each section of the graph and did not add in unnecessary detail. Answers accessing the top marks did not need to use all of the available space.

(b)(i) Nearly three fifths of the students scored all 3 marks. The two errors that occurred most frequently were either dividing the 140 by 10 to give a final answer of 336 or rather more rarely, students decided to divide 140 by 24. However neither of these errors were seen often. The unit mark, scored by about two fifths of the students, proved to be a larger problem in that a common unit error was Nm rather than joules. 'J' as the correct symbol for joules dominated responses, with a few of the students failing to earn the unit mark by using lower case j.

(b)(ii) The first mark was scored by about three fifths of the students. However a number of the students gave 'is converted / transferred to thermal / heat energy' as their answer. The second mark, scored by under a third of the students was often not scored for temperature, but for heat and occasionally thermal energy. Again friction was the most frequent incorrect response.

Question 4 (Standard and High Demand)

(a)(i) Fewer than two fifths of the students drew the correct thermistor symbol. Some of the students drew a symbol for an incorrect component, often a variable resistor, LED or LDR. Drawings of bead thermistors were quite common, as were a box or circle with just the letter T in it.

(a)(ii) The majority of the students substituted the data and calculated the correct answer. There were very few calculation errors, but a number of the students did not rearrange the equation correctly. The most common mistake was to use the temperature value, 20°C, for either current or potential difference.

(a)(iii) This question was poorly answered with only a small proportion of students scoring the mark. The majority of the students drew an upwards sloping straight line.

(a)(iv) The majority of the students were able to answer this question correctly.

(b) Only a quarter of the students answered this question correctly. There were some high quality explanations of why the ammeter in series should have low resistance so as not to affect the current it is measuring. Many of the students scored zero with answers such as 'it lets the current flow easily', 'it lets more current go through' and 'it stops it overheating'.

(c) This question was well answered by just over half of the students. Some students failed to score the mark because they merely threw in a word from the 'How Science Works' lexicon, for example 'it makes it more accurate / reliable / valid / fair'. A few misunderstood the question and explained why scientists in different countries use different temperature scales or stated that it made it easier to convert the units.

(d) Nearly half of the students scored one mark, usually for recognising that a light source was needed to replace the Bunsen burner. A smaller number of the students went on to gain the second mark for realising that the thermometer was redundant and a light meter was required. Some did not know the name of the scientific apparatus but gave an acceptable description of 'a device that measures the amount of light'. Many of the students missed marks because they gave answers like 'use light not heat' but did not refer to the specific apparatus. Others stated what needed removing but not what should replace it, or vice versa. There were a few totally wrong ideas e.g. 'use a better thermometer', 'increase / decrease the battery voltage' and 'add / remove change the ammeter / voltmeter'. It was clear that many students did not make good use of the example given in the stem of the question.

Question 5 (High Demand)

(a) A large proportion of the students scored zero on this question, many because of their failure to use the idea of momentum. The majority of these answers included reference to forces, commonly beginning 'every action has an equal and opposite reaction' etc. Some of the students picked up marks for stating that momentum is conserved or words to that effect and a smaller number picked up a mark for realising that the initial momentum was zero. Some students related the situation to an explosion but still struggled to score more than one mark. However, those who understood the situation were able to give clear answers gaining full marks.

(b) Over half of the students scored zero on this calculation. Many added the masses together before attempting to calculate any momentum, and there was a general lack of clear understanding. Very few of the students scored a mark for stating that momentum was conserved but some compensation marks were scored for finding the final momentum of the skateboarder.

Question 6 (High Demand)

(a) Nearly three fifths of the students gave the correct answer, 'number of protons'. Many of the students did not understand the term 'in common' and instead, wrote about the differences between isotopes.

(b)(i) About two fifths of the students correctly stated that nuclei are split in nuclear fission. Most of the remaining students had an idea of what happens but used ambiguous and vague terminology, using 'break apart', 'divide' 'particles' without supporting explanation and thus lacked sufficient clarity to obtain the mark.

(b)(ii) A lack of clarity again stopped students obtaining this mark with only about two fifths naming the reactor as the part where molybdenum is produced.

(c) About two thirds of the students identified the radiation as beta. However the reasons given were often confused, imprecise and sometimes contradictory. Examples seen include: 'atomic number stays the same but number of protons goes up', 'nucleus loses a proton and gains a neutron', 'nucleus loses a neutron but gains a proton and an electron', etc. Less than a third of the students gave complete answers that correctly gave the marking points in the mark scheme.

(d) Only less than a third of the students gave answers sufficient to score the mark. A small proportion of the students gave an answer in terms of the count rate halving.

(e)(i) About two thirds of the students recognised that the number remaining was 20,000 but then less than half of these students used the graph to correctly identify 6.2-6.3 days as the time required. A small amount of students drew lines on the graph at 80,000 and identified 0.8 days but half of them, then carried out further calculations on this and consequently lost the compensation mark.

(e)(ii) Fewer than a third of the students scored the mark for the ionising effect of radiation; of those who did, they usually went on to score the second mark. Most of the students that scored the second mark did so for general terms about radiation 'causing cancer' or some form of harm. Few students linked the ionising effect of radiation to damage or harm to individual cells or DNA.

(e)(iii) Many of the students reiterated statements from part 6(e)(ii) about the dangers of radiation rather than answering the question asked. Students' phrasing of their response was often confused with only about a fifth being able to describe that the benefits outweighed the risks.

Question 7 (High Demand)

(a) Vague descriptions meant that only just over two fifths of the students were able to access this mark. The term double insulated was not widely used with most answers scoring the mark for descriptions of the plastic casing being an insulator.

(b) The calculation was completed correctly by about two thirds of the students but a very small amount of the students were able to pick up a compensation mark when the two marks were not scored.

(c) A small proportion of the students were able to describe correctly the operation of an RCCB. There were many responses which referred to 230 V and others referred to it getting too hot etc. Some incorrect responses did refer to the live and neutral wires but in the wrong context.

Mark Ranges and Award of Grades

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

Converting Marks into UMS marks

Convert raw marks into Uniform Mark Scale (UMS) marks by using the link below.

UMS conversion calculator