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Examiners' Report November 2007

IGCSE

IGCSE Science (Double Award) (4437)

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Paper 1F

Candidates were able to access all the questions to demonstrate their knowledge and understanding of the specification. The course also encourages candidates to carry out practical activities with the appropriate collection, analysis and evaluation of data. This area seems less well assured and candidates are encouraged to practice quantitative manipulation of data so they can access questions of this type with greater success.

Question 1
The multiple choice questions proved to be helpful to candidates at the start of the examination. Most were able to gain many of the marks. Difficulty was often noted when choosing the correct sex chromosomes of a man and a woman.

Question 2
Part (a) of this question was answered well by most candidates. The most frequent error was naming B as transpiration. Most recalled oxygen as the gas used in respiration.

Question 3
Part (a) was answered well, though some candidates reversed the order of the renal blood vessels, and some are confused about whether to name tube C as the ureter or the urethra. Most answered (b) correctly. Most were able to correctly indicate the volume of urine in the bladder in (c) (i) and (ii), but only the more able candidates offered an explanation. Candidates are encouraged to note that the term "explain" means that the examiners are looking for the underlying biology for a given observation.

Question 4
Candidates struggled to put these terms in the correct sequence despite being assisted with the names of the terms. Clearly this concept causes difficulty and candidates need help in understanding the link between stimuli and appropriate responses. Part (b) was answered well, though some candidates answered nerves for hormones. Part (c) exposed a lack of knowledge about hormones which was disappointing to note. In contrast, part (d) was answered well with most candidates appreciating that shoots grow towards light.

Question 5
Many candidates understand that pesticides kill insects that eat crops but very few were able to recall an example of biological control, or to give the advantages that biological control has when compared to the use of pesticides. Sadly, very few candidates were able to recall that crops can be genetically modified to be resistant to pests, or to herbicides.

Question 6
Only the more able candidates were able to correctly assign the letters to the processes listed in the table, and part (b) was a struggle for most. They were unable to recall the example of diffusion (alveoli to blood); the example of osmosis (water to blood); or the example of active transport (soil to cytoplasm).

Question 7

Part (a) was answered well. In part (b), many candidates ignored the rubric and used names of the organisms. As ever, candidates are encouraged to read questions carefully before attempting their answers. In part (c), many candidates were able to recall bacteria and fungi as decomposers.

Question 8
Most were able to recall the lens as the part of the eye labelled, though some thought it was the pupil. Part (b) (i) seemed to pose difficulty with many simply rephrasing the question. The fact that less light would enter to stimulate the retina was not appreciated by most candidates. Candidates also struggled to cope with the demands of the genetics in part (ii). Many used the symbols for sex chromosomes and many were unable to select the correct parental genotypes or gametes, despite being given the letters to use. Many seem unaware of the meaning of the word 'phenotype'.

Question 9
The naming of the parts of the cell caused little difficulty but the function of the parts was less well known. In part (b), only the more able candidates appreciated that the bacterium would be digested by enzymes. A pleasing number of candidates calculated the correct answer for part (c), though candidates need to be aware that often a mark is available for a chosen number seen in the working. As such, they should be encouraged to show their working.

Question 10
This difficult biology was understood by many of the candidates, no doubt helped by the format.

Question 11
Candidates struggled to express themselves in continuous prose and, once again, it is suggested that they get as much practise at this style of question as is possible throughout the course. Those who impressed were aware of the multitude of abiotic and biotic factors that can be controlled in glasshouses to improve crop yield.

Paper 2F

Too few candidates entered for this paper to be able to compile a meaningful report. Please refer to report Examiner's Report for Chemistry 4435 for feedback relating to common questions.

Paper 3F

Questions 1 to 6 were aimed at Foundation Tier. Question 7 to 10 were common with the Higher Tier paper.

Question 1
Part (a) was well answered although there was some uncertainty seen in (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 (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)(ii) showed a lack of understanding of half-life. The completion of a sentence on the uses of radioactivity was poorly answered.

Question 7

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 8

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 9

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 10

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.

Paper 4H

Too few candidates entered for this paper to be able to compile a meaningful report. Please refer to report Examiner's Report for Biology 4325 for feedback relating to common questions.

Paper 5H

Too few candidates entered for this paper to be able to compile a meaningful report. Please refer to report Examiner's Report for Chemistry 4335 for feedback relating to common questions.

Paper 6H

Questions 1 to 4 are questions in common with the Foundation Tier Paper. Questions 5 to 10 only appear on this Paper. The 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 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 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 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. Most 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

Well answered with some gaining full marks.

Question 5
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 6
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 7
Most of the question was fairly 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. Some recognised that total internal reflection takes place but most failed to give a convincing explanation. To obtain full marks a candidate needs to include in their explanation that the angle of incidence = 45° (because angle of incidence = angle of reflection and that, in the diagram, angle of incidence + angle of reflection = 90°) and that the critical angle needs to be less than 45° because total internal reflection has occurred.

Question 8
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 majority of candidates.

Question 9
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 some candidates understood that as neutrons have no charge but alpha particles carry positive charge, the latter will be repelled by the positively charged nucleus. Many candidates correctly identified the purpose of the moderator and the purpose of the control rods. However few went 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 10
This question was well answered with a significant proportion of candidates gaining full marks. Only a 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 most were able to calculate the maximum height reached by the ball.

Paper 7

This paper produced a good range of marks and showed that many candidates were familiar with experimental work in biology.

Question 1
Provided an opportunity for all levels of candidates to get marks for recognising familiar apparatus. In part (a) most were able to correctly identify the beaker, tripod and Bunsen burner. A small number of candidates were unable to identify the tripod and vague answers such as stand did not earn credit. Most candidates were able to give two appropriate safety precautions for heating the milk. Suitable answers included wearing safety glasses, adjusting the Bunsen flame, keeping hair tied back and setting the apparatus away from the edge of the bench, but many other sensible suggestions were credited. In part (b) almost all could correctly name thermometer Q as showing the temperature at which the bacteria are added. Most candidates were able to suggest a fridge as a way of cooling the yoghurt, although other answers were credited use of a freezer earned no credit.

Question 2
Provided candidates with the opportunity to demonstrate their measurement skills and the majority of candidates were able to accurately measure the distances covered by the beetles. Most were also able to suggest how a lower temperature could be produced and why the student should not collect data above 35°C as this could harm or even kill the beetle. The last part of this question required students to plot a graph of the results. Many earned good credit for accurate graphs using an appropriate scale, with axes labelled with units and points accurately plotted and joined with neat lines labelled with 'age of beetle'.

Question 3
Illustrated a simple method of determining the energy content of a small food sample. Part (a) required them to name a suitable apparatus for accurately measuring 20 cm^3 of water. Responses such as measuring cylinder pipette and burette earned credit others such as jug or beaker were not credited. Again most candidates were able to calculate the energy value using the formula given and then use this to determine the energy content of a 1g biscuit. Centres should remind candidates to show the stages of their calculations as this often enables examiners to award credit for correct working even if the final answer is incorrect. In part (b) most could calculate the mean value and the more able candidates were able to suggest that energy may be lost to the atmosphere, to the glass tube or to the needle. Part (c) discriminated well between candidates. Only the most able could correctly explain that as the beaker has a lower surface area to volume ratio it will lose heat more slowly, so the temperature and therefore energy value will be higher.

Question 4
Enabled candidates to demonstrate their abilities in observation, data handling, analysis and interpretation of results. In part (a) they were required to determine the number of measuring cylinders used in the design and many failed to get this correct. Most were able to correctly identify an anomalous result and the better responses also suggested a cause for this result. They were then required to match a diagram of a result with a reading from the table. A significant number of candidates failed to earn full credit for this task. In part (b) candidates had to explain the effect of temperature on the rising of the dough. Some described the effect of temperature but did not explain it. Centres need to enable candidates to distinguish between

description and explanation. The most able candidates were able to describe the increase in kinetic energy of the enzyme and substrate molecules then describe denaturing of the enzyme structure as the optimum temperature is exceeded. The better responses also linked this to the release of carbon dioxide gas causing the dough to rise. Finally candidates had to examine the data and give the effect of vitamin C on the rising of the dough. Most stated that it increases the rising and the best responses qualified this by explaining that this effect only occurred at temperatures between 25 and 55^{o}C.

Question 5
Provided candidates with the opportunity to demonstrate understanding of some important terms used in experimental design. Some candidates could confidently match the terms to their descriptions. It is expected that candidates should be familiar with reliability, accuracy and precision as they are all used in the specification yet many appeared to be guessing. Candidates did better in suggesting why the counting of bubbles may produce inaccurate results.

Question 6
Described how quadrats could be used to compare the population of plants on two sides of a hill. The most able candidates were able to suggest improvements to the plan such as more replication and by sampling the two areas at random. Centres in which candidates had carried out or discussed such an investigation, given in the specification, had a significant advantage in answering this item. The final part of this question required a CORMS style experimental design and the well prepared candidates scored well.

Paper 8

Question 1
This question required candidates to select a suitable item of apparatus to measure a certain variable and then state the units of measurement of that variable. While most candidates gain all of the marks for apparatus selection (although a few candidates gave the same item for two different variables), more errors were made in stating the units used. There were common errors in indices (so volume was measured in cm^2).

Question 2
This question concerned the thermal decomposition of some metal carbonates. Many candidates gained both marks for identifying variables that must be kept constant in order to make it a fair test. However, many candidates did not relate their answers to the question and gave general answers such as “the amount” without specifying of what; some stated “time” despite this being the dependent variable. In part (b), most knew that repeating could be used to check reliability. The bar chart in part (c) caused unexpected problems. Candidates often failed to label the vertical scale, and those that did often omitted the appropriate units; bars were often not identified. Part (d) caused few problems. In part (e)(i) a number of candidates thought the gas would not be collected at all while in (ii) vague answers such as “the volume collected will be different” were not credited. Relatively few candidates could name a method of collecting the gas without using water in (iii). Despite making the scales more difficult by printing them as they would be seen if doing the experiment, most candidates gained full marks in part (f)(i); however (ii) proved more challenging with some candidates not being able to work out the time taken; candidates should know

the difference between significant figures and decimal places. Part (f)(iii) was, pleasingly, well answered.

Question 3
This question was based on the combustion of a candle in limited supply of oxygen. In part (a) candidates would be well advised to look at the number of marks available. If only 1 mark is available for describing a relationship, then a simple statement along the lines of "as x gets bigger, y gets bigger" should suffice, however, if 2 marks are available then more is required, such as in this case the idea of "direct proportionality" or "doubling one doubles the other". In part (a)(iii) the problem is not air leaving the beaker but air (or more importantly, oxygen) entering the beaker. Measuring the volume of the beaker in part (b) proved difficult for many candidates. Most candidates could identify the most reliable results in part (c), although the reason should have been based on the closeness together of the values – they are not "the same values". Less able candidates experienced problems with the graph in part (e), ranging from non linear graph scales, through careless plotting of points, to graph lines that were either no best fit or were multiple lines. Most could identify the anomalous point but, as is often the case, could not come up with a reasonable explanation of what may have gone wrong in measuring that datum point. The explanation offered must always explain why the value obtained is either too large or two small. In this case time was too long, and so the explanation had to account for this. In part (e)(iv) many candidates, rather than using smaller beakers, wanted to use beakers containing no air or even with a volume of 0 cm^3. In actual fact, the line will not go through (0,0) since the method of measuring volume does not account for the volume of the candle used. Part (f) required a quantitative answer for (i); in (ii) many candidates correctly read a time from their graph but then did not multiply this by 5.

Question 4
Candidates who used the data provided in this question generally scored well, while candidates who relied only on their existing knowledge tended to score very poorly. In part (a) a common (and rather surprising) error was rather than give two possibilities for the identity of the compound ("sodium carbonate" and "sodium hydrogen carbonate") was to come up with one identity and split it into two (so giving, for example, answers of "sodium" and "carbonate"). In part (b) less able candidates gave answers involving varied and often multiple problems and tests, while more able candidates applied the information given and were able to give succinct answers which addressed the question.

Paper 9

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 10), 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.

SCIENCE (DOUBLE AWARD) 4437, GRADE BOUNDARIES

Option 1 : with Paper 7 (Biology) & Paper 8 (Chemistry)

	A*	A	B	C	D	E	F	G
Foundation Tier				55	44	34	24	14
Higher Tier	N/A	N/A	N/A	N/A	N/A	N/A		

Option 2 : with Paper 7 (Biology) & Paper 9 (Physics)

	A*	A	B	C	D	E	F	G
Foundation Tier				54	44	34	24	14
Higher Tier	78	67	56	45	35	30		

Option 3 : with Paper 8 (Chemistry) & Paper 9 (Physics)

	A*	A	B	C	D	E	F	G
Foundation Tier				54	44	34	24	14
Higher Tier	78	67	56	45	35	30		

Option 4: with Coursework (Paper 10)

	A*	A	B	C	D	E	F	G
Foundation Tier				56	45	35	25	15
Higher Tier	80	69	58	48	36	30		

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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