RECOGNISING ACHIEVEMENT

GCSE

Chemistry B

Gateway Science Suite

General Certificate of Secondary Education **J644**

OCR Report to Centres

June 2012

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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 specification content, of the operation of the scheme of assessment and of the application of assessment criteria.

Reports should be read in conjunction with the published question papers and mark schemes for the examination.

OCR will not enter into any discussion or correspondence in connection with this report.

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General Certificate of Secondary Education

Chemistry B (Gateway) (J644)

OCR REPORT TO CENTRES

Overview

The number of candidates aggregating this session has increased over June 2011. This increase in candidates was shown in components B642, B645 and B646. However the number of candidates taking component B641 has reduced dramatically following the introduction of a new specification. The entry policy by Centres has been very good and only a small proportion of the candidates were entered for the wrong tier of entry.

All the examination papers differentiated effectively and allowed candidates to demonstrate their knowledge and understanding of GCSE Chemistry.

In terms of the skills assessment components the majority of candidates still take B645 rather than B646.

This session there was an improvement in the writing of both word and symbol equations, however candidates found equations involving electrons the most difficult type to balance and often gave electrons a positive charge using the symbol e^+. Candidates found all aspects of electrolysis difficult whether it was simple recall, electrode reactions or quantitative questions.

Candidates often found the recall of knowledge and understanding more difficult than analysis or application and there were several examples in the written components where simple knowledge was not recalled by many candidates. For example in B642/02 candidates could not remember how ethanol was manufactured by fermentation and by hydration.

Although there has been an improvement with quantitative work candidates still do not show their working out in a clear logical fashion making it difficult to award error carried forward marks. Candidates find percentage yield calculations quite easy but find calculations involving reacting masses and ratios very challenging.

B641/01 Modules C1, C2, C3 (Foundation Tier)

General Comments

This was a small cohort, as it was a legacy paper and most candidates were re-taking the module. The mean for the examination paper was 30 and the range of marks was from 11 to 49. There was little evidence that candidates had been entered for the wrong tier of entry.

Many candidates have benefitted from the advice in previous reports to Centres, but some of the difficulties highlighted in January 2012 were still apparent. Candidates still find balancing equations, atomic structure and aspects of the Periodic Table difficult.

Many candidates could not write chemical formula correctly and used the wrong case, size of subscript or large gaps between symbols.

Candidates were generally able to use data given in the stem and found recall questions more challenging.

The examination paper differentiated well and there was no evidence of misunderstanding of any questions. All candidates made good use of the time and were able to make a thorough attempt at the paper.

Comments on Individual Questions

Section A – Module C1

Question One

In (a) the majority scored a mark for damage to wildlife, but not many scored the second mark. A number of candidates gave two examples of wildlife.

Many candidates in (b)(i) recognised diesel as the missing fraction. In 1(b)(ii) just over a third of the candidates understood that the fraction at the top of the fractionating column has the **lowest** boiling point. Many thought it had the highest boiling point and so failed to score.

Question Two

Most candidates got the correct answer in (a)(i) and many were awarded the mark in (a)(ii). In (a)(ii), a common error was to repeat the information in the stem of the question. In (a)(iii), common answers awarded a mark were all about the poisonous gases produced. Some candidates referred to global warming and others about the ozone layer. Other candidates just mentioned pollution which was not sufficient.

Half the candidates in (b) scored both marks, but many candidates did not use the information in the table and gave names such as chlothene.

Many candidates in (c) did not know what polymerisation is. A common misconception was that it is a reaction that changes one fraction into another fraction.

Question Three

In (a), a large proportion of the candidates referred to the colour change and the change in mass.

Most candidates in (b)(i) were awarded a mark, but a number gave 10.5 as the temperature change. Most candidates recognised copper sulphate in (b)(ii).

In (c)(i), many candidates did not mention the use of a spirit burner and a common misconception was to refer to a Bunsen burner. In (c) (ii), many candidates gave answers that were credited on the mark scheme. Other candidates focused on the masses of fuel and water.

Question Four

In (a), many candidates could not explain why the compound was a hydrocarbon. Often candidates did not refer to only carbon and hydrogen or referred to a mixture of carbon and hydrogen.

Some candidates in (b) referred to an equals sign rather than a double bond.

A significant proportion of candidates deduced the correct number of atoms in (c).

In (d), many candidates gave incorrect subscripts or superscripts in their answer.

Section B – Module C2

Question Five

In (a), a small, but significant proportion of candidates selected concrete instead of steel.

Candidates often got the two recall questions in (b) and (c) correct.

A large proportion of candidates in (d) appreciated that granite was the hardest rock.

Question Six

In (a), many candidates appreciated that carbon monoxide was toxic although a significant proportion referred to harmful or dangerous which was not sufficient for a mark.

Candidates in (b) often referred to global warming rather than acid rain or ozone depletion.

Many candidates could not construct the balanced equation in (c) and often changed the formulae given in the question.

In (d)(i), many candidates did not recognise nitrogen as an element. Most candidates in (d)(ii) did not write about particles or the number or frequency of collisions.

Question Seven

In (a), many candidates could interpret the data in the tables, although some candidates described the usage rather than how the percentages had changed.

Many candidates gave a use for steel in (b)(i) the most common answer being as a building material. Only a small proportion of candidates could recall the meaning of the word alloy in (b)(ii) although more were able to give the name of another alloy in (b)(iii).

In (c) many candidates gave vague answers about the environment or that metals can be re-used or recycled.

Many candidates in (d)(i) referred to corrosive or non corrosive. In (d)(ii) many candidates did refer to magnetic attraction in their answers.

Section C – Module C3

Question Eight

Many candidates could write the word equation in (a).

The properties of magnesium in (b) were not well known. Common mistakes were that magnesium oxide is a gas at room temperature and that it does not conduct electricity when molten.

In (c)(i), many candidates could use the information in the table but in (c)(ii) candidates did not appreciate which particles were found in the nucleus and as a result often gave 12 as the answer.

Question Nine

Candidates could use the Periodic Table to give the atomic number and the group in (a) and (b), but found (c), (d) and (e) much more difficult. 35.5 was a common misconception for (c) and 80, 35 or 7 for (d).

Many candidates in (e) could not recall that chlorine was green while other candidates thought chlorine was a liquid at room temperature.

Question Ten

In (a) many candidates could interpret the results table and the test for carbon dioxide was well known in (b).

A significant proportion of candidates in (c)(i) could deduce that $FeSO_4$ contains three elements. In (c)(ii) only an extremely small proportion of candidates gave the correct observation. Most candidates gave bubbles of gas or a change of colour.

The flame test colour for sodium in (d) was not well known.

Question Eleven

In (a) candidates obtained a range of marks. A significant proportion of candidates did not know one or both of the gas tests. To score full marks they had to give both tests and both positive results.

Many candidates in (b) did not recognise water as a molecule. There were a number who did not make a choice.

B641/02 Modules C1, C2, C3 (Higher Tier)

General Comments

The overwhelming majority of candidates appeared able to attempt all questions within the allotted time with very few blanks. More calculations were worked out by candidates than in previous years.

Question 3b (i) probably had the most wrong answers to a calculation and this was invariably due to candidates using the mass of fuel rather than the mass of water when carrying out the calculation.

Question 3c illustrated that candidates are still unable to describe an exothermic reaction correctly in terms of bond making and breaking. This is an area that Centres should focus on in their teaching.

Q10 (d) Candidates were expected to draw the covalent molecule chlorine; compared to a few years ago most candidates were able to do this.

Q11 (c) exposed weaknesses regarding candidates' ability to distinguish between types of particles and forces at work within ionic/covalent compounds.

Comments on Individual Questions

Section A – Module C1

Question One

(a) Mainly well answered. A few candidates thought LPG had the highest boiling point. Many candidates giving far more information than required with frequent references to molecular size and intermolecular forces.

(b) A number of candidates confused distillation with cracking. A number of answers were too general – different sized molecules with different boiling points. Some candidates referred to height in the column rather than temperature.

Question Two

(a) Generally well answered. Some talked about the cup melting rather than dissolving and consequences of the cup dissolving were not always made clear e.g. break or break down.

(b) Well answered, most candidates were able to select the correct definition of polymerisation with 'a reaction in which many small alkane molecules join together' acting as a good distracter.

(c) Lots of too general answers like 'harmful gases' and 'pollution' did not score, but many candidates scored a mark for 'toxic gases' or named a correct gas.

Question Three

(a) Many candidates were able to describe how to ensure a fair test.

(b) (i) Many candidates used mass of fuel rather than mass of water when calculating the energy and scored no marks for their answer of 218.4 instead of the correct answer 10920 J.

(b) (ii) Most could correctly halve their answer to 2b (i) but a number divided by 100.

(c) Many wrong descriptions of an exothermic reaction. Answers like 'requires more/less energy for bond making than bond breaking', 'more bonds are made than broken', 'the energy taken in during bond breaking was then released as heat' were prevalent.

Question Four

(a) Most candidates stated or implied 'only' with some starting and finishing with that word or writing it in capitals or underlining it. Wrong answers either omitted idea of 'only', or referred to hydrogen or carbon molecules, including carbon dioxide or oxygen.

(b) Well answered. Most candidates knew that an alkene has a double bond.

(c) Most candidates were able to interpret the displayed formula and write the molecular formula of butane correctly as $C_4H_{10.}$ A few candidates must be more careful in how they write subscripts.

(d) The polymer was correctly identified as D by most candidates.

Question Five

(a) Most referred to prevention of growth of bacteria/mould/microbes and scored. A few candidates gave answers which were too general, like ideas of preventing food going off/extending shelf life.

(b) Generally well answered, with 'active' a slightly more popular wrong answer than 'insulating'.

Section B – Module C2

Question Six

(a) Whilst most referred to incomplete combustion or lack of oxygen to explain why carbon monoxide is made in a car engine, a number just referred to it being formed as a product of combustion or when carbon reacts/combines with oxygen.

(b) Mainly correct. A small number attempted to balance the equation by changing the formula of NO to N_2O_2. Almost no issues regarding case or subscript.

(c) (i) Some good answers here talking in terms of activation energy, most talked of fewer collisions with many referring to less frequent collisions.

(c) (ii) All too many failed to achieve this mark because the answer didn't include a time element, just 'more collisions'.

Question Seven

(a) The chemical name for rust, hydrated iron(III) oxide was not well known. Common incorrect answers included iron(II) oxide, iron hydroxide, hydrogenated iron oxide, etc.

(b) Salt was the most common answer but some named oxygen/water or some kind of acid.

(c) (i) Most candidates were able to identify when the reaction stopped.

(c) (ii) Very pleasing to see many candidates able to calculate the rate of reaction as 3 cm^3/min correctly.

(d) This is probably the best discriminator on the paper. In effect there were four half marks and few managed to make four correct points in order to score two. They may have identified slow corrosion, but did not go on to say giving longer life. Density and lightweight were frequently confused or used interchangeably when they should not have been. Low density / weight were often linked to speed rather than fuel economy. Many candidates did score one mark by correctly listing two correct properties.

Question Eight

(a) A few identified the paint as a colloid and then almost always scored a second mark for dispersed/suspended. A few candidates correctly realised that the particles are too small to sink. Many got totally confused by writing about hydrophobic and hydrophilic ends to molecules.

(b) Many candidates thought the paint just dried without giving any explanation. A number did say it was oxidised.

(c) Well answered, although a few candidates failed to give a full answer, just saying that the phosphorescent paint absorbed light and a few thought it glowed because it was radioactive.

Question Nine

(a) Most candidates able to name glass or concrete as being made from sand.

(b) Granite was usually named as the hardest rock. Marble was the most common incorrect response.

(c) Limestone or marble were usually given as correct answers but sometimes a metal was named.

Section C – Module C3

Question Ten

(a) There are 7 electrons in the outer shell of bromine, but too many candidates gave 1, 17 or 35.

(b) Bromine has 4 shells. Many candidates gave 3 as their answer, possibly looking at the chlorine diagram.

(c) Chlorine is a green gas. Some candidates just put ‘green’. Unfortunately there were a variety of other incorrect answers, both in terms of state and colour, e.g. blue liquid.

(d) This was very well done, only a few attempted to show ionic bonding.

Question Eleven

(a) Few unable to complete the word equation.

(b) (i) Many candidates calculated that there are 24 particles in the nucleus of a magnesium ion, but too many answers of 34 or 22.

(b) (ii) Most appreciated that electrons were lost from the atom in forming the ion, but a few failed to say how many.

(c) (i) A number spoiled what might have been a good answer by slipping in the terms atoms/molecules instead of ions to explain why magnesium oxide has a high melting point. Too many candidates incorrectly wrote about strong intermolecular bonds.

(c) (ii) Many candidates thought that magnesium oxide(s) does not conduct electricity because there are no delocalised electrons. The expected answer was the ions cannot move. A few candidates thought there was not enough space for the electricity to get through.

B642/01 Modules C4, C5, C6 (Foundation Tier)

General Comments

The paper differentiated well, allowing candidates to demonstrate their knowledge and understanding of chemistry. Candidates performed much better on Section A (Module C4) than on Sections B and C (Modules C5 and C6). The average mark for this examination paper was 30, and the marks awarded covered a wide mark range.

Candidates performed well on questions that involved analysis and interpretation. In some questions candidates needed to have a more secure knowledge of aspects of the specification.

Candidates used their knowledge and skills appropriately to respond to the questions on the Haber Process, water and rusting.

Candidates did not seem to have the knowledge required to respond to questions about quantitative analysis, fuel cells, fermentation, hardness of water and the chemistry of sodium chloride.

Comments on Individual Questions

Section A - Module C4

Question One

This question was about fertilisers.

(a) Most candidates made a good start to the paper, scoring the mark for the idea that fertilisers increase crop yield, replace essential elements or make plants grow bigger/faster. When candidates did not gain the mark it was usually because they were not precise in their use of scientific terminology, stating simply that fertilisers make or help plants grow.

(b) Many candidates scored the mark for nitrogen. Nitrates was a common error.

(c) In part (i) most candidates gained credit for correctly identifying apparatus A as a measuring cylinder. As in (a), when candidates did not gain the mark it was usually because they were not precise in their use of scientific terminology, giving answers such as measuring tube. To score the mark in part (ii) candidates needed to realise that the pH of the alkali would decrease when acid was added. References to the colour change of the indicator did not gain credit.

(d) Incorrect responses to part (i) often included 7 (the number of atoms in the formulae) or 6 (obtained by counting ‘SO’ as a single atom). In part (ii) many candidates correctly calculated the relative formula mass as 174.

Question Two

This question was about ammonia and required some interpretation of information.

(a) Most candidates correctly identified the symbol $\rightleftharpoons$ as indicating a reversible reaction.

(b) Air was usually correct, although natural gas was a common misconception.

(c) Many candidates scored the mark for the idea that unreacted nitrogen and hydrogen are recycled. When candidates did not gain the mark it was usually because they were not precise in their use of scientific terminology, stating simply that the unreacted nitrogen and hydrogen were re-used. Candidates needed to explain their answer further by making it clear that the gases were re-used in the reactor.

(d) Candidates responded well to the data interpretation question in part (i) and were able to identify that increasing the temperature increased the percentage yield of ammonia. The conditions that give the greatest yield of ammonia were usually correct in part (ii).

Question Three

This question was about water.

(a) Most candidates scored the mark for naming a water resource.

(b) To gain the mark in this question, candidates needed to explain that drinking water is chlorinated to kill microbes or bacteria. Explanations in terms of cleaning the water or making it safe to drink did not gain credit.

(c) Most candidates were able to interpret the data in this question and identify the two ions present in the sample of water as bromide and sulfate. Bromine was a common error and credit was not given to candidates who wrote simply wrote halide.

Question Four

This question was about cleaning materials.

(a) Detergent in part (i) and rinse agent in part (ii) were usually both correct.

(b) Good responses to this question described that washing clothes at lower temperatures saves energy / reduces shrinkage of clothes / doesn't damage dyes / allows enzymes to work better. Others needed to develop their answers beyond superficial references to preventing damage to clothes or simply being better for the environment.

(c) Dry cleaning as a process that uses a solvent other than water was well known. Some candidates contradicted themselves by stating that dry cleaning did not use water, but used steam instead. Weaker candidates referred to hand washing or not putting clothes in the washing machine.

Section B - Module C5

Question Five

This question focused on the Contact Process.

(a) Candidates were required to name the raw materials in the Contact Process. Many candidates had not learnt this aspect of the specification.

(b) This question required candidates to write a balanced symbol equation for the reaction of sulfur dioxide with oxygen to make sulfur trioxide. One mark was awarded for the correct reactants and products and one mark for the correct balancing. The balancing mark was dependent on the correct formulae, but one mark was allowed for a balanced equation with a minor error in subscripts or formulae. When candidates did not gain marks it was often because they wrote an incorrect formula for sulfur trioxide, e.g. SO_4, despite being given the correct formula in the question, or attempted to balance the equation by placing numbers within the formulae, e.g. $2S2O_3$.

Question Six

This question tested ideas about chemical reactions and strong and weak acids.

(a) Almost all candidates interpreted the graph correctly in part (i) and gained the mark for the time it takes to make 20 cm^3 of gas. In part (ii) most candidates appreciated that the reaction was fastest between 0 – 200 seconds. Part (iii) was less well answered with many candidates stating that either all the gas had been produced or that the calcium carbonate had dissolved, which did not gain credit.

(b) Many candidates gained at least one mark for correctly explaining why the reaction was slower with ethanoic acid, either in terms of ethanoic acid being a weaker acid or ethanoic acid having fewer/less crowded particles. Fewer candidates scored two marks for both ideas. For the third mark candidates had to extend their answer to include the idea that fewer/less crowded particles would lead to fewer collisions or to appreciate that the particles were hydrogen ions. Simply stating that ethanoic acid is a weak acid, without an implied comparison with hydrochloric acid was insufficient to gain credit.

Question Seven

This question was about electrolysis.

(a) In part (i), most candidates appreciated that increasing the current would increase the mass of copper made. In part (ii) good responses described that the copper anode would get smaller or dissolve.

(b) Potassium and iodine were usually correct. Iodide was a common error.

Question Eight

This question required candidates to carry out some quantitative analysis.

(a) Most candidates interpreted the data correctly to calculate the mass of water made.

(b) Again, most candidates appreciated that doubling the mass of copper sulfate heated would double the mass of the white solid made.

(c) The mass of copper was usually correct.

Question Nine

This question required candidates to interpret information on food packaging.

(a) Many candidates correctly analysed the data to identify vitamin B1. Candidates that did not gain credit had not appreciated that they needed to compare the ‘mass of food type in g per 100g of cereal’ with the ‘RDA in g’, and either chose fibre (with the largest ‘mass of food type in g per 100g of cereal’ or sugars (with the largest ‘RDA in g’).

(b) In part (i) candidates needed to appreciate that baby milk has to be diluted so it is easier to digest. Many candidates had not learnt this aspect of the specification and answered in terms of not providing more than the baby’s RDA of food types. In part (ii) the unit for concentration was not well known.

Section C - Module C6

Question Ten

This question was about rusting.

(a) Water and oxygen / air were usually correct.

(b) Good responses to part (i) described that painting iron prevents water and/or oxygen or air reaching the iron. Others needed to develop their answers beyond superficial references to acting as a barrier or protecting the iron. In part (ii) most candidates could state at least one other method of stopping iron from rusting. Covering with oil and covering with grease was the same marking point and therefore only gained one mark. Credit was not given for the idea of keeping the iron away from water or oxygen.

Question Eleven

This question focused on fuel cells.

(a) Electrical energy was usually correct.

(b) Many candidates did not appreciate that fuel cells produce little pollution because water is the only waste product or they do not give off greenhouse gases.

(c) Good responses to this question appreciated the advantages of fuel cells as using direct energy transfer, being lightweight, not needing to be recharged or the idea that the water produced can be drunk by astronauts. Others needed to develop their answers beyond vague references to fuel cells not running out or producing little pollution. Weaker candidates did not link their answers to the use of fuel cells in manned spacecraft and many thought, incorrectly, that fuel cells would take up little room.

Question Twelve

This question was about fermentation.

(a) A correct use of ethanol was not well known. Credit was not given to candidates who simply wrote ‘alcohol’.

(b) Good responses to this question gave a precise description of the conditions needed for fermentation, i.e. 25 – 50°C, absence of oxygen, presence of water and enzymes. Vague conditions, e.g. ‘warm’, did not gain credit.

Question Thirteen

This question was about hardness of water.

(a) Most candidates correctly interpreted the data to identify C in part (i) and A in part (ii).

(b) Good responses to this question suggested that strong acids would react with, or corrode, the metal of the heater element or washing machine. Others needed to develop their answers beyond superficial references to damaging the metal. Credit was not given for incorrect use of scientific terminology e.g. strong acid would dissolve or erode the metal.

(c) Many candidates gained the mark in part (i) for calcium carbonate. Calcium hydrogencarbonate was a common error. In part (ii) candidates often gave an answer of 3, the number of elements in the formula, rather than 6. Five was also a common error, obtained by counting ‘CO’ as the symbol for one atom.

Question Fourteen

This question was about the chemistry of sodium chloride. Many candidates had not learnt this aspect of the specification.

(a) A wide variety of incorrect responses were seen.

(b) Less than 2% of candidates knew the test for chlorine gas. Using a lighted splint to obtain a squeaky pop was the most common incorrect response, but a wide variety of incorrect tests were also seen.

B642/02 Modules C4, C5, C6 (Higher Tier)

General Comments

The paper differentiated well and allowed candidates of all abilities to show positive achievement. The marks obtained by candidates covered almost all of the mark range. Only a very small proportion of the candidates were entered for the wrong tier of entry. There was no evidence that candidates did not have sufficient time to finish the examination.

Candidates found sections A and B much less demanding than section C.

Candidates' ability to write symbol equations has improved but candidates still find constructing half-equations very difficult.

There is evidence that candidates have used the mark schemes for previous sessions to aid their revision. However candidates do not always read the question carefully and give a rehearsed answer to the wrong question.

Comments on Individual Questions

Section A - Module C4

Question One

This question focused on fertilisers.

In (a), candidates had to mention that fertilisers provide essential elements or the name of an essential element. A significant proportion of candidates used the terms nitrates, phosphates or ammonium salts, but these were not given credit in the mark scheme. To be awarded the second mark, candidates had to link the essential elements with protein, amino acid, RNA or DNA.

In (b)(i), candidates could often state the acid and alkali needed to make ammonium sulfate, but there were a significant number of candidates that used ammonium instead of ammonia and sulphur instead of sulphuric acid. The best answers referred to neutralisation or the reaction between OH^- and H^+. Other candidates did not refer to a reaction and mentioned the acid balancing the alkali instead; this was not given credit on the mark scheme.

Many candidates in (c) could calculate the relative formula mass as 132 and the percentage composition of ammonium sulfate as 21.2%. A significant proportion of the candidates did not use 28/132 but used 14/132 instead.

Question Two

This question was about the Haber process.

Most candidates appreciated in (a) that the unreacted hydrogen and nitrogen was recycled. Candidates that stated that the reactants were reused were not given credit on the mark scheme.

A large proportion of the candidates were able to interpret the information in the table in (b)(i) and (ii).

In (c)(i), most candidates appreciated that a catalyst increases the rate of reaction, with the more able candidates explaining how an increased rate of reaction would decrease the costs. Candidates that mentioned the percentage yield increases were not awarded a mark. A common misconception in (ii) was that there would be no labour costs in an automated process. Candidates in (ii) often appreciated that a high pressure would give a high rate of reaction and/or a high percentage yield.

Question Three

Although many candidates drew a diagram in (a), the labels included were often inadequate and did not mention any form of attraction between the tail and grease and between the head and water. Candidates were more likely to be awarded marks from their written answers. The more able candidates referred to intermolecular forces, while other candidates referred to attraction or bonds.

Most candidates were able to give two advantages in (b). The most popular answers referred to the lack of colours running and/or that delicate fabrics could be washed.

Most candidates appreciated in (c) that dry cleaning did not involve any water.

Question Four

The formula for buckminsterfullerene was well known.

In (b), many candidates referred to the presence of delocalised or free electrons in graphite.

Candidates in (c) were normally awarded a mark for referring to the large surface area available in a nanotube; other candidates mentioned the ability for molecules to be trapped inside the tube. A significant proportion of candidates did not attempt this question.

Section B - Module C5

Question Five

In (a), most candidates gave the correct answer of 280 seconds although 240 seconds was a common error.

Many candidates in (b) did not know the relationship between the amount in moles and the volume of gas at room temperature and pressure. Only a small fraction of the candidates were able to calculate the amount in moles of 0.00075.

Many varied definitions of a limiting reagent were given in (c), many of which were correct. The most popular response was that a limiting reagent runs out first of all.

Candidates in (d) often did not refer to the presence of hydrogen ions as the reacting particle and referred to a lower concentration of acid particles in ethanoic acid. Candidates often did not mention collisions between particles and just referred to the number or concentration of particles present in ethanoic acid.

Question Six

Candidates were often able to calculate the mass of white solid in (a) as 1.6g, but found calculating the amount in moles of water in (b), 0.025 moles, much more demanding.

Candidates often recognised carbon-12 in (c).

Question Seven

This question focussed on the Contact Process.

In (a), many candidates could construct the balanced equation.

In (b), a significant proportion of candidates could recall that a catalyst had no effect on the position of equilibrium. The answer that the yield was increased was not considered a contradiction since the yield per day would be increased if the rate had increased.

Although many could recognise the correct answer, all the other options proved effective distractors.

Question Eight

This question focussed on electrolysis.

In (a)(i), most candidates chose 2.08g. Candidates found (ii) very difficult and only a very small proportion of the candidates were able to calculate the correct answer of 1440 coulombs. The most common misconception was to use the time in minutes rather than the time in seconds.

Many candidates in (b)(i) referred to the lack of free electrons rather than free ions in solid lead bromide. Candidates were often not able to construct the equation to show the reaction of bromide ions to make bromine molecules in (ii). Candidates often could not recall the formula of a bromine molecule and wrote Br instead.

Section C - Module C6

Question Nine

Many candidates in (a) made errors of omission when writing the word equation. The most common omissions were to miss out iron as a reactant.

The way paint stops iron from rusting in (b) and the meaning of the term redox reaction were both well known.

Question Ten

Candidates found (a) very difficult and a significant proportion of the candidates were unable to recognise either the reactant or the product.

Candidates found (b) very difficult and often put the electron on the wrong side of the equation.

In (c), candidates did not always appreciate the significance of the context and gave general advantages of a fuel cell rather than one related to a manned spacecraft. For example, the production of water that could be used as drinking water is an advantage, but the fact that the hydrogen comes from a renewable source is not really relevant within a spacecraft.

Question Eleven

In (a), calcium hydrogencarbonate was often recognised by candidates, but calcium sulfate and calcium carbonate were effective distractors.

Candidates often mentioned that the strong acid will react with the metal in the washing machine in (b). It was not sufficient to refer to the acid damaging the washing machine.

Many candidates in (c) could not explain how an ion-exchange resin works and a significant proportion of the candidates did not attempt the question. Candidates often chose the incorrect ions such as sulfate or carbonate rather than calcium or magnesium ions. Centres need to advise candidates that if they use the formulae of an ion rather than a name then the formulae must be correct.

Question Twelve

Distillation was the most popular answer in (a).

Many candidates were unable to give advantages and disadvantages for the two processes. Candidates often needed to make comparative statements and failed to do so. Common misconceptions were that fermentation was a fast process and required lots of energy. The most likely mark scored was that fermentation used a renewable resource.

Question Thirteen

The idea of subsidence in (a) was quite well known but often it was a description of subsidence rather than the word itself.

Only a small proportion of the candidates were able to recall both gases in (b); gases such as carbon dioxide or oxygen were frequent wrong answers.

B645 Can-Do tasks and report on Science in the News

The reports sent for moderation in this, the final year of this specification, were of a similar standard to recent years. Most centres applied the criteria appropriately and as a result the majority of centres had their marks confirmed. There are one or two places where centres consistently applied the criteria generously. Some centres still seem to have ignored the advice given in previous reports about the application of criteria.

There were significantly more arithmetical errors this year and often these were reducing the marks of the candidates. At least one centre, for example, failed to add the Can Do tasks marks to the total.

Centres should be assured that it is the role of moderators to support the marks given by the centre whenever possible. Annotation of the sample, to show clearly where marks are awarded, helps considerably in doing this.

Administration

Centres coped well with the system of selection of candidates, but sometimes the delay in sending in marks to OCR slowed the process. The Jubilee holiday also slowed down the process. As a result, some samples were late getting to moderators. Centres are reminded that completed CCS160 forms are necessary and not sending them also delays the process. Not putting centre and candidate numbers on the work, wastes more time in moderation and increases the risk of candidates being given wrong marks.

Supervision of candidates

Centres are reminded that candidates can only bring in copies of their sources to the supervised session. They must not prepare the reports beforehand and then copy them out. This is tantamount to drafting and redrafting which breaks the rules. Many candidates word process their reports. They should not have access to the Internet when they are writing their reports and should not have their sources electronically. Some candidates paste in large amounts from websites or paste in graphs from websites. Pasting in text alone from websites is of little value and pasted in graphs have no value.

Can do tasks

These were introduced to ensure that candidates entering for Science would have some practical experiences and credit could be given for this. It is disappointing that many candidates, who can score the maximum of 24 marks on Can Do tasks, can do little or nothing on Science in the News. A 3 mark Can Do task was intended to be challenging if done properly.

Science in the News

Every year new tasks have been added, but still centres choose tasks which have been available from Year 1. Some centres say it is because they have marking schemes for these tasks and so they prefer to use them. There should not be marking schemes and the reports should be marked against the criteria. With the new Controlled Assessments, the tasks will change every year and old tasks cannot be used. Marking these against the criteria is essential.

Quality A

This is about researching and continues to be important with Controlled Assessments. It is not about the number of sources, but the way they are used in the report that is important. For 4 marks there must be at least two fully referenced sources which are used in the report. Too many centres, having awarded 4 marks correctly, go on to award 6 marks when there is no real attempt at a balanced report. The aim of a Science in the News task is to get the candidates to look at both sides of a question equally and then by the end of the report come up with a reasoned answer. It is not unusual for the candidate to give the answer in the first sentence or for most of the evidence to point one way. This is not balanced.

Quality B

There is still the problem of candidates not identifying trends and teachers not being able to distinguish a trend from a fact. This will continue to be a problem in Controlled Assessments. Without a trend, irrespective of any attempt at processing, the mark is zero. For 4 marks there must be two trends stated and some basic processing which might involve changing data from one form to another eg table to graph, fraction to percentage etc. Still centres award over 4 marks when there has not been further processing to reveal additional information. Just plotting another graph does not match what is required as it is not finding out further information. Plotting an apparent anomaly on the graph drawn for basic processing again is not creditworthy as further processing to reveal additional information has not been carried out. Candidates should decide for themselves what further processing they should do. They should not be told what to do for further processing.

Quality C

As acknowledged in the recent publication on nomenclature by The Association for Science Education (ASE), the use of the terms reliability and validity within Science in the News does not match the way they are used in scientific investigations. Here it is a more everyday use of the terms. For 2 marks the candidate needs to comment upon the quality of information. However, for 4 marks there must be a comparison of likely reliability of sources which identifies, with some explanation, the most and least reliable. Sometimes candidates refer to usefulness of sources or order of preference of sources. These are not the same as reliability. To go higher there should be a consideration of the reliability and validity of data. With Controlled Assessments candidates do not have to consider the reliability of sources they use for Research.

Quality D

Here candidates consider the social, economic and environmental aspects of the topic. They do not have to consider all three, but there must be some depth in their responses to support high marks. They must also include correct and appropriate Science.

Quality E

This is where the candidate uses all their resources to come to an answer to the question. Without reference to sources, the maximum mark for an answer with a reason is 2. For 3 or 4 marks the candidate must show where the sources have been used. Only if the candidate considers the relative significance of the sources in coming to an answer, can a mark above 4 be considered.

Quality F

It was usually possible to support the marks awarded for this Quality. The only problem comes when the candidate has word processed the report and pasted in sections from sources. Marks can only be given for what the candidate has written themselves. If short sections are pasted in they should be highlighted.

The Skills Assessment associated with Gateway Science was intended to give candidates an opportunity to study a scientific question and with research come to an individual answer to the question. It is pleasing to read the balanced arguments of the better candidates.

B646 Research Study, Data Task and Practical Skills

General Comments

This is the final Principal Moderator's report for this specification.

Over the last five years the performance of candidates has steadily improved as Centres came to realise what was required and developed strategies to develop their candidates' performance. It has been a successful mode of assessment some aspects of which are retained in the new Controlled Assessment tasks.

Skills and strategies developed for the Data Task and Research Study still have some validity in the new form of assessment as exemplified below.

Research from identified sources in response to given topics is clearly common to both assessments.

Planning an investigation is also common though significantly more detail is required in the plan for the new Controlled Assessment than was required in the answer to Q5 in the Data Task.

'Interpreting the data' and 'Processing data' have much in common though more is required in the latter in terms of treatment of uncertainty.

'Analysis of the data' and 'Analysing and interpreting' are also similar though again the latter is complicated by the requirement to consider secondary data. This consideration makes assessment of validity easier in the Evaluation section.

Evaluation is common to the two assessment schemes. Though the criteria are not identical, they are very similar.

The sections on conclusions also have their similarities with the addition of a link back to the research in the Controlled Assessment version.

Centres intending to undertake Gateway Controlled Assessment for the first time next year are encouraged to read the Principal Moderator's report for B713.

Data Task

A: Candidates usually showed ability in this quality. Graphs were correctly plotted on axes which were appropriate though sometimes units and titles were missing. The main problem found was graphs which were rather too small either because axes were inappropriately scaled or because the area of the grid covered was too limited.

B: Marks of four in this quality were common reflecting the ability of candidates to undertake simple processing such as averaging and to describe the basic pattern observed. Justified marks of more than four were rare as few candidates undertook significant further processing. Where Centres had provided hints as to what might be attempted, this was not often successful as candidates did not appreciate the reason for the processing and, thus, failed to reveal any additional information.

C: Candidates still find difficulty in addressing both data and method in this quality. Answers which examined the method in detail without considering the data were not worth much credit. The best way to cope with this quality is to start with the data and proceed to explain how the method affected the data described. There was some improvement in the performance of candidates in this quality.

D: Poor conclusions did not link with the data produced during the task and did not adequately use scientific explanations to explain the patterns found. There was also a problem with candidates miss-remembering explanations which they had been given in advance of attempting the task. Good answers were given by candidates who understood the science behind the investigation and who explained it by linking their explanation to results obtained.

E: It is important to realise that the experiment described must answer the question posed. Alternative experiments scored few marks. In order to score four marks the experiment must be described in sufficient detail to allow it to be performed by a third party. The variables and how they will be controlled/measured must be there as must a range of values to be used. Without a sufficient plan, answers to the second part of the question could be given no marks.

Research Study

A : Over the years, candidates have become better at scoring marks for this quality. In many Centres most candidates scored well with answers to all five questions clearly referenced with their sources. The sources were referenced either with a full URL or with sufficient details of a book and author.

B: Again the performance of candidates seems to have improved over the life of the specification. Candidates are including some science in their answers and even where this is copied or paraphrased from a source it is worth some credit if it is relevant. The best answers were where candidates had internalised the science and then used it to explain their answers to the questions.

C: Similarly candidates were, for the most part, able to relate their answers to the topic of the study through exploring areas on the specification in more depth or in explaining links to connected everyday topics. Again the best answers were those in the candidate's own words making use of information gleaned from sources.

D: Centres were usually quite accurate in awarding marks for this quality and it was quite rare to have to change them. Where this did prove necessary it was because there were many 'quotes' from sources which were not in the candidate's own words. Only the candidate's own work can be given credit for QWC.

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