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Examiners' Report Summer 2007

IGCSE

IGCSE Physics (4420)

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Contents

PHYSICS 4420, CHIEF EXAMINER'S REPORT

Paper 1F

Questions 9 to 15 are questions in common with the Higher Tier Paper. Questions 1 to 8 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 although Questions 7, 8, 14 and 15 which do not appear on the 4437/3F Double Award Paper were not well answered.

Question 1
A familiar question asking candidates to choose from a set of letters which ones represented amplitude and wavelength on a wave showed some uncertainty. Also matching definitions to words for 'frequency' and 'period' proved troublesome. Apart from water waves candidates could not always name two other examples of transverse waves often quoting 'sound'. However all knew that the other type of wave was longitudinal.

Question 2
Nearly all candidates recognised what was wrong with a plug that had a piece missing and why it was unsafe although not all could name the part which was a fuse. Most knew what happened to a fuse carrying too large a current although many dwelt on what happened to the glass tube and the metal end rather than the wire. Shown diagrams of the inside of two different fittings and asked why each fitting was safe most realised that the plastic one was safe because plastic is a non-conductor of electricity although some based their argument on it being a non-conductor of heat. Most recognised the earth wire in the other fitting but hardly any understood how it made the fitting safe to use.

Question 3
This graph question was very well done by all candidates with hardly any misplots. The equation relating average speed, distance moved and time taken was well known although a few candidates only presented the familiar triangle that helps to remember this relationship and left it at that.

Question 4
This was poorly answered with many candidates unable to distinguish between an energy transfer process and a process such as 'insulation'.
Part (b) revealed a great deal of confusion surrounding the ideas behind the process of convection.

Question 5
Some candidates were unfamiliar with the concept of density and were unable to define it in part (a). More were able to state the equation for the volume of a rectangular block in terms of its dimensions and suggest the use of millimetres as a suitable unit of measurement if the volume was in mm^3.
Hardly any candidates understood that blocks of the same material of different masses had the same density.

Question 6
Nearly all candidates associated atomic number with A rather than Z and so dropped a mark in (a). Many candidates think that the atomic number is dictated by the number of electrons rather than the number of protons but the meaning of the term isotope and the names of radioactive radiations were well known.

Question 7
The plastic comb used by a student to comb her hair acquired a positive charge. Most candidates knew that her hair became negatively charged but did not know that electrons had been transferred. Hardly any could answer part (b) explaining why the charge stayed on the surface of the comb because of the non-conducting properties of the comb and the air.

Question 8
All candidates knew that opposite poles of magnets attract and were able to draw a line of force in a magnetic field usually showing the correct direction. Few were able to pick examples of hard and soft magnetic materials from a list of materials with most stating that iron is magnetically hard.

Question 9
Candidates were given the velocity-time graph for a train accelerating, travelling at constant velocity and decelerating between two stations. Most candidates were able to recognise and explain the part of the graph that represented deceleration. Very few were able to comment further that the deceleration was uniform and took place over a longer period of time than a previous acceleration. In (b) surprisingly few knew which feature of the graph represented distance travelled and there were few correct answers to (b)(ii) for a line that showed the motion of a second train covering the same distance in the same time travelling at constant velocity. This part carried 3 marks and many candidates left it blank.

Question 10
Shown a series circuit with a power supply, ammeter, resistor, switch and lamp few candidates could name two circuit components other than the lamp which affect the size of the current. Many mentioned ammeter or switch.
The use of the formula relating charge, current and time was usually successful but the drawing of a second lamp that could be switched on and off independently was disappointing. The second lamp was often in parallel with the first switch or the resistor or even with a connecting wire. Those who did connect it in parallel with the first lamp could often not arrange for it to be switched on and off independently.

Question 11
Not all candidates could state the law of reflection. Most were successful in drawing a ray of light striking a window and undergoing reflection off the front surface although a few showed the reflected ray travelling along the normal. Hardly any realised that one way of stopping the reflection was to cover the window on the outside rather than the inside.
In (c) where recall on the electromagnetic waves was tested the responses were very poor.

Question 12
Given an energy flow diagram for a motorbike most candidates could calculate that 30 000 J of energy was the answer to be inserted in one of three gaps. The other gaps required forms of energy but instead of ‘heat’ the response seen was often ‘waste’. In (b) the use of the formula relating work done, force and distance was successful with many dropping a mark for not converting kilometre to metre.

Question 13
Hardly any candidates could explain the phenomenon of electromagnetic induction displayed in a dynamo lighting a lamp where a rotating magnet resulted in coils of wire experiencing a change in magnetic field leading to a voltage being induced in the coils. Most could state a way in which the brightness of the lamp could be increased.

Question 14
Most candidates could name the phenomenon of diffraction and draw wavefronts that had passed through a gap. Very few knew that the wavefronts would become more curved by narrowing the gap or increasing the wavelength of the waves. About half of the candidates knew why a sound wave of frequency 25 000Hz could not be heard but a calculation of its wavelength given the value of speed of sound was rarely successful. A surprising number of candidates did not know the formula relating speed, frequency and wavelength considering how well formula had been used earlier in the paper but also many of those who did know the formula calculated 25 000/340 instead of 340/25 000 showing a lack of confidence in dealing with an answer of less than 1.

Question 15
Not all candidates recognised the difference between an analogue and a digital signal or gave reasons where they had done so successfully. Encouragingly many were able to state an advantage and a use of digital signals.

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. Almost all were able to identify in which part of the journey the train was decelerating, to explain their answer and to make an appropriate comment on what the graph shows about the deceleration. In part (b)(i) they knew that the distance travelled is equal to the area under the graph and were able to draw an appropriate horizontal line on the graph below the maximum for the first train and to finish this line at the correct time.

Question 2
The resistor and the power source were generally identified, though the ammeter and/or the wires were fairly popular choices for less able candidates. Nearly all were able to evaluate part (a)(ii) correctly. Part (b) was usually well answered. Some candidates, however, showed the second lamp in parallel with the first but failed to include a switch in series. Others had a switch in series but since the lamp was not in parallel with the first lamp these candidates failed to get either mark.

Question 3
The law of reflection was usually known and in part (b) most were able to show that they understood it. In part (b)(ii) most were able to make a sensible suggestion though some failed to note that the question is about the window and so a response such as 'wear a cap' is not appropriate. Correct answers to part (c) and to part (d) were generally known.

Question 4
Part (a) was usually well answered though less able candidates thought that it was an electric motorbike even though there is no suggestion of this in the question. In part (b) a minority of candidates failed to convert kilometres to metres but the majority gained both marks.

Question 5
This question was generally well answered though some were not able to refer to induction and, in part (b), candidates sometimes suggested a bigger magnet when they should have described it as a more powerful magnet.

Question 6
Most knew that the diagram shows an example of diffraction and were able to add two appropriately shaped waves which seemed to be a wavelength apart. Most correctly gave 'increase the wavelength' and 'reduce the size of the gap' in part (b)(ii) though some confused their answers with inappropriate references to speed or the depth of the water. In (c)(i) most realised that the sound is inaudible, not because of diffraction, but because it is ultrasonic or above the frequency range for human hearing. The calculation in part (ii) was usually well answered because most knew the equation and could use it correctly.

Question 7
Examiners were pleased to note that there has been a significant improvement, compared to responses on a previous paper, in the understanding that candidates show of the nature, properties and uses of digital signals. The overwhelming majority gained the mark in (a)(i) and most were able, in part (ii), to give reasons for their answer. In part (b) the most popular correct answer is that digital signals are clearer and nearly all were able to offer an example of a use for them.

Question 8
Most knew that the sum of the clockwise moments is equal to the sum of the anticlockwise moments. However only a minority gained the second mark by mentioning that this is true when the system is balanced or in equilibrium. The calculation in part(b) was well answered.

Question 9
This sentence completion question on sound waves was well answered.

Question 10
Part (a) was well answered but, despite this powerful clue, a significant minority used degrees Celsius in part (b). However of those who calculated correctly, most were able to follow the instruction and give the answer to the nearest 10 kPa.

Question 11
This question on the advantages and disadvantages of hydroelectric power stations was well answered by the majority who often gained all the marks. However candidates are well advised to read the question carefully and to think before writing. There are no marks for mentioning the cost involved when you have been told not to or for giving 'produce large quantities of electricity' when that's in the stem of the question. Candidates need to appreciate the difference between a comprehension type of question and a question of this sort.

Question 12
Most correctly stated that it's because the lorry is accelerating that we know that force F is bigger than force B. However less able candidates often thought it was because the lorry is moving forward. A large majority gave the correct numerical answer in part (a)(iii) though a minority could not express the unit correctly.
In part (b) a minority claimed it is impossible for an object to accelerate without changing its speed. The most popular type of incorrect explanation involved the equation F = ma and only a small minority realised that, as acceleration is rate of change of velocity then, if the speed does not change, it must be the direction which changes. In part (c) nearly all gave appropriate answers and gained full marks. However some candidates suggested that speed will increase braking distance. They should note that this is not an adequate answer since high speed will increase braking distance and low speed will not. Examination candidates need to make their answers clear.

Question 13
Direct current was given by a large majority in (a)(i). In part (a)(ii), examiners were hoping to see speaker or loudspeaker but they were often disappointed. Some candidates seemed to misunderstand and gave examples of devices, such as an electric drill, which contain an electric motor. Part (b) was generally well answered. However some did not know that, for Fleming, the conventional direction of current is from positive to negative and some contented themselves with 'up to down'. Correct answers such as 'increase the strength of the magnetic field,' and 'increase the current' were often given though less able candidates seemed to forget that the question is about a wire and wrote about turns on a coil.

Question 14
The whole of this question was well answered with many candidates gaining full marks. If mistakes were made, they were, generally, to attempt to write an equation for (a)(i) which mentioned angles but not sines and, in (b)(ii), to show light being refracted from the rear face of the triangular glass block.

Question 15
The majority were able to give the correct forms of energy in part (a), offer an appropriate reason, in part (b)(i), for the temperature increase and suggest the relationship between the temperature increase and the height of the waterfall in (b)(ii).
Graph questions are usually well answered and (c), parts (i) and (ii), was not an exception. However candidates should note that while it is correct to make full use of the graph paper this means sensible use and that it is foolish to use unusual linear scales which make it difficult for them to plot or read the points accurately.

Question 16
Part (a) was well answered. Most knew that the pressure is caused by molecules colliding with the inside of the cylinder. However few mentioned that the result would be a force acting on an area and relate this to pressure. Some mistakenly thought that the answer must involve the inward movement of the piston and hence the compression of the gas. These candidates seemed to think that there would not be any pressure in the cylinder unless the piston was moved. Part (c)(i) was very well answered and most were able to offer 'temperature remains constant' and 'mass remains constant' or 'no gas escapes' in part (ii). Part (a)(iii) was well answered though there were some very odd spellings of kilopascals.

Question 17
(a) Nearly all completed the nuclear equation correctly and gained both marks. In part (b) most were able to explain the other purpose of the block of lead, though some incorrectly claimed it would cause all the alpha particles from the source to go towards the gold foil. In part (ii) many understood that most of a gold atom is empty space.
In (iii) some candidates thought that the deflections were caused by collisions. Most of those who realised that charges are responsible were able to offer a correct explanation; that the nucleus is positively charged and alpha particles are positively charged and so they repel each other. In part (iv) the examiners credited 'the nucleus is very small' but not just '... small'. In part (v) only a minority of candidates understood that the alpha particles which were deflected less than the others were either further away from the nucleus and/or were moving faster than the others. Examiners were concerned to note that some candidates appear to think that alpha particles vary in mass or in volume. Many candidates remembered that, where an alpha particle hits it, the zinc sulphide screen emits a tiny flash of light.

Paper 3

Question 1

(a) Practically all candidates successfully measured the distance *x* on Diagram 3 although a few responses had a power of ten error.

(b)(i) Most candidates successfully used the method shown in Diagram 1 to find the centre of gravity of the rectangular card in Diagram 4. Marks were not awarded if the diagonals were not visible.

(b)(ii) Candidates were required to draw two vertical lines: one through the supporting pin and one through the centre of gravity of the card.
A few drew the line through the pin parallel to one of the diagonals.

(b)(iii) The new distance *x* was nearly always within the accepted range if the drawn lines in (i) and (ii) were correct..

(b)(iv) The card was displaced as shown in Diagram 4 and then released. A description and explanation of the initial movement of the card was required. Two very common errors were:

1. 'released' was interpreted as no longer being attached to the pin and so falling towards the ground.
2. the final position of the card was described instead of the reason for its initial movement.

Very few candidates explained that the centre of gravity was to the left of the pin.
A significant number of candidates described a movement to the left when they clearly meant to the right.

(b)(v) The mark was often scored for 'as in Diagram 2' or 'G vertically below pin'. A common response :'G in line with the pin' did not score.

(c) Most candidates scored this mark by using terms such as 'irregular' 'uneven' or 'not symmetrical'.

(d) The mark scheme enabled some candidates to score 3 out of 4 even though they did not fully appreciate how the equipment was used to find the centre of gravity of an irregular shape. The plumbline was not always recognised and some candidates thought that the bottom part of it was a magnet.
A pin going through the card and also supporting the plumbline was supposed to be clamped. Instead many candidates described the shape being clamped and unable to rotate. Placing the plumbline at different points on the card did not then produce two or more lines that would intersect. At this point some candidates were clearly confused by their own descriptions.

(e) Asked how to ensure the accuracy of the experiment many responded by repeating it several times and finding the 'average' which was inappropriate here.

Question 2

(a) Candidates were shown the outline of a child's shoe on graph paper and asked to estimate the area of the shoe in cm^2. The correct value was close to 40 but few candidates scored more than 1 out of 3 for a value in the ranges 37-38 and 42-43.

(b)(i) The calculation of pressure using a given formula almost always involved a factor of 2 error by not considering the weight of the child to be acting on two feet.

(b)(ii) The mark given for justification of significant figures was scored more often than in previous sessions with many referring to force and area or to the 'numbers used in the calculation of pressure'.

Question 3

(a) Often 4 out of 4 marks were scored for a circuit diagram showing a fuse subject to a varying current. Along with power supply, variable resistor, ammeter and switch, lamps and stopwatches were also shown as circuit components. These together with the inappropriate use of a voltmeter were ignored.
The symbol for a variable resistor was not always known but was generously marked.
The stated range of the ammeter was often within the accepted range of 1.0 – 4.0 A. Unfortunately many gave 1.2 A as the bottom of the range even though the diagram shows that the current has not 'levelled off' at 1.2 A.
The method was described well although many unnecessarily described the function of each circuit component.
A 1 A fuse was to have various currents in it and the time taken for it to blow noted. Some excellent descriptions were seen especially where the fuse not subjected to the current until the current value had been set. A common error was to start the stopwatch and gradually increase the current until the fuse blew. As in 1(d) the candidate often became confused.

(b) Many candidates were unable to successfully read the stopwatch with 28. 2 s instead of 28.02 s often seen.

Question 4

(a) This was very well answered with nearly all candidates recognising the safety feature as the container surrounding the radioactive source.

(b) The mean value of the three background counts was nearly always correct.

(c) Nearly all candidates successfully subtracted the background count from a given reading.

(d)(i) The graph was very well plotted and the curve well drawn for the radioactive decay.

(d)(ii) Skilful work was seen in the determination of half life. Often several determinations were made and the average taken.

(e)(i) The ratemeter was almost always correctly read.

(e)(ii) Candidates had to subtract background count from the reading in (e)(i) and use the graph to find the appropriate time. This difficult task was achieved by a significant number of candidates although it was more usual for candidates to score 1 out of 3 for completing it but neglecting to allow for background count.

(f) Explanations for why readings were not repeated during the radioactive decay were poor as most candidates missed the point that readings are changing and averaging is inappropriate.
Many thought that it was to minimise exposure to the radiation or that it was only necessary to average background count because this was changing.

(g) A student coming in late offered a reading '*489 counts after five minutes*' based on the use of her own watch. Three criticisms were sought.
This scored poorly with many stating that her result was not in tabular form or she was subjected to a high level of radiation due to her sitting at the front.

COURSEWORK (PAPER 4), PRINCIPAL MODERATOR'S REPORT

General Comments on Science Coursework

The coursework component is only available to centres which are recognised by Edexcel as International Teaching Institutions.

The number of students entered for this component of the iGCSE examination was as follows:

Code	Subject	Number entered in 2007	Number entered in 2006
4420	Physics	239	97

All of the centres that entered students for this component of the examination had their science coursework moderated by Edexcel's co-ordinating Principal Moderator for GCSE. The moderating instrument used was the Sc1 criteria as used by Home centres, using exemplars provided by the JCQ (Joint Council for Qualifications) as a guide.

Centres entering students for the coursework component of the iGCSE examinations in 2007 therefore had their coursework moderated to the same standards as for all Home centres.

Physics 4420

A range of tasks was seen this year. The most common was resistance in wires. This is the most common Physics task seen in UK centres, and it can achieve the full range of marks.

Some other appropriate tasks seen were "stretching springs in parallel", thermistors, craters, momentum, and bouncing balls.

One inappropriate task was also seen this year – the pendulum (no longer used by most UK schools, largely because it is virtually impossible for GCSE students to incorporate sufficient scientific knowledge in skills P and A).

Centres are reminded that to fully achieve P8b, students need to clearly show how the preliminary work has affected their planning for the main task. It is not necessary to carry out the entire task as a trial run – only two values of the range chosen (normally the extremes of the range) are required, in order to see if the range chosen is appropriate. Results of the preliminary work must be given, to show how it has influenced planning for the main task.

When awarding A6b, teachers need to bear in mind that the specification requirements are that the students should explain the science behind the results they have obtained. Merely describing the shape of the graph does not result in the student achieving A6b. Students should link the shape of their graph to the underlying science.

For E4b, students are required to suggest at least one meaningful improvement to the technique used – and give some indication as to why the improvement(s) proposed would result in the obtaining of more accurate data.

PHYSICS 4420, GRADE BOUNDARIES

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

	A*	A	B	C	D	E	F	G
Foundation Tier				59	48	37	27	17
Higher Tier	76	65	54	43	30	23		

Option 2: with Coursework (Paper 04)

	A*	A	B	C	D	E	F	G
Foundation Tier				64	52	40	28	16
Higher Tier	82	70	58	47	34	27		

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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