

Examiners' Report/  
Principal Examiner Feedback

Summer 2012

International GCSE

Physics (4PH0) Paper 1P

Science Double Award (4SC0) Paper 1P

Edexcel Level 1/Level 2 Certificate

Physics (KPH0) Paper 1P

Science (Double Award) (KSC0) Paper 1P

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## **4PH0/KPH0 & 4SCO/KSCO (1P) Examiners' Report – Summer 2012**

### **General**

Many candidates scored very well across all aspects of this paper, indicating thorough preparation fully covering the specification. Numerical work was usually handled very well, including simple rearrangement of equations. Questions relating to experimental work and other skills covered by AO3 often allowed candidates greater freedom of expression and examiners were pleased to see many responses that indicated the candidates had experience of practical physics and were able to describe their ideas clearly.

### **Question 1**

The majority of candidates scored 4 marks. A few candidates did not recall microwaves in completing the table in part (a). Again, a few candidates did not identify 'ultraviolet' as being linked to sunburn and snow blindness. There was no evidence of the multiple-choice response boxes causing any confusion.

### **Question 2**

Q2aii Many candidates answered this question correctly with '45 degrees' or 'angle of reflection'. However, a number of candidates put angle of refraction or critical angle therefore gaining no marks. Some candidates contradicted themselves, '45 = refraction angle'.

Q2b Candidates were quite split on this question. A large number thought that the ray would refract at the first boundary and many others thought that the light only reflected at the first boundary and went straight out at the second. The greatest misconception of students was that the ray would not reflect the second time it met the glass/air boundary, although they had recognised that it would reflect the first time. A surprising number of candidates reflected the first ray out of the block.

### **Question 3**

Candidates generally scored very well on this question. A large number of factors were relevant and candidates were able to their knowledge in the context given. Candidates generally only lost marks for including several ideas from the same marking point, mainly the reactions of the driver, e.g. mentioning alcohol, tiredness and reaction time as three alternatives which would only gain them one mark overall. Responses such as reaction time, condition of car brakes, tyres and road surface were often seen. However, a lack of detail for some meant a number lost marks unnecessarily such as: 'the weather', 'the road'.

### **Question 4**

4 ai & ii Many candidates scored full marks for this question but a number missed the factor of 8 for the total force. A few candidates missed the mark for recalling the equation as they used non-standard symbols and/or wrote down the 'equation triangle' rather than an equation as required.

4bi The majority appreciated that the total force of the coins remained the same but roughly half were able to state clearly that this was due to the fact that it was the same number of coins.

In (ii), once again, a large number stated that the pressure was reduced but not many were able to state both aspects of the 2nd marking point i.e they either said it was the same force or that the area had increased – reference to both was required for the mark. A few took the maths route to calculate the new pressure and correctly obtained 27.5 Pa.

## Question 5

5ai This question was correctly answered by the majority of candidates. The few incorrect responses stem from the use of m or M instead of moment. Candidates should be aware that if they wish to write symbol equations, they must do so using “standard” terms. This could have been avoided if they simply used the wording from the question to illustrate the relationship, ie, moment, force and area.

5aii Most candidates had few problems with this calculation. The major issue was with the unit. Common mistakes were twofold in nature and were either:

- students have not learnt / remembered the significance of capitalisation for SI units and prefixes;
- students not remembering that if they forget the unit, sometimes it can be easy to recall by looking back at the equation and working it out.

5b Nearly all candidates were able to correctly realise that as the distance from the pivot decreased, the force must increase. However, many students failed to score the second mark which required a reference to the fact that the moment must remain constant (or the reverse argument that if the force was unchanged, the moment would be reduced). A number of candidates tried to apply the principle of moments inappropriately.

## Question 6

This question was set in an unusual context and candidates generally responded very well. There was little or no evidence of the candidates not understanding what was being asked of them.

6ai 1 or 2 marks gained by the majority but a few were unaware what ‘to the nearest metre’ meant

6aii A well answered question. A lot of candidates picked up on the fact that the pace length was estimated. Candidates who scored less than the maximum tended to lose a mark through repeating themselves.

6aiii Answered well by the majority of candidates. There were quite a few candidates mentioning repeats but omitting ‘remove anomalies’.

6bi The graphs were generally well produced, with the usual errors of lack of axes labels or dot to dot drawing of the line being rarer than in previous exams. Maximum marks were gained by many candidates. There were the occasional obvious mistakes of missing units, poor choice of axes, badly drawn line. The only error that cropped up several times was choosing the spacing on the axes such that the gap from 0-30 was the same as from 30-90, giving a straight line but no useful information.

6bii The large majority of candidates could read the appropriate value from their graph.

6bii Candidates who scored this mark correctly mentioned that the altimeter measures to the nearest 5 metres. However, a number of candidates failed to appreciate this idea and simply answered in terms of 'it's only a few metres different' or similar ideas.

### Question 7

7a The majority of candidates were able to explain 2 or 3 points to do with heat transfer, many giving answers relating to trapped air/air being an insulator. However, candidates often repeated their point in different wording and were not able to explain clearly enough to gain all four marks. The concept of reduced convection currents wasn't mentioned very often. Very few responses gave the points regarding sweating and evaporation. A large number gave ideas under the general heading of 'blanket stops cold air reaching him/her'

7b A high proportion of correct responses, the majority of which went for "yes, reflection of body heat". Of those who failed to gain a mark for this question, most failed to understand that the function of a blanket is to prevent the transfer of heat energy from the body to the surroundings. Many instead appeared to think that it heats the body up by transferring heat from the outside. Some poor uses of words were often made: for example, describing the foil as a "good insulator", based on the premise that it is a poor absorber of IR.

A surprising number of candidates thought that aluminium was a poor conductor. Some candidates seemed to not read the question properly and mentioned sun light reflecting away (it was night time) so lost the marks.

### Question 8

8a Most candidates chose the correct option although 'radioactive dating' was seen.

8b Very few candidates scored full marks. A large number quoted that 'alpha radiation is/can be breathed in'. Many candidates confused the radiation given off by the radon or americium with the actual substances (e.g. talked about the radon penetrating). A lot of candidates mentioned radon having a different half-life to americium and also that because smoke alarms are man-made then they wouldn't present any danger. A number of candidates also mentioned that the alpha particles from americium are only released when the smoke alarm sounds.

8c The vast majority of candidates correctly identified the number of particles for these two questions.

8di A good number of candidates gave the correct unit for activity. Candidates should be made aware of the correct conventions for the use of capital letters if they use abbreviations for units – in this case Bq was credited but incorrect versions, such as BQ, were not.

8dii Whilst almost every candidate was able to identify that there was a 50% decrease, a much smaller number were able to identify what it was, often referring to mass. If they did they usually referred to halving the radioactivity and rarely mentioned the emission of nuclei.

8diii Candidates did not tend to show working out for this, so if they calculated incorrectly they had no chance to gain a mark for using a correct method.

## Question 9

9a The large majority of candidates chose the correct option

9b Candidates were generally very good at being able to describe that a distance should be measured over a certain time, and being able to describe how to use the equipment. However they often lost marks in not stating a realistic answer, e.g. measuring only 10m or simply stating using a field. They were good at repeating and averaging in the experiment but often lacked detail in how to manipulate the results, i.e. using the equation. One answer which was quite popular but often poorly expressed involved setting up a rhythm of claps, but their descriptions often lacked detail and did not necessarily merit the 'known distance' mark. They were very split on using distance or echo method. There were also a few methods which would be marginal at best to detect valid results. The use of a CRO was preferred by some candidates but frequently the method of use lacked clarity.

9ci Most candidates gave the correct answer.

9cii Many candidates did not have any indication of the linear relationship despite being able to correctly identify the correct relationship of height and speed of sound. The vast majority of candidates appeared to recognise the need for a second point, but described the relationship as inversely proportional. Candidates appeared confused as to the application of terms such as linear/non-linear/constant/proportional/directly/indirectly/inversely.

9ciii Most candidates recognised that speed of sound reduces with height but only around half stated that the plane need not fly as fast. Some candidates overlooked the obvious here and discussed differences in air pressure/resistance rather than using the information given in the question. Other responses referred to the sound having difficulty reaching the ground.

## Question 10

The idea of a non-linear relationship was rarely evident unless accompanied by a graph. A lot of candidates clearly did not understand what an LDR is and how its resistance varies with light intensity. Responses that didn't score were mainly due to answers such as 'as light intensity increases resistance increases'. A few drew graphs which contradicted their written answer. Too many candidates did not appreciate that a sketch graph was not asking them for a circuit diagram.

## Question 11

11ai-ii The majority of candidates answered this well. For those who didn't gain the second mark almost always gained the mark for mentioning field lines. Some were not specific enough, or talked about the magnet cutting the field lines of the coil, suggesting a lack of knowledge about what produces field lines. It was good to see that many candidates understood that moving a magnet within a coil generated a voltage and therefore current. Many candidates correctly said that moving the magnet faster, having a stronger magnet or having more turns on the coil generated a higher voltage. There were however quite a few that lost marks because they said increase coils (instead of turns on the coil) or use bigger magnets with no reference to strength.

11bi Almost all candidates chose the correct response.

11bii Most candidates had problems formulating a coherent response to this question. This question needed a comparative response, less/smaller or larger for

candidates to score this point rather than stating that the filament converts a lot of energy into heat. Very few referred to the equation for efficiency in their answer so did not gain the second mark.

### Question 12

12a Most candidates scored both marks although a minority gave heat for the first response. A very few gave terms which were not in the list.

Q12bi The vast majority of candidates were able to correctly answer this question.

12bii As the candidates tended to write  $P=E/t$  for 12bi, the rearrangement to calculate energy caused a few problems in this part.

Q12c This question was answered very well, with the vast majority of candidates gaining full marks with clear working out.

### Question 13

13a A majority of candidates chose the correct option.

13b This usually scored full marks provided candidates chose the correct equation. Even those that did score in bi then forgot to square the speed. The most common problem was giving the equation for momentum instead of KE.

13ci and ii Again a majority of candidates scored full marks. A surprising number used 'gravity' instead of 'g' and a few forgot to include g at all.

13ciii A large number of candidates scored full marks, although some forgot to compare to the 24kW.

13civ This scored quite well and again most candidates scored the first mark although a few then divided 33000 by 18.

### Question 14

14a This question was answered well by the majority of candidates. However, a number of candidates failed to realise that they were supposed to use an equation that was given to them on the examination paper. The two most common mistakes were to either:

- start off with the wrong equation, usually going for pressure = force/area;
- get confused in the re-arranging of the correct equation.

14b-ci This was generally answered quite well. However, common reasons for losing marks included discussing a lower energy as opposed to lower *kinetic* energy and describing collisions without specifying collisions with the walls of the container. Also, some candidates described what happens when temperature increases in great detail and then writing a small amount that answered the question.

14cii Most students answered this correctly, with the majority going for the gas leaving the liquid. A number of students simply went for the gas leaving the can with the cream rather than thinking about the issues of the changing pressure. Some poor choices of wording were seen like the use of "evaporating" for the gas to come out of the cream or "dissolving" into the air. Many failed to pick up on the idea that this question really wanted to know what happens to a gas when a lower pressure is acting on it.

## Question 15

15ai A large majority of candidates correctly named terminal velocity.

15aii Although the question asked about the motion of an object that was already travelling at terminal velocity, a large number of candidates felt it necessary to describe how terminal velocity is reached. This wasted time and space for the candidates and indicated some lack of attention when reading the question. Most candidates scored a mark for the idea of balanced forces, although many students described this idea in several alternative ways, only scoring one point. Fewer candidates went on to say that balanced forces would lead to zero acceleration and almost no candidates were able to connect the two ideas together through reference to the laws of motion.

15aiii A higher terminal speed was evident in most responses. However, significantly fewer candidates understood that the vessel would accelerate for longer or could use the idea that there was less surface area. The most common mistake was to simply say there was 'less air resistance' in a way that indicated the spacecraft should still be accelerating.

15b This was done relatively well by students. Main issue with this question was that some students referred to stopping in terms of time and not distance. Also, some students were suggesting that the shuttle would have no air resistance / drag without the parachute rather than less. Another common misconception was that the shuttle would still have a forward force (some even suggesting that the resultant force was forward). There was a common misconception that the parachute would help in balancing out the engine force in order to create a terminal velocity.

## Question 16

16a This usually scored both marks although some candidates gave drag and air friction so scored only one. A few gave weight or gravity as one point.

16b The large majority of candidates could recall and use the appropriate equation correctly.

16c A large number appreciated that the area under the graph was the route to take and successfully obtained 44m. Others had an attempt at just using speed  $\times$  time =  $22 \times 4 = 88\text{m}$  so scored one mark. A significant number of candidates misread the graph and used 24 instead of 22.

16di Although the majority of candidates were aware that the slope of the graph was the appropriate property, a lot of candidates did not state that it was the change in the slope/gradient.

16dii Some candidates described factors that would increase the resultant force and hence the acceleration, but the graph clearly shows acceleration is decreasing. Other pupils failed to gain the marks as they mentioned factors that would simply change the acceleration, rather than explain the decrease given.

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