OCR
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GCSE

Chemistry A

Twenty First Century Science Suite

General Certificate of Secondary Education **J244**

OCR Report to Centres

January 2013

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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 A (Twenty First Century) (J244)

OCR REPORT TO CENTRES

Overview

The units assessed this session were A171 and A172. This is the last time this specification will be assessed in a winter series; henceforth, assessments for this specification will be offered in summer series only. Unit A173 will be assessed for the first time in summer 2013.

Most candidates were able to show the extent of their knowledge and understanding of the first six modules. In general, candidates engaged well with the papers, providing responses that demonstrated an improved level of understanding across the ability range. Many of the more able candidates performed very well and some excellent answers were seen.

As in previous sessions, the six-mark extended-writing questions proved to be a challenge for many candidates. Almost all candidates made an attempt to answer these questions, often writing at length. Answers from weaker candidates did not always address the entire task and generally were not well planned. In these answers, spelling, punctuation and grammar were often poor.

While candidates were much better prepared for the free-response questions than last year, many still fail to answer the question actually set. In the pressure of an examination it is easy to make mistakes of interpretation, which can severely limit the number of marks available to the candidate. Centres are recommended to train candidates in strategies such as highlighting significant words in the question to enable them to structure their answer around those points.

Centres are also reminded that the six-mark extended-writing questions often demand that the candidate considers more than one aspect of a problem, and so examiners reserve the highest level marks for those candidates who clearly address all the required aspects.

For other questions that required longer responses, some candidates lost marks because they gave short and 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 were able to make sensible selections from the information given, but found explaining some of the information or using data to make and justify decisions more challenging. Weaker candidates could perform simple numerical manipulation, but only the more able candidates could successfully perform more complicated mathematics.

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

Candidates should be reminded that if they wish to change their answer, the old answer should be crossed out and a new one written in its place. There were instances of alterations (eg from a 5 to a 6) that created a completely ambiguous response. Where a response is ambiguous, examiners have little option but to give zero credit.

With regard to objective tick-box questions, it is always worth reminding candidates that, irrespective of whether or not the number of ticks required is stated in the question, the number of marks allocated to the question does not necessarily equal the number of ticks required. This principle also applies to the number of lines drawn in a ‘join the boxes’ type question.

A171/01 Twenty First Century Science Chemistry A (C1, C2, C3) Foundation Tier

Section 1 – General comments:

Candidates engaged well with the paper, providing responses that demonstrate an improved level of understanding. Six-mark extended-writing questions were well answered, although improvements can still be made in linking ideas. This would also provide more access to the marks at Levels 2 and 3.

Candidates demonstrated an improved level of understanding of outliers, range and mean; the interpretation of graphs and tables of data continues to improve.

The ideas of combustion, plasticisers, chemicals from crude oil and intermolecular forces relating to boiling points were particular areas for development.

Section 2 – Comments on individual questions:

Q1(a)(i) and **(ii)** The retrieval of information from the graph was on the whole excellent.

Q1(b)(i) Most candidates only scored 1 mark either stating that particulate concentration went down or air pollution in the town reduced. Some candidates linked the two ideas but rarely did any candidates link in the particulate concentration being below the limit. A few answers incorrectly thought the council was wrong to introduce the charge on the basis that it was an infringement of freedom. A lot of answers ignored the guidance about using the graph and got wrapped up in wider discussions. Details of how the charges affected people's behaviour dominated many incorrect answers.

Q1(b)(ii) Candidates usually scored 1 or 2 marks here as there were plenty of opportunities to gain the two marks.

Several candidates lost marks from poorly phrased answers eg reducing the number of 'drivers' instead of the number of 'vehicles' was a common mistake.

Q1(c) Very few candidates scored anything for 'water'. Several candidates placed 'oxygen' correctly but chose 'carbon monoxide' or 'carbohydrate' in place of carbon dioxide.

Q2(a) Most candidates scored two marks here because they could explain the relationship from the graph between the number of vehicles and the nitrogen dioxide concentration. There was a sharp drop-off in the number of candidates that attempted to explain what reactions were happening to produce nitrogen oxides. Identifying the gases involved was a rarity with many candidates erroneously discussing catalytic convertors. Very few candidates had sufficient knowledge to move into Level 3 but those who did answered very well.

Q2(b)(i) Surprisingly few candidates mentioned anything about calculating an average/mean. A popular answer would involve something about outliers. Most candidates incorrectly used 'reliable' and accurate'. Most marks were gained by the use of 'mean', 'average' and 'outlier'.

Q2(b)(ii) A significant number of candidates could identify the range correctly.

Q2(c) Most candidates commented on the ‘number of vehicles’ on the motorway rather than providing responses related to 'types of cars', and to an even lesser extent 'different times' and ‘changes in weather conditions’.

Q3(a) Candidates struggled with this question because they gave the name of a product rather than the use. For example a frequent response was 'petrol', rather than 'fuel'. A large number of candidates mentioned a huge variety of materials with no link to oil at all. Another common response that didn't score was 'polymers', which was given in the question.

Q3(b) Some candidates could link the length of the hydrocarbon chain with boiling point but there was very poor use of scientific terminology. Many candidates wrote about having longer molecules in the hydrocarbon rather than longer chains and also breaking the ‘chains’ rather than breaking the ‘forces’ between the chains. Very few candidates discussed ‘energy’ and the increased amount of energy needed to separate longer chains. Only a small number of candidates scored two marks.

Q3(c) Candidates could identify that ‘monomers’ and ‘large molecules’ were part of the correct responses, but often chose the distracter statements rather than linking the correct statements.

Q3(d) The best answers here were where simple objects were chosen eg ‘window frames’, the old material identified as ‘wood’ and the new material of ‘PVC’. Other correct responses included bag, paper and plastic or tennis racket, wood and carbon fibre. Some students did not name an article at all, while others picked the most obscure objects. Many candidates used silk and cotton as their old material for items of clothing and nylon for the new material. A common error was mixing up the old and new materials. Eg where the object was given as ‘shoes’, the old material ‘polymer/plastic’ and the new material ‘leather’ Some candidates missed the point and named a material rather than an object eg 'silk' rather than 'scarf'. This then gave the candidates problems in naming the old material, for example, the old material used to make silk.

Q4(a)(i) and (**a)(ii)** Candidates extracted the information from the graph very well. The calculation to scale up the number of rejected posts was also well answered. Many candidates scored the ‘Error Carried Forward’ mark if they did struggle reading the graph.

Q4(b) This question was poorly answered. Candidates appeared to choose statements based on the keywords rather than the ‘best’ statements to actually answer the question.

Q4(c) Many candidates correctly selected plastic B as the most suitable plastic to use but their arguments were weak. The majority of responses were only Level 1 responses. To move up the levels, answers needed to include some analysis on the data given using the numbers in the answer. Very few candidates managed this. Some vaguely attempted discussions about how polymers are made and tried to relate the strength of the polymer to the flexibility for use as a fence post. This was not required as the question only needed analysis of data given. Very few candidates could construct an argument about the range and the consistency of the data given. It was pleasing to see candidates attempting, and scoring on these six-mark extended-writing questions.

Q5(a) Candidates answered this question well, with many scoring 2 marks.

Q5(b)(i) and **b(ii)** Again candidates could select the appropriate data from the information given.

Q5(b)(iii) Most candidates gained two marks here but a significant number did not quote the properties from the table and just stated 'polythene bags had less of everything in the table'. The main problem was candidates answering without referring to any properties eg 'polythene is the lowest of everything'.

Q5(b)(v) This question was poorly answered with candidates not being able to express the problems with plasticisers. They tended to write about problems with the environment and disposing of plastics that contain plasticisers or the effects on wildlife. Common responses for this question also dealt with plasticizers inhibiting the biodegradability of plastics. Very few candidates mentioned anything about toxicity, and even fewer mentioned leaching.

Q6(a) The advantages of adding chlorine were well answered. The chlorine 'Killing bacteria' was a popular correct point made. There were also a number of weak responses of chlorine being used to 'clean bacteria', or 'just to get rid of them'. The answers rarely went into any more detail than this.

The disadvantages of adding chlorine was more difficult. A significant number of candidates simply didn't attempt this section of the question or they described how chlorine itself in water could 'cause cancer'.

Very few students knew anything about chlorine reacting with organic material. Very few responses were Level three.

Q6(b) Candidates scored well here with most gaining 2 or 3 marks. Those who scored 3 rather than 4 did not link the aspects of the disadvantage of the membrane cell.

A171/02 Twenty First Century Science Chemistry A (C1, C2, C3) Higher Tier

General Comments:

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 free response and other styles of question. Many weaker candidates, however, showed sound ability in some areas but weakness in others, whilst a significant number showed a general weakness across all three modules. Areas where weakness was common included naming of salts, symbol equations, reactions in car engines that produce pollutant gases, the relationship between polymer structure and properties and the environmental impact of pesticides.

The majority of candidates followed instructions carefully most of the time, though, in some questions particular details in the rubric were ignored by some. Simple interpretation of data from graphs, bar charts and tables was generally good, but many candidates saw only the more obvious patterns and were confused when asked to use data to make and justify decisions. The extraction of numerical data and subsequent manipulation using simple mathematics was beyond a large number of candidates.

Whilst the six-mark extended-writing questions did give good differentiation, weaker candidates found this style of question particularly difficult. Many candidates gave long, rambling answers that had little relevance to the question, whilst others wrote only one or two lines that were clearly an inadequate response. These six-mark extended-writing 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 differentiated well, giving a good spread of marks across the ability range. A small number of questions, most commonly those involving mathematics, were not attempted by a significant number of candidates.. It was clear, however, that many candidates would have gained a more fruitful experience from sitting the Foundation tier paper.

Comments on Individual Questions:

Q1 This question differentiated well across the ability range.

(a) In (i) most candidates realised that particulate concentration fell after the charge was introduced, and some candidates also noticed that pollution was less at weekends. Only the more able could draw other conclusions e.g. the fall being gradual. A number of candidates gave explanations as well as or instead of conclusions. In (ii) more able candidates realised that fewer cars entered the town and some made other sensible suggestions based on people not wanting to pay the charge and using other methods of transport. A number of candidates described the bar chart data rather than trying to explain it.

(b) Most candidates scored at least one mark, and more able candidate scored both. A significant number ticked only two of the boxes.

(c) Only the more able candidates gave a correct example of a pollutant gas that harms people indirectly, and most of these could give a correct explanation. Many candidates suggested pollutant gases that harm people directly, and explain how they do this, which gained no credit.

(d) More able candidates gave valid suggestions to gain one or both marks. Many described actions that could be taken by individuals rather than actions that could be taken by the town council.

(e) Very few candidates gave the correct number of molecules.

Q2 Very few candidates scored better than level 2 in the six-mark extended-writing question of part (a), with most showing poor knowledge of the reactions involved

(a) Most candidates correctly described the relationship between the number of vehicles and the nitrogen dioxide concentration. Many went on to make a suggestion of how the nitrogen dioxide was formed, but few realised that the nitrogen and oxygen came from air or that these gases reacted in the high temperature of the car engine. Only a very small number knew that nitrogen monoxide was formed and released from the car exhaust. Many wrote at length about catalytic converters, which gained no credit.

(b) In (i) very few candidates realised that all values should be included when calculating a best estimate unless there is evidence that a value is incorrect. In (ii) many correctly calculated the average as the best estimate, but some incorrectly rounded the answer. A number of candidates missed out the value for sample 2 even though the stem of this question points out that all values were used. In (iii) most candidates simply compared the two best estimates, which gained no credit. Very few candidates realised that the best estimate calculated in (ii) was lower than all of the values recorded for the second motorway.

Q3 Few candidates could cope with the concept and maths involved in part (b).

(a) Most candidates scored at least one mark in (i), but many gave names of fractions rather than ways that chemicals refined from crude oil are used. The majority of candidates gained both marks in (ii).

(b) Only the most able gave the correct numbers of atoms. A very wide variety of numbers were given, many in double figures. Some weaker candidates gave formulae instead of numbers. Most who scored any marks gained all three.

Q4 The maths involved in part (b) defeated many candidates. Few gained more than Llevel 2 in the six-mark extended-writing part (c)

(a) Most candidates gained both marks.

(b) Only the more able had the mathematicals skills to perform this calculation correctly.

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Those who made a sensible attempt generally gained both marks. Incorrect answers ranged from very small to very large numbers. Many candidates simply presented a jumble of figures, often with no actual answer.

(c) Many candidates put the three polymers in correct order according to flexibility. Most of these quoted a factor that affects polymer properties, eg plasticizer, and then made some attempt to explain how. Few could go beyond this. More able candidates

suggested and tried to explain two or three factors, but only a few of the most able used ideas of forces between polymer chains in their answers. Some weaker candidates put the polymers in the wrong order of flexibility and many became confused between bonds in monomers and in polymers.

Q5 Data from the table was generally understood and used.

(a) Most candidates scored both marks.

(b) The majority of candidates correctly interpreted data from the table to gain both of the marks in (i). Fewer understood the question in (ii), with many still quoting from the table. Only the more able gave additional reasons for or against using disposable bags made of polythene.

Q6 Part (b) was the least well answered six-mark extended-writing question, with few candidates getting beyond level 1 and many scoring no marks at all.

(a) Most candidates knew that chlorine kills bacteria to gain one mark, but fewer related this to the disease cholera. Many weaker candidates wrote about chlorine purifying water or making it cleaner, which gained no credit.

(b) Many weaker candidates wrote about chlorine rather than pesticides. Answers involving air pollution were also quite common, and gained no credit. More able candidates gave answers that included one or more of the run-off from fields contaminating water, pesticides being concentration through food chains and residues left on food being ingested by people. Weaker candidates included a wide variety of irrelevant ideas, including details of cancer, asthma, acid rain and even holes in the ozone layer.

(c) Most candidates gave one or two sensible reasons for or against a universal ban of DDT. Only the most able gained all three marks.

(d) The majority of candidates had little idea of how to work out the names of these two salts. A wide variety of incorrect suggestions were made; common errors including nitric hydroxide, carbon nitrate, carbon sulphate sulfuric hydroxide and nitric carbonate. More able candidates fared better, with many gaining both marks.

A172/01 Twenty First Century Science Chemistry A (C4, C5, C6) Foundation Tier

Section 1 – General comments:

The overall performance of candidates was slightly better than in the previous session. Candidates were able to select correct points when given information, but found explaining some of the information more challenging.

Many of the mathematical questions were answered well by a majority of candidates.

Some candidates did not read the rubric through carefully enough; there was helpful information in many questions which was ignored in many cases eg the states of matter in 3(b)(i) but this was not used. In addition, a large number of candidates ticked too many responses in the "tick box" questions, or, in some cases, did not tick enough.

Section 2 – Comments on individual questions:

Q1 Many candidates performed well on this question.

(a) There was occasional confusion with putting the element in water rather than putting the mineral into a flame and looking at flame colour. A few candidates suggested using flame for pop test (hydrogen) but generally they had the right idea.

(b)(i) 2 marks were often achieved. The answer 'flame would be a different colour' was insufficient but quite often seen as a response. The flame colours needed to be specific for calcium and sodium.

(b)(ii) Candidates generally had the idea that both caesium and copper 'flames' were blue but did not always say it; responses often referred to elements giving the same colours. A few appreciated that it may be difficult to determine flame colour.

Q2

(a) There was a lot of confusion here with the negative numbers. The value of -59 was often thought to be higher than -35 so candidates identified trends the wrong way round. Bromine was often chosen and if bromine was selected then the candidates were unable to give a correct explanation. 2 marks were rarely awarded.

(b) There were a lot of negative values, but candidates could not access this without bromine as the answer to 2(a).

(c) 'At' and no response were both given as regularly as 'At2'. Many candidates gave 'As' or 'As2' as an incorrect response.

Q3

(a) There were many good responses given to this question. The best responses were those that clearly organised information into those that agreed with Fay, and those that supported Guy. Level 1 response's had a tendency to start off well with Fay and give several similarities. When Guy's ideas were discussed candidates stated responses such as 'and from the table there are differences/as Guy said there are differences'. These were too vague. Also weaker responses did not compare differences eg hydrogen is a gas and lithium isn't. Often candidates reached Level 2 by stating several similarities but few differences were offered even though they may have inferred several more. Those that got Level 3 gave all similarities and differences organised into a coherent response.

(b)(i) A disappointing number of candidates linked hydrogen incorrectly to (aq). Despite having been informed of the states of two of the chemicals, candidates still very often incorrectly linked the substances to their states.

(b)(ii) Candidates most often correctly selected 'solid does not conduct electricity' but the second tick was often placed randomly.

Q4 There were very few answers reaching Level 3; usually because candidates could not describe structure using the correct terminology and this meant they could not describe both a similarity and difference based on structure. Many achieved 2 marks for correctly identifying properties. At Level 1 there were a lot of good answers but candidates never got past comparing properties and /or structures. Some effort had clearly been made but there were very vague descriptions of tightly or loosely packed "molecules" or "gaps allowing electricity to get through". Often candidates were aware that it was 'things' moving which were responsible for graphite's conductivity, but they often chose the wrong 'thing' eg ions/atoms/layers. Level 2 responses were usually awarded for graphite being 'soft due to the layers'.

Q5 Was answered very well by a majority of candidates.

(a)(i) Candidates usually achieved 2 marks. If they didn't achieve 0.06 it was often due to a calculation error and they still got 1 mark for 12/200.

(a)(ii) The vast majority of candidates achieved a mark.

(a)(iii) Many candidates were able to select 'Ore 2' as the correct ore. The second mark was rarely awarded; 'more useful copper extracted/most copper/less waste' were common incorrect responses rather than responses being specific to per gram or kilogram.

(b)(i) Candidates who studied the 'talking heads' scored 3 marks easily. Some re-phrased it 'makes lots of money/lots of profit/used to make electricity/good conductor of electricity; polluting gases/harmful gases/bad for the environment/workers unemployed' which were insufficient for marks. The best responses were those organised clearly into advantages and disadvantages and were specific about those they stated.

(b)(ii) The majority of candidates were able to suggest either using ores without sulphur, or placing a "trap" in chimneys for sulphur dioxide.

(b)(iii) Very few candidates were able to select the correct ores from the list. Too many incorrectly thought that to make sulfur dioxide you had to choose something containing sulfur and something containing oxygen. Usually candidates selected one ore with sulphur and another, containing oxygen.

Q6

(a) Generally 1 or 2 marks awarded – there were no observable patterns if incorrect responses were offered.

(b) Many candidates failed to achieve both marks. Most chose alternatives for N_2 (often NO_2) and Ar, although the more obvious error would have been O for O_2.

Q7

(a) There were many good responses from candidates for all or part of this question. The best responses were those where candidates had written clear formulae with no mistakes in the size or position of the numbers. Mistakes were most often seen with numbers for carbon dioxide that were not subscript, or the oxygen symbol was too small.

(b) For this question responses were mixed. The best candidates who achieved Level 3 gave a sequence for the experiment where they had clearly given correct volumes and masses, and stated how they would keep the experiment fair. Mistakes were often made by candidates stating they would complete a fair test, but then gave the incorrect values for mass and volume of acid. Some did not achieve higher level responses because they merely stated “I will do everything the same” but not being specific about amounts or method. A few candidates did not understand the concept of fair testing or gave a description of a different investigation than the one suggested in the question.

(c) Most candidates achieved a mark here; usually for “use a lower temperature”. Some candidates appeared to have misread the question and chose the top two distracters, which would have made reaction faster.

Q8

(a) Most candidates were able to select the correct reason for the preliminary titration.

(b) In this question a mark was most often given for discounting Ben ie same bottle/same concentration. When they chose Carl often a general answer was given indicating measuring out too much or too little would affect the result, rather than specifically saying that Dee must have measured out too little. A significant number of candidates were confused as to what the phrase ‘going past the end point’ meant.

(c) Most candidates were able to correctly select neutralisation, but when an incorrect response was selected it was most often filtration or crystallisation.

Q9

(a) Many candidates were able to correctly give 15g as the answer. The no responses in 9(b)(i) suggests these candidates did not have a calculator.

(b)(ii) A number of candidates correctly used the formula given and were able to give 55% as their response; many were not sure how to do it. There were a few random numbers given, even after having got 5.5g in 9b(i). Often 36.6% was given, which was calculated using theoretical yield from 9(a).

A172/02 Twenty First Century Science Chemistry A (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. Occasionally, candidates ticked too many boxes in the single choice questions.

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 extended-writing questions, candidates generally answered more fully than in the previous session. Two of the questions (2a and 4) provided candidates with information to use in their answers. In general, candidates referred to the information extensively, showing that they are skilled at extracting and processing data from tables and diagrams. 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. Many candidates reached Level 3 in one or all of the six mark questions (which, again, is an improvement on the previous session).

Although time management was usually very good, some candidates omitted some questions entirely.

Comments on Individual Questions:

Q1

(a) Most candidates gained both marks for identifying bromine as having an incorrect boiling point, often linked to its liquid state or to a correct comparison with its melting point. Candidates, who suggested chlorine as the answer, were awarded a single mark if they gave a correct reason linked to the general trend in boiling points in the table.

(b) Just less than half of the candidates went on to suggest a boiling point for bromine that was in the acceptable range (above room temperature but well below that of iodine).

(c) Most candidates correctly gave the formula for astatine. Common errors included presenting astatine as atomic (At) or giving an incorrect symbol for the element (for example As_2).

Q2

(a) This question was well answered and a full range of achievement was seen. The commonest score for the question was 4 marks at Level 2. Candidates typically classified the properties of hydrogen from the table into ‘fitting’ or ‘not fitting’ the statements of Fay and Guy, but two broad types of error in the answers limited the candidates’ scores. Firstly, some answers did not fully link the properties of hydrogen to the properties of group 1. The question specifically asked candidates to ‘use their knowledge of group 1 elements’. Therefore some answers were incomplete. For

example, saying 'hydrogen doesn't fit with group 1 because it is a gas' is a lower level answer than 'hydrogen doesn't fit with group 1 because it is a gas but group 1 elements are all solids'. Secondly, some answers gave very confusing accounts that compared the properties incorrectly, for example stating that group 1 are all non-metals or that hydrogen must always gain electrons to form an ion.

(b)(i) Most candidates gained at least one mark, usually for correctly balancing the equation.

(b)(ii) Most correctly identified the correct formula for the hydride ion.

(b)(iii) This question was an interpretation question. Candidates were not expected to know the name of calcium hydride, but there was information in the question and from the Periodic Table that would enable them to deduce it. Most gave the correct name. Calcium hydroxide was a common incorrect answer

Q3

(a) An even spread of marks from 0 to 3 were seen for the question, showing skill at extracting and processing information. The table gave the colours for the flame tests. The skill that was being tested was that candidates needed to show that they could use the information to explain why the statement made by Ben was true. Some candidates copied out relevant information from the table, but did not explain why it supported Ben. So, for example, a list of elements and their flame colours was insufficient to access the available marks.

(b) Over half of the candidates did not score any marks here. This was usually due to answers being pitched at too low a level for a higher tier paper. Answers saying that 'the spectrum would look the same as arsenic' were not given credit. The mark scheme demanded that candidates recognised that spectra are compared by the position of their lines or by patterns. Some candidates thought that each element gives a single line in a spectrum, so that each line represents a different element.

(c) Most knew that the same types of atom have the same number of protons. Some candidates ticked two, rather than one box, implying that they had not read the question instructions carefully.

Q4 This six mark question was shared with the foundation tier paper; it was designed to differentiate candidates working at standard demand (grades C and D). A full range of achievement was seen. Again, some information was presented in table and diagram form to support candidates in answering the question. The question asked the candidates to 'use ideas about structure to explain the similarities and differences in the properties of diamond and graphite'. About 40% of candidates achieved Level 3 by accessing this task very well. Common reasons why Level 3 did not score included making incorrect statements about structures (for example conduction in graphite linked to moving ions, or the bonding in both being ionic), or for only discussing differences between the structures and omitting any discussion of similarities. Some candidates quoted incorrectly from the table, for example referring to diamond as 'strong' rather than 'hard' and graphite as 'weak' rather than 'soft'.

Q5

(a)(i) The most common score for this question was full marks (3). Almost all candidates knew how to quote answers to 3 significant figures. A very common error was incorrect rounding, for example by giving 79.8 as the final answer rather than 79.9.

(a)(ii) About a third of candidates used their answer to (a) (i) to give a correct mass of copper that could be extracted from a kilogram (error carried forward from an incorrect answer in (a) (i) was allowed). Developed quantitative calculations are a feature of all GCSE science papers and candidates need to be aware that they may need to use previous answers to perform calculations later in the same question. This question had a relatively high incidence of no responses.

Q6

(a) Many candidates started this answer incorrectly by choosing helium as the gas with a relative formula mass of 2. This led them to place hydrogen in the third row of the column, losing two marks. Almost all correctly chose carbon dioxide as the only gas that is a compound.

(b) The properties of molecular substances were well known with almost all candidates scoring at least one mark.

(c) Candidates were not so sure about covalent bonds. They commonly thought that electrons or nuclei are attracted together. Few candidates gained both marks.

Q7

(a) A full range of achievement was seen for this equation completion. Most candidates correctly gave the name of calcium chloride. Most knew that carbon dioxide was a product, but hydrogen was commonly given as the second blank product. The formula for calcium carbonate was less well known. CaC_2 and $CaCO_2$ were common incorrect answers. Some candidates lost marks for poorly writing the formulae of carbon dioxide and water. Answers such as Co_2, H_2o, h_2o and CO^2 were not given credit.

(b) This was the least well answered of the six-mark extended writing questions. There were several routes to gain marks. Candidates could discuss controlling conditions between 'runs' of the experiments or identify what they would measure during the reaction. Commonly however, they gave very low level responses such as 'He would look at the gas syringe and see the gas being made faster if the reaction was faster'. For Level 3 it was important that all aspects of the task were addressed. The question asked candidates to say how Alex would 'use his results'. Many answers did not refer to any results but only discussed vaguely 'if it looks faster, then it must be faster'.

(c) Almost all candidates selected at least one of the correct statements about reaction rate.

Q8

(a) Almost every candidate knew that the first titration result is used as a 'rough'.

(b) This was another question that asked candidates to process provided information. An even spread of scores from 0 to 3 were seen. Better answers addressed the question fully by referring to the different ideas of each person. Some answers only addressed some of the ideas and so limited the possible marks that could be scored.

(c) Most candidates knew water was formed. Fewer selected the correct ions for the left hand side of the equation. Sometimes careless errors in copying the formulae cost candidates marks.

Q9

(a) Over half of the candidates scored at least some credit in this calculation, usually for correct calculation of the Relative Formula Mass of sulfuric acid.

(b) In this question, poor expression sometimes cost marks. Answers such as 'because it is three times the mass of magnesium oxide' did not score, as this merely restates the information in the box. Better answers referred explicitly to the ratio of the Relative Formula Mass of the compounds being in the ratio of 1:3.

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