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Examiners' Report

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SCIENCE (DOUBLE AWARD) 4437, CHIEF EXAMINER'S REPORT

Paper 1F

General Comments
This unit was sat by a small number of candidates so generalisations about performance are difficult.

Question 1
Questions 1(a) to (g) were answered correctly by most candidates with item (f) on photosynthesis and item (g) on yeast cells proving the most difficult.

Question 2
Question 2 required candidates to identify two features a farmer would want a cow to have and candidates were able to suggest milk yield, milk quality as well as meat production as suitable examples. Most responses to part (b) also correctly described selective breeding as the farmer choosing two parents with desired characteristics to mate together.

Question 3
In question 3 part (a) candidates were confused between the left and right and atria and ventricles and some were unable to identify the tricuspid valve. Candidates were able to show the direction of blood flowing into the right side of the heart but did less well on showing the movement of blood from inside the left ventricle, through the tricuspid valve and out of the pulmonary artery. Some were able to describe the function of the valve as opening and closing to allow blood to only flow from atrium to ventricle and not flow back into the atrium. The final part of the question required two differences between blood in the left side and the right side of the heart. Some candidates were able to point out that there is more oxygen and less carbon dioxide in the blood in the left than in the right. Again a few candidates described colour of blood or confused which side contains blood from the lungs.

Question 4
In question 4 the paper showed a diagram of a tree and substances entering and leaving through the leaves and the roots. Most responses in part correctly identified water as entering the plant from the soil and being used in photosynthesis. All candidates could identify the sun as the source of energy for photosynthesis. In part (b) several candidates did not know which materials were transported in the xylem or phloem.

Question 5
Question 5(a) required candidates to name the system shown almost all correctly identified the reproduction system. In part (b) some confused the location of the ureter and the urethra but most could identify the bladder from the diagram. Most candidates were also able to name two waste products found in urine and the organs that excrete sweat and carbon dioxide and water as the skin and the lungs.

Question 6
In question 6 students had to explain the meaning of yield and a few had no idea what this term meant. This led to difficulties in answering the rest of the question. In part (b) we expected answers to sate that both herbicide and pesticide improve plant growth but that herbicide is most effective. Only a small number gained full credit

for this. More correct responses were found for part (c)(iii) describing the concept of measuring at the same time to ensure same temperature, rainfall and climate.

Question 7

In question 7 most candidates were able to give the function of the pancreas and the small intestine. The graph posed problems for many who misinterpreted the information provided. As such, their answers discussed lipase being broken down as opposed to lipid. They also believed that the fastest digestion took place in the acidic solution, presumably because this was the smallest bar in the graph. In part (c), starch was well known as the substrate for amylase, but few candidates knew that the product of maltose digestion is glucose.

Question 8

In question 8 many candidates failed to earn marks as they described the changes that take place in the pupil in different light levels rather than changes in the lens as it focuses on distant or near objects.

Question 9

The better candidates in question 9 recalled that there need to be two copies of the recessive allele present for someone to have cystic fibrosis. A range of incorrect answers were given, with one and three being the most popular. Some candidates left the answer blank. In part (b), candidates are encouraged to make sure that a space exists between the letters representing the alleles to give the examiners confidence that the candidates appreciate that only one allele occurs in a given gamete. The genotypes of the children were appreciated by many, but occasionally only one heterozygote was given. Candidates who achieved success with the gametes and the genotypes of the children understood that only one of the four possible genotypes of the children would develop cystic fibrosis. Weaker candidates struggled with this part of the question. In part (c), most appreciated that the nucleus contains the genetic material in a cell and that the material is made from DNA.

Question 10

In question 10 the standard of food chains was good with only a small number of candidates choosing an incorrect chain or putting the arrows the wrong way round. Part (b) challenged more candidates with some believing that voles ate the owls and the weasels. In (c)(i), a very small number failed to name an organism 'from the food web' stressing the need for candidates to read questions carefully. Parts (ii) and (iii) were well answered, though weaker candidates did not appreciate that producers are found at trophic level Y.

Question 11

The responses to question 11 were disappointing, revealing a lack of knowledge and understanding of micropropagation. Any verb that described the cutting or removal of small pieces of plant was accepted in the passage. Sterilisation was not commonly recalled nor was the role of nutrient agar. In part (b), most candidates recalled that clones are identical but failed to state that they had identical genetic material.

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

General Comments
Questions 1 to 6 only appear on this Paper. Questions 7 to 11 are questions in common with the Higher Tier Paper. All of the candidates entered for the Foundation Tier had entered what was, for them, the more appropriate tier.

Question 1
In part (a) most were able to complete the equation for average speed and part (b) was generally correct. However in part (c) most could not make three correct statements about the motion in part E and many seemed to think that the car must be moving to a stop.

Question 2
This question was generally well answered but some candidates were muddled about the energy changes in parts (a)(i) and (ii).

Question 3
This question was generally well answered though some could only manage (b)(ii) and (iii) where common sense was helpful.

Question 4
This question on the parts of the electromagnet spectrum and their uses and dangers was well answered.

Question 5
Some candidates showed little knowledge of the nature of atomic structure, of isotopes or of radioactive decay even though this question only required basic understanding.

Question 6
Candidates who had demonstrated some understanding in the previous question were generally able to gain some marks here. Unfortunately the converse was also true.

Question 7
Most correctly put X in the body of the sack and vertically below the line of the hook and rope. Only a minority realised that friction keeps the hook in place. The calculation was generally correct and most correctly completed the equation for moment or turning effect.

Question 8
Most realised that the components must be arranged in parallel. In part (a)(iii) 0 and 9 were often suggested rather than the more thoughtful 1 and 8.
In (b) only a minority recognised that X is a variable resistor and that it can be adjusted to reduce the resistance and thereby increase the current.

Question 9
Generally well done but the prompt '..full name..' usually failed to generate the response of 'total internal reflection' in part (b)(ii).

Question 10
Generally well answered but many failed adequately to explain, in part (c) that the student is trying to block out other sound which may distract her.

Question 11
Generally well answered but only a minority correctly suggested that the force of friction acts at the hinge as the lid opens.

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 4435 for feedback relating to common questions.

Paper 6H

Too few candidates entered for this paper to be able to compile a meaningful report. Please refer to report Examiner's Report for Physics 4420 for feedback relating to common questions.

Paper 7

General comments
This paper had similar requirements to those set in May 2005, in November 2005 and in May 2006. It was also felt to be of a similar standard to those papers. First impressions were that the candidates did not perform quite as well as in the previous papers.

Question 1
This question tested candidates' knowledge of food tests. It was generally answered well with most candidates scoring full marks. Some candidates mixed up the test solutions for glucose and lipids, however.

Question 2
Candidates were required to match the apparatus with the experiment. Many candidates scored full marks. A significant number got the apparatus for comparing the amount of carbon dioxide in inhaled and exhaled air and that for measuring the rate of anaerobic respiration in yeast the wrong way round.

Question 3
Part (a) required candidates to give a hypothesis for the experiment and this was generally answered successfully. However, it was clear that some of the less able candidates did not understand the question. The majority of candidates scored full marks for their table of results and most could give a conclusion. Very few candidates scored any marks in part (c) about improving the investigation. There were many vague answers such as 'repeat' or 'gather more results'.

Question 4
This question was about the effect of acid rain on germination. Most candidates were able to complete the table and a significant number were able to calculate the percentage of seeds that germinated in distilled water. The majority were able to talk about 'calculating an average' in part (b). The majority of candidates were able to say that increasing the acidity of the solution would decrease the percentage of seeds, although some candidates thought the opposite would occur. A significant number knew that temperature light should be kept constant, but very few were able to suggest precisely how this could be done.

Question 5
Most candidates had difficulty in estimating the density of plantains in area A, although some gained one mark for giving the number '20'. The majority of candidates gained full marks for completing the tally chart along with the number, although some just wrote in the number and forgot the tally. The graph was generally answered well – the main mark lost was in not giving a precise label for the Y axis of the 'total number of plants in three quadrats. Many candidates gained 2 marks in (d) by making appropriate comments about the effect of trampling. The most common answers related to the number of plants in area A being more and the amount of goundsel in area B being less.

Question 6
Almost all candidates did not answer the question asked about justifying the prediction using scientific knowledge. Many just repeated the hypothesis given in the question. Most candidates were able to fill in the missing mean (average) number of bubbles per minute. Many candidates gained full marks for a suitable conclusion, but fewer candidates gained full marks for explaining whether the results

supported the prediction. The majority who gained marks said the results did support the conclusion, but some candidates were able to give a qualified answer as to why the result did not support the conclusion. Marks could be gained either way, although, if the answer was 'no', then it had to be qualified for one mark. In part (d) a significant number of candidates did not appear to understand the question. Some just referred to the results going 'up' or 'down' with an increasing number of attempts. The result of question 6 proved to be too demanding for many candidates. Not many could suggest and explain ways in which this experiment could be modified – some referred to a different experiment. Similarly, when asked about a further experiment to provide more information about the effect of temperature, few answers actually referred directly to temperature. Some candidates were able to stage carbon dioxide or light as a key factor that could affect photosynthesis, but very few could state how either carbon dioxide or light could be controlled.

Question 7

This type of question has appeared on past papers, but candidates seemed to find planning this particular investigation about the effect of changing the concentration of the enzyme amylase on the rate of starch digestion challenging. The most common marking points gained were reference to time, mention the use of iodine solution, using the same volume of starch and reference to carrying out the investigation at the same temperature.

Paper 8

Question 1
This question was tested the students' ability to recognize items of laboratory apparatus and their use in the laboratory. Most students, as expected, could name the majority of items correctly. The funnel was sometimes incorrectly identified as a 'filter'. Candidates are expected to have used, or have seen in use, a full range of laboratory apparatus.

Most students could identify the funnel as being used to help remove insoluble substances for a solution but it was less common for students to be aware that the burette was suitable for measuring a given volume.

Question 2
This question was designed to be a relatively straightforward on the process of chromatography.

Part (a) required knowledge of the method used and the reason for that method. Very few candidates realized that if the sample was placed at the bottom of the paper it would dissolve in the eluting solvent in the beaker rather than be carried up the paper. Surprisingly few candidates could give observations that would be made during the procedure, suggesting that those candidates had not actually carried out this process. In (c) (i) most candidates scored the mark for the measurement but some candidates did not realize the measurement should be made from the middle of the start point to the middle of the spot. In (ii) candidates were expected to give two letters corresponding to the two coloured dots present in M, many candidates gave only one letter and so could not score. (iii) tested the candidates' ability to apply their knowledge of a procedure and resolve a problem; very few candidates suggested the expected answer of using a different solvent.

Question 3
This question was concerned with measuring the volatility of liquids. Part (a) dealt with the idea of 'fair testing' and was generally well answered. Part (b) dealt with experimental design. Many candidates seemed to be unaware of the flammable nature of many organic liquids and were more concerned with the prospect of the watch glass cracking. While most candidates could read the thermometer and stop watch scales in part (c) a few made the same mistake and gave 60.7 (rather than 67) and 45.7 (rather than 52) – thinking that every unlabeled scale division must be 0.1 rather than look at the values of the labels shown.

Part (d) required analysis of the data provided. This was generally well answered. The distillation apparatus in (e) caused a few more problems. The name of the process was known by approximately half of the candidates but some candidates failed to even attempt part (ii) while some others labeled everything on the diagram that they could. Only a minority of candidates could name the condenser and even fewer could relate this procedure to the boiling point of the liquids. As said earlier, candidates are expected to have used, or have seen in use, a full range of laboratory apparatus

Question 4
This question was based on the determination of the oxygen content of air. In part (a) very few candidates seemed aware that the volume of gases changed with temperature. The most common error in (b) was to read the left hand syringe as 55 rather than 45; these candidates had not noticed that the left syringe faced the

opposite direction to the right hand syringe. To answer part (c) candidates had to add together the gas volumes shown in the table above; many candidates did not realize this or gave answers that resulted from simple arithmetic errors. The graph in (c) proved to be straightforward although candidates must be made aware that a straight line graph needs the use of a rule to produce the line – freehand attempts at straight lines will not be credited. In (d) most could correctly identify an anomalous point. Part (e) was based on a standard laboratory experiment, although the use of phosphorus rather than magnesium is more often seen. Very few candidates understood that the magnesium would combine with oxygen in the air and so result in an increase in water level. It was not uncommon for candidates to state the water level would drop due to evaporation caused by the heat. In (d) (iii) candidates were expected to be able to explain why the use of a bell jar would give less accurate results than a syringe; very few candidates scored a mark here. It is expected that candidates will know that the wider the cross section of an item the less accurate it will be in measuring a volume (so a pipette is more accurate than a burette, which is more accurate than a measuring cylinder which is more accurate than a beaker); no candidate spotted this fact – those who gained a mark here did so by noting that the bell jar had no graduations.

Question 5

This question was based on reaction kinetics.

It was clear from some answers that some candidates did not read through the question carefully. In part (a) a common wrong answer was to state that temperature should be kept constant despite the fact that the question told then it was at 'room temperature'. In part (b) most failed to spot which student did not use $50cm^3$ of solution – had they read the introduction explaining the experiment? In part (c) most candidates were able to calculate the rate correctly but a similar proportion were unable to calculate the % concentration of the hydrogen peroxide; a common error was to say student D had used 60% rather than 50% (a result of not checking the total volume used by that student). In general the graph in (d) was well plotted but a significant number of candidates failed to add a line to the graph; the instruction in the question was 'draw a graph' – this means plot the points and draw a line. In d (ii) very few candidates scored the mark; as had been said before in examiners reports, when describing a relationship candidates are expected to give a full description; here the relationship was directly proportional and that was the expected answer, just saying 'as one gets bigger, so does the other' was not sufficient. Part (e) required some experimental design and fair testing. Some long and rambling answers were seen that failed to get down to the main points – some candidates may find it easier to answer this type of question with series of bullet-pointed statements.

Paper 9

Question 1

(a) All were able to read the measuring cylinder diagram correctly.

(b) In part (i) nearly all candidates were able to design a table with appropriate headings and the volume in cm^3 or ml and the readings in order. A small minority omitted to enter the sixth marble or failed to mention the unit for volume. Almost all labelled their graph appropriately in part (ii). They plotted the points correctly without employing 'blobs', identified the anomalous point and drew an appropriate line of best fit. Most understood that there must have been 28 cm^3 of water to start with and were able to recognise the pattern and to correctly suggest 105 cm^3 if another marble is added.

(c) Most obtained three or four marks. Marks were often lost because candidates restricted themselves to just one marble or, more commonly, because they failed to specify that you need to judge that the water initially put in the measuring cylinder must be sufficient to cover all the marbles but is not so much that it will overflow.

Question 2

(a) Almost all candidates were able to name the newtonmeter/spring balance/ newton balance, to read it correctly and to name the stand.

(b) Nearly all were able to suggest a suitable measuring device and to make an accurate measurement from the diagram.

(c) Almost all understood what was required and gave the correct answer, 130 (mm).

(d) Most completed the table correctly, plotted the points correctly and used a ruler to draw an appropriate line of best fit going through the origin.

(e) Most correctly concluded that the results show that (for loads up to about 7 newtons) the extension is proportional to the load or that Hooke's Law applies. Some lost a mark because they restricted themselves to 'the extension increases as the load increases'.

(f) A rather disappointing response from many candidates. A common suggestion was that a spring would give 'better' results or that the load should be increased in 'standard' steps. A minority made an appropriate suggestion and explained it. For example, 'take more readings (in the range 0 – 7 newtons) in order to improve reliability.

Question 3

(a) Nearly all understood how to 'read' the meniscus.

(b) Most realised that you need to measure the width of the smaller beaker, subtract this measurement from the width of the larger beaker and divide the result by two.
However some incorrectly referred to the length or circumference of the beakers.

(c) In part (i) most were able to sketch an appropriate graph which had the same starting point, which fell more steeply and which then levelled out at the same temperature. If a mark was lost it was likely to be the third of these marks.
Most understood that it is necessary to keep everything else the same so that any difference will be caused only by the difference in the thickness of the insulation.

(d) Any suitable suggestion with an appropriate explanation was credited. The most popular suggestions involved either putting a lid on the inner beaker or using a non-metal lid on the outer beaker.

(e) Nearly all got some marks, which could be obtained for; it will cool more quickly/ the graph will be steeper, damp sawdust is not such a good insulator/is a better heat conductor, because (trapped) water is a better conductor than (trapped) air or for realising that heat will be lost because (some) water in the damp sawdust will evaporate.

Question 4

(a) Nearly all understood that the spirit burner is used to heat water in the beaker and this gave them their first, and in some cases their only, mark. Many did not have both the thermometer and the thermistor in the water and a significant minority made no reference whatsoever to the transistor. Many did not understand that the usual purpose of a heat proof mat is to protect the bench and few suggested how the spirit burner could be used to try to keep the water at a constant temperature.

(b) Most read both meters correctly with only a very small minority suggesting, for example, 0.63 or 4.1.

(c) Most were able to deduce that the resistance will increase.

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 2006.

DOUBLE AWARD (SCIENCE) 4437, GRADE BOUNDARIES

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

	A*	A	B	C	D	E	F	G
Foundation Tier				57	46	36	26	16
Higher Tier	80	68	56	44	33	27		

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

	A*	A	B	C	D	E	F	G
Foundation Tier				57	46	36	26	16
Higher Tier	N/A	N/A	N/A	N/A	N/A	N/A		

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

	A*	A	B	C	D	E	F	G
Foundation Tier				N/A	N/A	N/A	N/A	N/A
Higher Tier	N/A	N/A	N/A	N/A	N/A	N/A		

Grade boundaries are not applicable for categories where no candidates entered coursework

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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