Examiners' Report November 2007

IGCSE

IGCSE Physics (4420)

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PHYSICS 4420, CHIEF EXAMINER'S REPORT

Paper 1F

Questions 1 to 9 were aimed at Foundation Tier. Question 9 to 15 were common with the Higher Tier paper.

Question 1
Part (a) was well answered although there was some uncertainty seen in part (b) regarding the order of wavelength and frequency of electromagnetic waves.

Question 2
Part (a) was well answered although non-heating electrical devices such as televisions were often seen. In part (b) most candidates were unable to give a second example of an electrical safety feature. Parts (c) and (d) were well understood and often a similar answer in both parts scored full marks.

Question 3
This was well answered apart from part (b). Some incomplete answers such as 'ball' were seen in (d)(ii) as examples of devices which store gravitational potential energy.

Question 4
This was very well answered apart from the occasional inexplicable error in (a)(i) and (a)(ii) when deducing values of time and distance from a distance-time graph.

Question 5
This question did not score well. In (a)(ii) most candidates were mislead by the low position of **X** in a tank of fluid into believing that the pressure only acted downward. Filling in a table to give the name and symbol for area and pressure showed some confusion with the former causing the main problem. Some incomplete units such as P for pascal were seen.

Question 6
The calculation in (b)(i)and(ii) showed a lack of understanding of half-life. The completion of a sentence on the uses of radioactivity was poorly answered.

Question 7
Parts (a)(ii)and(iii) were poorly answered showing little idea about the direction and shape of magnetic field lines.

Question 8
Candidates who ignored the instruction to use words from a box more than once if necessary did not score well on this question.

Question 9
Candidate were able to make deductions from data for a stretched spring but were unable to interpret a force-extension graph for another material.

Question 10
Some candidates could successfully describe the effect of a temperature increase on the behaviour of a circuit containing a thermistor but were unable to score any further marks.

Question 11
Candidates could not define frequency and time period or calculate these quantities in hertz and second respectively given a heart rate of 72 beats per minute.
A graph of heart rate against mass for various animals was very well drawn.

Question 12
This was very well answered by some but showed a stark contrast between those candidates who had encountered this topic and those who had not.

Question 13
Candidates were able to criticise a diagram of a molecular model of a liquid in part (a) but were unable to successfully comment further on the motion and position of the molecules during and after evaporation.

Question 14
This question on electromagnetism rarely scored well.

Question 15
This was well answered with candidates able to undertake a transformer calculation and correctly place step-up and step-down transformers in an electricity transmission system.

Paper 2H

Questions 1 to 7 are questions in common with the Foundation Tier Paper. Questions 8 to 17 only appear on this Paper. The great majority of the candidates entered for this tier had entered what was, for them, the most appropriate tier.

Question 1
This question was generally well answered although a small minority confused force and energy in (b)(i). A minority of answers in part (c) suggested that some candidates thought this was a graph of extension against force rather than of force against extension.

Question 2
Most showed the voltmeter in parallel across the resistor and the great majority were able to quote Ohm's law correctly. There were some confused responses to (b) parts (i) and (ii) which suggested that candidates had failed to understand what is happening in the circuit and had sometimes failed to distinguish between the fixed resistor and the thermistor.

Question 3
This question was generally well answered though a small minority failed to read correctly the heart rate scale on the graph and occasionally candidates showed points on their graph so large that they amounted to blobs. Almost all were able to explain why it is not possible to use the graph to predict the heart rate of a 5000 kg elephant. However a few spoiled their responses by claiming that the elephant would have a 'negative heart rate'.

Question 4
Very well answered with a high proportion gaining full marks.

Question 5
This question was generally well answered though a small minority did not seem to understand that the molecules themselves do not change state.

Question 6
Only a small minority gained all three marks though many secured one mark for showing the correct direction of the magnetic field lines without contradiction.

In part (b) most correctly suggested that iron is a suitable material and knew that it easily becomes magnified or demagnetised. However only a minority identified iron as a soft magnetic material or able to form temporary magnets.

Question 7
Very well answered with a high proportion gaining full marks.

Question 8
Most were able to identify acceleration, force and velocity as the only names in the list of quantities which are vectors.

Question 9
This question was generally well answered. However there was some confusion between a quantity, such as charge, and the unit, coulomb in this example, often used to measure the quantity.

Question 10
This question was generally well answered. However the most common errors were to state in (b)(i) that **d** represents the amplitude rather than half the amplitude and in part (b)(ii) that the sound has become 'less' which is ambiguous because it could be 'less' in terms of amplitude, frequency or wavelength. 'Less loud' is, of course, quite correct.

Question 11
This question on the advantages and disadvantages of using coal-fired power station for producing large quantities of electricity was generally well answered. However a minority repeated the question and offered 'can produce large quantities of electricity' as an advantage. A few confused renewable and non-renewable. Some answers, such as 'can be built anywhere' were too vague.

Question 12
Generally well answered particularly part (b). However some candidates did not appear to have read the question carefully or to have paid sufficient attention to the context. Some did not give the directions in part (a)(i) and referred to air resistance rather than water resistance, friction or drag. Part (a)(ii) refers to a significant increase so it's not 'gravity' however deep the water may be. Velocity refers to both speed and direction so it's 'falls' or 'downwards' at a steady speed to gain both marks in (c)(ii) rather than just 'at a constant speed'.

Question 13
Most of the question was well answered. However common mistakes for a significant minority of candidates were to use the voltage of one cell (1.5 V) rather than the voltage of the battery (9 V) in the calculation for (c) and/or to fail to convert correctly 3 hours to 3 × 60 × 60 seconds.

Question 14
Most of the question was well answered. However a small minority seemed to be unaware that there was any need to add to the diagram in (b)(i) and some contented themselves with just 'reflection' in (b)(ii). Part (d) proved to be difficult for the majority. Many recognised that total internal reflection takes place but failed to give a convincing explanation. However it was pleasing to see some very confident responses in which candidates showed that the angle of incidence is 45° and that total internal reflection takes place and thus were able to deduce that the critical angle must be less than 45°.

Question 15
Only a minority of candidates were able to gain all three marks by stating that the motion of molecules in a gas is random with, in the average case, many high speed collisions with each other. Most generally obtained more marks in part (ii) but, even so, few mentioned that a significant force is produced by <u>large numbers</u> of molecules colliding with the (inside) wall of the container. Part (b) was well answered by a large majority of candidates.

Question 16
Most recognised that the diagram showed the process of (nuclear) fission. In part (a)(ii) a significant proportion explained that these three neutrons would go on to hit other U235 nuclei but did not gain their second mark because they failed to state that the process would continue. In part (iv) it was pleasing to see that a significant proportion of candidates understood that as neutrons have no charge but alpha particles carry positive charge, the latter will be repelled by the positively charged nucleus. Most candidates correctly identified the purpose of the moderator and the purpose of the control rods. However most did not go of on to state a correct explanation in each case; that the moderator needs to slow the neutrons because slow moving neutrons are more likely to

cause fission and in part (ii) that the rate of the nuclear reaction needs to be controlled to regulate the temperature or, in an emergency, to prevent meltdown.

Question 17

This question was very well answered with a significant proportion of candidates gaining full marks. Only a very small minority confused themselves in part (a)(i) by, for example, taking no account of the ½ or that it's the *v* which is squared rather than some other part of the equation. The equation in (b)(ii) is more straightforward and almost all were able to calculate the maximum height reached by the ball.

Paper 3

Some excellent work was seen from some candidates. However many of the straightforward marks for measurements in Questions 1(a), 2(c) and 4(b) proved difficult to score for candidates of all abilities.

Question 1

(a)(i) : Candidates were expected to measure the length of a step between the centres of two neighbouring dots in a simulation of a random walk. Many measured from the inside of each dot giving a length of 11 mm instead of the expected 13 or 14 mm. This problem was compounded by the top diagram where the length between the arrow tip and the inside of the dot was also 11 mm. As a result candidates were given the benefit of the doubt in (i) with an answer of 11 mm. However no credit was given when this error was carried forward to part (a)(iii).

(a)(ii) : A surprising number miscounted the number of steps giving 10 instead of 11.

(a)(iii) : The commonest error was to measure the distance along all the steps even though path length had been defined as the shortest distance from start to finish.

(a)(iv) : This was poorly answered with some candidates not attempting it. A vertical step of the same length of the others from the finish point scored both marks but many added a horizontal step and some drew the extra step from the start point.

(b)(i)(ii) : Graph work was excellent with very few errors in taking readings from the graph in **(ii)** despite neither scale having small squares going up in steps of one.

(c) : Candidates often scored all three marks for stating why the model does not represent random motion. Some answered with vague statements about gas behaviour and a few referred to the graph not being a straight line. Many thought that in a model of random behaviour that the particles would not move in straight lines between collisions.
An acceptable answer to one of the points is : 'steps are not all the same length'. The reverse argument is also acceptable with 'steps are all the same length'. However a mixture of these two approaches gives an incoherent set of answers and should be avoided.

Question 2

(a) : This safety mark was often scored.

(b)(i) : Many candidates referred to the unclear image and the difficulty of measuring between successive light or dark bands. Some thought that the dark line on the image representing the boundary between deep and shallow water was significant.

(b)(ii) : This was poorly answered with only a few candidates suggesting measuring several wavelengths and finding the average. Instead many suggested using a higher quality camera, more light or a higher resolution screen to make it clearer.

(c)(i) : The measurement of the wavelength in deep water which was clearly labelled was usually accurate.

(c)(ii) : The wavelength in shallow water was often measured as the horizontal distance instead of the perpendicular distance between two wavefronts.
(c)(iii) : This was poorly answered. The measurement of the angle between the directions of the waves in deep and shallow water required lines to be drawn before a protractor could be used. The preferred way was to extend both arrows backwards until they crossed. A more popular way was to draw a vertical line as an extension of a deep water wavefront. The measurement of an angle to the dotted boundary line was often seen.

(d)(i)(ii) : Most candidates deduced that James's result did not fit the trend but struggled to say why.

(d)(iii) : Some candidates had taken measurements outside the permitted tolerances in (c)(ii)(iii) but still had data that fitted the trend in the table. A small number had the same readings as one student (Carmen) in the table but still thought that this could not fit the trend.
A significant number of candidates thought that their data could not fit the trend because it was outside the range shown in the table.

Question 3

(a) : This planning exercise was well answered. The fourth mark was often not scored because candidates did not compare temperature rises for the water after placing the metal rod in different parts of the flame. Some misleading statements about the position of the rod being above or under the flame were seen.

(b) : This was very well answered with many candidates scoring all four marks for factors that needed to stay constant. Time for the rod in the water and the temperature of the room did not score and were often seen. A few boiled the water and described the wrong experiment.

(c)(i)(ii) : Some marks were dropped here. Some referred to repeat readings and digital thermometers even though extra apparatus was required to improve reliability.
For safety, most realised that a means of holding the heated rod was desirable but the use of goggles was often seen and not awarded.

(d) : As expected this deduction of a temperature difference from two thermometer readings was well answered.

Question 4

(a)(i) : Many candidates were able to set up a circuit with a d.c. power supply, an ammeter and a variable resistor but most failed to connect two metal rods in series. Credit was given if the rods were correctly connected in parallel but in many cases only one rod was connected.

(a)(ii) : A significant number of candidates incorrectly showed the direction of the current.

(a)(iii) : Disappointingly few candidates used the information given in the first line of the question that metal rods with currents in the same direction attract. Some circuits showing such currents were described as repelling each other because they carried like charges. Attraction between positives and negatives was sometimes given as a reason for attraction in circuits where only one rod was connected.

(b)(i) : As in Question 2(c)(ii) some candidates had problems measuring the perpendicular separation between two lines even though it was clearly labelled.

(b)(ii) : The reading of current from an ammeter scale was well answered. The few candidates who gave unexplained values may well have not associated the question with the diagram at the foot of the previous page.

(b)(iii) : Nearly all candidates knew that the value for the separation of the rods in Diagram 3 would be less than their value in (b)(i) for Diagram 2.

(b)(iv) : Very few candidates thought that the method of verifying Hooke's law using the same apparatus was to place masses in the centre of the top rod while ensuring that the rod remains horizontal. Most placed the masses at the bottom of each spring.

COURSEWORK (PAPER 4), PRINCIPAL MODERATOR'S REPORT

Centres who entered candidates for the coursework option have received a report directly from the Principal Moderator.

For general comments about coursework please refer to the Moderator's Report for June 2007.

PHYSICS 4420, GRADE BOUNDARIES

Option 1: with Written Alternative to Coursework (Paper 3)

	A*	A	B	C	D	E	F	G
Foundation Tier				58	47	36	26	16
Higher Tier	78	65	52	39	31	27		

Option 2: with Coursework (Paper 04)

	A*	A	B	C	D	E	F	G
Foundation Tier				N/A	N/A	N/A	N/A	N/A
Higher Tier	82	69	56	43	34	29		

No candidates at foundation tier entered coursework so there are no grade boundaries for this category.

Note: Grade boundaries may vary from year to year and from subject to subject, depending on the demand of the question paper.

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