OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry B J644

Gateway Science Suite

General Certificate of Secondary Education

Report on the Units

June 2008

J644/MS/R/08

Oxford Cambridge and RSA Examinations

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This report on the Examination provides information on the performance of candidates which it is hoped will be useful to teachers in their preparation of candidates for future examinations. It is intended to be constructive and informative and to promote better understanding of the syllabus content, of the operation of the scheme of assessment and of the application of assessment criteria.

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REPORT ON THE UNITS

B641/01 Foundation Tier

General Comments

Centres entry policy was very well targeted with only a small proportion of candidates whose performance suggested that they should have taken the higher examination paper.

The mean mark for the examination paper was approximately 33 and the highest mark awarded was 57. The examination successfully discriminated between the target grades (C to G).

Most questions were attempted by the candidates. All the candidates made an honest attempt at the questions, there were few frivolous answers.

Comments on Individual Questions

Section A (Module C1)

Question 1

This question was about food labelling.

(a) In part (a) a large number of correct answers were seen. Candidates who did not score often gave 'Sweeteners' as the answer

(b) Part (b) was rarely answered incorrectly.

(c) Although Q.1(c) was targeted at grade F, it was poorly answered by most candidates. Common incorrect responses were 'to stop oxygen getting in', 'to stop food going off'.

(d) This question was better answered than part (c) but many candidates gave the opposite response of 'stops oil and water mixing'.

Question 2

Parts (a) and (b) were better answered than parts (c) and (d).

(a) Well answered, but a number of candidates incorrectly referred to onions as food for their answer, or that the onion had a strong smell.

(b) The vast majority of candidates were able to tick the two correct answers.

(c) This was well answered but part **(d)** received a number of responses of which soluble was a common incorrect answer.

Question 3

This question was about crude oil and cracking.

(a) Part **(i)** was found to be the easiest question on the paper and the vast majority of candidates were able to correctly identify gases and petrol in answer to part **(ii)**.

(b) Most candidates were able to correctly label the apparatus. Surprisingly a number of candidates thought that the test-tube was a delivery tube.

Question 4

This question was about the combustion of hydrocarbons.

(a)(i) The majority of candidates were able to identify the condensate as water. A number of candidates gave condensation and carbon dioxide as their answer.

(a)(ii) Surprisingly a large number of candidates were unable to name limewater as the test reagent for carbon dioxide.

(b) This question discriminated well with the better candidates giving two correct reasons. A number of candidates incorrectly spoke about safety in the context of the fuel exploding.

Question 5

The subject matter of this question was again about the burning of fuels.

(a)(i)(ii) The majority of candidates scored full marks on these parts.

(b) This question did not discriminate. Few candidates irrespective of their ability knew that heat energy is measured in joules. The most common answer was ‘degrees centigrade’.

Section B (Module C2)

Question 6

(a) The answers from many candidates were too general e.g. ‘pollution’, or ‘machinery’.

(b) A number of candidates were able to give the correct response ‘3’.

(c) Many candidates tried to write a symbolic equation with no success. Other candidates fell into the usual traps of adding heat to the calcium carbonate and a significant number added oxygen to the reactant.

(d)(i)(ii) The majority of candidates were able to answer these two parts correctly.

(e) Sand was the most common answer.

Question 7

This question was about rocks and volcanoes.

(a) The majority of candidates were able to score at least two of the three marks.

(b) The stem of the question confused a number of candidates who made references to the fertility of the soil. The most popular correct response was to ‘warn people’.

Question 8

(a) The majority of candidates were able to name two materials used to build a car.

(b) Candidates gave very poor answers to this question. A large number spoke about ‘making a car from the iron’ as an advantage of recycling. Few candidates showed an understanding of the meaning of the word ‘advantage’.

(c) 'Water' was a common correct answer but many candidates did correctly state 'salt' as their answer. The stem of the question made it almost certain that most candidates would score on this question.

Question 9

(a) Well answered.

(b)(i) Well answered.
(ii) Weaker candidates often referred to 'time getting quicker, longer or shorter'.
(iii) Candidates found this question more difficult than was envisaged. Few achieved three marks. Many candidates wanted to add more acid, increase its strength or add more solid. To achieve three marks a candidate only needed to say heat (increase temperature), stir and add a catalyst.

Section C (Module C3)

Question 10

This question was about bonding and the Periodic Table.

(a) The definition of a 'molecule' was not well known by foundation level candidates. Candidates who had some idea, by talking about atoms failed to use the word join. This question was found to be the most difficult.

(b) Seven and three were common responses, but many candidates gave the correct answer 9.

(c) Generally well answered.

(d)(i)(ii) Only the most able candidates at this level were able to give correct answers to these questions. Group was a common response to part (i) and because they react with water to part (ii). Totally missing the point a number of candidates said, 'they were the alkali metals' and others said, 'they react the same'. If a candidate had said 'they react similarly' they would have scored.

Question 11

This question was about Group 1 elements.

(a) Most candidates managed to give the correct answer.

(b) Part **(i)** was well answered. Weaker candidates were unable to extrapolate from part (i) and answer part **(ii)** correctly.

(c) At least half the candidates were unable to match the colour of the flame 'orange' to sodium.

Question 12

This question was about electrolysis.

(a) Most candidates were able to score two marks for this question. Few scored three. Candidates confused the sign of the cation and anion.

(b) This question was found to be extremely difficult. Only a handful of candidates scored any marks at all. A large number of candidates left it blank.

Question 13

(a) Parts **(i)(ii)** were well answered.

(b) The majority of candidates correctly stated that copper is a good conductor of heat. A number lost the mark by only saying that copper is a good conductor. A few said it conducts electricity.

(c) This question was targeted at a low demand but plainly few candidates had any idea what a superconductor was or had not been taught this part of the specification.

(d) Part (d) was found by the candidates to be the easiest question on the paper and responded by getting it correct.

B641/02 Higher Tier

General Comments

The exam was of a similar standard to last year and generally candidates performed as expected.

Chemical symbols and equations were better than last year with better placement of sub and superscripts. Charges on ions still seem to 'float' anywhere near the symbol.

The longer response questions sometimes lacked precision in the use of language so answers became ambiguous.

There were a small number of candidates who may have been better off being entered for the Foundation Tier but this was less than last year.

Questions such as 12 (b)(ii) (relative reactivity) and 3(b) (cracking) which had been poorly answered in the past were better answered this year suggesting that comments made in this report are noticed and acted upon.

Comments on Individual Questions

Section A (Module C1)

Question 1

(a) This was very well answered and provided a nice easy start to the paper.

(b) This was also well answered. The vast majority of candidates were able to correctly state the answer as No, for which no marks were given. They were then able to correctly explain their answer but some accounts were much more straightforward than others.

(c) This was well answered and there were some very good diagrams. Simply explaining what hydrophilic and hydrophobic meant did not score. Some diagrams had hydrophobic heads binding to a single water molecule that was significantly bigger than the emulsifier molecule. Some poor answers had a single water molecule joined to a single oil molecule by an individual emulsifier molecule. Some candidates drew before and after diagrams showing separate layers and then a mixture but did not explain how this was achieved so did not score.

Question 2

(a)(i) Most candidates responded in terms of harm, irritation or damage but very few got the 'requires poisonous'.
(ii) Most candidates got this correct but a sizeable minority got the answer round the wrong way stating that the perfume should wash off. Others responded by stating that the perfume would react with water.

(b) This question was poorly answered with the majority of candidates responding in terms of particles and not specifying what sort of particles or the nature of the forces. Having failed to score the first mark through lack of scientific precision the second mark was lost due to very vague and general answers. Although not particularly well answered this question proved to be an effective discriminator at the top end.

(c) Generally well answered.

Question 3

(a)(i) Well answered.
(ii) Well answered. The main incorrect response was the reverse of the correct answer, ie diesel, heating oil and tar.

(b) This was mainly well answered. The explanation of cracking was better than explanations of how this enabled demand to be met. A few candidates answered in terms of fractional distillation so failed to score.

Question 4

(a)(i) This was well answered. Incorrect answers included carbon dioxide and condensation.
(ii) This was also well answered. The most common incorrect response was bromine water.

(b) This was reasonably well answered. There were lots of reverse arguments which did score if the answer was clear enough.

Question 5

(a) This was fairly well answered, with answer A, the temperature decrease being the only wrong response.

(b) This was not very well answered but did prove to be an effective discriminator. There were many partial answers talking about bond making but with no mention of bond breaking. Other responses talked about number of bonds rather then their energy value.

(c) A lot of candidates got this right but others could not divide 560 by 0.7. They divided 560 by 7 and then tried to adjust the number of zeros, usually incorrectly. Did they have calculators?

Section B (Module C2)

Question 6

(a) This was well answered. The most common error was to only tick one box rather than the two required.

(b) This was also well answered. The common error here was the inclusion of heat or oxygen within the word equation. Very few symbol equations were seen and these were almost always wrong.

(c)(i) This was usually correct. The commonest incorrect response was 0-30 seconds.
(ii) A wide variation of lines was seen here but the vast majority were steeper than the original. Many lines ran close to the original and could quite easily have been made steeper.

(d) A lot of candidates got this right but many also opted for the distractor of sand.

Question 7

(a) Most candidates knew the answer to this but some gave a much clearer answer than others. Most answers were in terms of predicting when an eruption might occur. Some scored the mark for finding out about the Earth's structure. Those talking in terms of soil fertility did not score.

(b) A wide variety of answers scored here. Those in terms of plate movement and earthquakes did not.

(c) There were some very good diagrams and explanations in this question. The main reason for not scoring three was that candidates could not remember which plate was the denser. Some candidates could not name one or both plates.

Question 8

(a)(i) This was usually well answered but a sizeable minority gave an answer in terms of environmentally friendly or less pollution. Such vague and unspecified answers do not score.
(ii) Fairly well answered.

(b) Most candidates were able to give two factors to speed up rusting. Those that scored only one tended not to get it wrong but had not given a second factor.

Question 9

(a) This was not particularly well answered. A few correctly identified that a gas (hydrogen) was released but many talked about the zinc dissolving and apparently then not weighing anything.

(b)(i) Very well answered. A few thought that the rate decreased and a very few responded in terms of time taken.
(ii) With a very wide range available most got this right. A few opted for the same time (140s) and a very few selected a longer time.

Question 10

A wide variety of answers were seen here. Some were very good, others were much more muddled. A common mistake was to confuse respiration with photosynthesis in the production of oxygen.

Section C (Module C3)

Question 11

(a) Most candidates gained the electron transfer mark but few then went on to mention attraction between ions for the second mark. Again poor use of language meant some candidates did not make clear distinctions between atoms and ions.

(b) Most diagrams were very well drawn.

(c) This was reasonably well answered. Some candidates answered in terms of the water containing a metal or impurities rather than in terms of bonding

Question 12

(a)(i) This was usually well done. Attempts at symbol equations usually did not score due to errors.
(ii) This was also well done. The main error here was to take the equation above and replace the sodium with potassium but the not to identify the products.

(b)(i) Generally well answered.
(ii) Generally well answered although some candidates stated that potassium had more electrons to lose.

(c) This was reasonably answered but quite a few candidates reversed it and made sodium from the ion. Others made negative sodium ions.

Question 13

(a) This was not very well answered. A lot of candidates talked about purification in the way that impure copper is treated. Others were unclear about the correct charges on ions. This meant that it proved to be a good discriminator at the top end.

(b) Generally well answered but some responses suggested that they were talking about mining costs rather than extracting the metal from its ore.

Question 14

(a) Generally well answered. Some answers were in terms of conducting electricity or failed to mention heat.

(b) Reasonably answered but lots of answers in terms of weight rather than density.

(c) This was not particularly well answered. The phrase 'sea of electrons' was used a lot but not well explained. Many diagrams contained positively charged atoms and there was little indication that electrons could move through the structure. Some candidates talked in terms of vibration and one atom setting the next vibrating.

(d) Some candidates had the idea of reduced power loss but this was often poorly expressed. Candidates gave examples of possible uses rather than stating benefits.

B642/01 Foundation Tier

General Comments

The exam was taken by a relatively small number of candidates.
The exam was judged to be of a comparable standard to that of last year.
The vast majority of candidates were entered at the appropriate level.

Comments on Individual Questions

Section A (Module C4)

Question 1

This was a simple match the boxes type question and provided a nice easy start to the paper. A large number of candidates did not use a ruler for drawing lines. Quite a few lines had been messily changed and it was sometimes quite difficult to follow lines to their destination.

Question 2

(a) The first part of this (state of graphite) was well answered. Those that got it wrong did not normally give an incorrect state but a totally different answer eg black, suggesting that the question was not understood. The second part (melting point) was less well answered including responses of low, soft and liquid.

(b) Most candidates scored one on this with a few scoring two. Omission rather than error was the main reason for not scoring the second mark. The main wrong answer was conduction of electricity. A few candidates gave a list of all the properties of diamond, relevant or not.

Question 3

(a)(i) This was very well answered with the common wrong answer being calcium phosphate.
(ii) Also well answered with the common wrong answer being ammonium nitrate

(b)(i) This was well answered with the most common wrong response being ammonium on its own as opposed to ammonia. Ammonium hydroxide was acceptable.
(ii) This was reasonably well answered. A number of candidates realised that the acid had to contain nitrogen but could not name the acid so responded with nitrogen. Other candidates named any acid they could think of.

Question 4

(a) This was well answered but a sizeable minority gave the answer 6.

(b) This was poorly answered with most candidates responding in terms of cleaning which had already been given in the question. Some candidates suggested that sulfuric acid was used as a fertiliser. It is used to make fertiliser, the difference being rather important.

(c)(i) This was well answered with few candidates giving a neutral or alkaline value.
(ii) This was not particularly well answered. A lot of candidates assumed that adding any amount of acid to any amount of alkali produced a neutral solution which in this case gained credit but few candidates were able to state simply that the pH would increase.
(iii) This was poorly answered with a lot of answers giving sodium chloride or sea salt.

Question 5

(a) Very well answered.

(b) Also well answered. The commonest wrong answer was filtration. This proved to be a good discriminator at the top end.

(c) This was not well answered. Many answers were in terms of drinking water or unable to exist without it which did not answer the question which was in terms of industry. The most popular correct answer was its use for cooling.

Section B (Module C5)

Question 6

(a) This was well answered but a surprising number suggested adding acid or alkali.

(b) This was poorly answered with only about 40% getting the correct answer from a choice of 3. This was the same across the full ability range, perhaps suggesting that concentration has not been taught to many foundation students.

(c) This was not particularly well answered but did prove to be an effective discriminator. Many answers were about ease of taking or taste or the ability of the immune system or organs to cope. The allowable answer of too strong was the most common scoring answer.

Question 7

(a) Very well answered. This was a good discriminator at grade C.

(b) Poorly answered with common wrong answers of water or sulfur.

Question 8

(a) Generally well answered. The most common mistake was to reverse the answers but a number of greens, yellows, and colourless (phenolphthalein ?) were seen.

(b)(i) Well answered at grades C and D but less so at the lower grades. How many of these candidates had a calculator?
(ii) This was not particularly well answered. Common wrong answers were less acid used or wider range.
(iii) This was a good top end discriminator. A common mistake was to average all 3 results or to add the two results together and then not divide by two.

Question 9
(a) This was another good top end discriminator. Most candidates that displayed any working knew what to do but couldn't always add up.
(b) A lot of candidates scored at least one here. The failure to score the second mark may suggest that they had not understood the question and scored the one by a lucky guess.

Question 10

(a) This was very well answered.

(b)(i) This was reasonably well answered. Some candidates just restated the question using different words eg the reaction stopped because it finished.

(ii) This was fairly well answered. By far the most common mistake was to use litmus and there was also quite a lot who mentioned a pH stick.

Question 11

(a) This was well answered although at the F/G level about 50% got it wrong indicating that at this level a lot of guessing was going on.

(b) This was reasonably well answered but all the wrong answers were selected in roughly equal proportions.

(c) This was extremely poorly answered even by the strongest candidates. Most of the answers were in terms of electrolysis can only happen in a liquid and no mention was made of mobility of ions.

Section C (Module C6)

Question 12

(a)(i) This was very well answered.
(ii) Also very well answered.

(b) This was also well answered with virtually all candidates getting the left side correct, but a sizeable minority put energy on the right so did not score.

(c) This was well answered.

(d) This was poorly answered. Most answers were in terms of not running out.

Question 13

(a) This was very well answered.

(b)(i) This proved to be a good discriminator. Most candidates gave the idea of a barrier but this was not enough to gain the mark. Those that explained what the barrier did scored.
(ii) A wide range of answers were available here and most scored at least one. Several duplicated their answer eg galvanising and coating with zinc.

(c) This was reasonably well answered with all distractors being used equally.

Question 14

(a) This was very well answered.

(b) This was poorly answered with candidates explaining what an emulsifying agent did or where emulsions could be found.

(c) This was reasonably answered with all the distractors being used equally.

Question 15

(a) This was another good discriminator. Common wrong answers were a drug taken orally, a legal drug or a drug available with or without prescription.

(b) This was generally well answered. The most common answer was paracetemol, spelt in a wide variety of ways but there was a wide range of acceptable answers given. Common wrong answers were penicillin or antibiotics.

(c) This was very well answered. It was interesting to see that a lot of candidates had crossed through the symbols in an effort to make sure they counted them all.

(d) This was reasonably well answered. The most common wrong answer was in terms of digestion.

B642/02 Higher Tier

General Comments

This was the first session in which a large number of candidates sat this component. The average mark for this examination paper was 38, and the range of marks obtained was from 2 to 60. A small but significant number of candidates obtained marks which suggested they would have been better suited to the Foundation Tier examination paper rather than the Higher Tier.

All sections of the examination papers differentiated well and allowed candidates to demonstrate their knowledge and understanding of GCSE Chemistry. In general candidates need to take more time when writing chemical formulae, in particular must avoid writing ambiguous formulae such as CaCo3.

Candidates found Section C a little more accessible than the other two sections which assess a lot more of the quantitative concepts.

Comments on Individual Questions

Section A (Module C4)

Question 1

This question was about diamond and graphite.

(a) A large proportion of the candidates were able to select melting point and hardness as the key properties needed by diamond. A significant proportion of candidates referred to diamond being a solid but this was not awarded a mark.

(b) Candidates found part **(i)** very demanding as it was not sufficient to refer to the presence of strong bonds and only a small proportion of candidates explained that the strong bonds need to be broken. Some candidates referred to strong intermolecular forces being broken or overcome rather than covalent bonds and this was not given credit.
(ii) The presence of delocalised electrons was well known by candidates. Reference to free or moving electrons was also allowed in the mark scheme.

Question 2

This question focussed on the preparation and use of fertilisers.

(a) Although many candidates could state the alkali and acid needed to make ammonium nitrate a small proportion of candidates gave ammonium rather than ammonia. In part **(i)** ammonium hydroxide and ammonium carbonate were also given credit. A small proportion of candidates referred to nitrogen or nitrogen hydroxide as the base.

(b) A small but significant proportion of candidates did not attempt this question and it is likely that they did not realise it was a question. Most of the candidates that attempted the question could balance the equation.

(c) Although many candidates could calculate the percentage yield as 40% in part **(i)**, others were not able to recall the relationship between actual yield, predicted yield and percentage yield. One mark was available for stating this relationship if the wrong percentage yield was calculated.

In part **(ii)** many candidates realised that the mass of potassium carbonate was half that used in part (i) and as a result half of the product could be made. Credit was given for half of the actual yield or half of the predicted yield.

(d) A level of response mark scheme was used in this question so that to be awarded the maximum mark a candidate had to recall four facts about eutrophication and had to correctly link these facts.
Poor answers were typified by reference to two or three isolated facts with no attempt to link them e.g. in eutrophication animals in the water die and there is an algal bloom. A common misconception was that the lack of oxygen in the water was caused by the algal bloom rather than by the action of aerobic bacteria.
Some excellent answers were seen where many facts about eutrophication were organised into a coherent description with clear links between the facts. Often these answers were organised using bullets.

Question 3

This question was about sulfuric acid and neutralisation.

(a) A large proportion of candidates explained that the pH of sulfuric acid increased because the sodium hydroxide neutralises the acid. In part **(ii)** the name of the salt sodium sulfate was well known but there were a small proportion of candidates that gave sodium sulfide, common salt or sodium chloride.

(b) Candidates found this question very difficult. Candidates were more likely to be awarded a mark by giving the name of the ion rather than by writing a formula. Common errors included H_2^+, H^{2+} and H_2^{2+}. Hydroxide ion was not given credit.

Question 4

This question was about water purification.

(a) Many candidates failed to mention that the substances removed were insoluble, however credit was given for a correct example of a substance removed during filtration.

(b) A common misconception was to refer to the presence of microbes rather than pollutants. Many candidates failed to mention that the poisonous pollutants were soluble in water, however credit was given for a correct example of a poisonous pollutant not removed during water purification. Another misconception was to refer to the presence of lead in the water, this was not considered relevant because the lead ions enter the water after purification.

(c) Parts **(i)** and **(ii)** were marked together. Although a significant proportion of candidates referred to distillation or evaporation and condensation many other candidates used filtration or just evaporation. To be awarded a mark in part (ii) candidates had to refer to using lots of fuel to heat water or lots of energy needed.

Section B (Module C5)

Question 5

This question on acid-base titrations was the most demanding on the examination paper.

(a) A common misconception was to refer to the speed of the colour change rather than the range of colours that will be shown by universal indicator.

(b) The idea of titration number 1 being a rough one was not well known and candidates often referred to the titre being an outlier.

(c) This calculation was very demanding and only a very small proportion of candidates was able to be awarded full marks. The connection between moles, volume and concentration was not well known. A significant proportion of candidates left parts **(ii)** and **(iii)** blank. Typically candidates scored one or two marks with the average titre being one of these marks.
A common misconception in parts **(i)** and **(iii)** was to use the volume in cm^3 rather than convert it to dm^3. As a result a significant number of candidates quoted an answer of 2.5 moles rather than the correct amount of 0.0025 moles.
In part **(ii)** an error carried forward was used and the number of moles had to be the same as in part (i) – unfortunately only a small proportion of candidates realised this connection.
In part **(iii)** only a very small proportion of candidates benefited from the error carried forward. The correct answer was 0.125 mol/dm^3.

Question 6

This question involved empirical formulae and simple calculations and was one of the least demanding questions on the examination paper.

(a) Many candidates were able to calculate the molar mass of $Fe(OH)_3$ as 107 g/mol.

(b) Candidates generally scored either two marks or none at all.

Question 7

This question focused on the electrolysis of aqueous copper(II) sulfate.

(a) The most frequent incorrect responses were the first two boxes.

(b) Candidates found this part question very demanding. To be awarded a mark candidates had to refer to ions not being able to move in a solid. A common misconception was to refer to electrons rather than ions.

Question 8

This question used the reaction of sulfamic acid with limescale to assess aspects of gas formation.

(a) Candidates had to realise that the acid had run out rather than the calcium carbonate however credit was given for stating that an unnamed reactant had run out.

(b) Most candidates were awarded marks from their diagrams rather than from any written answer. However many candidates did not take sufficient care with their labelled diagrams and often included ‘gaps’ that made the apparatus have leaks. Other candidates did not include labels so it was often impossible to tell the nature of the apparatus used to collect and measure the volume of gas formed.
The most frequently used piece of apparatus was a gas syringe but other candidates described the displacement of water in a burette and in a measuring cylinder.
A common misconception was to put a funnel directly over the beaker. A significant number of candidates drew a diagram to show the chemical test for carbon dioxide using lime water.

(c) The correct answer was 0.72 dm^3. A significant proportion of candidates gave 800 obtained by dividing the molar volume by the number of moles.

Question 9

This question on equilibrium and the Contact Process was a very demanding targeting the highest grades at GCSE.
Many candidates used the bullet points to target their answer to the rate of reaction and position of equilibrium. However there was a significant proportion of candidates that used the idea of yield instead and this was not given credit.
The majority of candidates were awarded one or two marks and these normally where the marks associated with the use of a catalyst.
The idea of a compromise temperature was poorly expressed by candidates and although the effect of temperature on rate of reaction was well known the effect of temperature on the position of equilibrium was not.
Only a very small proportion of candidates realised that even at atmospheric pressure the position of equilibrium was on the side of the products and so many candidates referred to moving the equilibrium to the right hand side by increasing the pressure.

Section C (Module C6)

Question 10

This question focussed on a hydrogen-oxygen fuel cell was one of the least demanding on the examination paper.

(a) Although many candidates could write the word equation for the reaction between oxygen and hydrogen in a fuel cell a significant proportion included energy on the right hand side of the equation. This was not given credit.

(b) Candidates often referred to the advantages of making water in terms of no pollution or that it could be drunk. A misconception was that a fuel cell would not run out.

(c) A common misconception was to include catalyst instead of the energy change.

(d) Exothermic was well known by Higher Tier candidates.

Question 11

Candidates found part (a) and (b) of the question on rusting much less demanding than part (c).

(a) Although it was well known that paint formed a protective barrier many candidates did not include that the barrier prevented oxygen and/or water from reaching the iron.

(b) Almost all Higher tier candidates recognised the term redox.

(c) Despite the bullet points in the stem of the question many candidates did not explain how tinning prevents rusting. A common misconception from those candidates who attempted to explain tinning was that it acted as a sacrificial metal. A significantly higher proportion of the candidates recalled that zinc was a sacrificial metal but few candidates realised that until scratched both zinc and tin acted as a protective barrier from water and/or oxygen.
A small but significant proportion of the candidates did not know that galvanising involved zinc.
A small proportion of the candidates did not attempt this question.

Question 12

This question was about oils and soaps.

(a) Most candidates could write the word equation for saponification and in part **(ii)** could recognise the term saponification.

(b) Many candidates recognised the term immiscible.

(c) The formation of margarine by reacting vegetable oil with hydrogen was not well known and a significant proportion of the candidates did not attempt this question. Some candidates referred to saturating or partially saturating vegetable oil and this was given credit.

Question 13

This question was about the structures of aspirin and paracetamol.

(a) The majority of candidates in part **(i)** were able to write that the molecular formula of aspirin was $C_9H_8O_4$.
Candidates had little difficulty interpreting the information provided by displayed formulae and could give at least one similarity and one difference in the formulae. Many candidates referred to the presence of a benzene ring. A significant proportion of candidates referred to the presence of molecules rather than atoms in the formula.

(b) In part **(i)** most candidates gave everyday non-scientific answers to the question which were normally sufficient to gain credit. For example they were faster acting or easier to swallow. A common misconception was that they could be digested faster.
Only a very few candidates in part **(ii)** could explain how aspirin could be made soluble. Although it did not really answer the question as set the mark scheme allowed a mark for candidates that stated the aspirin was made into a salt. A significant proportion of the candidates did not attempt part (ii).

B645 Report on Gateway Science Skills Assessment

A General Comments

Although this is the second year of this specification, for many centres who did not enter candidates last year, this was the first time work had been moderated.

The Skills Assessment for Gateway is very different from the previous Sc1 Coursework component of GCSE and which represented a 'common assessment element' for all Awarding Bodies. For Science, there are two components Can-Do Tasks and Science in the News.

The new Skills moderators appointed by OCR were provided with training in the new requirements, and it is very pleasing to report that the process of moderation, despite large numbers, went very smoothly and that most of the candidates who were entered gained great benefits from all aspects of the Skills Assessment.

Candidates were entered for Skills Assessment 1 (Can-Do tasks and Science in the News) for Science and separate Biology, Chemistry and Physics.
The table summarises the number of candidates in each specification.

Specification	Subject	Number of centres	Number of candidates
B625	Science	762	90810
B635	Biology	202	7941
B645	Chemistry	150	5536
B655	Physics	148	5419

It is possible that candidates use the same piece of SinN for more than one specification. However, each specification is moderated separately so if the same piece of work is used it must be copied each time it is used. Marks cannot be just transferred from one specification to another.

B Administration matters

Administration matters - general

Teachers are required to supply, for each of the candidates chosen in the sample, a breakdown of the marks awarded for the Can-Do tasks together with the marks awarded for each of the six Qualities in the Science in the News Task which had been chosen for assessment. Although the form gives spaces for dates these are for internal use and are not required by the Moderator.

It is pleasing to report that there were fewer arithmetical errors in Can-Do tasks than in the previous year. If moderators find any mistakes in the sample, the centre will be asked to check the arithmetic of the whole sample. Centres must use the Can-Do tasks in the system, they cannot devise their own. In a separate science e.g. Physics all the Can-Do tasks must be from the Physics list.

Administration matters – selecting tasks for Science in the News

One of the strengths of Gateway Skills Assessment is that all of the materials which are required for each of the Science in the News tasks are provided by OCR and are available on the secure Interchange website. Teachers do not need to invent tasks to be done but can download suitable materials.

Initially one task was provided for each module B1, B2, C1, C2, P1 and P2. There were also tasks for B5 or B6, C5 or C6 and P5 or P6. A task set for P1, for example, cannot be used for B1 and a task from P5 or P6 cannot be used for Science.

New tasks have been added to the Interchange website in June 2007 and June 2008 to provide even more choice. There will be a continuing programme for the addition of new topics year by year to keep the specification up-to-date. No task will be removed from the listing during the lifetime of the specification but teachers may decide that some of the tasks have become less relevant with the passing of time. In this way it is hoped that OCR will be able to reflect any changes in the way in which the contents of the course are linked to current scientific issues.

At the initial INSET training sessions '*Should smoking be banned in public places?*' was used as an exemplar task for discussion and development but this was not included in the listing of the tasks available for assessment because it was felt it had lost relevance since the decision had been made and become law. A few centres still used this task for assessment this year and it was accepted so that candidates were not disadvantaged. However, it will not be accepted in future years.

There is the facility for centres to write their own Science in the News tasks. No centre has done this yet and obtained the necessary approval. Centres are reminded that if they want to develop their own SinN tasks they should seek advice from OCR before writing them, and that topics need to be approved before they are used.

There were some problems where centres were attempting to double enter from Entry Level. Tasks that were suitable for Entry Level e.g. Chocolate are not appropriate for GCSE Science.

Administration matters - Supervision of Skills Assessment

Another of the strengths of Gateway Skills Assessment is that the assessed work is under the direct control of the teacher. All SinN are written under controlled conditions where the teacher can sign the Centre Authentication Form (CSS160) with confidence.

The teacher should give the candidates the OCR stimulus material for a task after the topic has been studied so that they are fully equipped with the background to the task. The teacher can read through the stimulus material and explain any scientific words but they must not give any opinion. The stimulus material is not differentiated and the same task is presented to candidates across the whole attainment range. One approach with lower-attaining candidates is to provide only the appropriate parts of the stimulus material, rather than presenting them with the complete document. OCR provides a writing frame which could be used with lower-attaining candidates. Centres are allowed to use their own writing frames providing they are generic i.e. the same writing frame for all tasks. Writing frames are not recommended for more able candidates as it will tend to limit their approach.

There is considerable evidence that candidates do their best when they are given independence to study the topic and look at both sides of the argument. Too often when reports are read one gets the impression that the candidate has really not looked at both sides of the issue.

Administration matters – research time

Each topic requires the candidates to undertake some research for themselves in a period of approximately one week. This research could be done in school, either in the laboratory or a computer facility or it could be done at home. The candidates do not need to be supervised during this preliminary research and they do not necessarily need to work on their own. If the preliminary research is done in school, teachers can provide some materials to get the candidates started with their task. However, it was felt that in some centres the candidates had been provided with a complete list of source material for use and the necessary element of choice and selection for relevant aspects on the part of the candidate had therefore been removed. With the previous POAE system it was often felt in Strand A that teachers did not give opportunities for students to select appropriate equipment, it is similar here. The best reports came where students had the freedom to investigate the question set.

Where there are a large number of candidates in the sample it is reasonable to expect:

- different source materials to be used,
- different processing to be done, for example, not all candidates having the same bar chart display,
- candidates to answer the question in different ways.

Administration matters – supervised session

When the preliminary research has been completed, the SinN tasks are written up under controlled conditions in the classroom/laboratory. Candidates are required to work independently and, although a time of 1 hour is suggested, the centre may use more or less time as required. If it extends beyond one lesson, the work should be collected in between the sessions and stored securely.

A limit of 400-800 words is also suggested in the specification. There is no automatic penalty for reports that are longer but long reports, often including large sections copied from a website/book etc, may lose the tightly-focussed structure which is required for a clear match to the 6 mark standard in Quality A.

Candidates can bring into the session completed charts/graphs that they have done together with a completed bibliography. This will prevent time being wasted during the session.

Most of the reports submitted for moderation were hand-written and subsequently photocopied, but centres should ensure that it is possible to read the photocopy and that any annotation by the teacher explaining why particular marks have been awarded is visible. In cases where the photocopy is difficult to read the moderators will automatically return the work to the centre.

Some reports were word-processed and this is acceptable providing the centre can ensure:

- that no complete or largely complete report is brought into the writing session on a USB storage pen or in any other electronic format
- that no competed report is taken out or e-mailed to another person.

If these conditions cannot be guaranteed, it is not possible for the teacher to sign the Centre Authentication Form, and hand-written reports should be used.

Under no circumstances should any Science in the News tasks be drafted and subsequently redrafted. The report produced at the end of the supervised writing session is what has to be submitted. If there are deficiencies, this should be reported to students and they should be told to avoid these when they do their next SinN. There was clear evidence that drafting and redrafting went on in a very small minority of Centres. Evidence of drafting and redrafting of

candidates' reports or too much coaching will lead to the work not being accepted for moderation.

C Can-Do tasks

Can-Do tasks are an important part of the Gateway Science specification. They are motivational for students at all attainment levels. The Tasks ensure that practical Science is an important aspect of the specification, and they can also ensure that ICT is used appropriately.

They are not expected to differentiate candidates at Grade C and above.

The Tasks can be used throughout KS3 and KS4 and candidates at an earlier stage will clearly benefit from having their positive achievements rewarded. All the teacher needs to do is to record the tasks each candidate achieves. These tasks must be credited for individual work and not for a group of candidates collectively completing a task. All aspects of a task must be completed before credit is given and it is not possible to award 1 or 2 marks for a 3 mark task.

Centres are not expected to provide any evidence for the moderator to support the awarding of marks for Can-Do tasks.

It is pleasing to see that candidates are taking these seriously and centres are reporting the benefits of motivation of candidates at all levels but especially with lower-attaining candidates.

D Science in the News

Approach

Since Can-Do tasks will not differentiate at Grade C and above, it is essential that the necessary differentiation between the levels of attainment of candidates is obtained using Science in the News.

The mark descriptors need to be applied hierarchically. They can only be awarded when the whole statement is fully matched.

It was still clear that in some centres the candidates had not been fully prepared, and they had been given the task to do without a clear idea of what was required. It is also clear that in some centres only one SinN task has been attempted. This does not provide an opportunity for candidates to improve their performance. Some centres conduct SinN under examination conditions. There is nothing wrong with this but it is not essential.

It has always been OCR policy to encourage teachers to annotate coursework. As candidates may attempt several SinN this represents a burden on teachers when, in reality, very little of the work will be seen by a moderator. It is recommended that the emphasis should be given to reporting back to students so they can improve in the future. When the sample is requested by the moderator, a little time should be spent annotating the reports that have to be sent. In particular annotation should concentrate on why intermediate marks (i.e. 1, 3 and 5) have been awarded. The aim of annotation is to provide evidence that the moderator is able to accept in support of the marks awarded by the centre.

It is important that internal standardisation is carried out and the moderator informed of the way in which it has been done. Several Centres had clearly not internally standardised the marks and consequently the rank order was not valid. In such cases the sample had to be returned to the centre, and it is not desirable for the teachers at centres, for moderators or for OCR if work has to be returned at the beginning of June to be re-marked. It is possible that the marks of a

whole centre could be reduced if one or two teachers have over-marked and internal standardisation has not taken place.

Quality A (Approach to the Task)

Candidates who do not undertake any research of their own cannot be awarded a mark in Quality A since the use of the OCR source material does not count for research purposes. However, candidates who do not do any research for themselves are able to gain marks in the other five Qualities.

It is important candidates read and prepare to use the source material before entering the supervised session. This could be compared with the way they would prepare for an exam with pre-release material. Reports sometimes show that nothing has been done with the source material before the supervised session. Criticisms of exams with pre-release material are often centred on candidates not using pre-release material fully. This is certainly the case here.

For 2 marks candidates only need to use one source - from a book, newspaper, Internet etc. The source does not have to be referenced.

For 4 marks, however a candidate must use more than one source. Two sources are sufficient and it helps later in their report if one source is for and one source is against the question posed. It is essential that not only that each of the sources is fully referenced so that it can be checked, but also that it is clearly identified where it has been used in the report. A reference such as www.bbc.co.uk does not provide sufficient information but www.bbc.co.uk/science/hottopics/cannabis does. Without this level of referencing it is very difficult to support a match to 4 marks.

For an award of 6 marks it has to be clear that the sources have been used correctly to produce a structured and balanced report. A good 6 mark report will look at evidence for both sides of the argument. Centres are reminded that 6 marks are awarded for the quality of the research and how it is used, rather than the quantity of research which has been done. Little credit can be given where large amounts from a website are just pasted in but not used even if the work is fully referenced.

It is recommended that candidates attach their preliminary research to the back of the report which has been produced during the supervised session. This will assist the teacher in marking the report since it will save having to go back to the sources to check the information. This preliminary work may also be sent to the moderator as supplementary information, but this is not a requirement. Moderators are expected only to moderate the report. They are not required to look for evidence in research material as this was not produced in the supervised session.

Quality B (Analysis of the data)

The award of marks for this quality is dependent on the candidates actually processing the information/data which they have collected.

For 2 marks the candidate needs to identify a simple trend or pattern e.g. *'….more women get skin cancer than men…*'. It is not sufficient to quote just a fact e.g. *'…7000 women in England get skin cancer…'*. Trends can come from the OCR source material or from the candidate's research. There are always ample trends and/or patterns within the OCR source material. The trends quoted must be correct.

For 4 marks there must be evidence of more than one trend, although which is the main trend may not be obvious, and some processing done by the candidate. This could be by drawing a

graph, pie chart or bar chart from the data, calculating averages or percentages, or extracting data from a graph. It is important that the processing is correct. A poorly drawn graph with incorrect scales or incorrect average calculations will not gain credit.

Few candidates progressed beyond 4 marks. It is not sufficient just to pick out an apparent anomaly in data. To secure above 4 marks the candidate must do some further processing to identify some new information or to identify anomalies. In a few cases it was apparent that a candidate was told to take a particular approach to get 6 marks but did not fully understand what they were trying to do.

One example of a true 6 mark response is when a candidate looks up the population of women in England, Wales, Scotland and Northern Ireland and uses the information to work out the number of cases in each country per million women. They find out that the rate is the same in England and Wales but significantly more than in Scotland and Northern Ireland. The rate is identical for women in Scotland and Northern Ireland. Candidates are not expected to give a reason why this difference exists but just to identify this information. It is appreciated that this represents a high level of processing of data above the level of processing used for 4 marks.

The moderator does expect to see different approaches to the same Task from different candidates within the Centre.

Quality C (Evaluation of the data)

The accuracy, reliability and validity of data are important aspects of Science National Criteria and they are assessed in Science through SinN. There are still some reports where these are totally ignored and so a mark of zero has to be awarded. Candidates found consideration of accuracy difficult in SinN.

For 2 marks the candidate needs to make some comment about the quality of the sources used or the data within them.

For 4 marks the candidate must compare the reliability of different sources and explain why one source is likely to be more reliable than another. There were still few marks above 4 because candidates did not understand what is meant by validity and appreciate that validity can only be considered when reliability has been established.

Quality D (Relating Data to the issues)

Again social, economic and environmental aspects of the topic are an important part of Science National Criteria and which some centres did not develop sufficiently with their candidates.

Different SinN tasks provide different opportunities for consideration of social, economic and environmental aspects, and it is difficult to link all three of them in some tasks. Teachers should remember that the 2, 4 and 6 mark descriptors are loosely linked to performance at F, C and A respectively. So when awarding 2 marks teachers should ask whether the response matches the expectation from an F grade candidate. Similarly, performance at C and A can be the evidence for awarding 4 and 6 marks. It is not necessary to cover all three aspects even at 6 marks providing the approach to these aspects is at a suitably high level.

Often these social, economic and environmental aspects were diffused throughout reports rather than in a separate section. This does not affect the mark awarded but makes it more difficult for both the teacher and the moderator.

Quality E (Justifying a conclusion)

All of the tasks are posed as questions and therefore need an answer. There are fewer examples of candidates not attempting an answer to the question this series. No marks can be awarded where no decision is reached. In some cases it is obvious that the decision has been made before the question was studied. The aim is candidates come to a decision as a result of their studies.

For 2 marks the candidate needs to decide *'yes'* or *'no'* and then give a reason. The use of the word *'….because…..'* in the candidate's response is useful but not essential. For a match to 4 marks the candidate does need to link clearly their choice to two particular sources. For 6 marks a candidate needs to decide which source is more significant. It was still the case that few candidates could do this. It is here that researching sources with different viewpoints becomes helpful.

Quality F (Quality of written communication)

Centres were quite good assessing this Quality. However, the use of a scribe to write the report for the candidate could limit the mark that can be awarded.

For 2 marks there could be many mistakes but it would still be possible to read the report.
For 4 marks there should start to be the use of scientific vocabulary correctly used.
For 6 marks there are few errors and a good use of scientific words.

Some reports had been word-processed and a spell-checker obviously used. Candidates do need to take care when using spell-checkers since it can result is significant errors, for example '*..defiantly..*' instead of '*..definitely..*'.

E Summary Comments

The job of moderators is to try to support the decisions of centres. Where the marks are outside tolerance and adjustments have to be made, the work was always considered by at least two moderators.

Moderators were encouraged to provide useful reports for Centres. The moderation was accomplished efficiently and effectively, despite the new scheme and many totally new moderators. Much of the success was due to the work of Team leaders in co-ordinating their teams.

Cluster group meetings, attendance at OCR INSET meetings and meetings arranged in-house all provided centres with an appropriate awareness and understanding of the new framework. Centres should have copies of the Science Support booklet (which is also available on Interchange).

Many Centres have used the free OCR Coursework Consultancy service. Each year a Centre can submit good quality photocopies of three marked SinN reports to OCR. They will then receive a written report from a senior moderator on the quality of the marking. This means centres can then enter candidates for moderation with some confidence.

F 2008 Grade Thresholds for B625

The distribution of marks for Science in 2008 was very similar to the distribution of marks for 2007.

Grade boundaries for 2008

	Grade threshold							
	Max. mark	A*	A	B	C	D	E	F
Can-Do tasks and SinN	60	53	**49**	44	**40**	35	30	**25**

Since the same work can be submitted for Science in the News for Science and separate sciences the same boundaries apply for B635, B645 and B655. Approximately two thirds of the separate science cohorts used Science Skills Assessments rather than Additional Science Skills Assessments. A great deal of care was taken to ensure that performance by the two routes was comparable.

The grade thresholds have been decided on the basis of the work that was presented for award in June 2008. The threshold marks will not necessarily be the same in subsequent awards. Some adjustments may be expected as experience with the mark descriptors grows.

Changes to Science in the News Level of Response Grid

Following consultation with teachers and moderators, OCR has made a number of changes to the wording of the Level of Response Grid to assist teachers in interpreting the qualities to be assessed.

The revision to the wording will not have an impact on the number of marks awarded or the standard of the assessment for each quality assessed. This means that any work that has been marked already using the original Level of Response Grid for guidance does **not** need to be marked again.

Centres will be notified of the nature of these changes through a Notice to Centres in October and through our website (www.ocr.org.uk).

B646 Report on Gateway Additional Science Skills Assessment

A General Comments

This was the first year in which Research Study, Data Task and Practical Skills were assessed. Similar but not identical skills have been assessed in the past; which both helped and hindered the adoption of the new mode of skills assessment.

In the Research Study candidates were, overall, better at producing Research than was the case when Science in the News was first introduced last year. Experience with last year's tasks clearly helped with this skill. The questions, which focussed skills on a particular area, also helped. On the down side some centres emphasised the similarities at the expense of the differences.
The Research Study involves the answering of five questions after researching to find the information necessary. Below are listed some of the ways centres deviated from this.

- Writing the answers as a continuous piece of prose rather than as five answers.
- Assessing the reliability and validity of sources (this is not necessary although it's a good habit).
- Treating the exercise as a Science in the News task on the topic of the study, ignoring the questions.

In the Data Task, centres already had experience of some of the skills involved from 'POAE' in years gone by. This meant that Quality A and Quality D were quite well done. The Data Task, however, concentrates much more on the data and less on the process of acquiring it. Below are listed some of the common ways in which candidates lost marks.

- Not doing any further processing in addition to the averages.
- Failing to talk about the reliability and validity of the data.
- Concentrating too much on the weaknesses of the method and ways to improve it.
- Putting insufficient detail into the method for Quality E.
- Disregarding the variable identified in Q5.

Candidates were entered for Skills Assessment 2 (Research Study, Data Task and Practical Skills) for Additional Science and separate Biology, Chemistry and Physics.
The table summarises the number of candidates in each specification.

Specification	Subject	Number of centres	Number of candidates
B626	Additional Science	573	63150
B636	Biology	102	2922
B646	Chemistry	97	3598
B656	Physics	109	3565

B Administration

In Science Skills, when the sample of work is sent to the moderator, it has to be sent with the record of Can-Do tasks completed. This record gives a breakdown of how the total mark was arrived at.

For Additional Science there is a cover sheet on which the three marks which make up the Additional Science Skills Assessment should be recorded.

Most centres attached this sheet to the work (though there were still some arithmetical errors). A significant number of centres, however, failed to attach this sheet. This meant that the only way a moderator could know the Practical Skills mark was to subtract the marks from Research Study and Data Task from the total mark. This sometimes gave a total greater than six and made it necessary for the centre to complete a form adjusting the marks appropriately. Centres are requested to ensure that this cover sheet is attached to the scripts requested in future.

Selecting the Correct Task

Only Research Studies and Data Tasks linked to modules 3 and 4 of each subject can be used for skills assessment in Additional Science (B626).

There were a few instances where centres had used tasks linked with module 5 or 6 of a science to assess skills in Additional Science. This is not permitted. The tasks linked with modules 5 or 6 are only appropriate for the separate sciences. In 2008 candidates who had been assessed on inappropriate work were not penalised. This concession will not automatically be available in 2009.

Supervision of Candidates

There is no need for close supervision of the gathering of information for the Research Study. Indeed, this research may be done at home if desired. Nor is there any need for supervision of the collection of data for the Data Task, other than the normal precautions during practical work.

The supervised sessions, however, do have to be supervised. Restrictions for each type of skills assessment are given below.

Research Study

Supervision should be sufficient to allow staff to sign the centre declaration form, stating that the study produced is the candidate's own work, with confidence.

Candidates should not bring into the supervised session any electronic media nor should they have access to the internet or their own areas on the school network. This is to avoid candidates simply copying and pasting work already completed at home (possibly with the help of others).

Candidates should not be allowed simply to copy out a piece of work previously produced. This practice has been used, this year, by a small number of centres.

If candidates word process their study, any direct quotes from books or web sites should be in a different font to make it clear which is the candidate's own work. Quotes should also be identified as such in hand written studies.

Data Task

The same rules regarding level of supervision apply to Data Tasks as apply to Research Studies.

Candidates should not have access to the internet or to textbooks. All that is allowed in the supervised session is as follows.

- The original instruction sheet for the experiment.
- The candidate's own results and any other data set which is to be used.
- The questions to be answered.
- A periodic table and physics formulae sheet if applicable.

This is the same as would be allowed in a written examination.

Annotation

Annotation of scripts submitted for moderation is helpful to both the moderator and the candidate.

It is the job of a moderator, not to mark the work, but to support the decisions made by the centre wherever possible. It is much easier for a moderator to do this if reasons why a certain mark has been given are noted on the work itself.

This is useful particularly where intermediate marks (1, 3 or 5) are given. Brief written comments are more useful than notes like B4 or C5 written in the margin. These brief written notes can be at the point where marks are awarded or separately at the end.

There is no necessity to annotate all scripts, just those which are sent for moderation. It is easier for the Moderator to support the decisions of the centre if the centre explains why the marks were given.

Other Matters

Where it is necessary to adjust the marks of a centre the work is looked at by at least two moderators.

If the adjustment is large it is looked at by at least three including the Principal Moderator.

Further guidance on assessment of skills can be found in the Additional Science Support Booklet which was sent to all centres and which is also available on Interchange and at www.ocr.org.uk.

Next year a series of training courses will take place in different parts of the country, details of these has been sent to centres and is also available on www.ocr.org.uk .

Centres can be part of a cluster. Cluster co-ordinators conduct meetings where centres can exchange ideas and experiences as well as receiving training.

The coursework consultancy service allows centres to send three pieces of marked skills assessment of each type to be checked by a senior moderator. The moderator will send a report providing feedback on the marking. It is rare for a centre which has used this service to have their marks adjusted. Photocopied marked work should be sent to the science team at OCR in Cambridge.

C Research Studies

Many centres had candidates who scored well in this part of the skills assessment. Where candidates did less well it was because:

- they did not give full URLs for their sources.
- they did not refer to their sources within the answers to the questions.
- they answered the questions in insufficient detail.
- they relied too much on quoting sections of web sites or textbooks.

Unlike Science in the News Tasks, where the research is 'open ended', Research Studies have questions which must be answered. These questions are not for guidance, they require answers. It is best if the candidates give numbered responses to the numbered questions. If they are written as essays, it is easy for a candidate to miss something essential. It also makes the study less easy to mark and to moderate.

These are Research Studies and research does need to be done. In some cases, it is possible to answer the questions set without doing a great deal of research. The answers given in these cases are unlikely to be good enough to achieve higher marks, something beyond or in greater detail than the content of the specification is required.

Candidates who were 'over-prepared' for the study tended to do less research and to score lower marks.

Quality A (Collecting Information)

This has to do with the research part of the study. The questions guide the candidate as to what research needs to be carried out. Since the topics of the studies lie outside the content of the specification, some research is always necessary.

Two marks can be gained without any sources being given as long as it is clear, from the answers, that some research has been done.

To gain four marks sources must be given and must be given in full. For an internet site this means the full URL for the page(s) used. A moderator needs to be able to check the source should this prove necessary. At least two sources should be given. It should be clear that the sources have been used in the study.

To gain six marks for this skill the sources must be referenced within the text of the study so that it is clear where the information used came from. These references need to appear in the answers to all five questions.

Quality B (Interpreting Information)

In many Research Studies there is some simple interpretation involved in the first two questions. Correct interpretation here can give marks at a low level but is not sufficient to achieve a mark of six. Higher marks can only be achieved by the use of scientific explanation in answer to the later, more open ended, questions.

To achieve the higher marks the science used must be correct and it must be understood by the candidate. It is not sufficient to include only a quote, or a paraphrase, of the web site, however relevant to the answer it may be. A candidate needs to show understanding either by adding content of their own or by internalising the information and writing in their own words.

Maximum marks were sometimes given for quotes from sources which were not entirely relevant to the question asked. The maximum mark available for a relevant quote from a web site would be four.

For six marks the science used must be correct, relevant and written at a level which clearly shows that the candidate understands what is being written.

Evidence for this skill could be found in the answers to any of the questions but full marks would not be available if only some of the questions were answered.

Quality C (Developing and Using Scientific Ideas)

This skill links with the topic of the study. Answers to one or more of the questions will involve the application of the science in the study to either issues of current importance, everyday applications, development of ideas and theories or theoretical explanation of facts.

The quality and completeness of the answers provided here is the discriminating factor which decides on the level of the marks given. It is unlikely that an adequate answer can be found in a book or on the internet. An individual answer written in a way which demonstrates the candidate understands the issues involved and in which the candidate makes relevant and, where appropriate, original comments is required for 6 marks.

Quality D (Quality of Written Communication)

Centres usually had few problems assessing this skill but there are dangers.

Credit has, on a significant number of occasions, been given for the quality of the English in passages copied from the internet. In these cases the quality of the English in the more open ended questions later in the study does not match up. It is the candidate's own work which should be used to decide the level awarded.

Competent use of English is not sufficient for the higher marks. There must be significant and correct use of scientific and technical vocabulary.

In centres with many very good candidates, weaker candidates are sometimes under-marked because they do not measure up to the high standards exhibited by the majority. To a very limited extent the same problem is observed in centres with a large number of weaker candidates.

It is important to mark according to the criteria not comparatively within the centre.

D Data Tasks

Data Tasks consist of a practical task and five questions, each linked to one of the skills being assessed.

Since the completion of the practical task is not assessed, it can be adapted to suit the facilities at the centre. However, care must be taken to ensure that the variables measured and controlled are the same and that the adapted method generates data which allows the five questions to be answered.

It is recommended that the questions be answered in the order given in the task and that care be taken that the answers given fulfil the criteria for assessment. This is particularly important in

Quality E where a significant number of centres treated it as merely a way of suggesting further work. Although questions are linked to skills, marks for each skill can be scored in other questions.

Many centres opted to use only the fall-back data. This was done for a variety of reasons. Sometimes it was because the results obtained by the students were not good enough to provide a reliable conclusion, sometimes it was to make the whole exercise more straightforward.

It is definitely to the candidate's advantage to have their own results in addition to the fall back data. Alternatively, a set generated by the teacher or a set generated by the class as a whole could be used.

If their own data were insufficient leading to the use of the fall-back data, it is still a good idea to include the candidates own data to enable a better evaluation of the data for Quality C.

Quality A (Interpreting the Data)

Candidates usually scored well in this quality with many scoring full marks and few less than four. Where marks were lost it was usually due to errors in plotting, too small a graph or, most frequently, an inappropriate line.

It was pleasing to note that, other than where appropriate, 'dot to dot' graphs were rare. It was sometimes the case that 'best fit' straight lines were drawn where a curve was clearly more appropriate and 'best fit' straight lines were sometimes just straight lines paying little regard to the position of the points.

Marks are given for an appropriate means of displaying the data. This is nearly always a graph. Graphs should have correctly labelled axes with the controlled variable on the 'x' axis and the dependant variable on the 'y' axis. The graph (not just the axes) should occupy at least half of an A4 sheet. Plotting should be accurate to half a square. An appropriate straight line or curve should complete the graph. An appropriate line is one which fits the data obtained unless the candidate could be expected to know that a particular relationship should produce a straight line.

A table of results on its own is rarely worth any credit as the format for a table is usually given and a table alone is not the most appropriate method of recording the data.

The candidate's raw data and the averages should be given as well as the graph. There were some occasions, this year, where centres did not include the raw data which made the checking of averaging and plotting impossible.

Quality B (Analysis of the Data)

Finding patterns and trends presented few difficulties for most candidates. Sometimes a full description was lacking which limited the mark obtained. Sometimes a straight line was taken to mean direct proportionality, which, of course, need not be the case. The processing part of the criteria could be satisfied by the simple processing included within the task e.g. averaging. It should be noted, however, that incorrect processing should not be given credit. Four marks was usually secure but a real score of six was rare.

To score six marks additional processing is necessary. This additional processing must lead somewhere. One place it could lead is to the discovery of an anomaly but it is not sufficient to spot an anomaly by examining the graph or the raw data. Neither is it sufficient to do some extra

processing e.g. calculating a gradient and combine it with the detection of an unrelated anomaly. The further processing must lead to additional information.

Where six marks were validly scored it was usually by assessing the validity of the data. This was sometimes done by quantitatively comparing two data sets and showing agreement or otherwise (this could be own data with the fall-back data or two sets of class data). It could also be done by assessing whether a best-fit straight line showed proportionality when the exercise should have shown this. An anomaly could be detected by calculating a theoretical value and comparing it with the experimental value obtained.

Quality C (Evaluation of the Data)

This skill was also often marked over generously. Centres should note the wording 'Evaluation of the Data' not of the method.

Data is reliable if it is consistent. If all three repeats of a particular value concur then that data is reliable, whether or not it is accurate. If the values do not concur it is not reliable. In Data Tasks where there are no repeats proximity to the best fit line could be used instead. This is part of the skill, the other part does refer to the method and comments should be made as to how the method used resulted, or did not result, in reliable data.

The assessment grid is hierarchical and both parts need to be present to score four marks. Many candidates produced a very thorough description of the limitations of their method and suggested suitable improvements but only scored three marks.

To achieve six marks the validity of the data needs to be discussed. This was rarely seen in studies moderated. Validity has to do with whether the data are sufficient to give a firm conclusion. Comparing two data sets to show concurrence or comparing quantities calculated from the data with known values could show this. It doesn't matter whether the data is valid or not, as long as its validity is assessed.

Quality D (Justifying a Conclusion)

Centres were usually quite accurate in assessing this part of the Data Task. There was sometimes a tendency to give too high a mark for a conclusion which was correct science but which was not really linked to the data which had been produced.

It is important that the science used in explaining the trends and patterns observed is correct and that it explains all of the trends and patterns completely.

To gain six marks the explanation should also be set out logically, demonstrating understanding of the science involved.

Quality E (Planning Further Work)

Gaining full marks in this quality was a rare occurrence. There were a number of problems, all regularly seen.

- The further work planned had little to do with the question asked.
- The further work was planned in insufficient detail.
- The second part of the question was not addressed.

Centres are reminded once more that the assessment grid is hierarchical so, if there is insufficient detail in the method, the maximum mark which can be scored is three.

If the work planned does not address the question asked then no marks can be scored.

The detail has to be sufficient to allow a third party to carry out the intended experiment. It is not necessary to write a full page of very detailed instructions but the following basic information must be included.

- What variable will be changed and how.
- What variables will be held constant and how.
- What range of reading will be taken.
- How the data obtained will be treated.

The method used for the original data task can be used as a starting point to save having to give a detailed description of apparatus. Candidates are not expected to devise a totally new experimental method but to adapt the method already used.

The discriminator which decides whether more than four marks can be scored is an appreciation of how the results of the experiment increase understanding of the topic. This can usually be achieved by a good answer to the second part of question 5.

E Practical Skills

This is a mark given by the centre as a summary of the practical skills demonstrated by each candidate over the period of the course.

The intention is to gain a general impression rather than to have a snapshot of the skills on a particular occasion.

Some centres had a good range of marks but it was surprising to see how many centres had a complete cohort all scoring six marks.

F Separate Sciences

The problems and successes noticed in work submitted for the separate sciences were the same as for Additional Science in both Research Studies and Data Tasks.

The overall scores tended to be higher because, in general, candidates were of higher ability.

It was rare to see examples of Research Studies and Data Tasks from the units attached to the separate science (modules 5 and 6) and some were not seen at all.

Many of these skills exercises provide interesting ways of delivering and enhancing the separate science units. I hope to see them used more next year.

G Grade Boundaries

Grade	A*	A	B	C	D	E	F
Mark/60	52	47	41	36	30	24	18

Since the same work can be submitted for Additional Science and Biology, Chemistry or Physics the grade boundaries apply for B626, B636, B646 and B656. Approximately one third of the separate science cohorts used Additional Science Skills Assessments rather than Science Skills Assessments. A great deal of care was taken to ensure that performance by the two routes was comparable.

The grade thresholds have been decided on the basis of the work that was presented for award in June 2008. The threshold marks will not necessarily be the same in subsequent awards. Some adjustments may be expected as experience with the mark descriptors grows.

Grade Thresholds

General Certificate of Secondary Education
Chemistry B (Specification Code J644)
June 2008 Examination Series

Unit Threshold Marks

Unit		Maximum Mark	A*	A	B	C	D	E	F	G	U
B641/01	Raw	60	-	-	-	35	29	23	18	13	0
	UMS	69	-	-	-	60	50	40	30	20	0
B641/02	Raw	60	45	37	29	22	17	14	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0
B642/01	Raw	60	-	-	-	35	29	23	17	11	0
	UMS	69	-	-	-	60	50	40	30	20	0
B642/02	Raw	60	45	37	29	31	17	15	-	-	0
	UMS	100	90	80	70	60	50	45	-	-	0
B645/01	Raw	60	53	49	44	40	35	30	25	20	0
	UMS	100	90	80	70	60	50	40	30	20	0
B646/01	Raw	60	52	47	41	36	30	24	18	12	0
	UMS	100	90	80	70	60	50	40	30	20	0

B645 & B646 - The grade thresholds have been decided on the basis of the work that was presented for award in June 2008. The threshold marks will not necessarily be the same in subsequent awards.

Specification Aggregation Results

Overall threshold marks in UMS (ie after conversion of raw marks to uniform marks)

	Maximum Mark	A*	A	B	C	D	E	F	G	U
J644	300	270	240	210	180	150	120	90	60	0

The cumulative percentage of candidates awarded each grade was as follows:

	A*	A	B	C	D	E	F	G	U	Total No. of Cands
J644	24.8	55.0	78.9	92.6	97.4	99.2	99.7	99.9	100.0	8917

9001 candidates were entered for aggregation this series

For a description of how UMS marks are calculated see:
http://www.ocr.org.uk/learners/ums_results.html

Statistics are correct at the time of publication.

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