Examiners' Report/
Principal Examiner Feedback

June 2011

International GCSE
Physics (4PH0) Paper 1P
Science Double Award (4SC0) Paper 1P

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Question 1
(a) This part caused very few problems to candidates, the vast majority of whom scored 3 marks. The most common error was to put 'chemical' energy instead of 'elastic' in the second part.
(b) Again, many candidates scored full marks, but there were a number of common errors. Some candidates did not read this question carefully and could not distinguish between the question which was asked and the standard conversion between KE and GPE when the ball was bounced. If the energy goes away from the ball they should be able to state what type of energy it is transferred to or where is goes to – not just a vague 'it is transferred away'.

Question 2
Parts (a) and (b) were answered correctly in almost all cases.
(c) Many candidates scored full marks. Common errors arose where the candidates had not matched the hazard to the method of reducing the risk. For example, 'UV could cause blindness, wear sun cream to protect from UV'. Whilst both of these statements are true, this would only score one of the two possible marks. Also, there was some confusion between the effects of infrared and ultraviolet caused by the Sun, with a general 'apply sun cream' being applied to both. A number of candidates referred to 'wear protection' and 'avoid exposure'. This early in the examination paper, these answers were accepted, but they were rather more vague than the examiners would have liked. A number of answers referred to 'causing mutation' without further elaboration, suggesting the growth of extra arms, etc. Again, the answer was accepted at this point in the examination paper, but it would have been preferable to see some reference to cells.

Question 3
(a) Very few errors in this part of the question.
(b) Candidates should ensure that they read this type of question carefully. This question requires the candidates to think about how the equipment already provided could be used better. One mark would have been awarded for the candidates saying that they would use the 0.5cm scale on the ruler. No marks were awarded for stating that they should use a mm scale as there is not one available on the ruler provided.

Question 4
(a) Whilst it was recognised that electromagnetism related to movement, current and magnetism, a number of candidates still seemed to be confusing motors and dynamos. Many candidates talked about cutting of magnetic lines and induction of current. Some talked of charges or poles attracting and repelling which was not appropriate. A number of answers also referred only to electricity rather than the current in the circuit/coil. Another occasional problem among weaker candidates was the phrase "switch is closed" which they took to mean the circuit was switched off.
(b) Generally very well answered, with the only common error being a reference to 'more coils' rather than 'more turns'.
(c) The confusion between the motor effect and electromagnetic induction continued, although less pronounced here. Many candidates realised that when

the magnetic field is cut by the coil a current is induced, although some found it rather difficult to express themselves to say this.

Question 5

(a) The majority of candidates scored full marks. When an equation is asked for, candidates should be careful to ensure that they write out the equation using the words used in the question, although standard symbols would be accepted. Some candidates tried to shorten down the word moment to the letter m. Using m in the equation was wrong since this is the standard symbol for mass not moment.

(b) This question proved an excellent discriminator in that it separated out those that could use scientific language precisely from those that had a vague sense of the meaning. Hence, those that could clearly express the idea that objects experience a downward force caused by the acceleration due to gravitational attraction scored well. Others who had a vague sense of what gravity was, but were clear that it acted downwards could score 1 mark, whereas those who knew it would be easier to close the lid but could not express why scored zero. This illustrates a common misconception about there being something like a mystical being called gravity that makes things fall. The specification refers to "gravitational force" and teachers are encouraged to use this expression as a matter of course.

Question 6

(a) Very few errors occurred here.

(b) Again, the large majority of candidates scored full marks. The main source of error in response was the 'r' being put too high within the angle area or else on the outside of the ray line indicating the ray not the angle of reflection.

(c) The large number of candidates who struggled to complete the ray diagram accurately or to outline a method of checking the image position suggests that many have not carried out experiments relating to light waves, such as those implied in sections 3.14 – 3.19 of the specification. Candidates who had carried out such experiments found this question much easier to answer. A standard answer to the second part of this question involved confirming that the object-mirror distance was equal to the image-mirror distance. Although i=r is a law of reflection, this could not be used to establish the correct position of the image.

Question 7

(a) Almost always answered correctly.

(b) Some candidates found this question difficult to tackle. The key to answering why it gets hot is thinking about the type of device it is (an electric kettle) and what happens (it gets hot). This should get the candidate thinking about energy transfers ie electrical energy to thermal energy.

(c) The equation was recalled well and generally applied correctly. The examiners needed to see the value of 8.7 (A) and some candidates round their value to 9 A directly and so lost mark for omitting this step. The large majority of candidates correctly chose the 13 A fuse, although clear statements of why this was the correct fuse were less common.

Question 8

(a) The calculation of speed was generally completed correctly, although a number of candidates found it difficult to handle units consistently. It would have been advisable for the candidates to convert the distance to metres and the time into seconds before performing the calculation to find the speed in m/s. Any value given with the corresponding unit was accepted, e.g. 36 km/h. In part (iii), candidates often found it difficult to express their ideas concisely and clearly. Some explained that an average by definition had lower and higher values without understanding its relevance to the train. Others seemed to think 15 minutes was not enough time for the train to reach its maximum speed. Others referred to 10m/s achieved in part (ii) and just said trains travel faster than this.

(b) Many candidates scored full marks. However, there were a number of errors seen regularly. In part (i) candidates should have been using the whole length of the diagonal to find the gradient of the to calculate the acceleration. In part (ii) the answer should be found using the area under the best fit line. The easiest way to do this was to divide the area up into two triangles and a square and then finding the area using the scale on the graph. Some candidates counted the number of squares but did not use the scale to find the distance. Other candidates attempted to rearrange the equation used in Q8(a)(i) but this was not a valid method since there was no way to find the average speed quickly and using the maximum speed was wrong. Equations for constant speed are not valid since it accelerated and decelerated.

Question 9

(a) The calculation was carried out successfully by the vast majority of candidates. In part (iii), a common error was to say that the gravitational potential energy and the work done were proportional, rather than equal.

(b) Probably the least well-answered question on the whole paper, even though the ideas are specifically referred to in the spec sections 4.6-4.8. Candidates often just gave definitions of the three processes – not necessarily correctly. Most of the marks given were for relatively low-level answers such as “air is an insulator” or “foil reflects heat”. Confusion was common between convection and the idea of hot air actually leaving the house. Some thought that the purpose of the insulating material was to conduct heat into the house as aluminium was a good conductor. Few appreciated that the fibres were insulators. Under convection most candidates just repeated the question by saying the air was trapped without saying what that meant. Many thought that the aluminium foil prevented warm air leaking out of the top of the house. Those who realised that the question did not involve ionising radiations often scored the mark for shiny surfaces reflect heat radiation. Good candidates correctly stated that it was a poor absorber or a poor emitter.

Question 10

(a) Candidates generally scored well on this question. Common errors included placing the voltmeter in series in some part of the circuit.

(b) Most candidates used the correct equation, although very few could correctly handle the conversion from mA to A.

The graph in 10b(iii) frequently scored full marks although some candidates failed to label the axes or joined the plots with straight lines. Although most could state that current increased with temperature many then struggled to explain the non linear relationship in suitable terms. A majority correctly stated that the student in 10b(v) was wrong as they could justify if by just saying the current increased, although good candidates went on to explain why that meant that the resistance decreased.

Question 11

(a) Most candidates did achieve at least 3 marks. The main errors seen were the omission of any units or incorrect reading of the volume of liquid (many candidates put down 173 instead of 176).

(b) Answered extremely well by most candidates. The main area of confusion was the incorrect arrangement of the equation if they had referred to it.

(c) In this answer there needs to be an understanding of what accurate means. Some candidates started to use this term in the answers without explaining what, in practical terms, it meant. Most candidates recognised that using equipment with more scale divisions was good eg mass in g to one decimal place. However, this mark was only available once, so referring to a more precise scale on the balance and on the measuring cylinder only scored one mark. A number of candidates referred simply to ‘using more accurate equipment / balances / measuring cylinders. These answered gained no credit.

Question 12

This question required knowledge of pressure in liquids – not in gases (as used incorrectly by a significant minority of candidates who tried to use kinetic theory of gases to conclude that the pressure in the half full cup was higher than the full cup despite the fact that this is counter-intuitive.). The candidates needed to state that the greater pressure was in the full cup (or the pressure was less in the hall full cup) to score the first mark. The candidates then needed to use their scientific knowledge of the pressure equation to find the other 3 marks, either by using pressure = force / area or pressure = density x g x height difference.

Eg Pressure = force / area (1 mark). Force due to tea is more in the full cup than the empty cup ie higher weight (1mark). But area is the same (1 mark) so pressure greater in full cup.

Where candidates had followed this reasoning the most common mistake was to miss out a statement of the factor(s) that remained constant.

Question 13

(a) Candidates could relate the symbol to numbers of protons and neutrons almost without exception.

(b) The definition of isotopes was known by almost 100% of candidates.

(c) Candidates had virtually no problems in completing the nuclear equation.

(d) Successful candidates were able to relate what they knew about the three radiations to this question. The implication of the properties needed to be linked to their effect on the tumour. Candidates should think about how far each of them would penetrate through the tumour and how much ionisation damage would be caused to the tumour and the surrounding healthy tissue. A significant number of candidates could not apply their knowledge to the situation given. Many candidates assumed the source of radiation was outside the horse ('the alpha radiation would be stopped by the skin') despite being told in the stem of the question that the iridium was put into the tumour.

(e) This question required candidates to apply their knowledge of activity to the treatment of tumours and a recognition of the fact that the activity of a sample got lower over a period of time. This question was not asking candidates to state how the converted the timespans between units. A lot of responses equated half-life with level of activity, indicating that work needs to be done in explaining what the terms, activity, decay and half-life mean – for example, it was common to see answers referring to the 'radiation lasting in the body'. Many assumed that one half-life was a measure of the useful life of the isotope. Only the most able candidates were able to give a measured response that stated the need for high activity to continue for the length of the treatment while in situ in the tumour, balanced with the desire for activity to fall reasonably quickly.

Question 14

(a) Often well answered but weaker candidates did not appreciate that they had to write proton and neutron twice and so added other spurious particles for the spare two.

(b) In part (i) most candidates understood the chance of collision, but often failed to understand the other problems of alpha particle range and loss of energy. A few thought the alpha particles became ionised by the air. Many thought that the air might slow the particles down or that air molecules would bump into the detector and produce a signal. In part (ii) many candidates scored both marks. In part (iii) the question required the candidates to look carefully at the information in the question and create an answer to explain why the outcomes occurred. It was not enough to simply just copy out parts of the question for the marks. Similarly, many candidates seemed to write down all they could recall about the structure of an atom, leaving it for the examiners to decide which parts were relevant. Most candidates did gain a mark for saying the atom is made up of mainly empty space – although the examiners would have preferred candidates to refer to the nucleus rather than the space. Most candidates referred to a repulsion, although some candidates did not mention that the two positive charges would cause the repulsion to occur. Hardly any of the other marking points were mentioned by candidates. Some candidates did indicate that the nuclei are a small target however this lacked a lot of detail so no mark was awarded. Many candidates found it difficult to relate the three facts given to the appropriate part of the conclusion. Only a small minority stated that the nucleus must be more massive than the alpha and did not refer to mass when justifying the conclusion that the nucleus was dense as they also confused mass and density. A number of candidates required more space to answer than was provided – however, if the candidates had selected the parts of their knowledge that were relevant and linked them concisely to the information given this problem would not have occurred in most cases.

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