OCR
RECOGNISING ACHIEVEMENT

GCSE

Chemistry B

Gateway Science Suite

General Certificate of Secondary Education **J644**

OCR Report to Centres

January 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.

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General Certificate of Secondary Education

Chemistry B (Gateway) (J644)

OCR REPORT TO CENTRES

Overview

All four papers differentiated well and allowed candidates to demonstrate positive achievement in Chemistry. Most candidates were entered for the appropriate Tier and attempted most of the questions.

In the two B642 papers there was an improvement in the candidate's ability to deal with quantitative questions although the conversion from cm^3 to dm^3 was often missing. Overall candidates were able to balance symbol equations when given the formulae to use but find writing the formula of compounds difficult.

There is lots of evidence that candidates have been using previous mark schemes to aid their revision. However candidates often give a mark scheme answer and do not appreciate that the question was different. It is important that candidates read the questions carefully and make sure that the answer they write down actually addresses the question that is set.

As in previous series, candidates found questions on structure and bonding difficult and were not able to distinguish effectively between intermolecular, covalent and ionic bonds. In the same way, candidates often confused particles, for example confusing molecules with ions.

Candidates could often cope with the questions that involved data analysis and interpretation but in the B642 papers were not always able to give accurate definitions to chemical terms such as relative atomic mass.

In this series, candidates were particularly weak on their knowledge of titration and hardness in water.

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

General Comments

Similar to previous years, the number of candidates in January was small, approximately 700. The overall performance of the candidates was similar to previous years.

Candidates found Section C the most difficult. It was disappointing to see questions testing candidates understanding of the Periodic Table continually being wrongly answered.

Candidates continue to find success at writing word equations. The candidates were not able to balance the one symbol equation on this paper.

Data interpretation questions were in general well answered.

There was no misunderstanding of any question and all candidates made a thorough attempt at this paper.

Comments on Individual Questions

Section A – Module C1

1(a) few candidates knew that small molecules which join to make a polymer are called monomers.

1(b) (i) (ii) these data interpretation questions were well answered.

1(c) most candidates could write down a use for polystyrene.

1(d) about half the candidates understood what biodegradable meant.

2(a) very pleased to see that nearly all candidates were able to add up correctly the number of carbons and hydrogens in heptane.

2(b) about half the candidates were able to identify oxygen as the gas heptane burns in and similarly for 2(c)(i) water was correctly named as the condensate by about half the candidates. Many repeated the name of the burning gas, heptane. In 2(c)(ii) most scored a mark for knowing that lime water goes cloudy, but only a third realised that carbon dioxide was responsible.

3(a) (b) very well answered.

4(a) (i) (ii) and b (i) (ii) were well answered.

4(c) few candidates understood the function of an antioxidant. Many incorrect responses referred to stopping food going off, stopping oxygen getting to the food; increase the shelf life of the food or taking oxygen out of the food.

Section B – Module C2

5(a) (b)(i) both question well answered especially b(i) where almost every candidates correctly used the graph to find out how long it took to make 20cm^3 of gas.

5(b)(ii) few candidates could explain why a reaction stops. A simple answer like all the powder has reacted or all the acid has reacted would have sufficed. A common misconception was that no more gas was being made.

5(c) there were some very good graphs sketched correctly onto the graph and scored two marks, at the worst one mark. Many candidates failed to read the question and attempted to draw graphs on the question paper for which credit was given if correct.

6(a) very well answered, most candidates could link the material to its job in the paint.

6(b) few candidates could explain how paint dries. A number of candidates knew that air or oxygen was involved but the idea that the drying of a liquid involves evaporation was not well understood. A common incorrect answer was that the paint dries slowly.

6(c) (d) both questions required a choice from a list and were fairly well answered.

The two data interpretation questions 7a (i) and 7a (ii) were very well answered.

7(b) had many answers that were two imprecise – using terms like save the planet, environmentally friendly and avoids pollution as reasons for the importance of recycling materials from old cars. The concept that it will save having to mine, or use new materials was lost on most candidates.

8(a) most candidates knew the percentage of nitrogen in the air or calculated it.

8(b) differentiated well. Only the better candidates scored 2 marks. Some candidates did not include enough detail and scored one mark for correctly naming the gas given off or taken in during photosynthesis and in respiration

9(a) Only a third of the candidates were able to write down the number of atoms in the formula $CaCO_3$. Some candidates looked up atomic numbers and added them others gave answers that ranged from 3 to 7. Similarly the balancing of the equation proved to be one of the most difficult questions on the paper.

Section C – Module C3

10(a) (i) (ii) (ii) few candidates were successful in answering these questions. The reason why elements are in a group or period of the Periodic Table was not well known.

10(b) many candidates gave fluorine as the correct response to part (b). The most common incorrect answer was beryllium which has an atomic mass of 9.

10(c) few candidates knew the relative charge and mass of a neutron.

11(a) the flame test colours were known by about half the candidates.

11(b) very few candidates scored more than one mark for explaining why sodium is kept under water. Many candidates gave one reason and did not appreciate that the mark allocation suggested two reasons.

11(c) it was a pleasure to see so many candidates correctly naming the compound, potassium chloride.

12(a) it was expected that most candidates would be able to name a transition metal but this question illustrated the candidates could not use the Periodic Table.

12(b) candidates understood thermal decomposition but worded their answer so badly that the term decomposition was repeated rather than defined as substances breaking down. Most knew that heat was required so scored 1 mark.

13(a) candidates could write word equations. In 13(b) many could recognise the particles as ions.

13(c) did not differentiate; it is possible many candidates irrespective of their target grade, just guessed. Few knew that magnesium oxide has a very high melting point.

14(a) (c) (ii) (ii) all these questions were very well answered.

14(b) answers to this part were too vague eg tungsten has a high melting point. The expected answer is tungsten has a melting point above 2000^{o}C.

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

General Comments

The paper differentiated well and performance across the three sections of the paper appeared to be fairly consistent, allowing candidates to demonstrate their knowledge and understanding of chemistry. The average mark for this examination paper was 35.4, and the marks awarded covered almost all the 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 gases in the air, rates of reaction and Group 1 elements.

Candidates did not seem to have the knowledge required to respond to questions about the displayed formula of a polymer, paints and pigments and energy changes in chemical reactions.

Comments on Individual Questions

SECTION A – MODULE C1

Question 1

This question tested ideas about polymers and required candidates to interpret information.

(a) Most candidates made a good start to the paper scoring at least 1 mark for a condition needed for polymerisation. When candidates did not gain both marks it was often because they were not precise in their use of scientific terminology, stating simply pressure rather than high pressure.

(b) Candidates responded well to this data interpretation question and were able to identify E as the best material for making the pipe because it was insoluble in oil and had a melting point above 100ºC. When candidates did not gain full marks it was usually because they simply stated that polymer E had a high melting point, without relating the melting point to the temperature of the oil.

(c) To gain the mark in this question, candidates needed to explain that the forces or bonds between the polymer chains are weak or describe that the polymer molecules can slide over one another. When candidates did not gain the mark it was usually because they confused intermolecular and intramolecular bonds.

(d) This part of the question differentiated well. To score the mark candidates needed to draw the basic covalent structure of the polymer poly(chloroethene), including the correct use of brackets. Candidates who wrote the formula without an ‘n’ to indicate many repeat units were not penalised. Credit was also given to candidates who drew 2 or more repeat units. Candidates need to ensure that they include the bonds at the side in the polymer structure to gain credit. Structures containing double bonds or only 3 bonds on carbon atoms did not gain marks.

Question 2

This question was about burning fuels and energy changes.

(a) Most candidates correctly identified water as the liquid that condenses in tube A in part (i). Candidates showed a sound understanding of the test for carbon dioxide in part (ii) and were able to describe that the limewater would turn milky/cloudy due to the presence of carbon dioxide gas.

(b) Candidates needed to appreciate that bond formation is exothermic and to then describe that more energy is given out during bond formation than is taken in during bond breaking. When candidates did not get marks it was usually because they simply stated that the burning of heptane is exothermic because the reaction gives out heat energy or gave an answer in terms of the number of bonds broken or made.

(c) Many candidates scored both marks for 5250J. One mark was awarded for candidates who used the mass of fuel, instead of the mass of water, or who used the combined mass of the water and the fuel.

Question 3

This question was about perfumes.

(a) Good responses to this question explained that perfume needs to be non-toxic so that it does not poison you and insoluble in water so that it is not washed off easily. Others needed to develop their answers beyond superficial references to perfume not harming you. Some candidates confused insolubility in water with the fact that perfumes don't react with water.

(b) This question discriminated well. Many candidates often scored 1 mark for the idea of weak intermolecular forces. The other mark was for either the idea of the forces between the particles being weakened or overcome or the idea that particles with lots of energy escape from the liquid. Simply describing evaporation without any valid explanation was insufficient. References to diffusion also failed to score.

Question 4

This question required candidates to write a balanced symbol equation for the thermal decomposition of baking powder. One mark was awarded for the correct reactants and products and 1 mark for the correct balancing. The balancing mark was dependent on the correct formulae, but 1 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 sodium carbonate, eg $NaCO_3$, or attempted to balance the equation by placing numbers within the formulae, eg $2Na2HCO_3$.

SECTION B – MODULE C2

Question 5

This question focused on paints and dyes.

(a) Candidates needed to appreciate that emulsion paint dries when the solvent/water evaporates. Credit was also given for references to oxidation.

(b) To gain the mark in part (i) candidates needed to describe that a colloid contains pigment particles that are dispersed in the solvent or liquid. When candidates did not gain credit it was usually because they described particles dissolved in a liquid. In part (ii), many candidates were able to explain that the pigment particles are too small to sink.

Question 6

This question tested ideas about rates of reaction.

(a) As in Q4, 1 mark was awarded for the correct reactants and products and 1 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 H instead of H_2 for hydrogen gas.

(b) Most candidates interpreted the graph correctly and gained the mark for the time at which the reaction stops.

(c) Many candidates showed a good understanding of how using powdered zinc, instead of lumps of zinc, would effect the reaction and were able to sketch the new results on the graph.

Question 7

This question was about the air.

(a) For 1 mark candidates were required to complete the table to show the percentages of nitrogen and oxygen in clean air. Many candidates had not learnt this aspect of the specification.

(b) Many candidates showed a good understanding of how photosynthesis and respiration keep the percentages of carbon dioxide and nitrogen in the air fairly constant.

(c) To gain the mark in this question, candidates were required to put the possible steps in the formation of the atmosphere in the correct order. One mark was awarded if just two steps were in the correct order.

Question 8

This question focused on construction materials.

(a) The balanced symbol equation for the thermal decomposition of calcium carbonate was well done by candidates. Attempting to balance this, already balanced, equation or inclusion of '+ heat' in the equation were the most common errors.

(b) Good responses to this question described the fact that reinforced concrete combines the strength/flexibility of steel with the hardness of concrete. Others needed to develop their answers beyond superficial references to reinforced concrete being stronger without clearly referring to the steel. Some candidates described concrete as preventing the steel from rusting and did not gain credit.

Question 9

This question also tested ideas about rates of reaction.

(a) Most candidates interpreted the data in the table correctly and gained the mark for identifying experiment A as having the highest concentration of hydrochloric acid.

(b) Many candidates gained at least 2 marks for correctly explaining why the reaction was faster at a higher temperature, either in terms of particles moving faster/having more energy and more frequent collisions occurring. Fewer candidates scored the third mark for the idea that the collisions were more energetic or successful. Simply stating that more collisions will occur did not gain credit unless no other marks were awarded.

SECTION C – MODULE C3

Question 10

This question was about atoms.

(a) In part (i), most candidates appreciated that element B is in Group 1 because it has 1 electron in its outer shell. Part (ii) was also well answered, although a common error was stating that element E was in Period 3 because it needs to gain 3 electrons to get a full outer shell. D was usually correct in part (iii).

(b) In part (i) a range of answers for the relative charge and relative mass of a neutron were seen. Most candidates were able to complete the table to give the symbol for, and sub-atomic particles in, chlorine-37 in part (ii). One mark was awarded for the symbol and one mark for the sub-atomic particles, with the marking points being independent.

Question 11

This question focused on Group 1 elements.

(a) Many candidates were able to describe, in detail, how to carry out a flame test. Some candidates lost marks because they drew only a diagram, but failed to label it.

(b) Potassium chloride was usually correct.

(c) Most candidates were able to describe in some considerable detail what you would see when potassium reacts with water.

Question 12

This question was about the transition metal iron.

(a) This question discriminated well. One mark was awarded for an unbalanced ionic equation. The addition of incorrect charges to the formula for iron(II) hydroxide was a common error.

(b) Orange was a common error for the colour of the precipitate of iron(II) hydroxide.

Question 13

This question focused on ionic bonding.

(a) Most candidates wrote the correct word equation for the reaction of magnesium with oxygen.

(b) Again, most candidates could correctly draw a diagram to show the electronic structure of an oxygen atom. A common error was a structure of 2.8.

(c) Many candidates gained the mark for the diagram showing the electronic structure of a magnesium ion. A charge of 2- was a common error.

(d) To gain marks candidates had to be precise in their use of scientific terminology. Answers that included contradictions, eg the idea that magnesium oxide has a giant ionic structure with strong intermolecular forces, did not score full marks. Candidates who understood that a large amount of energy was needed to overcome the attractions in the structure gained credit.

(e) NaO_2 was a common error.

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

General Comments

Similar to previous years, the number of candidates in January was small, approximately 250. The overall performance of the candidates was similar to previous years.

Candidates showed improvement in their ability to perform percentage yield calculations.

Question 8 showed the candidates' lack of understanding of titrations. Not one candidate knew what a pipette was or what a pipette filler was. The majority assumed that a pipette was a little plastic measuring device ie a teat pipette.

Comments on Individual Questions

Section A – Module C4

1(a) this question discriminated well with candidates aspiring to grade C recognising that sulfuric acid has 7 atoms. Ammonium nitrate was a common wrong choice.

1(b) most candidates named ammonia or ammonium nitrate as the fertiliser.

1(c) few candidates knew that sulfuric acid is used as car battery acid.

1(d) very few candidates recognised the name of one of the two acids in the list that react with magnesium carbonate to make carbon dioxide gas. Sodium hydroxide was a common incorrect answer.

1(e) this question was better answered with many more candidates naming sodium hydroxide and hydrochloric acid correctly.

2(a) this question discriminated well with oxygen or air being correct answers. Water was also allowed in the mark scheme.

2(b) this question was well answered with two thirds of candidates able to list at least two costs.

3(a) few candidates knew the essential elements present in ammonium phosphate. Among the many incorrect answers, ammonium and phosphate predominated.

3(a) (b) both questions well answered. Almost all candidates knew that roots absorbed fertilisers.

3(d) this calculation discriminated very well. Most aspiring C-grade candidates were able to calculate the relative formula mass for ammonium phosphate as 149.

3(e) candidates either scored 0 or 2 for this calculation on percentage yield. There has been a distinct improvement in the success rate of candidates able to perform this type of calculation. Approximately two thirds of the cohort scored 2 marks.

4(a) (b) (c) enabled all but a handful of candidates to score 3 marks.

4(d) many candidates were able to balance the equation.

4(e) a difficult question that differentiated well. About a third of candidates recognised that sea water is alkaline and/or could neutralise acidic gases.

Section B – Module C5

5(a) a majority of candidates were able to identify an ion with three elements present.

5(b) although this calculation had a high omit rate, a significant proportion of the candidates successfully calculated the mass, in grams, of calcium ions in the sample.

5(c) candidates found this to be a difficult question and the question did not discriminate. Candidates who scored usually gained credit for the addition of more ions. Few spoke about evaporation of the water making the sea water more concentrated.

5(d) (e) both questions did not differentiate, many candidates just guessed the answers.

5(f) (i) most candidates knew that cathode is the negative electrode.

5(f) (ii) the majority of candidates scored 0 for this question. They had no idea why it is possible to electrolyse sea water. The few candidates who scored 1 mark wrote about ions, charged particles or particles moving but failed to link the two and score 2 marks.

6(a) about half the candidates recognised the state symbol ‘g’ as gas. Gram was the most frequently given incorrect answer.

6(b) this calculation differentiated well. The mathematical demands were met by just less than half the candidates.

6(c) The majority of candidates chose one correct sentence describing equilibrium but few managed two.

6(d) Few candidates had any idea what is meant by the statement ‘the position of equilibrium is on the right’. This question had a high omit rate.

7(a) (i) Disappointing to find so few candidates suggesting why the mass decreases in the reaction. Many candidates wrote about the solid dissolving others wrote about acid evaporating etc.

7(a) (ii) very well answered with most candidates able to interpret the data.

7(b) (i) surprisingly only about two thirds of the candidates recognised the end of the reaction from the data.

7(b) (ii) about half the candidates knew why the reaction had stopped.

8 most candidates could not explain how the titration should be carried out. A number of candidates, who at least knew what a burette is, placed the acid in the burette and the alkali in the flask, which, in the experiment asked, would not work.

Section C – Module C6

9(a) very well answered, the candidates used the Periodic Table to identify the elements present in freon.

9(b) the question differentiated well with candidates targeted at grade C able to achieve 1 or 2 marks comfortably.

10(a) (i) most candidates were able to calculate the volume of soap solution added.

10(a) (ii) this data interpretation question did not differentiate well. Less than half the candidates identified the water sample which contains only temporary hardness as 'tap water'.

10(a) (ii) and 10 (b) both these questions had high omit rates The most common answer given in 10(a) (ii) was that distilled water is pure or soft. Only a handful of candidates knew that it was being used as a control. Few candidates knew how to remove permanent hardness. Most answers wrote about boiling the water.

11(a) (i) (ii) both questions were well answered.

11(b) few candidates knew that yeast supplies an enzyme or was used to increase the rate of the fermentation.

11(c) differentiated well with the more able candidates choosing hydration as the correct answer.

12 well answered question with many candidates able to score 1 mark and a large proportion 2 marks for linking each chemical to its use.

13(a) (i) (ii) well answered questions. Most candidates knew what an analgesic does and could give examples of them.

13(b) the majority of candidates were able to write down the molecular formula of aspirin correctly.

14(a) (b) both questions on rusting differentiated well. Few candidates scored more than 1 mark in 14(b) for ways of stopping iron rusting. Painting was the most common answer for 1 mark. Many candidates wrote about keeping the bike dry.

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

General Comments

The cohort for this examination has increased from January 2011. The paper differentiated well and allowed candidates of all abilities to show positive achievement.

Candidates found section B much more demanding than the other two sections.

Candidates' ability to write symbol equations has improved but candidates still find writing the formulae of ionic compounds 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 sometimes give a rehearsed answer to the wrong question.

Candidates have also found simple recall of some key definitions difficult in this examination.

Comments on Individual Questions

Question One

Most candidates gave the names rather than the formulae. In (a) many candidates gave sodium hydroxide rather than one of the acids. In (b) although a significant proportion of the candidates gave sodium hydroxide and hydrochloric acid other candidates misinterpreted the question and gave substances not in the list eg sodium and chlorine. Candidates found (c) the least demanding question in this section.

Question Two

In (a)(i) many candidates were able to calculate the correct answer of 149. A common misconception was that the number of nitrogen atoms in the formula was 12 rather than 3. A smaller proportion of the candidates in (i) were able to calculate the percentage by mass of nitrogen as 28.2. A small proportion of candidates could not round the answer obtained and quoted 28.1 instead. Candidates that showed full working out were often able to get an error carried forward mark for (ii).

Almost all candidates in (b) were able to calculate the percentage yield as 70%.

The best answers to (c) were well organised and presented a coherent description. Other candidates only gave isolated facts and did not try to link ideas together. The most common link missing was that aerobic bacteria feed on the dead and decaying plants and so used up dissolved oxygen. The most common misconception was that ammonium phosphate poisoned the aquatic life.

Question Three

Most candidates in (a) could describe that as the percentage of carbon dioxide increased that the pH would decrease. In (b) most candidates answered a different question to the one that was set basing their answers on previous mark schemes resulting to the use of indicators in titrations. Candidates did not appreciate that the difference in pH was so small that there would be no significant difference in the colour of the universal indicator. Many candidates were able to construct the balanced equation.

Question Four

In (a) candidates had difficulty explaining why a catalyst reduces the cost. The most common correct answer was it would need less energy. Candidates also had difficulty with (b) and often gave a factor but did not fully explain the factor. Candidates often referred to using a continuous process but this could not be given credit because it was mentioned in the stem. Other candidates appreciated that lowering the labour cost would be a good idea but did not mention about automation. In terms of temperature and pressure candidates did not link these factors with a reduction in the energy cost. A significant proportion of candidates did not attempt (b).

Question Five

In (a) candidates often referred to weak bonds or weak intermolecular forces between the layers but credit was not given if answers did not refer to the layers. Many candidates in (b) (i) were able to appreciate the significance of electrons in relation to electrical conductivity. Candidates often mentioned no free electrons or no delocalised electrons. In (ii) candidates often referred to intermolecular forces rather than strong covalent bonds and this was not given any credit in this question. Candidates then had to link this with a large amount of energy needed to break the bonds, a common misconception was to refer to a high temperature needed to break the bonds but this was really given in the stem.

Question Six

Many candidates were able to calculate the mass of hydrogen as 120 tonnes in (a). Candidates were rarely able to get two marks in (b) and often got just one mark. All the distractors in the question proved effective. Part (c) was better answered than a similar question in a previous series and often candidates referred to the greater concentration of the products. Candidates who referred to more products being made were not given credit because the question referred to an equilibrium where the amount of product made equals the amount of reactant made. A significant proportion of candidates did not attempt (c).

Question Seven

In (a) many candidates were unable to deduce the formation for sodium sulphate and the most common answer was $NaSO_4$ or $NaSO_4^-$. Candidates rarely got 1.2 g for the mass of calcium ions in (b). The most common error was to fail to convert the volume to dm^3 and quote 1200 g as the answer. Candidates found (c) difficult and rarely quoted 0.535 mol/dm^3. Even some candidates who could do the calculation did not round up the value correctly and gave 0.53. No credit was given for those candidates that quoted the answer to just one significant figure.

Although many candidates could get one mark for the balancing part of (d) only a very small proportion of the candidates were able to include the correct state symbols. Typically the ions were given (l) as the state symbol and the precipitate as (aq).

The answer to (e) only needed reference to ions that could move but many candidates gave electrons that could move instead. Other candidates appreciated that the particles could move but did not name the particle. Some candidates gave answers that were more strongly linked to electrolysis and referred to the ions being attracted to the electrodes – these answers were given full credit.

Question Eight

A significant proportion of the candidates did not attempt one of more of the part questions.

Candidates found (a) difficult despite the bullet points in the question. Most candidates managed just one mark normally by calculating the mass of carbon dioxide, 0.44g, and the relative formula mass of carbon dioxide, 44. The most able candidates were able to give calculate the volume of 0.24dm^3. Candidates who organised their answers often managed to get error carried forward

marks. There was a significant proportion of candidates who could not calculate the relative formula mass for carbon dioxide.

Some candidates in (b) were able to calculate the amount in moles as 0.02 but 50 and 0.05 moles were common incorrect answers stated by candidates. Candidates often could not remember the relationship between moles, volume and concentration and others did not convert the volume to dm^3.

Many candidates in (c) referred to the calcium carbonate rather than the acids. Candidates often did not refer to the same amount or the same number of moles of acid or hydrogen ions available.

Candidates often did not make it clear in (d) which acid their answer referred to and as a result could not be given credit. Candidates rarely used collision theory in order to explain the answer. The best answers referred to ethanoic acid having less crowded hydrogen ions so there are fewer collisions.

Question Nine

Candidates were not able to recall the two definitions asked for in this question and a significant proportion of the candidates did not attempt one or both of the definitions. In (a) the idea of the simplest whole number ratio was poorly expressed. In (b) some candidates appreciated that the definition was linked to carbon but did not mention carbon-12.

Question Ten

In (a) candidates often gave very detailed answers about CFCs some included the propagation reactions that result in ozone depletion. The formation of chlorine atoms of chlorine free radicals from CFCs was well known and given credit in the mark scheme. Other candidates focused on the harmful effects at the Earth's surface and this was also given credit. Since CFCs are greenhouse gases references to the greenhouse effect or global warming was also given credit in the mark scheme.

Good answers to (b) referred to one electron going to each of the two atoms, however other answers confused the chlorine particles involved and referred to chlorine molecules or ions.

Question Eleven

Candidates found the analysis of the data in (a) very demanding and the idea that temporary hardness is removed by boiling appeared to be poorly understood. In (i) many comments were made about the volume of soap being added being the highest but little reference to the change in volume after the tap water was boiled. A significant proportion of candidates stated in (ii) that it was needed for a fair test rather than the distilled water was used as a control or to help make comparisons.

In (b) many candidates could recall the formula of water and carbon dioxide and were able to construct the balanced equation. The mark scheme allowed the use of H_2CO_3 rather than H_2O and CO_2.

Question Twelve

In (a) most candidates were able to interpret the graph provided.

In (b) some candidates did not refer to the processes and as a result could not be awarded a mark since it was not possible to tell which process the comment referred to. Candidates also made contradictory statements which could not be credited. Good answers were typified by

comments about each process including the different conditions used, sustainability and renewability, rate of reaction and purity of product. Only a small proportion of the candidates gave their answer as a table which was a very good way of presenting the answer. A significant proportion of candidates did not attempt this question.

Question Thirteen

Many candidates could deduce the molecular formula of aspirin in (a) and could describe differences and similarities in the structures in (b). A significant proportion of the candidates referred to the benzene ring by name.

Question Fourteen

Candidates had little difficulty explaining the two ways of rust protection in (a) and (b). The most common misconceptions were that magnesium acted as a protective barrier and that it rusted. Many candidates could not recall the word equation in (c) and in particular did not remember the chemical name for rust. Common errors were hydrated iron(III) hydroxide, iron(III) oxide, hydrated iron oxide(III) other candidates used iron(III) or iron(II) instead of iron on the left hand side of the equation. A significant proportion of candidates did not attempt (c).

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