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Examiners' Report Summer 2007

IGCSE

IGCSE Science (Double Award) (4437)

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Summer 2007

Contents

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

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
This question consisted of eight objective items. Most candidates scored well on these items with item (c) which required the identification of the heart chamber that supplies blood to the body proving the most difficult for candidates.

Question 2
In this question candidates had to match the correct donated body part to the description choosing their answers form the list provided. Most candidates gained marks with the most difficult being the secretion of insulin which was sometimes mismatched to the kidney.

Question 3
This question required the candidates to match the section of a leaf to descriptions of the region. Most gained good marks on these items.

Question 4
In (a) candidates were required to pick from the data the mammal that produces most sugar in its milk and compare the protein found in milk from cows with milk from rabbits. Many scored high marks on these items. Part (b) concerned digestion of milk protein with candidates selecting from a list of substances the products of protein digestion, the enzyme that digests protein and the acid used to help this enzyme. While some candidates gained full marks many seemed to guessing. Part (c) asked candidates to explain why polar bear milk contains the most fat. Most were able to link this to the cold environment with the better responses describing how fat can act as an insulating layer and how the fat can be used as an energy source. Finally part (d) asked for two substances required in babies milk other than fat, protein and sugar. Vitamins and minerals were the most popular correct answer given.

Question 5
This question provided candidates with a diagram of a flask being used for micropropogation. The first part (a) required two functions of the roots inside the flask, most responses correctly described the roles as absorbing minerals and water and anchoring the plant in place. In part (b) many candidates could not explain the meaning of sterile. In this context it means free from bacteria or fungi. Candidates did better and were able to name a mineral in part (c). However part (d) which required the purpose of covering the opening of the flask was only answered correctly by the most able candidates who correctly described how this would keep out microorganisms and maintain the humidity or prevent water loss from the shoot. Candidates did better in part (e) naming two conditions that are needed for photosynthesis.

Question 6
Part (a) required candidates to count the bricks covered by plants and transfer this data to a table, calculating percentage coverage. Many gained full marks for this but very few gained both marks for part (b). Most response correctly suggested that sulphur dioxide prevents plant growth but only very few linked this to its acidic properties.

Question 7
In this question many candidates were able to correctly identify where the horse would chew its food and store its faeces. They also were able to identify where most villi are found. The role of peristaltic muscular contractions in moving food along the oesophagus was recalled by the vast majority. A variety of answers were offered for part (c) (i), with starch and glucose being the most common wrong responses. Pleasingly, cellulose as the correct answer was seen on many scripts. The function of vitamin C is not widely known. A range of responses were accepted including its role in avoiding scurvy and ensuring skin and gums were kept healthy. Part (d) (i) was almost always answered correctly, but only the better candidates were able to calculate that the horse would use 5 250 kJ of energy when walking fast for one hour. Many wrote 10.5 as their answer.

Question 8
In this question oxygen being used and carbon dioxide being produced was understood by most candidates. In (a) (ii), one mark was awarded for having yeast in the middle of the food chain and one mark was awarded for drawing arrows in the correct direction. It was the latter point that caused most difficulty. Some candidates simply drew straight lines with no arrow heads which was not credited. Part (b) was well answered, though the calculation caused difficulty for some. The correct answer of 50% gained full marks. However, if this answer was not seen, markers were asked to look at the working and award one mark if 38-57, 57-38 or 19 were visible. As such, candidates are encouraged to show their working. In part (c) credit was given for appreciating that the temperature was higher and that this would affect the enzymes involved in metabolism, which would increase yeast reproduction and, therefore, increase the food available for the flies. Most candidates gained an easy mark for recognising that the temperature was higher, but very few candidates explained how this might be linked to obtaining more fly offspring. Knowledge of how sex chromosomes are inherited was poor, with very few candidates scoring full marks. The reason why equal numbers of male and female offspring were not obtained escaped most candidates who clearly struggle with the concept of random fertilisation.

Question 9

In part (a) marks were awarded for appreciating that that the insects would reduce crop yield because they would reduce leaf area, which would reduce photosynthesis. Less able candidates realised that there would be less yield but were unable to explain why. The fact that pesticide kills insects is well known but candidates need to be encouraged to answer questions fully. In this case an explanation was also required. The most common correct explanation made reference to the idea of increasing yield by reducing crop loss. Interpreting the data in the table in part (c) posed few problems with most choosing day 28 as the day when the crop was sprayed with pesticide for the second time, and 48 000 as the decrease in numbers after spraying on day 5. Several ideas were rewarded with regard to recognised disadvantages of using pesticides such as lack of specificity, bioaccumulation, food chain disruption, the need for reapplication and the possibility of promoting resistance. The best candidates scored 2 marks, and most were able to gain 1 mark. A surprising number of candidates believe that the pesticide would damage the crop.

Candidates are encouraged to avoid the use of bland phrases, such as, “causes harm to the environment”: the examiners are looking for specific ideas. Answers linked to cost implications were not rewarded. The use of the word “immune” rather than “resistant” should be discouraged for sound biological reasons.

Question 10

In this question some were able to recall the substances removed by the kidneys and most that red blood cells play an important role in oxygen transport. They also recalled that white blood cells, or more specifically, lymphocytes produce antibodies. Explaining why paralysis of breathing muscles is dangerous proved more discriminating. Marks were awarded for naming the muscles involved and for describing the effect that their inability to contract would have on pressure/volume changes and the uptake/removal of named gases.

Paper 2F

Question 1
This question was generally well answered.

Question 2
This question was generally well answered.

Question 3
This question was about the rusting of iron and the prevention of rusting.
In part (c) the more able candidates could give two suitable coatings, although a common error was to sate "galvanising"; while this is a method of preventing rusting, the question asked for the name of a material used – which in this case would be "zinc". Less able candidates often put bizarre answers such as "paper". Methods of preventing rusting should be well known to candidates – it may help engage less weaker candidates if activities such a survey of the school/local area was conducted to see the methods of rust prevention used.

Question 4
A common error in part (b) was to make "zinc chlorine" or "water" as products.
Part (d) directly tests a statement in the specification, hence it was surprising that so many poor answers were seen. Despite requiring substances other than acids, a number of candidates named acids while other guessed and things metals may react with – a common error being "alkali" – probably in response to seeing the word "acid".

Question 5
All that was required in part (b) was the name of an acid, many candidates failed to realise this and gave a wide variety of possible sources of H^+ ions, such as water or even sodium hydroxide.
In part (d)(iv) candidates were expected to give the formulae of the products. The mark for the formula of water was more frequently given than the mark for the formula of calcium carbonate. While at Foundation level candidates will not be required to balance equations, it would be worth their while checking that symbol equations they write are balanced, since if they do not balance without the addition of stoichiometric coefficients then they are wrong.

Question 6
Part (b) proved to be the most challenging question on this paper. Many candidates seemed to have no idea how to approach answering this question while all that was required was a statement that the different fractions had different boiling points and so they condense at different heights as they rise up the column.
Many gained the mark in (e)(ii) for the production of carbon monoxide, however, it must be pointed out that stating that carbon monoxide is "dangerous" is insufficient for the second mark – this requires either an indication that it causes death (so "poisonous" is correct) or the mechanism by which it causes death.

Question 7

A few candidates drew two correct curves on the graph; common errors included that for A levelling out slightly higher than the given curve (and that for B slightly below) and failure to label the curves. Some candidates just labelled two points on the existing line as "A" and "B". The test for oxygen was often correct, but errors included the use of a lighted spill or not including a test at all. As in 4(b), no mark can be awarded for the result of a test unless the correct test has been applied in the first place.

Question 8

This question was generally well answered.

Question 9

Only the more able candidates gained the mark in (a)(ii); some of the less able candidates showing very poor knowledge of organic chemistry and involving water in their answers (clearly being confused with either the use of the word in reference to solutions of the more everyday use of the word in reference to how wet something is).

Very few correct structures for 1,2 dibromoethane were seen. Near misses included structures that retained the double bond but had either penta-valent carbon atoms or the loss of hydrogen. Other attempts showed not only a lack of knowledge of the chemistry involved but also a total disregard for valency.

Part (c) yielded few mark for candidates, while it was not uncommon to have structures with the correct number of carbon atoms, it was common to have both tri- and penta- valent carbon atoms and to have an incorrect number of hydrogen atoms.

Question 10

In (a), the observations made during the sodium/water reaction were often correct, although flames and the dissolving of sodium were common errors. The equation often showed sodium oxide as a product, or omitted the hydrogen formed, while a substantial number of candidates tried to give a chemical equation instead of the word equation requested

Few candidates scored full marks in (b)(i). Only a minority mentioned the sharing of electrons, although rather more had the electron transfer in the wrong direction. The commonest error was to omit the statement about oxygen gaining two electrons.

In (b)(ii) some candidates attempted to write a chemical equation rather than just a formula, however, they received full credit.

Paper 3F

Questions 7 to 11 are questions in common with the Higher Tier Paper. Questions 1 to 6 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

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
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 8
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 9
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 10
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 11
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.

Paper 4H

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

Many candidates were able to correctly identify where the horse would chew its food and store its faeces. They also were able to identify where most villi are found. As such, the question proved a gentle introduction to the paper. The role of peristaltic muscular contractions in moving food along the oesophagus was recalled by the vast majority. Candidates struggled to recall that cellulose is the carbohydrate used to make plant cell walls. As such, a variety of answers were offered for part (c)(i), with starch and glucose being the most common wrong responses. The function of vitamin C is not widely known. A range of responses were accepted including its role in avoiding scurvy and ensuring skin and gums were kept healthy. Part (d)(i) was almost always answered correctly, but only the more able candidates were able to calculate that the horse would use 5 250 kJ of energy when walking fast for one hour. The incorrect answer of 10.5 was often seen.

Question 2

Oxygen being used and carbon dioxide being produced was understood by most candidates. In (a)(ii), one mark was awarded for having yeast in the middle of the food chain and one mark was awarded for drawing arrows in the correct direction. It was the latter point that caused most difficulty. Some candidates simply drew straight lines with no arrow heads which was not credited. Part (b) was well answered, though the calculation caused difficulty for some. The correct answer of 50% gained full marks. However, if this answer was not seen, markers were asked to look at the working and award one mark if 38-57, 57-38 or 19 were visible. As such, candidates are encouraged to show their working. In part (c) credit was given for appreciating that the temperature was higher and that this would affect the enzymes involved in metabolism, which would increase yeast reproduction and, therefore, increase the food available for the flies. Most candidates gained an easy mark for recognising that the temperature was higher, but only the more able candidates explained how this might be linked to obtaining more fly offspring. Knowledge of how sex chromosomes are inherited is very good, with many candidates scoring full marks. The examiners were also impressed by the neat, logical manner in which diagrams were drawn and explained. Some lost credit for not explaining that XX is female and that XY is male, and others lost credit by failing to discuss the random nature of fertilisation. The reason why equal numbers of male and female offspring were not obtained escaped most candidates who clearly struggle with the concept of random fertilisation.

Question 3
The marks were awarded for appreciating that the insects would reduce crop yield because they would reduce leaf area, which would reduce photosynthesis. Less able candidates realised that there would be less yield but were unable to explain why. The fact that pesticide kills insects is well known but candidates need to be encouraged to answer questions fully. In this case an explanation was also required. The most common correct explanation made reference to the idea of increasing yield by reducing crop loss. Interpreting the data in the table in part (c) posed few problems with most choosing day 28 as the day when the crop was sprayed with pesticide for the second time, and 48 000 as the decrease in numbers after spraying on day 5. Several ideas were rewarded with regard to recognised disadvantages of using pesticides such as lack of specificity, bioaccumulation, food chain disruption, the need for reapplication and the possibility of promoting resistance. The most able candidates scored 2 marks, and most were able to gain 1 mark. A surprising number of candidates believe that the pesticide would damage the crop. Candidates are encouraged to avoid the use of bland phrases, such as, "causes harm to the environment": the examiners are looking for specific ideas. Answers linked to cost implications were not rewarded. The use of the word "immune" rather than "resistant" should be discouraged for sound biological reasons.

Question 4
Many were able to recall the substances removed by the kidneys and that red blood cells play an important role in oxygen transport. They also recalled that white blood cells, or more specifically, lymphocytes produce antibodies. Explaining why paralysis of breathing muscles is dangerous proved more discriminating. Marks were awarded for naming the muscles involved and for describing the effect that their inability to contract would have on pressure/volume changes and the uptake/removal of named gases.

Question 5
Most were able to establish that the ratio was 15:1, and many explained that polluted water with a high BOD would contain lots of organic matter which would be used by microorganisms that would consume oxygen by respiration. Those who understood what eutrophication was were able to deduce that the BOD would increase.

Question 6
The detrimental consequences of cigarette smoking are well known. The examiners were impressed by the depth of knowledge shown by candidates. Emphysema, bronchitis and cancer were often discussed in detail and many candidates obtained full marks. A small number wrote about nicotine and addiction, and about the effects smoking has on the circulatory system. These topics were irrelevant and did not gain credit.

Question 7
This question was well answered with many candidates gaining full marks. Most difficulty seemed to relate to the placing of an arrow to represent the process of decomposition. One arrow from flowering plants, herbivores or carnivores to the atmosphere was the expectation.

Question 8

The vast majority appreciated that the palisade cells of the mesophyll would contain the most chlorophyll. Many candidates had clearly not read the question carefully and put "chloroplasts" as their answer. In part (b) credit was not given for naming colours. Answers in the range of 420 to 460 and 650 to 690 were accepted. The nm units were not expected. The vast majority realised that there would be less photosynthesis in green light and a pleasing number made reference to green light being reflected or not absorbed. Most recalled that light intensity, ambient temperature and carbon dioxide are the main factors that affect the rate of photosynthesis.

Question 9

The early part of this question was challenging. Candidates were expected to recall the structure of the human heart and compare it to the unfamiliar heart of a fish. It was therefore pleasing to note that candidates had little difficulty in appreciating that both hearts have an atrium, a ventricle, a valve and that they both have a vein bringing blood to the heart and an artery taking blood away from the heart. Structural differences between the hearts were less well answered, though many understood that there were numerical differences in the number of chambers and the number of associated blood vessels. Part (c) was difficult for candidates with most appreciating that blood only flows through the heart once, but then struggling to amplify this point. The role of adrenaline in speeding the heart rate at times of "fight, fright and flight", however couched, was recalled by most. Surprisingly, many failed to identify the endocrine gland that secretes adrenaline. Those who claimed it was the adrenaline gland did not gain credit. The table in part (d) was well answered by most. Lungs or alveoli were accepted for oxygen. The small intestine or villi were accepted for glucose. Intestine alone gained no credit. A surprising number of candidates wrongly wrote pancreas. The term cell was required to gain a mark for the destination of glucose. Kidney, nephron or renal tubule, were often seen as correct answers for urea. Answers to ADH had the greatest variety but the better candidates recalled pituitary (despite some horrible spellings) and the terms kidney, nephron, renal tubule or collecting duct.

Question 10

The enzymes involved in genetic modification are well known, though a surprising number referred to endonuclease rather than restriction endonuclease. Nevertheless, the term endonuclease alone was credited. The term transgenic is only familiar to the more able candidates, less able candidates quoting clones or merely repeating the term genetically modified. In part (b) many were able to name a human hormone, with insulin being the most popular choice. Less able candidates then stated what the hormone does, (control blood glucose levels), rather than answer the actual question which expected candidates to discuss the process. As such, answers mentioning the speed and bulk of production were credited, as were answers that appreciated that it is **human** insulin that is manufactured and that this would have fewer side effects, however this idea was couched.

Question 11

This question generated the full range of marks. The term explant is unfamiliar to most, as is the fact that these small pieces of plant are cultured in sterile nutrient agar. Most were able to suggest what the nutrient medium should contain with minerals, vitamins and hormones, (accepted despite the fact that they should really refer to growth regulators), being the most common responses. Most appreciated that the pots contain soil or compost and that light intensity, ambient temperature and carbon dioxide levels can be controlled. Other sensible conditions were accepted. The fact that clones are produced which are, by definition, genetically identical was understood by many candidates.

Question 12

Most candidates appreciated that mutations are changes to genetic material, though few mentioned that they are rare and that they can be inherited. Marks were awarded for recognising that mutations can be detrimental or beneficial, and how either of these might impact on the size of a population. Marks were also awarded for naming a particular characteristic caused by a mutation such as Down syndrome, cystic fibrosis or albinism. Finally, marks were credited for reference to the impact mutations have on the processes of natural selection, evolution or speciation. Candidates find continuous prose difficult, particularly when the task is as challenging as this one. They are encouraged to think before they leap and to create a plan before starting to write. That said, there were many excellent answers gaining full marks, which represents credit to their understanding and their teaching.

Paper 5H

Question 1

This question was about the rate of decomposition of hydrogen peroxide. Many candidates drew two correct curves on the graph; common errors included that for A levelling out slightly higher than the given curve (and that for B slightly below) and failure to label the curves. The test for oxygen was invariably correct.

Question 2

This question was about the reversible decomposition of ammonium chloride. Although most candidates correctly named the movement of particles as diffusion, a range of other terms was seen, including Brownian movement and neutralisation.

Question 3

This question was about alkenes, and was generally well attempted. Even so, there were places where many candidates lost marks:
(b)(ii) – showing both bromine atoms on the same carbon atom or retaining the double bond in the final structure
(c) – many structures with the correct numbers of carbon and hydrogen atoms showed carbon atoms with three and five bonds.

Question 4

This question was about the reactions of sodium with water and oxygen. In (a), the observations made during the sodium/water reaction were often correct, although flames and the dissolving of sodium were common errors. The equation often showed sodium oxide as a product, or omitted the hydrogen formed, while a substantial number of candidates gave a chemical equation instead of the word equation asked for. Only the most able candidates scored full marks in (b)(i). Only a minority mentioned the sharing of electrons, although rather more had the electron transfer in the wrong direction. The commonest error was to omit the statement about oxygen gaining two electrons.

Question 5

This question was about hydrocarbons obtained from crude oil. In (b), a significant number of candidates wrote about fractional distillation instead of cracking. Most answers scored two or more marks – the commonest error was to give the name of a catalyst used for other purposes (such as iron or nickel). The equation in (c)(i) was rarely correct – common errors were to start with a hydrocarbon other than methane and to show hydrogen as a product instead of water. The explanation of the dangerous nature of carbon monoxide in (c)(ii) was often correct, although some candidates failed to mention the toxic nature of the gas or used inappropriate terms to describe its effect on blood (such as "destroys the haemoglobin").

Question 6

This question was about testing for the ions in ammonium chloride. Answers were generally poor. Many candidates got off to a bad start in (a) by giving incorrect formulae for the ions – common errors included NH_3, NH_3^- and Cl_2. The equation in (b) was rarely correct, with many candidates using NH_3Cl as the starting material, and a wide range of products was seen. Full marks in (c) were rare, with a significant number of candidates choosing bromine or litmus paper as the reagent. Those who chose silver nitrate usually went on to score for the observation but not the equation.

Question 7

This question was about the halogens and hydrogen halides. Part (d) was well answered by few candidates. Although the majority had the colours of litmus correct, a substantial number chose red for both or had the colours the wrong way round. The reason for the red colour in (d)(i) was often given only in terms such as "hydrogen bromide is acidic", with no reference to its reaction with, or dissociation in, water. In (d)(ii) the reason for the blue colour was often given in terms of methylbenzene being an alkali and neutralising the hydrogen bromide.

Question 8

This question was about the isotopes and chemistry of iron. The calculation of the relative atomic mass in (b) was usually correct, with most candidates using the correct data from the table and quoting the answer to the required one decimal place. In (c), several candidates lost the mark through referring to protons as well as electrons.

Question 9

This question was about carbon dioxide, diamond and graphite (although the diagrams did not use these names). High scores were rare, and many candidates failed to make correct choices of letters in all four parts of (a). In (a)(iii), many of those who chose X (carbon dioxide) as the substance with the lowest boiling point offered explanations in terms of the breaking of covalent bonds. In (b), the high sublimation point of Z (graphite) was often explained in terms of the breaking of intermolecular forces.

Question 10

This question was about the manufacture of ammonia. In (a), there were several references to rate instead of yield. Part (b) proved difficult for many candidates, with references to collision rates and, surprisingly, statements that gas molecules moved faster as the gas liquefies. The bonding diagram in (e) was well attempted, with most candidates showing six shared electrons.

Question 11

This question was about the titration of a solution of hydrogen bromide. The calculations in (a) were often completely correct, with only less able candidates using a wrong method to calculate the amount. It was disappointing to see many candidates choosing universal indicator to check the point of neutralisation, and even those who chose methyl orange or phenolphthalein gave a colour change for the wrong indicator or the correct colours but the wrong way round.

Paper 6H

Questions 1 to 5 are questions in common with the Foundation Tier Paper.
Questions 6 to 11 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. 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 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 7
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 8
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 9
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 points accurately.

Question 10
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. Many of these candidates seemed to think that there would not be any pressure in the cylinder unless the piston was moved. Part (c)(i) was 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 11
In part (a) most completed the nuclear equation correctly and gained both marks. In part (b) many 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) some 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 small 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 several candidates appear to think that alpha particles vary in mass or in volume. Some candidates knew that, where an alpha particle hits it, the zinc sulphide screen emits a tiny flash of light.

Paper 7

General

The paper was felt to be of a similar standard to those set previously. The candidates' performance was felt to be similar to that of the previous series. The paper was marked out of 47 instead of 50. There was an erratum for this paper, but it was felt that the candidates from some centres had answered as if they had not seen the erratum notice. It was decided to discount answers from the related questions. Those were Q1bi and Q1bii. In the data for Q6, there was a minus sign missing from the last percentage change figure in the table. The plotting of this point was disregarded. It was felt that no candidates were disadvantaged by this omission.

Question 1
Part (a) was answered well with almost all candidates able to identify 'measuring cylinder' and correctly drew the line at 5 cm^3. Both parts of (b) were discounted, as it was clear that not all candidates knew about the erratum.

Question 2
Part (a) was answered well, although some candidates got 'Heat the leaf in boiling ethanol' and 'Add iodine solution' the wrong way round. In part (b) most candidates either gained 1 mark for 'no photosynthesis' or for 'the idea of 'de-starching', with some gaining both ideas. In (c) most candidates recognised that ethanol was flammable and thus was dangerous, but some missed the point of the question and talked about aspects of heating. In (d), almost all candidates gained the mark for the colour iodine would turn if starch was present.

Question 3
In part (a) most candidates gained 1 or 2 marks, but some either missed the time or where the pulse should be taken. In part (b)(i) most gained 1 mark, but not mainly gained the second mark for the increase being slower as the time of exercise progressed. In part (b)(ii) most candidates gained the mark for 4/64. In part (b)(iii) most candidates gained 2 marks, usually saying that the pulse rate would decrease to 68 or the resting value. In part (c) the majority of candidates gained the 4 marks for the table, but some missed out the value at 10 minutes.

Question 4
In part (a) most candidates had the tallies correct and also the calculation. Part (b) discriminated well, with the full range of answers given. The most common answers related to the size of the bubbles not being equal and named abiotic factors not being controlled. Some candidates, however, did not appear to understand the question.

Question 5
This question was answered well, with many candidates gaining full marks. It is clear that 'CORMS', from feedback meetings and the previous reports is being used well. A few candidates forget to give examples of fair testing.

Question 6

Most candidates gained full marks in part (a). In part (b) many candidates gained full marks for the graph (the last point was discounted), although some got the axes the wrong way round. Most candidates gained the mark in (b)(ii), reading off their graph, and also the mark in (c). Part (d) discriminated well, with some candidates thinking that sucrose moved into the cell instead of water.

Paper 8

Question 1
This question was generally answered well.

Question 2
While most candidates managed to pick up some marks in (a) for identifying variables that must be kept constant in order to make the investigation a "fair test", only the best candidates gained all three marks. Common errors included: trying to keep the temperature of the copper sulphate solution constant (despite this being the dependent variable) rather than the start temperature constant; keeping the amount of copper sulphate constant rather than specifying either "volume" or "concentration" (indeed, the amount of copper sulphate could be kept constant while both increasing its volume and decreasing its concentration).
The majority of candidates gained the marks in (d) but some thought that the metals that did not react gave unreliable results despite all the results being identical.
Most candidates gained some marks by drawing a bar chart in (e), although some careless work resulted in bars at the wrong heights. A small minority of candidates tried including bars for the metals that did not react.
The most common error in (f)(i) was the failure to use comparative language – this was essential since the question was based on comparing the reactivity of the metals (hence "zinc gave a big temperature change " did not gain the second mark while "zinc gave the biggest temperature change" did).
Only the least able candidates failed to score in (f)(iii). In (f)(iv) the idea was that the candidates should use the information at the very start of the question to realise that they needed to select a salt of a metal less reactive than copper. Since the question had given them the data to be able to conclude that both silver and gold are less reactive than copper, the expected answer was a salt of one of these two metals. However, a salt of platinum was often given (this, of course, would work and so gained full credit) but often salts of potassium or sodium were suggested.

Question 3
Most candidates gained two marks for plotting correctly the graph points, although some careless plotting was seen – it is recommended that candidates check their plotting by reading (x,y) co-ordinates for each datum point off the graph and then comparing it to the table of data. Fewer gained the mark for the drawing of a smooth curve - some omitted the line all together (the phrase "draw a graph" requires both plotting and a line drawn) while others either joined the points with rule or (very frequently) included the point they had indicated as anomalous in their line. If a point has been identified as anomalous, then it should be ignored when drawing the line.
In (a)(iii) while many candidates could identify a cause for an incorrect reading to be obtained, very few gave enough information to show that the identified problem would cause the time to be longer (slower reaction) – ("wrong concentration of acid" would not get the mark, but "acid too dilute" would).
In (b), most candidates could read values from their graph, but marks were lost in (b)(ii) by either giving only one significant figure (the graph can be read to 2 significant figure, and so the rate can be given to a similar degree of accuracy) or using the temperature rather than the time in the division. Some careless use of calculators was evident, work should be checked. (b)(iii) required the use of the values in (ii) to conclude how rate changed when temperature was increased – this should have alerted those who had figures in (ii) that indicated that the rate decreased as temperature rose, that something was amiss, this was not the case –

they either ignored their figures in (ii) or then spent a fruitless time in (iv) trying to explain how increasing the temperature results in a slower reaction. In (b)(iv) most candidates gained some credit for their explanation but many answers gave only partial explanations.
Most could appreciate, at least partially, the merit of insulating the container in (c), however, only the most able candidates could relate the reduction in heat loss to a more constant temperature. A statement of "more accurate" was not sufficient – even if the temperature is dropping significantly it can be known accurately at any given time simply by reading a thermometer.
Part (d) caused unexpected problems. Candidates had to state how they could obtain results at temperatures below room temperature. This requires the acid to be cooled down, and so what was required was a sensible method of cooling the acid (such as stand it in an ice bath or place the acid in a fridge). Common wrong answers included "do not heat the acid as much" – (any heating will raise its temperature and so this would not work); "do the experiment in a colder room" (it is normal to change the temperature of the chemicals and not the environment when studying the effect of temperature – we do not go into successively hotter room when increasing the temperature); "use more concentrated acid" – (why making the acid more concentrated should reduce its temperature remains a mystery).

Question 4
Many candidates gained full marks for completing the table in (b). However, some candidates failed to record all of the data.
Only the most able candidates gained marks in the remaining parts of this question.
In (c) the idea of the tap being open was rarely seen, one common wrong answer was to state that not enough iron was used (any amount of iron would still cause some change in water level) while it was not uncommon for candidates to enter into an explanation based on pressure and the trough of water – suggesting that the water level would never change in this experiment.
In (d) a few candidates spotted that we did not know the starting volume for the air but few could suggest a solution to the problem; some suggested entirely different experiments.

Paper 9

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 10), 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
4437	Double Award	150	Nil

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.

Science (Double Award) 4337

Four centres entered students for Double Award this year. Favourite tasks were Osmosis, Enzymes, Rates and Resistance – very much in common with home centres. One inappropriate task was displacement of metals, because students were unable to explain why one metal displaces another form solution, but fails to displace a third metal from solution.

It should be remembered that O6b requires students to clearly and correctly label the column headings of results tables, and give the correct units.

Graphs, at A6a are usually best-fit lines, which in most cases are either straight lines, or alternatively smooth curves. Dot-to-dot lines do not normally access A6a.

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				57	47	37	27	17
Higher Tier	78	68	58	48	37	31		

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

	A*	A	B	C	D	E	F	G
Foundation Tier				55	45	35	26	17
Higher Tier	78	67	56	46	35	29		

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

	A*	A	B	C	D	E	F	G
Foundation Tier				56	46	36	27	18
Higher Tier	77	67	57	47	36	30		

Option 4: with Coursework (Paper 10)

	A*	A	B	C	D	E	F	G
Foundation Tier				58	47	37	27	17
Higher Tier	81	70	59	49	38	32		

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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