Examiners' Report/ Principal Examiner Feedback

January 2014

Pearson Edexcel International GCSE in Physics (4PH0) Paper 2P

Edexcel Level 1/Level 2 Certificates Physics (KPH0) Paper 2P

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4PH0 & KPH0 (2P) Examiners' Report – January 2014

General comments

As in previous examinations, most students were able to recall the equations and usually they handled the related calculations well. Students who gave the best practical descriptions often appeared to be writing from first-hand experience. Responses to the longer questions showed that the less able students tend to struggle when assembling a logical description or when asked to offer more than one idea. There was a wide range of response and it was good to see that many students were able to give full and accurate answers.

Question 1

Most students chose the correct responses to the multiple-choice questions. These were designed to provide a straightforward entry to the paper and to test basic understanding of beta emission.

In part 1(b), the students were expected to apply their knowledge of beta radiation to the context of cancer therapy. The examiners expected responses in terms of range, ionising ability and the effect of beta particles on living tissue. Some of the weaker responses exposed a confusion of ideas between radiotherapy and the use radioactive medical tracers.

Many students also showed an awareness of the short half-life of iodine-131 and of iodine uptake by the thyroid. Whilst the specification does not require knowledge of specific therapies, these ideas could receive credit in the context of this question.

Question 2

In part 2(a), most students were able to state that magnitude is the common property of both scalars and vectors. The examiners also accepted idea of "size" as the similarity here. However, fewer students were confident in stating a difference. Many realised that the difference involves the idea of direction, but omitted to state that this property is associated with vectors.

Responses to part 2(b) were generally good, with most worth two or more marks. The students have a good understanding of this part of the specification. Several of the weaker responses included two ticks against one quantity, which gained no credit for that row. When a student changes their mind about their answer, they should take care to make this clear to the examiner by crossing through the part they wish to be disregarded.

Question 3

Many students gave vague responses when asked for an example of Brownian motion in part 3(a)(i). They either omitted to name the particles that were moving or to give the medium causing the movement. Pollen grains in water and smoke particles in air were the most common acceptable responses. Explanations of the evidence that Brownian motion gives for the particle theory of matter were generally weak. Some students were able to mention the random motion but very few went to complete their explanation by linking this to the idea of collisions with unseen particles.

Answers to part 3(b) showed some good understanding and the majority of the students gave explanations worthy of full marks. The best responses came from students who chose to include clearly labelled diagrams showing the different arrangements of the particles. Those students who gave just a written response usually gave a good account of the particles in ice and steam, but tended to struggle with their explanation of the arrangement and motion of particles in water. The weakest responses relied heavily on simple repetition of the information given in the table. There was no credit for doing this.

Question 4

Most students were able to suggest at least one sensible change to the experimental set up in 4(a). Popular ideas were stirring the water, centralising the heat source or placing the thermometer closer to the thermistor. Many candidates confused ideas of making accurate measurements with those of collecting reliable data. Their suggestions, such as repeating the readings, controlling an inappropriate variable or extending the temperature range, did not receive credit.

Most students could name the ammeter for part 4(b).

Graph plotting was generally very good, with most students labelling their graph properly and choosing an appropriate scale. The majority of the graphs were drawn to show the independent variable (temperature) along the x-axis, but a significant minority of students neglected to include the units in their labels. There were many good responses to part 4(c)(i) and students who drew a smooth curve that included (80,0.2) or (100,0.4) generally went on to identify an appropriate anomalous point in 4(c)(ii).

The majority of the students knew the equation for 4(d)(i), but a few chose to present it as a triangular mnemonic. Whilst the triangle provides an excellent aide memoire for the student, it does not state the equation, so cannot gain any credit. The students who decided to set out part 4(d)(ii) in the style of a mathematical proof were usually able to show all of their steps and tended to score highly. Most students began well by showing the correct relationship between the voltage and the resistance. However, the tasks of showing how to convert between amps and milliamps and how to complete the calculation proved to be more difficult. A significant minority of students made rounding errors.

Question 5

Some students appeared to be unfamiliar with the concept of a pedestrian airbag and assumed that the question was about a regular front seat airbag. The mark scheme made allowance for this and responses following this approach received credit for valid points.

When a question asks for an explanation, students should attempt to set out their ideas in a linked or logical way. The more successful responses included some reference to the increased time of collision afforded by an airbag and usually linked this idea to the reduction of the force on the victim of the accident. Although the idea of reducing injuries was stated in the stem of the question, a further mark was available to those students who linked this outcome to the reduction in force.

The equation linking force, change of momentum and time is given on page 2 of the paper. No credit was given for quoting this equation directly, but many students did receive credit for making use of the equation to link points in their explanation. The best responses also mentioned the concept of rate of change of momentum. The students who responded least well were those who overlooked the instruction to use ideas about momentum.

Question 6

In 6(a)(i), the students were asked to show how the apparatus should be set up, but some just gave an illustration showing separate pieces of equipment in no particular arrangement. Better diagrams included a labelled light source or ray box. The best responses also showed correct refraction in the block and a protractor placed to measure an appropriate angle. Most students knew that the angles of incidence and refraction should be measured and that finding the sine of each angle can lead to a value for refractive index. Responses to 6(a)(ii) and 6(a)(iii) were generally very good, with some students correctly describing how to use the graph of sin i against sin r. The mark scheme also made allowance for those who gave alternative appropriate responses to question 6(a), such as tracing the rays using optical pins or finding refractive index via critical angle.

Most students drew good diagrams to illustrate the action of the right-angled prism in the reflector for part 6(b)(i). However, very few understood that the incident ray slows down as it enters the plastic.

Question 7

In 7(a) most students could explain the movement of rods in terms of a repulsive force. However, a significant minority went on to explain the repulsion in terms of charges rather than magnetic poles. This confusion between electromagnetism and electrostatics was fairly common.

Some students realised that the rods were magnetically soft, but did not suggest an appropriate material. Explanations for 7(b) were generally good and many included the ideas that the rods were easy to magnetise and lost this magnetism quickly when the current was switched off.

Those students who realised that the magnetic field in 7(c) would continually reverse in polarity rarely went on to link this idea to the changing direction of the current in the coil. Some responses did include the idea that the field would be weaker.

Generally, the higher scoring students responded well to a question that required them to apply their knowledge in an unfamiliar context.

Question 8

Most students identified the missing force in 8(a) correctly and nearly all stated the equation linking moment, force and perpendicular distance. Calculations of the moment in 8(bii) were generally correct. However, students found it more difficult to calculate the force of the man pushing at the end of the plank. Those who applied the principal of moments carefully and systematically went on to complete a successful calculation in 8(c). Many students gained some credit for unsuccessful attempts that included sufficient working to show that they had at least a partial understanding of the required technique. The most common mistake was to neglect the effect of the weight of the plank.

Summary Section

Based on the performance shown in this paper, students should:

- Take note of the number of marks given for each question and use this as a guide as to the amount of detail expected in the answer
- Be familiar with the equations listed in the specification and be able to use them confidently
- Show all working, so that some credit can still be given for answers that are only partly correct
- Describe experiments in reasonable detail and be ready to comment on experimental data and methods
- Recall the units given in the specification and use them appropriately, for instance when describing the measurements taken in an experiment
- Take care to follow the instructions in the question, for instance when requested to use particular ideas in the answer
- Realise that an explanation will require a basic linkage of ideas in the response, for instance giving cause and effect
- Allow time at the end of the examination to check answers carefully and correct basic slips in wording or calculation

Grade Boundaries

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