Version 1.0: 150805

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science: Single and Double Award (Modular) 3468/3469

Specification A

Examiners' Report

2005 examination - June series

- Full Course

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Set and published by the Assessment and Qualifications Alliance.

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Paper 1 (3468/1F) Double Award – Foundation Tier

General

There were seventeen questions on the paper. The first nine appeared only on the Foundation Tier and were targeted at grades E, F and G. The final eight (standard demand) questions were common to Foundation and Higher Tiers. These were targeted at grades C and D.

This year the majority of candidates were able to score very respectable marks, with very few questions left un-attempted. Many candidates probably left the examination with a sense of positive achievement.

The marks for Quality of Written Communication this year appeared in questions 7 and 13. In both cases the mark was to be awarded for the correct use of scientific terms and was awarded less frequently than had been hoped.

Some examiners expressed concern about the apparent increase in illegible handwriting this year. Although it is still a very small percentage, candidates should be aware that if the examiner cannot read the script they will not be awarded any marks for that part.

Most candidates followed the rubric instructions correctly. There were, however, a few candidates who did not. For example, when asked to state **one** example or give **one** reason, they should not give a list of possible alternatives.

Question 1 (Low Demand)

(a) This was correctly answered by most candidates.

(b) This question revealed that a large percentage of candidates had misread the timescale on the diagram. They believed that the top of the diagram represented the furthest back in time, coming towards the present day as you moved down the page. This led to many of them stating that Ornitholestes had evolved from Tyrannosaurus rather than from Eoraptor.

(c) Some candidates guessed at differences that might have existed, rather than stating the differences that could be seen in the diagram.

(d) In part (i) most candidates usually answered correctly, though part (ii) again revealed those candidates who had the time scale going in the wrong direction, as they stated that the mass of the dinosaurs decreased during evolution.

(e) Most candidates were able to make some reference to the bones or hard parts of the animal.

(f) This was generally well answered.

Question 2 (Low Demand)

This was generally a high-scoring question. The main reason for failing to score full marks was confusion between sexual and asexual reproduction in part (a).

Question 3 (Low Demand)

This question scored highly for most candidates.

(a) The most common reason for not gaining a mark was to write HE instead of He as the symbol for Helium.

(d) A large number of candidates chose xenon rather than iodine. This was probably because they were looking at the figure for atomic mass rather than atomic number.

Question 4 (Low Demand)

(a) Relatively few candidates were able to name all four parts of the atom labelled but most could name some. Several candidates merely labelled them as positive or negative particles, ignoring the fact that the question asked them for *names.*

(b) Although many candidates could identify the atom as belonging to group 1, few were able to give a correct reason.

(c) Rather more candidates could identify the atom as being lithium, even if they were wrong in part (b).

Question 5 (Low Demand)

This question was generally very well answered, although many candidates believed that sun beds and mobile phones both operate with gamma rays.

Question 6 (Low Demand)

(a) Most candidates could extract at least one correct figure from the table.

(b) In part (i) the term ultrasound or ultrasonic was not known by many. Examiners saw several references to supersonic and even a few to 'panasonic'. In (ii) some candidates were confusing ultrasound with microwaves, which led them to giving answers concerning radar.

Question 7 (Low Demand)

Most candidates realised that whatever was inside the cabinet represented some kind of danger to the operator and were able to score at least one mark for the idea of harm being caused to the body. Many, however, failed to describe the particular dangers associated with radioactive materials. A significant number merely repeated the question e.g. 'it stops the material touching the skin'. The mark for Quality of Written Communication was awarded only infrequently, since candidates failed to use scientific terms such as radiation, mutation and cells.

Question 8 (Low Demand)

(a) In questions involving the description of a graph, candidates should remember to note how many marks are allocated. This question asked them to describe, *in detail*, how the mass of oxygen in one breath changed with height above sea level. Nearly all candidates obtained one mark for simply stating that the higher you climb, the smaller the amount of oxygen. Very few obtained a second or third mark for some kind of quantitative interpretation of the data. Some read the value at 5000 m (the end of the graph line), rather than at 3000 m, as asked for in the question.

(b) Many candidates obtained the correct answer, but showed no working in part (i). Showing working in a calculation has two benefits: a mistake is less likely to be made if written down rather than calculated mentally; if a mistake is made, it is often possible for the examiner to award a mark for the correct method.

In (ii) a common mistake was to confuse the roles of the red and white blood cells.

Question 9 (Standard Demand)

(a) The pie chart was completed correctly by the majority of candidates. Common mistakes were to copy the pie chart given at the start of the question, to forget to label the sectors and to make the shading of one gas indistinguishable from another.

(b) Oxygen and carbon dioxide were often reversed and nitrogen appeared in many answers.

(c) Most could identify respiration as the correct process, although 'breathing' was a common incorrect response.

Question 10 (Standard Demand)

(a) Many candidates could use the words *dominant* and *recessive* correctly to explain the results but very few could use the word *factor* correctly.

(b) This part of the question was generally answered well.

Question 11 (Standard Demand)

Both parts of this question were usually answered well, with only a few candidates becoming confused between *advantage* and *disadvantage.* However, the word *regular* was often taken to mean *frequent* and hence the fact that a woman's periods become more regular was often seen as a disadvantage.

Question 12 (Standard Demand)

(a) It was disappointing to see that relatively few candidates could correctly work out the states of bromine and iodine at room temperature, given the melting points and boiling points.

(b) Most candidates correctly identified fluorine as being the most reactive.

(c) Many candidates lost the mark for writing hydrogen *bromine* instead of hydrogen bromide.

Question 13 (Standard Demand)

(a) Several candidates in part (i) chose to write a symbolic equation rather than the word equation that was asked for. They were awarded the marks if they used the correct symbols but all too often they failed to do so. In (ii) the 'pop' test was usually well known but often a glowing splint was used instead of a lighted one.

(b) It proved difficult for the candidates to score full marks in this part of the question proved. Most could obtain one or two marks for stating the numbers of each atom but the use of technical terms such as *bonding* or *covalent* was often very poor. This resulted in relatively few candidates being awarded the mark for the Quality of Written Communication.,

Question 14 (Standard Demand)

There was an improvement in the number of candidates who could recognise wave features.

Question 15 (Standard Demand)

(a) 'Protons' was often correctly given as the first answer but few candidates gave the correct answer for isotopes.

(b) Many candidates were able to score all three marks for a completely correct answer in part (i). Of those who failed to do so, the most common mistake was to miss out the units (weeks).

Others correctly read the number 68 from the graph and successfully halved it to 34 but then did not know what to do next.

Part (ii) was rarely answered correctly, with most candidates clearly making a guess at the answer.

Question 16 (Standard Demand)

(a) In part (i), most candidates earned a mark for correctly identifying the figure of 88.1. However, a significant number failed to do so because they rounded off the figure to 88, which could apply to three different age ranges.

Part (ii) was generally well-answered but (iii) was not. This was another graph question that asked for a *detailed* description. Thus, whilst most candidates obtained one mark for stating that the life expectancy of male smokers was reduced, very few candidates obtained any more marks, as there was no further detail or mathematical analysis given. Several candidates misinterpreted the question, with their answers comparing male smokers with female smokers.

(b) It was very common to see an assertion that 'this data proves that smoking causes lung cancer'. This was probably because many candidates were misinterpreting the pie chart. Relatively few realised that the data was about people who actually got lung cancer.

Question 17 (Standard Demand)

The majority of candidates gained full marks for this question.

Paper 2 (3468/2F) Double Award – Foundation Tier

General

There were eighteen questions on this paper. The first ten, a total of fifty marks, were targeted at grades E, F and G. The last eight questions were targeted at grades C and D and were common to both Foundation and Higher Tiers,

All candidates appeared to have had sufficient time to complete their paper. The majority attempted most parts of the paper. Candidates gained marks when their answers were clear and precise. Vague and unspecific responses were often seen for questions requiring explanations or descriptions. Such responses sometimes repeated information already given in the question or contradicted part of what was a correct answer. It should be noted that when candidates gave several answers when only one or two were required, they risked not being credited for their correct ideas if errors or contradictions were included in their response.

Although most candidates had knowledge of basic scientific ideas, they seemed to have difficulty with the understanding of some scientific words and terminology. These included exothermic, relative formula mass, acceleration, velocity, geostationary, hydrocarbon, cracking, greenhouse effect, acid rain, proportion, process and organism. Some very common biological processes, such as photosynthesis and respiration, as well as chemical reactions and quantitative relationships, were not well known. It should be noted that candidates were asked to show their working so that if they gave an incorrect answer, they could still gain credit for the correct use of the figures. Experimental procedures were not understood as well as might have been expected. The use of the words 'it', 'them' and they' meant that many candidates lost marks when their response was ambiguous.

Fundamental concepts, including straightforward factual recall, the understanding of key ideas and the application of these were tested throughout the paper. This meant that candidates needed to be reminded that it was essential to read the questions carefully, analyse the information and think about what is required before writing their response.

Question 1 (Low Demand)

(a) This part of the question was well answered.

(b) Most candidates indicated correctly that the wax prevented water from being lost from the plant. There were a significant number of incorrect answers such as 'the wax is weatherproof and keeps the water out' and 'the wax stops animals eating the plant'.

Question 2 (Low Demand)

This question was generally well attempted, although many candidates confined their responses to a restatement of the stem of the question and did not add to it. These candidates did not identify the processes involved, such as building, growing and dumping.

Question 3 (Low Demand)

(a) The majority of candidates were able to respond appropriately although 'oxygen' and 'soil' were frequently offered by candidates.

(b) Many thought that fertilisers kill weeds.

Question 4 (Low Demand)

The diagram was helpful to candidates, who generally were able to understand how using coal in power stations can damage the environment. Most candidates did not identify the cause as the burning of coal. There was quite a lot of confusion between the named gas and its specific effect, that is, sulphur dioxide causes acid rain and additional carbon dioxide increases the greenhouse effect. Many incorrect references to damage of the ozone layer were seen.

Question 5 (Low Demand)

(a) This was well answered by most candidates.

(b) The first part often evoked the response 'light' rather than 'heat' or 'energy'.

(c) Some candidates were unsure about the difference between 'oxygen' and 'oxide'.

Question 6 (Low Demand)

(a) Most candidates could not select carefully and then fit the correct words into the appropriate spaces. 'Limewater' was frequently correct but the gas turning it milky was often 'oxygen', or surprisingly, 'copper sulphate'.

(b) The idea of a reversible reaction was well known and although many candidates chose to express this in their own way they still gained credit.

(c) It was difficult to understand why so many candidates could correctly give the numbers of each atom in NH_4C1 but were then unable to calculate its relative formula mass.

Question 7 (Low Demand)

(a) Very few candidates expressed the idea of balanced forces, although the majority were able to state that the bus would move. Some went on to correctly indicate the direction in which the bus would move, or that it would speed up. The idea of unbalanced forces was rarely mentioned, with many candidates making imprecise statements about changes in the force of friction. The formula was usually correct, with 'time taken' or 'speed' being the most popular incorrect terms. Factors affecting stopping distances were well understood.

(b) Several candidates in (ii), did not appreciate that the friction is between the car's tyres and the road.

Question 8 (Low Demand)

(a) If the idea of geostationary was understood, then these candidates realised that the satellites would orbit the 'equator' at the same rate that the Earth 'spins'. A minority of candidates appreciated that these geostationary satellites are for 'sending messages'. Most thought, incorrectly, that they were for 'scanning the Earth'; because of this very few candidates knew there would be signal interference.

(b) Most candidates considered the main problem would be that the satellites would 'crash into each other due to lack of space'.

Question 9 (Low Demand)

(a) The more able candidates correctly identified a hydrocarbon as being made up of carbon atoms and hydrogen atoms.

(b) Most candidates did not use the term 'fractional distillation'. Many did gain credit for stating that the crude oil was heated but several of these candidates were confused between the terms 'cracking' and 'fractional distillation'.

(c) There were very few candidates who understood that cracking produces alkenes.

Question 10 (Low Demand)

(a) Generally well answered.

(b) Generally well answered.

(c) Few candidates realised that the hydroelectric power stations can be started up quickly.

(d) The more able candidates answered both questions correctly.

Question 11 (Standard Demand)

(a) The majority of candidates were able to respond positively to the challenge that the question offered them and were able to construct and label the biomass pyramid appropriately. However, there were some candidates who either did not centre their pyramids or did not label each section.

(b) Many candidates found it difficult to determine the proportion of energy and several included a unit.

Question 12 (Standard Demand)

(a) A surprisingly large number of candidates were confused about the processes of photosynthesis and respiration, which are essential to appreciate the carbon cycle. Decomposers, fungi, microorganisms and microbes were identified by the majority of candidates as the group of organisms Z that bring about decay.

(b) This part was poorly answered by many candidates because they did not link their arguments to 'the environmental effect of carbon dioxide emissions'. Many responses involved the quality of the fruits and vegetables and the energy wasted in heating and lighting the greenhouses. Few candidates 'carbon dioxide is a greenhouse gas or that it contributes to global warming.

Question 13 (Standard Demand)

(a) The named fertiliser was often correct, although there were many incorrect names including 'ammonia nitrate', 'nitrate fertiliser' and nitric fertiliser.

(b) This part of the question was frequently incorrect because candidates thought that the temperature of the process had some part to play in different catalysts being used.

(c) Many did know that catalysts are not used up or can be reused, although there was a significant number of candidates who stated that the catalyst 'reacted away'.

(d) Candidates were aware that a catalyst speeds up the chemical reaction but only a minority of these identified the economic benefits of this.

(e) An increase of pressure on the reaction was not well understood and far too many candidates discussed this in terms of temperature increase and the associated gain of energy.

Question 14 (Standard Demand)

Most candidates' responses gained the 'use less fertiliser mark' but there was a lack of appreciation that nitrate fertilisers do not simply dissolve and run off the land but are absorbed into the ground and can still end up in drinking water supplies. The other main incorrect idea was that filtration will remove nitrate ions.

Question 15 (Standard Demand)

Most candidates attempted this question but many did seem to have a problem with the comprehension task and the production of logical reasons. Several candidates did not realise that the idea required them to consider the evidence that there had been life on Mars and not whether life would evolve on Mars. Very few candidates were able to explain the significance of the soil experiment.

Question 16 (Standard Demand)

(a) The most able candidates correctly described the motion as 'acceleration' and 'steady speed'. Too many offered 'acceleration at a steady speed' and 'stationary'.

(b) In the calculation, too many candidates correctly identified the change of velocity but then multiplied this by time. Again, the better candidates calculated the correct answer 10 but few of these gave the correct unit m/s^2.

Question 17 (Standard Demand)

(a) The component Y was too often named as a 'resistor' rather than a 'variable resistor'.

(b) The voltmeter was usually identified correctly.

(c) Most candidates who attempted the graph were able to plot the points correctly, although many did not join the points.

(d) Only a small number of candidates were able to name component X as a 'diode or rectifier'.

Question 18 (Standard Demand)

Those candidates attempting a detailed response were usually awarded a mark for moving the magnet to the coil. However, the majority did not understand that this movement of the magnet 'produced' the voltage / current. There were very few who appreciated that there was an 'induced current'. Many candidates described the voltage plot on the screen without linking it clearly or showing any understanding of its relationship to the movement of the magnet.

Paper 1 (3468/1H) Double Award – Higher Tier

General

There were seventeen questions on the paper. The first eight questions were common to both Foundation and Higher Tiers. These were targeted at grades C and D. The final eight questions were targeted at grades B to A*.

This year the majority of candidates were able to score very respectable marks, with very few questions left un-attempted. Most candidates probably left the examination with a sense of positive achievement.

The marks for Quality of Written Communication this year appeared in questions 4 and 13. In both cases the mark was to be awarded for the correct use of scientific terms and in both cases the mark was awarded less frequently than had been hoped.

Some examiners expressed concern about the apparent increase in illegible handwriting this year. Although it is still a very small percentage, candidates should be aware that if the examiner cannot read the script they will not be awarded any marks for that part.

Most candidates followed the rubric instructions correctly. There were, however, a few who did not. For instance, when asked to state **one** example, or give **one** reason, they should not give a list of possible alternatives.

Question 1 (Low Demand)

(a) Many candidates could use the words *dominant* and *recessive* correctly to explain the results but very few could use the word *factor* correctly. A significant number thought dominance changed with generations, meant more common, and could be relative.

(b) This part of the question was generally well answered.

Question 2 (Low Demand)

This was generally well answered, though it was usually possible to recognise the gender of the writer! Many girls, as well as boys, seemed to interpret 'regular' as 'more frequent' which is why it was put as a disadvantage.

Question 3 (Low Demand)

(a) It was disappointing to see that relatively few candidates could correctly work out the states of bromine and iodine at room temperature, given the melting points and boiling points. Many refused to believe the data and gave liquid for iodine, clearly never having seen it.

(b) Most candidates correctly identified fluorine as being the most reactive.

(c) Many candidates lost the mark for writing hydrogen *bromine* instead of hydrogen bromide.

Question 4 (Standard Demand)

(a) A significant minority insisted on writing symbol equations and lost the mark for H (instead of H_2) in (i). In part (ii) a surprising number did not know the test for hydrogen or confused it with oxygen, perhaps indicating lack of practical experience.

(b) It proved difficult for candidates to score full marks in this part. Most could obtain one or two marks for stating the numbers of each atom but the use of technical terms such as *bonding* or *covalent* was often very poor. This resulted in relatively few candidates being awarded the mark for the Quality of Written Communication.

Question 5 (Standard Demand)

The majority of candidates identified the wave features.

Question 6 (Standard Demand)

(a) 'Protons' was often correctly given as the first answer but few candidates gave the correct answer for isotopes.

(b) Part (i) was generally answered but a significant number of candidates failed to score all 3 marks for a completely correct answer. Of those who failed to do so, the most common mistake was to miss out the units (weeks). Others correctly read the number 68 from the graph and successfully halved it to 34 but then did not know what to do next.

Part (ii) was rarely answered correctly, with most candidates clearly making a guess at the answer.

Question 7 (Standard Demand)

(a) In part (i) most candidates earned a mark for correctly identifying the figure of 88.1. However, a significant number failed to do so because they rounded off the figure to 88, which could apply to three different age ranges.

Part (ii) was generally well-answered but part (iii) was not. This was another graph question that asked for a *detailed* description. Thus, whilst most candidates obtained one mark for stating that the life expectancy of male smokers was reduced, very few obtained any more marks, as there was no further detail or mathematical analysis given. Several candidates misinterpreted the question and their answers compared male smokers with female smokers.

(b) It was very common to see an assertion that 'this data proves that smoking causes lung cancer'. This was probably because many candidates were misinterpreting the pie chart. Relatively few realised that the data was about people who actually got lung cancer.

Question 8 (Standard Demand)

The majority of candidates gained full marks for this question.

Question 9 (High Demand)

(a) Part (i) was generally well done. Weaker candidates confused mitosis with meiosis or gave hybrid spellings in the hope of finding a generous examiner.

(b) Most candidates gained full marks but several decided Dolly was a clone of sheep X on the grounds of appearance alone.

(c) In part (i) it was pleasing to note that better candidates now know the three hormones given in the specification. In (ii) only the better candidates appreciated the negative feedback effect of oestrogen on FSH production.

Question 10 (High Demand)

A significant number of candidates gave what would otherwise have been correct answers in the wrong section.

(a) Many argued that the observations both supported and rejected the explanation. Most candidates were able to score at least one mark.

(b) Most candidates scored a mark for competitive advantage but only a small number followed this up with reference to genes being passed on to the next generation. Very few candidates mentioned mutation as a source of variation.

Question 11 (High Demand)

(a) This was very poorly answered. The vast majority of candidates ignored the word 'explain' and merely described the trend shown in the table, rather than giving an explanation in terms of the distances of outer electrons from the nucleus.

(b) Part (i) was usually correctly answered but (ii) was rarely answered successfully. Most either answered that 'hydrogen fluoride is a gas because it has a low boiling point', or that 'hydrogen and fluorine are both gases so hydrogen fluoride will be also'. Candidates who could offer an explanation frequently lost marks by referring to 'weak intramolecular forces'.

(c) This was often not attempted; only the best candidates can balance an ionic half equation.

Question 12 (High Demand)

(a) This part was well answered.

(b) Part (i) was also well answered but in (ii) few candidates answered in terms of neutrons. Most candidates described an increase in electron number in (iii) but relatively few stated that the number increased by one with each element.

Question 13 (High Demand)

(a) Most candidates recognised the two signals in part (i) but in (ii) many gave 'faster' and 'cheaper' as advantages.

(b) Part (i) was very poorly answered by the majority of candidates. Many had the idea that different speeds of ultrasound are used to identify different tissues. Few explained that partial reflection, caused at a boundary between tissues of different densities, enabled time to be measured. The Quality of Written Communication mark was rarely awarded, candidates failing to use the terms described above. In (ii) the majority of candidates were able to do the calculation. The strategy of a 'triangle' was often used, though less than previously but not always interpreted correctly.

Question 14 (High Demand)

(a) Many candidates were unable to give an acceptable explanation for their choice of radionuclide though this was often correct. Weaker candidates often merely stated that the half-life was long / short without stating why this was an advantage. In (i) many candidates missed the idea of p*artial* absorption of beta rays. In part (ii) many missed the idea that gamma rays escape easily, without damaging the body.

(b) This was poorly done, with only the better candidates realising that a neutron loses an electron to become a proton.

Question 15 (High Demand)

Many candidates scored all four marks; of those who did not, a number missed the significance of *alkali* metals and referred to metals in general as being dense and high-melting.

Question 16 (High Demand)

Many candidates lost marks because of an inability to express their ideas concisely and accurately. A good number thought that sweating increased skin temperature or that blood vessels rise up through the skin. A very common idea is that friction in muscles generates the heat. A casual use of English is also apparent in the view that 'heat up', 'get hot' and 'temperature rise' are interchangeable. Few candidates scored full marks, as most talked in generalities.

Question 17 (High Demand)

Very few candidates scored full marks. Most did not even consider respiration at any point.

(a) Many 'hedged their bets' by saying 'less light at night' or 'less photosynthesis'. Many did not mention light at all. Few candidates really knew that respiration occurs 24 hours per day in plants. Whilst the majority realised that photosynthesis was not taking place, they did not notice that the CO_2 concentration was increasing. If they did, it was ascribed to humans / animals breathing.

In part (ii) few stated that the rate of photosynthesis exceeded the rate of respiration. A surprising number could not tell daytime from night. At this level 'sun' is not an acceptable alternative to light.

Paper 2 (3468/2H) Double Award – Higher Tier

General

There were sixteen questions on this paper. The first eight, a total of forty marks, were targeted at grades C and D and were common to both Foundation and Higher Tiers. The last eight questions were targeted at grades B and A.

A number of candidates were inappropriately entered for this paper. Centres must understand that approximately 55% of the marks are targeted at grades B to A* and that borderline grade C candidates would therefore find the majority of questions well beyond their capabilities.

All candidates appeared to have had sufficient time to complete their paper. The majority attempted most parts of the paper. Candidates gained marks when their answers were clear and precise. Vague and unspecific responses were often seen for questions requiring explanations or descriptions. Such responses sometimes repeated information already given in the question or contradicted part of what was a correct answer. It should be noted that when candidates gave several answers when only one or two were required, they risked not being credited for their correct ideas if errors or contradictions were included in their response.

Although most candidates had knowledge of basic scientific ideas, they seemed to have difficulty with the understanding of some scientific words and terminology. These included acceleration, velocity, proportion, organism and continuous process. Some very common biological processes, such as photosynthesis and respiration, as well as chemical reactions and quantitative relationships were not always well known. It should be noted that candidates were asked to show their working, so that if they gave an incorrect answer, they could still gain credit for the correct use of the figures. Experimental procedures were not understood as well as might have been expected. The use of the words 'it', 'them' and 'they' meant that many candidates lost marks when their response was ambiguous.

Fundamental concepts, including straightforward factual recall, the understanding of key ideas and the application of these, were tested throughout the paper. This meant that candidates needed to be reminded that it is essential to read the questions carefully, analyse the information and think about what is required before writing their response.

Question 1 (Standard Demand)

(a) The majority of candidates were able to construct and label the biomass pyramid appropriately. However, there were some candidates who either did not centre their pyramids or did not label each section.

(b) The proportion of 1:12 was usually correctly calculated by the more able candidates. Far too many included a unit.

Question 2 (Standard Demand)

(a) A large number of candidates knew about the processes of photosynthesis and respiration, which are essential to the carbon cycle. Decomposers, fungi, microorganisms, and microbes were identified by the majority of candidates as the group of organisms Z that brings about decay.

(b) This was poorly answered by some candidates because they did not link their arguments to 'the environmental effect of carbon dioxide emissions'. Many responses involved the quality of the fruits and vegetables and the energy wasted in heating and lighting the greenhouses. Few candidates argued that carbon dioxide is a greenhouse gas or that it contributes to global warming.

Question 3 (Standard Demand)

(a) The named fertiliser was often correct, although the common error was 'ammonia nitrate'.

(b) This part of the question was frequently incorrect because candidates thought that the temperature of the processes had some part to play in different catalysts being used.

(c) Many candidates knew that catalysts are not used up or can be reused, although a few stated that the catalyst reacted away.

(d) Candidates were aware that a catalyst speeds up the chemical reaction but not all could identify the economic benefits of this.

(e) An increase of pressure on the reaction was not well understood and far too many candidates discussed this in terms of temperature increase and the associated gain of energy.

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Most candidates' responses gained the 'use less fertiliser mark', but there was a lack of appreciation that nitrate fertilisers do not simply dissolve and run off the land but are absorbed into the ground and can still end up in drinking water supplies. The other main incorrect idea was that filtration will remove nitrate ions.

Question 5 (Standard Demand)

Candidates did seem to have a problem with the comprehension task and the production of logical reasons. Several candidates did not realise that the idea required them to consider the evidence that there had been life on Mars and not whether life would evolve on Mars. Very few were able to explain the significance of the soil experiment.

Question 6 (Standard Demand)

(a) The most able candidates correctly described the motion as 'acceleration' and 'steady speed'. Too many offered 'acceleration at a steady speed' and 'stationary'.

(b) In the calculation, several candidates correctly identified the change of velocity but then multiplied this by the time. Again, the better candidates calculated the correct answer 10 but few of these gave the correct unit m/s^2.

Question 7 (Standard Demand)

(a) The component Y was sometimes named as a 'resistor' rather than a 'variable resistor'.

(b) The voltmeter was usually identified correctly.

(c) Most candidates who attempted the graph were able to plot the points correctly, although some did join the points.

(d) Only the better candidates were able to name component X as a 'diode or rectifier'.

Question 8 (Standard Demand)

Those candidates attempting a detailed response were usually awarded marks for moving the magnet to and away from the coil. However, many candidates did not understand that this movement of the magnet 'produced' the voltage / current. There were very few who appreciated that there was an 'induced current'. Many candidates described the voltage plot on the screen without linking it clearly or showing any understanding of its relationship to the movement of the magnet.

Question 9 (High Demand)

(a) Few candidates were able to identify putrefying and nitrifying bacteria but far more candidates were able to identify correctly ammonia / ammonium compounds.

(b) Many candidates knew the 'eutrophication story'. However, there were others who tried to relate this to 'blue baby syndrome' (question 4), others who considered the fertiliser as a toxin and described the build up of toxins in food chains and many who discussed the idea of illness and various health problems for human consumers. Water plants using up the dissolved oxygen was still a common misconception.

Question 10 (High Demand)

Most candidates correctly calculated the energy 'lost' and then went on to gain most of the marks for part (b). It was usually only those candidates who did not refer to 'energy' who did not gain more than two marks.

Question 11 (High Demand)

(a) Many candidates knew that high temperatures can denature / damage / destroy the enzyme, but few candidates appreciated that enzymes are proteins.

(b) Again, there were too many incorrect references to enzymes being 'killed'. Very few candidates displayed an understanding of 'continuous', descriptions tending to refer to just using larger quantities. A considerable number of candidates thought that the waste products would still contain unused starch and wanted to continually recycle the waste back into the reaction. There were very few references to immobilising the enzyme.

Question 12 (High Demand)

(a) Activation energy was generally known to be the energy needed to start the reaction or to break the bonds of the reactants. There was doubt in some candidates' minds as to whether this was an exothermic or an endothermic reaction. Many candidates were able to answer in terms of energy released but few developed their responses in terms of net energy change or transfer.

(b) The first part of (b) was surprisingly poorly answered. Full marks in the second part were often gained, not by the candidate understanding the calculation but by candidates working out that the relative mass of 2HC1 is 73.

Question 13 (High Demand)

Many candidates were able to complete the calculation but several lost a mark through the incorrect choice of unit. Those numerical answers which were incorrect either did not know the formula or could not transpose the $\frac{1}{2}$ in the formula.

Question 14 (High Demand)

Apart from (a)(i) there were mostly poor responses to all parts of this question. The sequence of the life cycle of a star was given to candidates in diagrammatic form and many candidates were still unable to describe the sequence in the correct order.

Question 15 (High Demand)

The combustion of fossil fuels to produce carbon dioxide was reasonably well understood. Only the best candidates could describe the formation of insoluble carbonates or the formation of soluble hydrogen carbonates.

Question 16 (High Demand)

(a) There were some good answers with reliability, lack of noise pollution and the generation of more electricity being the most common correct responses.

(b) Answers relating to nuclear power often missed the point that no greenhouse gases are produced and were vague about the danger posed by using radioactive materials. There was confusion about the function of solar cells and solar panels. This caused candidates to propose that hot, sunny places were the most likely areas where solar energy would be used to generate electricity.

Paper 1 (3469F) Single Award – Foundation Tier

General

There were seventeen questions on the paper. The first nine questions appeared only on the Foundation Tier and were targeted at grades E, F and G. The final eight (termed Standard Demand) were common to Foundation and Higher Tiers. These were targeted at grades C and D.

This year the majority of candidates were able to score very respectable marks, with very few questions left un-attempted. Most candidates probably left the examination with a sense of positive achievement.

The marks for Quality of Written Communication this year appeared in questions 7 and 13. In both cases the mark was to be awarded for the correct use of scientific terms and in both cases the mark was awarded less frequently than had been hoped.

Some examiners expressed concern about the apparent increase in illegible handwriting this year. Although it is still a very small percentage, candidates should be aware that if the examiner cannot read the script they will not be awarded any marks for that part.

Most candidates followed the rubric instructions correctly. There were, however, a few who did not. For example, when asked to state **one** example, or give **one** reason, they should not give a list of possible alternatives.

Question 1 (Low Demand)

(a) Answered correctly by most candidates.

(b) Answers revealed that a large percentage of candidates had misread the timescale on the diagram. They believed that the top of the diagram represented the furthest back in time, coming towards the present day as you moved down the page. This led to many of them stating that Ornitholestes had evolved from Tyrannosaurus rather than from Eoraptor.

(c) Some candidates guessed at differences that might have existed, rather than stating the differences that could be seen in the diagram.

(d) Part (i) was usually answered correctly with (ii) again revealing those candidates who had the timescale going in the wrong direction, as they stated that the mass of the dinosaurs decreased during evolution.

(e) Most were able to make some reference to the bones or hard parts of the animal.

(f) This part was generally well answered.

Question 2 (Low Demand)

This was generally a high-scoring question. The main reason for failing to score full marks was confusion between carbon dioxide and sulphur dioxide in part (a).

Question 3 (Low Demand)

Most candidates scored highly in this question.

(a) The most common reason for not gaining a mark was to write HE instead of He as the symbol for Helium.

(d) A large number of candidates chose xenon rather than iodine. This was probably because they were looking at the figure for atomic mass rather than atomic number.

Question 4 (Low Demand)

(a) Relatively few candidates were able to name all four parts of the atom labelled but most could name some. Several candidates merely labelled them as positive or negative particles, ignoring the fact that the question asked them for *names.*

(b) Although many candidates could identify the atom as belonging to group 1, few were able to give a correct explanation as to the reason.

(c) Rather more candidates could identify the atom as being lithium, even if they were wrong in part (b).

Question 5 (Low Demand)

This question was generally very well answered, although many candidates believed that sun beds and mobile phones both operate with gamma rays.

Question 6 (Low Demand)

(a) Most candidates gave the correct answer.

(b) Many opted for Mars as one of the planets.

(c) This part of the question was generally well answered.

(d) A surprisingly high number of candidates repeated the question or answered in terms of diameter.

Question 7 (Low Demand)

Most candidates realised that whatever was inside the cabinet represented some kind of danger to the operator and were able to score at least one mark for the idea of harm being caused to the body. Many, however, failed to describe the particular dangers associated with radioactive materials, with a significant number merely repeating the question e.g. 'it stops the material touching the skin'. The mark for Quality of Written Communication was awarded only infrequently, since candidates failed to use scientific terms such as radiation, mutation and cells.

Question 8 (Low Demand)

(a) In questions involving the description of a graph, candidates should remember to note how many marks are allocated. This question asked them to describe, *in detail*, how the mass of oxygen in one breath changed with height above sea level. Nearly all candidates obtained one

mark for simply stating that the higher you climb, the smaller the amount of oxygen. Very few obtained a second or third mark for some kind of quantitative interpretation of the data. Some read the value for 5000 m (the end of the graph line) rather than for 3000 m as asked for in the question.

(b) Many candidates obtained the correct answer in part (i) but showed no working. Showing working in a calculation has two benefits: a mistake is less likely to be made if written down rather than calculated mentally; if a mistake is made, it is often possible for the examiner to award a mark for the correct method. In (ii) a common mistake was to confuse the roles of the red and white blood cells.

Question 9 (Low Demand)

(a) Relatively few candidates completed the pie chart correctly. Common mistakes were to forget to label the sectors and to make the shading of one component indistinguishable from another.

(b) Part (i) was quite well answered. Few candidates understood relative boiling points, so bitumen was the most common answer in (ii). Only a minority understood the meaning of the term volatile.

Question 10 (Standard Demand)

(a) Many candidates could use the words *dominant* and *recessive* correctly to explain the results but very few could use the word *factor* correctly.

(b) This part was generally well answered.

Question 11 (Standard Demand)

(a) Credit was not given in (1) for the most common answer 'to keep warm'. Candidates were asked for explanation, so they needed to refer to insulation or reducing heat loss. Most candidates gave correct answers to part (2).

(b) In 1i) many candidates thought that the ears would shade the animal. Part (2) was generally well answered.

Question 12 (Standard Demand)

(a) It was disappointing to see that relatively few candidates could correctly work out the states of bromine and iodine at room temperature, given the melting points and boiling points.

(b) Most candidates correctly identified fluorine as being the most reactive.

(c) Many lost the mark for writing hydrogen *bromine* instead of hydrogen bromide. Significant numbers gave hydrogen chloride

Question 13 Standard Demand)

(a) This was well answered.

(b) Candidates frequently identified the correct tablet in (i) but were unable to give an explanation in terms of the amount of product formed. Similarly in (ii), explanations seldom referred to the shape of the graph. In part (iii) it was rare to see an explanation in terms of the substrate being used up. In (iv) few candidates knew the test for carbon dioxide.

Question 14 (Standard Demand)

There was an improvement in the numbers of candidates who could recognise wave features.

Question 15 (Standard Demand)

Although many candidates managed to score one or two of the marks, many were content with generalities such as 'take photographs' or 'samples'. Consequently the mark for Quality of Written Communication was rarely awarded.

Question 16 *(Standard Demand)*

(a) This part was generally well done but weaker candidates gave 'insulation' or 'double glazing' indiscriminately.

(b) This was less well answered, with most being in terms of 'using less energy' or 'lasting longer'.

Question 17 (Standard Demand)

(a) In part (i), most candidates earned a mark for correctly identifying the figure of 88.1. However, a significant number failed to do so because they rounded off the figure to 88, which could apply to three different age ranges. Part (ii) was generally well-answered but part (iii) was not. This was another graph question that asked for a *detailed* description. Thus, whilst most candidates could obtain one mark for stating that the life expectancy of male smokers was reduced, very few obtained any more marks as there was no further detail or mathematical analysis given. Several candidates misinterpreted the question, with their answers comparing male smokers with female smokers.

(b) It was very common to see an assertion that 'this data proves that smoking causes lung cancer'. This was probably because many candidates were misinterpreting the pie chart. Relatively few realised that the data was about people who actually got lung cancer.

Paper 1 (3469H) Single Award – Higher Tier

General

There were seventeen questions on the paper. The first eight were common to both Foundation and Higher Tiers. These were targeted at grades C and D. The final eight questions were targeted at grades B to A*.

This year the majority of candidates were able to score very respectable marks, with very few questions left un-attempted. Many candidates probably left the examination with a sense of positive achievement.

The marks for Quality of Written Communication this year appeared in questions 4 and 13. In both cases, the mark was to be awarded for the correct use of scientific terms and in both cases the mark was awarded less frequently than had been hoped.

Some examiners expressed concern about the apparent increase in illegible handwriting this year. Although it is still a very small percentage, candidates should be aware that if the examiner cannot read the script they will not be awarded any marks for that part.

Most candidates followed the rubric instructions correctly. There were, however, a few who did not. For example, when asked to state **one** example, or give **one** reason, they should not give a list of possible alternatives.

Question 1 (Standard Demand)

(a) Many candidates could use the words *dominant* and *recessive* correctly to explain the results but very few could use the word *factor* correctly. A significant number thought dominance changed with generations, meant more common and could be relative.

(b) This was generally well answered.

Question 2 (Standard Demand)

(a) In part (1) the more able candidates answered in terms of insulation but weaker candidates tended to answer in terms of 'keeping warm'. Most candidates gave correct answers to part (2).

(b) In (1) the more able candidates answered in terms of heat loss but weaker candidates gave explanations involving shading the animal. Part (2) was generally very well answered.

Question 3 (Standard Demand)

(a) It was disappointing to see that relatively few candidates could correctly work out the states of bromine and iodine at room temperature, given the melting points and boiling points. Many refused to believe the data and gave liquid for iodine, clearly never having seen it.

(b) Most candidates correctly identified fluorine as being the most reactive.

(c) Many lost the mark for writing hydrogen bromine instead of hydrogen bromide.

Question 4 (Standard Demand)

(a) This part was well answered.

(b) In part (i) most candidates realised that it was tablet Y and a large number went on to score by stating that more gas was produced. Many failed to score for stating that the reaction went on for longer. In part (ii) most realised that it was tablet X. Only the stronger candidates then scored by stating that the curve was steeper, or by making a comparison between the volumes of gas produced after a certain length of time. In part (iii) many scored by realising that the reaction had stopped, or that all of the calcium carbonate had been used up. Weaker candidates stated that the acid had been neutralised or that the volume stayed the same and failed to score. In part (iv) a very large number stated that it would put out a burning splint or give a squeaky pop.

Question 5 (Standard Demand)

(a) 'Protons' was often correctly given as the first answer but few candidates gave the correct answer for isotopes.

(b) Part (i) was generally answered well but a significant number of candidates failed to score all 3 marks for a completely correct answer. Of those who failed to do so, the most common mistake was to miss out the units (weeks). Others correctly read the number 68 from the graph and successfully halved it to 34 but then did not know what to do next.

Part (ii) was rarely answered correctly, with most candidates clearly making a guess at the answer.

Question 6 (Standard Demand)

There were many good answers and most were able to score at least two marks. Weaker candidates answered in terms of the robot looking for life, or looking to see if there had been life, or testing air. Stronger candidates scored more highly by going further and stating that it would look for bacteria or

their fossils and test the amount of oxygen in the atmosphere. Only the stronger candidates gained the Quality of Written Communication mark, which was given for the correct use of scientific terms such as those described above.

Question 7 (Standard Demand)

(a) Most candidates were able to state that insulation would be used for 1, 2 and 4 and that double glazing or curtains would save energy loss from 5. Many were able to state that draught excluders would be used around the door but a large number gave answers in terms of using thick mats, using sealant in the gaps around the door, or just keeping it closed.

(b) Many were able to score by answering in terms of wasting less energy or transferring more useful energy. A large number confused efficiency with saving electricity.

Question 8 (Standard Demand)

(a) In part (i) most candidates earned a mark for correctly identifying the figure of 88.1. However, a significant number failed to do so because they rounded off the figure to 88, which could apply to three different age ranges.

Part (ii) was generally well answered but (iii) was not. This was another graph question that asked for a detailed description. Thus, whilst most candidates could obtain one mark for stating that the life expectancy of male smokers was reduced, very few obtained any further marks as there was no more detail or mathematical analysis given. Several candidates misinterpreted the question with their answers comparing male smokers with female smokers.

(b) It was very common to see an assertion that 'this data proves that smoking causes lung cancer'. This was probably because many candidates were misinterpreting the pie chart. Relatively few realised that the data was about people who actually got lung cancer.

Question 8 (Standard Demand)

The majority of candidates gained full marks for this question.

Question 9 (High Demand)

(a) Part (i) was generally well done. Weaker candidates confused mitosis with meiosis or gave hybrid spellings in the hope of finding a generous examiner.

(b) Most candidates gained full marks but several decided Dolly was a clone of sheep X on the grounds of appearance alone.

(c) It was pleasing to note that better candidates in part (i), now know the three hormones given in the specification. In (ii) only the better candidates appreciated the negative feedback effect of oestrogen on FSH production.

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Question 10 (High Demand)

A significant number of candidates put what would otherwise have been correct answers in the wrong section.

(a) Many tried arguing that the observations both supported and rejected the explanation, with most candidates able to score at least one mark.

(b) Most candidates scored a mark for competitive advantage but few followed this up with reference to genes being passed on to the next generation. Very few candidates mentioned mutation as a source of variation.

Question 11 (High Demand)

(a) There were many good answers in (i). In part (ii) very few candidates gave explanations as required. Most merely described the trend in the table or answered in terms of reactivity. Few described the shielding effect of electron shells on the nucleus and the resultant effect of this on the ease of attracting electrons.

(b) Many were able to answer in terms of Group 0 elements having a full outer shell but only stronger candidates went on to explain that this meant that losing, gaining or sharing electrons would not take place.

Question 12 (High Demand)

(a) This part was well answered.

(b) This was also well answered in (i) but in part (ii), few candidates answered in terms of neutrons. Whilst in (iii) most candidates described an increase in electron number, relatively few stated that the number increased by one with each element.

Question 13 (High Demand)

(a) This part of the question was well answered.

(b) This part was well answered.

(c) Very few candidates scored two marks, due to not reading the question carefully. Few realised that they had to pick out the similarity in the times that the galaxies have been travelling away from us and relate this to the possibility that they were all produced at the same time. Most merely gave descriptions of the 'big bang' theory and red shift.

Question 14 (High Demand)

(a) Most candidates recognised the two signals in part (i) but in (ii) many gave 'faster' and 'cheaper' as advantages.

(b) Part (i) was very poorly answered by the majority of candidates with many having the idea that different speeds of ultrasound are used to identify different tissues. Few explained that partial reflection caused at a boundary between tissues of different densities, enabled time to be measured. The Quality of Written Communication mark was rarely awarded, candidates failing to use the terms described above. In (ii) hardly any candidates scored two marks. Many achieved a mark for the detection of flaws but few went on to give any details of how this would be done. A large number scored for cleaning watches or small pieces of machinery but few went on to say that this had to be in a fluid. A large number repeated a description of the previous question.

Question 15 (High Demand)

Many candidates lost marks because of an inability to express their ideas concisely and accurately. Many thought that sweating increased skin temperature or that blood vessels rise up through the skin. A very common idea is that friction in muscles generates the heat. A casual use of English is also apparent in the view that 'heat up', 'get hot' and 'temperature rise' are interchangeable. Few candidates scored full marks, as most talked in generalities.

Question 16 (High Demand)

(a) Hardly any candidates were able to draw a completely correct circuit diagram, although most were able to score one or two marks for two correct symbols. The main stumbling block was the symbol for a variable resistor.

(b) Although a number were able to state that the current would decrease, few candidates were able to go on and explain why, in terms of the resistance increasing.

Question 17 (High Demand)

Only the strongest candidates scored well on this question.

(a) Only a minority were able to state that X, Y and Z were hydrocarbons.

(b) Most candidates gave (fractional) distillation or displacement.

(c) Few gave polymers or plastics.

(d) Many were able to state that Z could be used as a fuel but then went on to state that it was petrol.

Module Tests

346001, 346002, 346005, 346006, 346009, 346010, Double Award 346013, 346015, 346017, Single Award

Each test consisted of ten multiple choice typw questions to be completed in 30 minutes. Five questions were common to both Foundation and Higher Tiers. Tests for all modules were available in the Winter, Spring and Summer sessions. Candidates could take the tests in any order and could sit either tier for each test. The tier of the terminal paper determined the tier of award.

Centres received the raw mark grade boundaries obtained in each test series, along with the UMS (uniform mark scores) for each candidate, before the entry date for the next series of tests. Use of uniform marks took account of the varying degree of difficulty of different versions of the tests.

At the end of the course the total uniform marks for all candidates were standardised against aggregations for the written papers and coursework. This process accounted for differences in the ability of the cohorts of candidates taking each test, as measured against their performance on the terminal papers. All marks were then combined in the normal way to give the total mark and final grade boundaries for the subject.

Teachers should note that the uniform marks for each test were more important for a candidate's final grade than the notional, advisory grade for that test. Candidates at grades A* - D tended to achieve slightly higher final grades than indicated by an average of their module test grades.

Centre-assessed component

General

This was the third year of the operation of this particular assessment scheme for Sc1. By now, most centres are familiar with the requirements for this component and consequently followed the procedures correctly, producing well-annotated and internally moderated work. In a few cases it was apparent that internal standardisation had not taken place. It is a requirement of the Code of Practice, to which all awarding bodies are subject, that internal standardisation should be carried out. One of the best ways of doing this is to use the exemplar material which is published in the 'Coursework Standardising and Guidance' booklet, which is published in the autumn term each year. It is particularly important that this is carefully carried out in centres which have a large proportion of new members of staff.

Coursework advisers

Each centre is allocated a Coursework Adviser whose role it is to help and assist centres with all matters relating to the setting and marking of coursework for Sc1 assessment. This year the coursework advisers were more pro-active, often telephoning centres to check whether they needed any assistance or advice. Coursework advisers can comment upon the suitability of proposed investigations and this aspect appears to have been utilised much more this year.

Administration

Moderators reported that this year there was a wide variation between centres in terms of the administration. Some reported that centres had carried out the administration tasks very well, but about half of the centres had been very slow in returning samples, often missing the deadline by a considerable margin. It is possible that one of the reasons for this is the fact that many centres had appointed new examinations officers this year and they were unfamiliar with the requirements of the system.

The due date for the submission of coursework is always May 5th. Because moderators have to work to a very tight time-scale, it would be much appreciated if centres could submit their samples before this date if at all possible. It would also be of great help if centres could submit a list of their candidates in rank or numerical order, to the moderator.

Although delay in submitting sample work was the most common error, other mistakes that delayed the moderation procedure were also reported. The error that caused the most difficulty was the case where a centre had not completed the marks on the back of the Candidate Record Form or did not highlight which marks had contributed to the final total. This is essential and if not completed, would mean that the moderator must return the work to the centre for this to be done. This leads to inevitable delays and could possibly hold up the issue of results for that centre.

In some cases the Candidate Record forms had candidate numbers or signatures missing. It is a good idea to make sure that all candidates sign a Candidate Record Form before embarking upon study leave. Where this opportunity is missed, it may be possible to get a candidate to sign the form when he or she reports for the written paper.

Annotation of Candidates' Work

Annotation of candidates' work appeared to be improved this year. This makes it much easier for the moderator to see where and why the teacher believes that a particular mark description has been matched. The custom of writing the code for the mark description in brackets to indicate a partial match is particularly useful. Thus (P.6a) written in the script would indicate that part of the mark description for

P.6a has been matched at that point. If the teacher judges that sufficient of these partial matches occur on the script, then that mark may be awarded.

Choice of Suitable Tasks

The majority of centres had chosen suitable tasks for their candidates to investigate; however, the range of investigations tended to be very restricted. Osmosis, Photosynthesis, Rates of Reaction, and Resistance again comprised about 80% of the total. Rather more centres this year chose tasks that were not suitable. For example, an essay on how to improve the chances of survival of an endangered species is not suitable for matching the mark descriptions of Sc1.

Some centres chose investigations in which it is difficult for high ability candidates to demonstrate a high level of scientific knowledge and understanding, for example, thermal insulation. The level of response shown by candidates carrying out this investigation is usually quite low. For example, simply measuring the temperature of a beaker of hot water left to cool at the start and then 10 minutes later does not allow the highest levels of Skill Area O to be reached. Such an investigation might well be ideal for candidates who would have difficulties with anything more sophisticated, but it proves difficult for the higher ability candidates to demonstrate their high level skills.

Data Logging

Comparatively few instances of the use of data loggers were seen. If data loggers are used, it is important to let the moderator know exactly what the data logger recorded or calculated and how much was the work of the candidate. Moderators saw more than one example where the candidate had been using a data logger to investigate the motion of a trolley down a slope, using light gates. The data logger had not only recorded the times, but had also calculated the acceleration, printed a table of results and drawn a graph. All that the candidate had to do was to keep lifting up the trolley and putting it back on to the top of the slope. This removes from the candidate a lot of the opportunities for making decisions and showing both skill and scientific knowledge and understanding.

Application of the Criteria

Nearly all centres took account of the hierarchy principle of the criteria and the Level of Demand arrow – although some centres were awarding P.8b when either P.6a or P.6b had not been matched.

The notes that follow refer to the four Skill Areas. Inevitably these notes concentrate upon the errors made in applying the mark descriptions, but this should not be taken to imply that there was widespread misapplication – indeed the majority of centres showed that they have a clear understanding of how the criteria should be applied.

Skill Area P

For P.4a, some centres are awarding the mark to candidates who merely state 'To make it a fair test, I will keep all other factors the same', without specifying what these factors are, or how they are to be kept the same.

For P.4b, some candidates are simply writing a list of equipment, without specifying the way in which it is to be used.

The award of P.8b has generally improved in the sense that candidates are now referring to preliminary work. The usual way of matching this mark description is to carry out a rough trial to see whether the range of values selected will yield a sensible difference between the two extremes. However, moderators reported two common shortcomings:

(i) Some candidates merely alluded to very similar work which had been done in a previous lesson, e.g. 'I have already done an experiment to investigate the affect of changing the length of a wire, so I know that constantan wire will be suitable to use to investigate the effect of changing the cross-sectional area'.

(ii) In order to qualify for P.8b, the candidate must not only quote the results of any preliminary work, but should also explain how these have influenced the plan. They should explain either that the results show that they need to change their plan because it is unlikely to provide valid or useful results, or explain that the results confirm that their original plan appears to be suitable.

Skill Area O

As noted last year, one of the difficulties that centres seem to have is in deciding whether, if a piece of work is worth 6 marks in Skill Area O**,** it should be considered for 7 or 8 marks**.** A useful point to note is that in the Programme of Study, which is printed above the mark descriptions and from which the mark descriptions are derived, states that 'Candidates should be taught to use a wide range of materials and equipment appropriately...'. Take, for example, a candidate who is investigating the resistance of a wire. A candidate who has been given a selection of pre-cut wires, and is provided with a digital ohmmeter to clip across the ends does not have much opportunity to display high level skills. Another candidate who sets up a circuit using a voltmeter and an ammeter, chooses and measures their own length and diameter of the wire, displays a much higher level of response.

Skill Area A

There was more evidence this year of candidates not stating the conclusion drawn from the results, or not commenting upon the shape of any graphs that they had drawn. A.4b requires the student to identify trends and patterns in the evidence. A simple statement beginning 'The graph shows that as the (*independent variable)* increases then the (*dependent variable)* increases/decreases' would help here.

Graphical skills again varied tremendously. Unless the candidate is extremely competent in the use of a graph-drawing piece of software, it is usually preferable for the candidate to draw the graph by hand, using pencil and graph paper. Axes were often not labelled or had incorrect units or non-linear scales. Lines of best fit appeared to be poorly understood by some candidates. There is a common misconception that a line of best fit must always be a straight line. This often led to incorrect lines being drawn. Often it is important to include the origin, as in some circumstances this can prove to be a useful point for determining the line of best fit.
Some centres were again choosing investigations which involved the use of categoric variables, such as 'Which metal is the best conductor of heat?' or 'Which paper towel is the best absorber?' This limits the opportunity to award A.4b, which refers to a pattern or trend in the results.

A.8b was sometimes awarded to candidates who had done little more than to say 'These results prove that my prediction was correct'. If candidates are encouraged to make a sketch graph of their predicted results in Skill Area P, this can often be used to compare with the achieved results in Skill Area A. A comparison between the two is often helpful in achieving the mark for A.8b.

Skill Area E

Moderators felt that there had been an improvement this year with regard to E.4a. More candidates were clearly identifying anomalous results by either quoting the values or indicating them on the graph.

E.6b however is still being erroneously awarded to candidates who simply list other variables that they would like to investigate. One of the best ways in which a candidate can qualify for this mark is to identify a part of the range where the results are dubious or uncertain or even where there is a gap. A

thorough explanation as to why more results in this region would be of benefit, and how these results would be obtained, can often lead to an acceptable award of this mark.

Summary

The overall impression this year was that the standard of work seen was very similar to that of last year. As the criteria upon which the marks are based is unchanged, and bearing in mind the very large entry size, the moderators saw no reason to change the grade boundaries from those of last year.

Double Award

Max mark	A*	A	B	C	D	E	F	G
60	53	47	41	36	30	25	20	15

Single Award

Max mark	A*	A	B	C	D	E	F	G
30	27	24	21	19	16	13	10	7

Mark Range and Award of Grades

Science: Double Award (Modular) (3468)

Foundation tier

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
Paper 1 3468/1F	90	175	94.3	27.9
Paper 2 3468/2F	90	175	76.7	24.3
Module Tests 3468/M	300	210	100.5	23.7
Coursework 3462/8/C	60	140	80.1	21.5
Foundation tier overall 3468	-	700	351.6	83.6

		Max. mark	C	D	E	F	G
3468/1F boundary mark	raw	90	61	50	39	29	19
	scaled	175	119	97	76	56	37
3468/2F boundary mark	raw	90	51	42	33	24	15
	scaled	175	99	82	64	47	29
3468/M boundary marks	raw	300	171	145	120	95	70
	scaled	210	120	102	84	67	49
3462/8/C boundary mark	raw	60	36	30	25	20	15
	scaled	140	84	70	58	47	35
Foundation tier scaled boundary mark		700	408	344	280	216	152

Higher tier

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
Paper 1 3468/1H	90	175	95.8	21.8
Paper 2 3468/2H	90	175	78.2	27.1
Module Tests 3468/M	300	210	144.7	19.3
Coursework 3462/8/C	60	140	103.9	17.1
Higher tier overall 3468	-	700	422.6	73.0

		Max. mark	A*	A	B	C	D	allowed E
3468/1H boundary mark	raw	90	66	57	48	40	35	-
	scaled	175	128	111	93	78	68	-
3468/2H boundary mark	raw	90	63	52	41	30	21	-
	scaled	175	122	101	80	58	41	-
3468/M boundary mark	raw	300	248	222	196	171	145	-
	scaled	210	174	155	137	120	102	-
3462/8/C boundary mark	raw	60	53	47	41	36	30	-
	scaled	140	124	110	96	84	70	-
Higher tier scaled boundary mark		700	526	462	401	340	280	250

Provisional statistics for the award

Foundation tier (268,882 candidates)

	C	D	E	F	G
Cumulative %	27.3	54.3	75.2	89.5	96.3

Higher tier (157,920 candidates)

	A*	A	B	C	D	allowed E
Cumulative %	9.6	27.8	58.1	88.4	98.0	99.1

Overall (426,802 candidates)

	A*	A	B	C	D	E	F	G
Cumulative %	3.5	10.3	21.5	49.9	70.5	84.1	93.0	97.4

Science: Single Award (Modular) (3469)

Foundation tier

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3469/F	90	175	71.3	26.4
3469/M	150	105	44.4	13.1
3463/9/C	30	70	37.8	10.7
Foundation tier overall 3469	-	350	153.5	42.8

		Max. mark	C	D	E	F	G
3469/F boundary mark	raw	90	59	48	38	28	18
	scaled	175	115	93	74	54	35
3469/M boundary marks	raw	150	87	74	61	48	35
	scaled	105	61	52	43	34	25
3463/9/C boundary marks	raw	30	19	16	13	10	7
	scaled	70	44	37	30	23	16
Foundation tier scaled boundary mark		350	205	173	142	111	80

Higher Tier

Component	Maximum Mark (Raw)	Maximum Mark (Scaled)	Mean Mark (Scaled)	Standard Deviation (Scaled)
3469/H	90	175	73.0	22.1
3469/M	150	105	68.5	9.2
3463/9/C	30	70	49.7	9.2
Foundation tier overall 3469	-	350	191.2	33.0

		Max. mark	A*	A	B	C	D	allowed E
3469/H boundary mark	raw	90	65	54	43	33	25	-
	scaled	175	126	105	84	64	49	-
3469/M boundary marks	raw	150	125	112	99	87	74	-
	scaled	105	88	78	69	61	52	-
3463/9/C boundary marks	raw	30	27	24	21	19	16	-
	scaled	70	63	56	49	44	37	-
Higher tier scaled boundary mark		350	251	226	197	169	138	122

Provisional statistics for the award

Foundation tier (25,683 candidates)

	C	D	E	F	G
Cumulative %	11.6	30.4	53.4	75.4	89.8

Higher tier (3,097 candidates)

	A*	A	B	C	D	allowed E
Cumulative %	3.9	13.9	41.5	74.2	93.7	96.6

Overall (28,780 candidates)

	A*	A	B	C	D	E	F	G
Cumulative %	0.4	1.5	4.5	18.4	37.2	58.0	77.7	90.6

Definitions

Boundary Mark: the minimum (scaled) mark required by a candidate to qualify for a given grade. Although component grade boundaries are provided, these are advisory. Candidates' final grades depend only on their total marks for the subject.

Mean Mark: is the sum of all candidates' marks divided by the number of candidates. In order to compare mean marks for different components, the mean mark (scaled) should be expressed as a percentage of the maximum mark (scaled).

Standard Deviation: a measure of the spread of candidates' marks. In most components, approximately two-thirds of all candidates lie in a range of plus or minus one standard deviation from the mean, and approximately 95% of all candidates lie in a range of plus or minus two standard deviations from the mean. In order to compare the standard deviations for different components, the standard deviation (scaled) should be expressed as a percentage of the maximum mark (scaled).