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Examiners' Report Summer 2008

IGCSE

IGCSE Chemistry (4335)

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4335 Chemistry Paper 1F Section A

General Comments

Questions in this section are targeted at grades G to E.

Question 1

In part (c)(i), almost no candidates could say what an element was. Most gave a symbol or name as an example, or stated that it was made up of protons, neutrons and electrons.

Question 2

In part (b)(i), most candidates knew that the answer required was something to do with reactivity, but relatively few stated that zinc was more reactive than iron. Many attempts that came close referred to iron(II) or to iron(II) sulphate.

Question 3

In part (a)(i), the test for hydrogen was often correctly described, although with many candidates using a glowing splint through confusion with the test for oxygen.

Question 4

This question was generally answered well.

Question 5

This question required candidates to show the correct order of instructions used to prepare a salt. Very few left any of the boxes unfilled or repeated the instructions already used. Although a minority scored full marks, most received partial credit for orders that were partly correct.
In part (b)(iv), although the expected answer for a substance with pH = 7 was water, a great variety of suggestions was made, many of which were the names of acids.

Question 6

In part (b)(ii), many candidates were able to correctly give the formula, although CuO_2 and near misses such as Cuo and CUo were seen quite frequently.

Uses of carbon dioxide were well known in part (c)(iii), with fire extinguishers being the commonest choice.

4335 Chemistry Paper 1F Section B / Paper 2H Section A

Questions in this section are targeted at grades D and C.

Paper 1F Question 7 / Paper 2H Question 1

This question was based on the industrial extraction of aluminium. Most candidates gained the mark in parts (a)(i) and (ii) although a number gave aluminium as the electrode material. Some candidates omitted (a)(iii), it is suggested that rather than just look for dotted lines or gaps in which to write answers, candidates read the questions and use the marks indicated on the paper as a guide to what is required. In (a)(iv) a common error was to use bauxite as the electrolyte or even water. Most gained the mark in (a)(v) although some who went for electrode replacement did not gain the mark due to vague answers that referred to “electrode” rather than “anode” or “positive electrode”. Part (b) was well answered although some very strand compounds were seen in (ii), candidates who correctly identifies the compounds as carbon dioxide sometimes did not go on to score the second mark because they identified the oxygen involved as coming from the air.

Paper 1F Question 8 / Paper 2H Question 2

This question was based on organic chemistry.

In (a)(i) common errors included stating physical properties were the same or that chemical properties followed a trend; other errors included statements about being saturated or hydrocarbons, some stated they had the same general formula despite the question asked. Part (a)(ii) was almost always correct and most gained the mark in (a)(iii). There were some unexpected errors in (b)(i) with hydrogen shown as having two electrons or carbon as 12. In (b)(ii) those candidates who new the formula of methane, which was given at the start of the question, generally picked up the marks; the number of candidates who did not know the formula of methane was disappointing. A common error in naming the shape was to call it “pyramidal” – this description is used for ammonia (and other tetrahedral based molecules where one position is occupied by a lone pair – it will not be required at IGCSE!). Very few candidates scored both marks in (c)(i) – terms such as “chemical formula” are not the equivalent of the term “molecular formula”, it was not uncommon to see descriptions of isotopes to be written, sometimes followed by two correct diagrams of the isomers! Many candidates drew two diagrams of butane and just bent, rather than branched, the chain. Candidates who were unable to interpret the molecular formula of butane that was given could not score.

Paper 1F Question 9 / Paper 2H Question 3

This question was about the chemistry of Group 2 elements. Part (a) was well answered, however in (b)(i) many candidates gave the same observations as for sodium – but calcium does not melt, it does not just float (although it may well move up and down) and it definitely does not catch fire when placed in water. The formula of calcium hydroxide was often incorrect. In (b)(iii) some candidates hedges their bet by giving two colours – this is not a good idea since it means that both colours must be correct; given that the indicator was litmus, having two colours is contradictory. Hence any reference to purple was wrong (since purple means neutral for litmus). In (c) the colours were well known (although a few though the oxide of magnesium was black). Collecting the hydrogen caused some problems, candidates sometimes gave contradictory answers – such us “upwards into a test tube – upward displacement”. Some candidates chose to give three methods – a dangerous thing to do since all three methods need to be correct to gain the two marks, if one method is wrong and two correct then only one mark can be awarded. Despite asking for a word equation in (c)(iii) many tried to write a symbol equation – this does not answer the question set and so does not gain any marks. In the word equations "carbon dioxide" was not an uncommon product.

Paper 1F Question 10 / Paper 2H Question 4

This question was about ion identification tests.
More able candidates scored well while less able candidates scored very poorly. In (a)(i) a common error was to identify the gas as chlorine, the same answer was often seen in (ii) – the ion name must end –ide. In (iv) the oxidation state/charge of the iron was often omitted or wrong. (b)(i) was often correct, as was (ii) – although it must be stressed that the flame test colour for potassium is NOT purple; again the use of double colours should be avoided since both must be correct. Part (c) was poorly answered, many did not state there would be a yellow precipitate and in (ii) the formulae of the products were often incorrect. It is worth remembering that in the common questions there will never be a need to balance an equation – so if a candidate finds that they need to balance their equation they must have got something wrong.

4335 Chemistry Paper 2H Section B

Questions in this section are targeted at grades A*, A and B.

Question 5

This question was, in general, very poorly answered. In (a), those who were unable to name the process were usually unable to pick up any marks in (ii). In part (ii) there were often incorrect references to "copper sulphate molecules". Many answers stated that "diffusion was the movement of particles from areas of high to low concentration" – this gives a rather simplistic idea and suggests one way travel, while we decided to credit this answer on this occasion it should be noted that diffusion is the **net** movement of particles from areas of high to low concentration and is brought about by the **random** motion of particles. There was some confusion with diffusion and Brownian motion; it should be noted that Brownian motion has been deleted from the specification.
Part (b) yielded some very strange answers, varying from a pungent gas being evolved to brown precipitates of copper. Some suggested that the copper(II) hydroxide precipitate was green or blue/green – which it is not. Very few correctly gave the formula of the complex ion.

Question 6

This question was based on sodium.
Most gained some credit in (a)(i), but although many used the term "effervescence" a number seemed not to appreciate its meaning – answers such as "it effervesces and bubbles" were not uncommon. It should be noted that the sodium should not catch fire spontaneously if a safe sized piece is used in this reaction and the sodium does not dissolve – if it simply dissolved then evaporation of the final solution should yield sodium metal. A common error in the equation was to either have sodium with a valency of two or to form the oxide. Most realised that rubidium would bubble more violently. In (b) many answers showed a lack of logical idea development, although in the majority of cases full marks could still be awarded. Part (b)(ii) showed some very

poor use of terminology, most got the idea of strong forces or bonds requiring a lot of energy to break but the mark for stating the bonds/attractions were between ion was rarely awarded; it was not uncommon to see answers such as "ionic bonds lead to strong intermolecular forces between atoms"! This shows a fundamental problem with the understanding of atoms, ions and molecules. Part (iii) required a comparison to be made – so comparative language had to be used; in MgO the bonds are strong**er** – not just strong and magnesium ions do not have a high charge, they have a high**er** charge than sodium ions.

Question 7

Part (a) was poorly answered by many candidates –although most picked up at least one mark. Some candidates decided not to use the reagents provided in the question, some even chose to start with magnesium chloride. Having been told the solubilities of magnesium carbonate and magnesium chloride, a worrying number chose to use a pipette or burette for the magnesium carbonate and then to collect the magnesium chloride as a precipitate. Salt preparations provide students with a chance to conduct some relatively safe practical work, some candidates seem not to have done (or even seen) these preparations. The calculation in (b) caused some problems, in (ii) those candidates who managed to recall the correct relationship to use (moles = concentration x volume) often failed to convert the volume into dm^3. Part (iii) required use of the ratio in the provided chemical equation, some claimed a 1:1 ratio and so did not gain the mark. In (iii) common errors were again not to remember to use dm^3 or to multiply rather than divide.

Question 8

The test for the carbonate ion was generally well known, although some gave the test for sulphate or halide ions. The equation was frequently wrong, the common error being an incorrect formula for sodium carbonate (despite it appearing in (c)!). There was some confusion in (b) with candidates thinking that the same limewater was going to be used and stating "goes clear again" – even if the same limewater was used, it would not change. Most candidates picked up some marks in (c), but few scored full marks in (i) – it was common to have formula mass of sodium hydrogencarbonate of 168 (2 moles) or 107 (2 sodiums). In (ii) some candidates ignored the equation given and tried working out the moles of carbon dioxide based on its molar mass.

Question 9

This question was based on the halogens.

Most were successful in predicting the boiling point of bromine (74.5^oC being a very common answer) but some ignored the minus sign in front of the figures for the boiling point of chlorine – and so predicted boiling points that were too high. In (b)(i), those who knew the formula of hydrogen chloride often did not recall that both hydrogen and chlorine are diatomic. In (b)(ii) most scored two marks for the first part but then scored poorly in the second part – it was not uncommon to think methylbenzene was an alkali and that there was (or was not) a neutralisation reaction. A common problem was the colour of universal indicator paper – a number stated that there would be no colour change and then lost the mark by stating it would stay green; universal indicator paper is normally orange until it comes into contact with water. Some thought litmus and universal indicator were the same thing.

Question 10

Most could name the type of rust prevention and a place where it is used, although it should be noted that it is not used for "tins" (which are so called as they were made from tin-plated steel) nor for food cans - soluble zinc compounds should not be ingested in quantity and so galvanised food cans may lead to death. In (iii) there were many answers that were based on "protective layers of zinc oxide" – this question was requiring an explanation of how a **damaged** zinc layer still prevented rusting, if the zinc layer is not intact then the zinc oxide that forms on the zinc would also not be intact. In part (b) common errors were to fail to make the nickel nitrate into the solution, to "react the nickel nitrate with the metals" (seemingly missing the whole point of the experiment since if the added metal is less reactive than zinc there will be no reaction) rather than adding them together. Some candidates decided that rather than use nickel nitrate and the provided metals they would use all manner of other substances. Disappointingly some thought nickel nitrate and nickel were one and the same thing. Part (c)(i) was well answered but (c)(ii) proved challenging. Most candidates gained the mark for calculating the number of coulombs but then in the conversion to faradays some inverted the fraction (96000/240 rather than the correct 240/96000), if this stage had been achieved it was then frequent to fail to appreciate the 2+ charge of the nickel ion. In the last step it was not uncommon to use the formula mass of nickel nitrate rather than the molar mass of nickel. Another not uncommon error was to move the decimal point between one line of working and the next, leading to an error of a factor of 10.

Question 11

Parts (a) (i) and (ii) were well answered but some answers to (iii) focussed on rates or assumes that all equilibria were the same as the formation of ammonia and so the yield must decrease as temperature rose. A frequent error in (b) was to ignore the requirement to show at least 4 carbon atoms in the structure. The calculation in (c) was often incomplete. Many good answers were seen (as well as some very poor ones) but there were commonly errors in simplifying ratios. It was not uncommon for just the empirical formula to be calculated with no attempt to find the molecular formula. Some of those that did attempt to find the molecular formula did not appreciate that if the relative formula mass of the compound divided by the relative formula mass of the empirical formula is not an exact whole number then a mistake must have been made.

General points

- If a word equation is asked for then a chemical equation (using formulae) will not score. The opposite is also true.
- If **one** or **two** etc. reasons points are asked for then it is not a good idea to give more than the requested number since any errors will lead to the loss of a mark.
- If a colour is required, do not give two colours as the answer as both colours must be correct.
- If a temperature (or pressure) is required then do not give a range since both extremes of the range must be correct.
- Candidates should use words in calculation to explain what they are doing.

4335 Chemistry Paper 03

General Comments

Questions in this paper are targeted at full range of grades from G to A*.

Question 1

This question was generally answered well.

Question 2

In part (a) almost all candidates wrote three values, usually to 2 decimal places (with the last one as a 0 or 5). Very few read the burettes incorrectly, and the commonest errors were to invert the initial and final readings or to write 1.3 instead of 1.30. In (b), every possible combination of ticks was seen; apart from the correct choice, the most common combinations were all four or the last three. Many candidates scored consequential marks in the calculation, although quite a number did not give the final answer to the expected 2 decimal places. A few averaged the final burette readings instead of the titres.

Question 3

Part (a) was generally well done, with the vast majority of candidates choosing two features of malachite, rather than of the acid. Most chose two correct features, although some gave two answers that covered the same point, such as "same mass" and "same amount" (without any qualification, "amount" was taken to mean the number of moles). The "odd one out" in (b)(i) was usually correctly chosen, with an appropriate reason. Student 1 was the most common incorrect choice, usually because a negative sign was used to show the mass loss. Many tables in (b)(ii) scored 3 or 4 marks, although the headings often lacked one of the units or the correct headings. "Mass" with no indication of what it referred to, was quite commonly seen. A disappointing number included the results of all four students.

In (c), almost all candidates chose the obvious scale of 1 cm to represent 0.1 g. A few did not start the scale at zero, and some used 1 or 10 instead of 0.1, but most were able to plot the points correctly, although a surprising number omitted the one for 90 %. The straight line was usually carefully drawn, although it was not always extended to the origin, and the anomalous point was nearly always recognised. Many candidates had some idea of the errors that caused the anomalous result, but failed to score because their answers did not clearly explain why the mass of carbon dioxide was higher, rather than just different, from the expected value. So, "temperature too high" scored, but "wrong temperature" did not; "too much acid added" scored, but "acid concentration wrong" did not. Those who referred to the stopwatch sometimes wrote that it was started too late, rather than stopped too late. Nearly all candidates were able to estimate the mass of carbon dioxide at 70 % concentration.

In (d), most candidates were able to state that the mass increased as the concentration increased (although some had the relationship the other way round), but far fewer stated the direct proportion or a phrase such as "the mass double as the concentration doubles". Although most explanations referred to the collision theory, very few candidates scored both marks. Some omitted to mention particles, or referred to atoms or molecules, while most stated that there would be more collisions, but with no reference to frequency or time.

Question 4

In part (a)(iii) the vast majority of candidates were able to correctly calculate the solubility using the given formula, with a few scoring the marks consequentially on incorrect answers to (a)(ii). Although the solubility scale on the graph was more difficult than the scale used in 3(c), most candidates plotted all the points correctly. Nearly half chose to draw a straight line rather than a curve of best fit through the points. This error cost candidates only one mark, as (b)(ii) was marked consequentially.

Question 5

This question was generally answered well.

4335 Chemistry Paper 04 (Coursework)

The total number of centres entering candidates for this component of the examination increased again this year. Five home centres entered candidates this year, which is also an increase on last year.

The moderating instrument used was the Sc1 criteria as used by home centres, using exemplars provided by the JCQ (Joint Council for Qualifications) as a guide.
Centres entering students for the coursework component of the iGCSE examinations in 2008, therefore had their coursework moderated to the same standards as for all home centres.

The most common task seen this year was once again a rates task – sodium thiosulphate / hydrochloric acid. Two centres did combustion of alcohols as an alternative. This latter task usually scored high marks.

The rates task is a very common task in UK centres, but it does have some disadvantages. Firstly, if the students (or teacher) decide to investigate the effect of varying the concentration of sodium thiosulphate solution, it is difficult for the students to incorporate sufficient scientific knowledge to fully access P8a.
It is more appropriate to study temperature as the variable, so that students can discuss exothermic and endothermic steps, as well as the concept of activation energy.

Centres which awarded full marks for the visual disappearance of a cross in the thiosulphate/acid task were too generous. The observation of a cross disappearing as the precipitate of sulphur forms is a subjective matter, and therefore it lacks **precision**. (Precision is a key factor in the award of O8a). Please note also that the requirements of O6a and O6b should be fully met before O8a is considered.

Students who choose to investigate the effect of varying temperature on the reaction rate, should be encouraged to record the actual temperatures used. Quoting temperatures to the nearest ten degrees (perhaps following the range of temperatures stated in the planning phase) lacks precision.

CHEMISTRY 4335, GRADE BOUNDARIES

Option 1: with Written Alternative to Coursework (Paper 3)

	A*	A	B	C	D	E	F	G
Foundation Tier				61	49	37	25	13
Higher Tier	74	62	50	38	25	18		

Option 2: with Coursework (Paper 04)

	A*	A	B	C	D	E	F	G
Foundation Tier				64	51	38	26	14
Higher Tier	77	65	53	41	27	20		

Note: Grade boundaries may vary from year to year and from subject to subject, depending on the demand of the question paper.

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