RECOGNISING ACHIEVEMENT

GCSE

Chemistry A

Twenty First Century Science Suite

General Certificate of Secondary Education **J244**

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

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OCR REPORT TO CENTRES

Overview

On this second session in which the new specification has been assessed, many candidates performed well. Both the more able candidates and the weaker candidates were able to show the extent of their knowledge and understanding of the first six modules. Some excellent answers were seen.

The six-mark Level of Response questions again proved to be a challenge for many candidates. Though almost all made an attempt to answer these questions, often writing at length, only a minority scored well. Some good answers were seen from more able candidates, but few gained Level 3. Many candidates repeated the question and gave long answers that went well beyond the lines provided. Answers did not always address the entire task and few were well planned. Spelling, punctuation and grammar were often poor.

Other questions that also required longer answers were often far longer than necessary, requiring the use of additional sheets of paper. Whilst some candidates wrote at length, others lost marks because they gave incomplete answers. Where two or three marks were available it was common for candidates to express only one idea, hence scoring only one mark.

Most candidates could interpret simple data well, but many were confused when asked to compare data presented in different formats or use data to make and justify decisions.

These papers contain a relatively small number of objective style questions. Few candidates left these questions unanswered and most followed the rubric. For many weaker candidates these provided the larger part of their score.

All papers discriminated well across their target ability ranges, affording more able candidates the opportunity to score highly whilst allowing weaker candidates to score a reasonable number of marks.

A171/01 Modules C1, C2, C3 (Foundation Tier)

General Comments

The candidates engaged with the majority of the paper including the longer Level of Response questions.

Candidates seemed well prepared to retrieve information from the tables and process data.

Expressing the properties of polymers seemed to be a challenge for candidates when faced with command phrases such as ‘give differences’ or ‘suggest why’.

Centres could look to improve the linking of ideas of candidates within the longer Level of Response questions to enable candidates the opportunity to access higher levels of marks.

Comments on Individual Questions

1 (a) Generally well answered.

1 (b) Candidates struggled to access Levels 2 and 3 as they appeared to find linking of ideas difficult. Ideas of combustion were generally clearly expressed. Ideas of photosynthesis were less clear, but the bigger issue was the lack of discussion about the balance between the two processes and whether Sue was correct or not.

1 (c) Candidates could identify the effects of carbon monoxide and sulfur dioxide but found it more challenging to give an explanation of these effects.

2 (a) (i) Generally well answered.

2 (a) (ii) Generally well answered.

2 (b) Where candidates gained marks it was for the description of the pattern rather than for the explanation of the chemistry behind the pattern. For example very few candidates identified that nitrogen dioxide is produced by cars, but they could identify the pattern of the concentration of nitrogen dioxide being high when more cars were used.

2 (c) (i) There was an improvement in the calculation of the best estimate. Candidates also showed their working and some were able to gain some credit for this despite the final answer being incorrect.

2 (c) (ii) Candidates found it difficult to express their answers for this question. The majority of candidates struggled to score either of the two marks available here. They failed to respond to the command word of ‘compare’, and so the lack of comparison words such as higher and lower, in relation to the values were absent in most cases.

3 (a) Generally well answered with the majority of candidates scoring at least one mark.

3 (b) Almost all candidates scored at least one mark for correctly identifying two or three statements about polymer properties that were true or false.

3 (c) (i) Generally well answered. The quality of expression of the candidates responses varied when trying to define an ‘increase’ in mass applied to the polymer, leading to the polymer stretching ‘further’ or ‘more’.

3 (c) (ii) Candidates found this a challenging question and often referred to a comparison of properties of individual results of polymers rather than identifying the difference in stretch or strength from the graph. Some candidates misinterpreted the data and wrote about the mass of the polymers rather than the load applied to the polymer. Another common misconception was when candidates referred to the flexibility of the polymer rather than the ability to stretch.

3 (d) Candidates generally scored well on this question but they found it difficult to express their answers clearly. The keywords of ‘load’, ‘strength’ and ‘stretch’ were often confused or unqualified. In this question the candidates needed to make a simple statement to compare the properties of the polymers to polymer C but they struggled to give clearly expressed answers.

4 (a) Very well answered with the majority of candidates scoring both marks.

4 (b) Candidates needed to correctly identify the relationship between the size of molecule and the boiling point of the molecule to progress beyond a Level 1 response. The majority of candidates were unable to do this. Candidates often repeated the same point to fill the space given rather than explain a second point or link ideas.

4 (c) This was generally well answered with the majority of candidates being able to identify all four correct words to complete the sentences.

5 (a) (i) Very well answered with almost all candidates scoring at least one mark.

5 (a) (ii) Very well answered with almost all candidates scoring at least one mark.

5 (b) As with previous Level of Response questions in this paper, the candidates generally struggled to express their ideas in a way which allowed access to Level 3, although significantly more candidates did access Level 2 in this question compared to question 4. Common practice in everyday life was frequently quoted in candidates responses. For example ‘people don’t read the packaging’ was given as a sensible response. Such comments were able to gain credit within the marking of the Level 1 response criteria. The misconception that ‘too much salt causes obesity’, was apparent in many responses.

6 (a) (i) Generally well answered. The majority of candidates scored at least one mark.

6 (a) (ii) Generally well answered. The majority of candidates scored at least one mark.

6 (b) (i) The majority of candidates could correctly identify limestone.

6 (b) (ii) Candidates tended to score one of the two marks available for identifying the waste gas of hydrogen chloride, but struggled to identify why this was harmful to the environment.

6 (b) (iii) The majority of candidates were unable to score with a significant number of candidates not attempting to respond.

6 (b) (iv) Candidates struggled to identify the correct response of ‘neutralisation’. ‘Oxidation’ was a common incorrect response.

A171/02 Modules C1, C2, C3 (Higher Tier)

General Comments

This paper had two major changes from previous years: there were 60 marks overall instead of 42 and three six-mark Level of Response questions were included. Only the more able seem to have been able to gain many of the 'extra' marks. Weaker candidates were able to score only marginally more marks than they did on the 42 mark paper. One reason for this was probably the inclusion of the three six-mark free response questions. Whilst these questions did give good discrimination, weaker candidates found the exercise particularly difficult.

As in previous sessions, more able candidates showed a broad knowledge and understanding of modules C1, C2 and C3. The most able could apply this knowledge and understanding successfully to the majority of questions on the paper, including the other (not six-mark) free response questions. Many weaker candidates, however, showed sound ability in some areas but weakness in others, whilst some showed a general weakness across all three modules. Areas where weakness was common included ideas of molecular and intermolecular bonding, experimental design to control variables and the factors to be considered when deciding if a value is an outlier.

The majority of candidates followed instructions carefully most of the time, though in some questions particular details in the rubric were ignored by many. Most candidates could interpret simple data well, but many were confused when asked to use data to make and justify decisions. Many had great difficulty in comparing data presented in different formats.

Particularly in the six mark Level of Response questions, many candidates repeated the question as part of their answer. Not only did this waste some time, but for many it resulted in writing well beyond the lines provided for the answer. For these, and a number of other questions, answers were often far longer than necessary, requiring the use of additional sheets of paper. These Level of Response questions were often poorly planned, with ideas jumping form one context to another. Coherent, logically ordered answers were rarely seen. Spelling, punctuation and grammar were often poor.

The overall spread of questions gave all candidates of appropriate ability for this paper the opportunity to demonstrate their expertise. Most questions discriminated well, giving a good spread of marks across the ability range. Only a small number of questions were not attempted. It was clear, however, that a small number of candidates would have gained a more fruitful experience from sitting the Foundation Tier paper.

Comments on Individual Questions

In question 1 most candidates were able to gain some marks from the first Level of Response question on this paper, but only the more able scored well in part **(b)**.

1 (a) Most candidates realised that the development of photosynthesising organisms caused a decrease in carbon dioxide concentration and an increase in oxygen level. Many also included ideas about water vapour condensing to form oceans and carbon dioxide dissolving in this water. Some more able candidates also included the formation of sedimentary rocks and/or fossil fuels. Few candidates made an attempt to explain the more recent increase in carbon dioxide, and most of those who did simply mentioned human activity as the cause. The burning of fossil fuels was included in only a small minority of answers. Although the question asked about changes to concentrations of carbon dioxide and oxygen, some candidates included irrelevant details about other gases. A number of weaker candidates simply described the changes that had taken place without offering any explanation.

1 (b) In part **(i)** only the more able could identify the solid as calcium sulfate. A wide variety of incorrect responses were seen. More candidates knew that calcium hydroxide is an alkali to gain the mark in **(ii)**. Again many different incorrect suggestions were seen. In **(iii)** only the more able realised that the carbon dioxide produced when using calcium carbonate is a pollutant/greenhouse gas or that it contributes to global warming. A number of candidates knew that carbon dioxide was produced but did not say why this could be a problem.

The interpretation of data required for question 2 was clearly beyond the ability of many candidates.

2 (a) In parts **(i)** and **(ii)** the majority of candidates could successfully identify the students correctly.

2 (b) A large number of candidates simply described the changes in numbers of vehicles travelling along the road. Many believed the graph to show this. A minority actually attempted the question that was asked and related the data in the graph to that in the tables. Many of these simply said that there was more nitrogen dioxide when more cars were present but did not try to use data from the tables to explain the actual shape of the graph. Very few included the idea that nitrogen dioxide is produced by car engines.

2 (c) In **(i)** many candidates thought the question asked whether this value should be included in the calculation, and framed incorrect answers as a result. Typically, answers stated that the value is an outlier and gave reasons for not including it, gaining no credit. Other common errors suggested that this value may have been measured on a different day, at a different time or in a different place, not realising that sample 2 was taken at the same time and place as the other nine samples. Few understood that the question actually asks what should be considered when deciding whether or not to include the value. Some very able candidates correctly suggested that the scientists should consider how different this value is from the others or how much variability is shown in the other values. Some candidates gained credit for sensible suggestions of factors that might have affected this one sample. In **(ii)** only more able candidates realised that the nitrogen dioxide concentration was higher on day 2 than on day 1 and suggested a plausible reason eg more cars on day 2. The most common error was to suggest fewer cars on day 1. Others suggested that there might have been more cars on one day than the other, but did not identify which day had more cars. Some weaker candidates did not realise that the day 2 results were taken at the same place and same hour as those on day 1 and based incorrect answers accordingly.

2 (d) Almost all candidates scored at least one mark, with most gaining two or three.

Again the interpretation of data presented problems for many candidates in question 3.

3 (a) The most common answers were based solely on ideas of fair testing, accuracy and reliability, and received no credit. More able candidates suggested that changing other factors would change the outcome or the results, or suggested that this was the only way that the different polymers could be compared and/or the best polymer chosen.

3 (b) A significant minority of candidates realised that the more stretchy the ropes the less strength they had, but fewer also mentioned that the results for D did not follow this pattern. Some candidates received credit for suggesting that the result for D showed that there was no pattern. Many weaker candidates incorrectly suggested that stronger ropes stretched more. Some confused stretchiness with flexibility.

3 (c) Nearly all candidates gained one mark, with most gaining both.

3 (d) The majority of candidates either did not use the terms "forces" and "molecules", as instructed in the question, or used them in an inappropriate way. Only the most able realised that different polymers have different forces of attraction between their molecules. Even fewer suggested that the higher these forces, the stronger the rope or the more energy needed to break it. Many candidates could not correctly distinguish between intermolecular forces and the covalent bonds within molecules.

3 (e) This question discriminated well, allowing most candidates to score some marks but only the more able to gain all three. Most compared C with the other polymers, some described a compromise between stretchiness and strength, and others simply described how C matched the requirements. Only the weakest candidates could not put together a relevant and coherent answer.

In question 4 many candidates became confused about molecular and intermolecular bonding.

4 (a) Only the very weakest candidates did not give hydrogen and carbon to gain this mark. A common error was to also include carbon dioxide or water.

4 (b) Most candidates gained one mark, but only the more able gained both.

4 (c) All but the weakest candidates could describe the relationship between molecular size and boiling point, though a number thought that the fractions that boiled at a higher temperature did so because they contained more molecules. Few candidates explained that the forces of attraction between molecules increases with molecular size, and only the most able went further to explain that more energy, and therefore a higher temperature, is needed to separate and boil these larger molecules. Some candidates included details of how molecules are arranged in liquids and gases, often unsuccessfully trying to use these ideas to explain the different boiling points. Many weaker candidates simply described the diagram or offered long answers that gained little or no credit. Others substituted melting point for boiling point in their answers. A number of candidates wrote about the hydrocarbons being burned rather than boiled. Confusion between bonds within molecules and forces between molecules was common, with many candidates thinking that the atoms became separated on boiling.

Question 5 was a Level of Response question and most candidates gained some marks.

5 (a) The best answers used information from the stem together with other details to present arguments both for and against the use of PVC plasticisers. They assessed the evidence that plasticizers present a risk and explained why people might view this evidence differently. More commonly candidates included some of the detail from the question but added nothing to it. Often it was stated that different people would have different views without adequate explanation of why. Many presented one side of the argument much more strongly than the other. Answers often included ideas of the bioaccumulation of toxic chemicals along food chains, but few gave the more relevant ideas of plasticizer leaching from packaging into food or by direct contact with skin. Many candidates described how babies could ingest plasticizer from toys. The effect of plasticizers on rate of growth was often quoted, though a number of candidates thought that this referred to feral rats with some thinking this to be an advantage. The benefits of PVC were less well documented, though a few candidates realised that increased flexibility made this a polymer with a wide variety of uses. Some weaker candidates copied information from the 'talking heads' without meaningful discussion. A number of the weakest could not distinguish between the polymer PVC and the plasticizers it contained, with a few basing their answers on the toxicity of chlorine, the poor biodegradability of PVC or the harm caused by combustion products of the polymer.

5 (b) Almost all candidates gained a mark in **(i)** for C and a mark in **(ii)** for A.

5 (c) Almost all candidates gained one mark, with many gaining both.

6 (a) In **(i)** most candidates correctly suggested that the salt melts the ice or that the grit helps vehicles to grip the road. Some of the more able indicated that salt lowers the freezing point of water. Answers from weaker candidates often included 'wrong science' such as suggesting that the salt dissolved the ice or absorbed and so dried up the ice. Some suggested rock salt was used because it is cheap or that it has not been purified. Most candidates gained the mark in **(ii)** for the idea that rock salt is impure or contains grit. Weaker candidates often gave answers that were too vague to score or based an answer on the connection between high salt intake and strokes.

6 (b) In **(i)** the majority of candidates knew that water is pumped into underground salt deposits, but fewer described how this forms salt solution that is then brought up to the surface. Some weaker candidates thought that salt is dug out of the ground before being dissolved in water. In **(ii)** most realised that solution mining of salt could cause subsidence but fewer could describe how this occurs. Common incorrect answers were based on toxicity of salt in the surrounding environment or the release of toxic gas from electrolysis. A few candidates thought solution mining could cause flooding. In **(iii)** only the more able completed the table without error to score both marks, but many could partially complete it for one mark.

6 (c) More able candidates correctly knew that deposits of limestone and coal are found in NW England. A wide variety of incorrect answers were seen from weaker candidates. Many of these were based on ideas that the area is thinly populated so that pollution will affect fewer people or that the area has lots of unused space for waste to be deposited. Some thought that sulfuric acid was found there or that the industry would be good for the large unemployed workforce. Though the question asks for reasons other than the availability of salt in NW England, many candidates gave this as an answer.

A172/01 Modules C4, C5, C6 (Foundation Tier)

General Comments

Overall the candidates performed well with only a small number of Nil Responses to questions. The six mark questions were often not well answered by many candidates but this is probably due to a lack of practice at this stage. In addition, these responses were often poorly sequenced and did not always address all parts of the question.

Weaker candidates were not clear about key scientific terms such as “trend in reactivity” and misinterpreted this by discussing the time of a reaction or what observations could be made; or gave symbol equations (usually incorrect) as opposed to word equations as requested in the rubric.

In some questions candidates did not read what was asked of them so if two responses needed circling only one response was circled, or lines were drawn to connect all boxes rather than just one line to connect two boxes.

Many candidates were able to discuss advantages and disadvantages to local people with regard to mining, giving clear and valid reasons for their ideas.

Knowledge and understanding of electrolysis proved to be very weak, but many candidates demonstrated a good understanding of properties and how these could be used in different ways.

Comments on Individual Questions

1 (a) Many correct responses were given, although some marks were lost when a minority of candidates discussed times for reactions or colours of flames as opposed to the actual trend.

1 (b) (i) Most candidates achieved one mark, but fewer achieved both. The best responses were those that compared the reactivity of iodine to bromine, and then astatine to iodine.

1 (b) (ii) This was answered poorly; many candidates agreed with the statement that all groups become less reactive down the group without considering the trends of other groups at all.

2 Many candidates were able to give the common appearance of elements in Group 1 and also discussed conductivity. A minority gave higher level responses and were able to cite the melting point of iodine and lithium’s higher boiling point as a lack of support for Mendeleev. The best responses were those that sequenced their responses in a logical way; identified similarities and differences in both groups (clearly stating which group they were discussing) and then gave evidence against Mendeleev’s grouping.

3 (a) This was answered fairly well. Many candidates were able to interpret the electron arrangement for fluorine.

3 (b) This was also fairly well answered. Many candidates gave the correct configuration for sodium.

3 (c) Many candidates were also able to identify chlorine when given the electron arrangement.

3 (d) Fewer candidates were able to give the correct particles inside the nucleus; common incorrect responses being electrons and protons. Neutrons and protons was the correct response.

4 (a) (i) Many candidates achieved two marks, and few achieved nothing. Common responses achieving one mark instead of two were those where candidates gave generic equations such as Metal + chlorine → sodium chloride instead of specifically sodium. A few candidates attempted symbol equations (although this was not required), which are actually more challenging, but were unable to give the correct formula for chlorine as Cl_2.

4 (a) (ii) Although some candidates were able to correctly identify the "toxic" symbol, they were in a minority. Common misconceptions included "harmful" and "irritant." Only a small minority of candidates were able to state the precaution as a fume cupboard.

4 (b) Most candidates were able to achieve one mark here – usually for potassium chloride with a coloured flame (true) and potassium chloride is a gas (false).

5 Very few candidates achieved Level 3 responses, but many did achieve Level 2 responses. Candidate's responses indicated that they had some understanding of identifying different compounds but were confused about why Amy's conclusion was different to Zak's conclusion. A common misconceptions was that Zak had added too much sodium hydroxide. The best responses were those that stated that both Zak and Amy would actually observe a white precipitate, and that this re-dissolves if there are zinc ions present. In addition, good responses included statements about the second test, and the appearance of a white precipitate here too. Space and time was wasted by candidates merely repeating the question.

6(a) Both **(i)** and **(ii)** were answered well by the majority of candidates; correct masses were selected and successfully added together. The most common incorrect responses were those where candidates had selected atomic numbers instead of relative atomic masses.

6 (b) (i) Candidates were able to give an advantage to opening a mine to Kay, but fewer were able to give a disadvantage; responses here tended to be general rather than specific e.g. pollution rather than dust or toxicity of waste.

6 (b) (ii) Candidates were able to acknowledge the reason for keeping a mine open in terms of the need for lead to make specific items, or jobs for local residents, but very few were able to explain that lead mining can't be made completely safe or that the benefits outweigh risks for the second mark.

7 (a) This was answered very poorly. There was little understanding of reduction and responses tended to be randomly selected.

7 (b) This was also very poorly answered. In **(ii)** a majority of candidates lost all marks because they linked two lines from each box instead of the one from each required in the question.

7 (c) Most candidates were able to link the correct properties to uses and very few achieved no marks at all.

8 (a) This was answered badly. Candidates who had some understanding often wrote hydrogen chloride instead of hydrochloric acid, and surprisingly few were able to give the correct responses as water and H_2O.

8 (b) A minority of candidates selected the correct two responses, but many failed to recognise the copper hydroxide as the second response.

8 (c) There were some potentially good responses in this question which were often out of sequence. Some candidates lost marks since they gave good science followed by a contradiction e.g. evaporate copper chloride solution, followed by filtering. The best responses were those that gave clear, sequenced methods describing each process and why it was completed such as "filter to remove the solid copper carbonate, and then heat the solution to evaporate most of the water. Finally allow the crystals to dry at room temperature so that larger crystals are made." No candidates suggested washing the crystals or using a desiccator.

8 (d) Part **(i)** was answered well; most candidates correctly calculated the mass, but unfortunately were unable to follow this with a calculation of percentage mass for part **(ii)**.

9 (a) This was answered well, with the vast majority of candidates being able to select the correct compounds and formulae for different substances.

9 (b) This was also answered well; most candidates correctly selected zinc sulphate as the answer.

9 (c) This was not answered well. Most candidates did not understand rates of reaction and were unable to give ways to increase the rate of the reaction given. In most cases, candidates thought that more zinc and more acid were the responses required. The answer required more concentrated acid as opposed to stronger acid.

9 (d) Few candidates were able to interpret the graph correctly, although slightly more candidates correctly selected 'fastest rate' over 'reaction stopped' in **(ii)**. The most common misconception for part **(ii)** was that the rate was constant.

9 (e) Even fewer candidates were able to explain the change in pH. This required the candidates to state that acid was present initially but that this was used up as the reaction progressed; many described the pH as becoming alkaline.

A172/02 Modules C4, C5, C6 (Higher Tier)

General Comments

In general, candidates were appropriately entered for the Higher Tier paper and had been well prepared for the examination. All questions were attempted by the overwhelming majority of the candidates.

In the objective questions, very few candidates left any gaps, showing good examination technique by eliminating distracters for more difficult answers. Where two choices were needed, candidates generally made two choices, showing that they followed instructions effectively.

Candidates generally answered the longer answer questions well. In the two and three mark questions, candidates showed a skilled approach and generally made enough points to access the number of marks available. In the six mark Level of Response questions, candidates did not always address the entire task. It is important that candidates re-read the question and the information provided to make sure that they are answering all aspects of the question. Very few candidates gained a Level 3 response in any of the three Level of Response questions.

Although time management was usually very good, some candidates omitted some of the longer answers entirely.

Comments on Individual Questions

1 (a) This question was well answered, with almost every candidate scoring at least one of the available two marks, implying a sound knowledge of Group 1 chemistry.

1 (b) Most candidates gave the correct formula for rubidium oxide. The usual reason for not gaining the mark was to give an incorrect symbol for rubidium.

2 (a) Almost all candidates scored some credit for this first Level of Response question. Most gained Level 2. Most candidates identified general properties from the table which were reasons for assigning the elements into groups. Candidates found the data for Group 7 more problematic to handle due to the differences in state and the negative values for state changes. Fewer candidates gave answers at Level 3, which demanded a higher level analysis of the data to comment on the exceptions to the general trends.

2 (b) Most candidates scored both marks and correctly discussed both a similarity and a difference in the electron arrangement for sodium and potassium atoms.

3 (a) Candidates generally handled this very well, extracting information from the table about the atoms and ions. The most difficult choice to make appeared to be part **(ii)** where candidates found it more challenging to identify an atom and ion from proton and electron numbers alone.

3 (b) Although almost all candidates knew that particle C has a positive charge, only about half correctly identified the charge as '+1'.

4 (a) Candidates showed sound understanding of the reaction between sodium and oxygen. A full spread of marks was seen. Although most knew that the surface would go dull or tarnish, fewer linked this to the reaction with oxygen. Reacting with *air* was a common, partially correct response.

4 (b) This was well answered, with many candidates earning both the ‘correct formula’ and the ‘balancing’ marks. The most common error was to give the incorrect formula of sodium chloride, e.g. $NaCl_2$.

5 (a) Most candidates gained two marks for correctly linking the atoms to the correct diagram and correct relative mass.

5 (b) Most candidates gained at least one of the two available marks, usually for recognising that molecules have weak attractions between them.

5 (c) Again, one mark was the most usual score. The idea that the attraction between the nuclei of atoms and the electrons was the statement that was most commonly missed.

6 Candidates found this the most challenging of the Level of Response questions. Many candidates did not make a clear statement to identify the ions in the solution. Many thought that calcium was present. A large proportion of the candidates did not include any information from the data sheet on page 2 of the question paper, even though the question directed them to look at it. Many gave answers which only contrasted information in the results tables from Amy and Zak. For higher levels, it was important that candidates identified the correct ions and the tests that showed that they were present. Very few gave a Level 3 response to this question.

7 (a) Many candidates gained all three marks for this calculation, with most gaining at least one mark for some working that was partially correct. It is important that candidates show their working so that partial credit can be given if an answer is not fully correct. Not all candidates did so.

7 (b) (i) This answer required candidates to apply ideas about science specifically to an individual (Kay). Although most gained two marks, a significant number of candidates gave vague answers about ‘the area’ Kay had just moved into.

7 (b) (ii) Most candidates gave an advantage of the mine staying open, for example by providing employment, but fewer answered Jed’s point by discussing the difficulty of making any process ‘completely safe’.

8 (a) Most candidates correctly completed the equation. The most common errors were to give the name of the acid as ‘hydrogen chloride’ rather than ‘hydrochloric acid’ and to give the second product as hydrogen.

8 (b) Most candidates correctly identified both compounds that could be used. Some identified one correctly and made an incorrect choice for the second compound, scoring no marks.

8 (c) (i) Candidates found this question challenging. Most talked in general terms about ‘the acid pH’ and ‘becoming neutral’ rather than discussing that the value of the pH would increase from low to 7.

8 (c) (ii) Almost all candidates knew that a pH meter or universal indicator could be used to test pH, However, the question did not indicate the number of correct choices. Many gave an additional incorrect choice, commonly litmus. Such answers did not score.

9 (a) Candidates who outlined a method for titration gained a Level 1. To gain Level 2 it was important that the answer showed how an endpoint would be identified. Although many knew that a colour change was important, many answers either neglected to clearly state that an indicator had to be added to the flask, or gave an incorrect indicator for a titration (for example universal indicator). Not all candidates used the correct glassware, for example a burette. For a Level 3, candidates needed to give fine detail, such as the use of a rough trial, repeats or taking averages. Almost no candidates accessed Level 3 for this question.

9 (b) (i) Most correctly identified the correct theoretical yield from the choices available.

9 (b) (ii) Over half of the candidates gained some credit for this calculation. Some neglected to reduce the actual yield by 1.0g (for the water in the crystals) before calculating the percentage.

9 (c) (i) Most correctly identified 'concentration' as the factor, but some gave vague answers such as 'how dilute it is' which did not gain credit.

9 (c) (ii) This question proved very difficult, with very few candidates scoring any marks. Most did not realise that the limiting factor (the amount of potassium hydroxide) does not change, and so the mass of crystals would be the same. Some misunderstood the question and discussed the rate of the reaction.

9 (d) (i) Almost all candidates gained at least one mark for one correct value in the table, usually the concentration of hydrochloric acid.

9 (d) (ii) Just over half of the candidates knew the correct equation for neutralisation. Others chose incorrect ions or molecules. All distracters were chosen, implying some confusion in this area.

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