Examiners' Report November 2007

IGCSE

IGCSE Chemistry (4335)

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Paper 1F, Section A
The entry for this paper was very small, hence these comments are based on a very small number of scripts.

Question 1
This question required students to use and interpret the Periodic Table. In part (b) it was evident that either some candidates did not know which group the noble gases were or they did not include Helium in their counting. In parts (c) and (d) it must be remembered that where a question asks for a symbol (or a formula) then the name is **not** an acceptable answer; the most common error here was candidates mixing up "relative atomic mass" and "atomic number". A common error in part (e) was to give group 2 as the answer, so getting the sign of the charge on the ions incorrect.

Question 2
This question was generally well answered. Parts (c), (d) and (f) proved to be challenging. The differences between elements and compounds seemed not to be well known, at the frequency with which "allotropes" was given as an answer suggested that the meaning of this term was also not well known. In part (f) only a minority of candidates knew that for relative masses, the comparison was to carbon.

Question 3
While some candidates scored well on this question, other gave seemingly random answers. Candidates are expected to know a range of separation techniques, and know when they can be used. The table below summarises the separation techniques tested in this question:

type of mixture	what is to be obtained	technique
a solution of a solid solute dissolved in a liquid solvent	the liquid solvent	distillation (evaporation of the solvent, followed by condensation)
a solution of a solid solute dissolved in a liquid solvent	the solid solute	evaporation of the solvent (so leaving behind the solute) or crystallization (evaporation of the solvent until crystals start to form).
an insoluble solid in a liquid	the liquid	filtration
a mixture of coloured compounds	one of the coloured compounds	chromatography
a mixture of liquids	one of the liquids	fractional distillation

Question 4
This question was based on the reaction of Group 1 metals with water. A common error with the equation was to give the state symbol for water as (aq). In part (b), despite similar questions being asked in the past, very few candidates could give two correct observations; it should be noted that the metal does not "dissolve" (if it did, "sodium solution" would be made) the metal reacts and we can see the piece of metal getting smaller, we also cannot see that a gas is given off – we conclude this since we can see bubbles formed. In part (d) the test to show that the solution produced is alkaline was not well known. All that was required was the naming of a

suitable indicator and the appropriate colour change. When litmus is used as the indicator, blue litmus is not suitable for testing an alkali – red litmus should be used.

Question 5
This question was about the rusting of iron. While most candidates coped well with parts (a) and (b), most gained few marks on the rest of the question. A common error in part (d) was to state that rusting was an example of combustion. In part (f) a common error was to say that a method of preventing iron rusting was "to keep it somewhere dry"; while it is true that this would indeed avoid the formation of rust, it is not a practical method of rust prevention.

Question 6
This question was very poorly answered. In part (b) you cannot see "carbon dioxide gas being made", it is a colourless gas and so is not seen, the effect of the gas (the fizzing) is seen. More able candidates gained marks in part (c) for the test for carbon dioxide. In part (d) a number of answers stated that sulphur dioxide gas is not acidic, and so were missing the point of this question. This course includes a number of acidic gases (and so a test based on the effect on blue litmus is not conclusive) but only one alkaline gas (ammonia) – (and so a test based on the effect on red litmus is conclusive). The formation of sulphurous acid from sulphur dioxide and water was virtually unknown; since the question asked for a word equation, those candidates who attempted a symbol equation were guaranteeing themselves no marks on this part. The effect of acid rain generated many seemingly random environmental problems.

Question 7
More able candidates gained a reasonable number of marks on this question while less able candidates typically scored one or zero. A common error was to omit the important word "only" in part (e). Correct word equations in part (f) were not seen; as in 6(e), equations involving symbols will not be accepted when a word equation is asked for.

Question 8
This question was very poorly answered. In part (a) many answered included labels that related to metals other than iron or just wrote seemingly random words. In part (b)(i) the most common answer was to select the incorrect equation and in part (b)(ii) most could not state what had been reduced. A minority of candidates realized that carbon monoxide was toxic while virtually none of the candidates could explain why Aluminium was not extracted using a blast furnace – many stated that aluminium had too high a melting point (possible getting mixed up with the melting point of aluminium oxide and the need to add cryolite in order to allow electrolysis to be conducted).

Common Questions

General Comments

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

Paper 1F Question 9 / Paper 2H Question 1

This question was about hydrocarbons. Most candidates successfully identified the correct hydrocarbons in part (a), with perhaps the commonest error being to choose two members of the same homologous series instead of two isomers. The poly(ethene) structure in part (b) was usually correct, and it was pleasing to see very few double bonds or missing continuation bonds this session.

Paper 1F Question 10 / Paper 2H Question 2

This question was about atomic structure and electronic configuration. In part (a), there were very few all-correct answers, and a disappointing number of candidates were unable to write correct relative charges for the electron and neutron. By far the most common error was to give 0 as the relative mass of the electron. Although candidates are correct in thinking that the mass is negligible in comparison to the other sub-atomic particles, they are required to know an approximate numerical value; most of those who gave a value used a fraction rather than a value such as 0.000545, both of which are acceptable. Parts (b) and (c) were generally well answered, although in (c) a few misread the questions and calculated the total number of electrons in an astatine atom. In part (d), the idea of a full electron shell was usually correctly expressed, although with a surprising number using the inappropriate term **saturated**; the resulting lack of reactivity was sometimes described as just a similarity in reactivity.

Paper 1F Question 11 / Paper 2H Question 3

This question was about the reactivity series of metals. Part (a) was generally well answered, although some candidates stated that magnesium was more reactive without a mention of zinc. The equation in part (b) was often correct, with very few word equations being seen. Candidates should be careful, when writing the symbol for iron in an equation, not to include an oxidation number such as (II). A surprising number of candidates failed to make a correct selection of colours from the table; the correct colours in the wrong order, and a mixture of solid and solution colours, were common errors. In part (c), the great majority of candidates correctly compared the reactivity of hydrogen with both iron and copper.

Paper 1F Question 12 / Paper 2H Question 4

This question was about the preparation of magnesium sulphate, and was generally very poorly answered. Few candidates scored all 3 marks in part (a); "enthalpy change" and "increases" were the expected answers. The product of combustion of hydrogen in part (b) was often given as "hydrogen peroxide", "hydroxide" rather than water. Part (c) proved to be very challenging for all but the most able candidates, and it seemed that many were not familiar with the sequence of steps in a salt preparation. The commonest errors were to assume the starting point of a solution of magnesium sulphate, rather than the reagents specified in the question, and to write about heating without making it clear what was being heated (the reagents, the residue, the filtered solution or the crystals). Many described heating to evaporate all the water even though they had already referred to the crystallisation point, while a few answers described a titration or wrote about fractional distillation.

Paper 1F Question 13 / Paper 2H Question 5

This question was about hydrogen chloride, and proved difficult for many candidates. In part (a), although most candidates correctly drew the bonding diagram, many went on to explain the low boiling point in terms of breaking covalent bonds or weak forces between ions. In part (b), many answers contained more than one ion, eg H^+ and Cl^-, and H, H_2 and hydrogen were often seen; the methylbenzene solution explanation was often given in terms of neutralisation. In part (c), only the most able candidates gave both correct colours in (i), while the explanation in (ii) was often spoiled by a reference to protons or neutrons. A variety of tests appeared in part (d), including the flame test, litmus and silver nitrate, while many who chose sodium hydroxide failed to give the correct colours or did not mention "precipitate".

Paper 2H, Section B

General Comments

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

Question 6

This question was based on ethanol. Most candidates managed to choose sugar or carbohydrate in part (a), although some gave the specific name glucose instead of the type; empirical formula was sometimes confused with general formula. The conditions required in parts (b) and (c)(ii) were often given correctly by the more able candidates but either reversed or confused with other industrial processes by less able candidates. Part (d) was surprisingly poorly answered, with many candidates describing Brazil as a poor country and therefore one that could not afford to hydrate ethene, or stating that there was plenty of room to grow crops, but with no reference to sugar cane. The use of sodium as the reagent in part (e) was known by some, although many chose a sodium compound such as sodium hydroxide. The reaction product was often stated to be sodium ethanoate, although some hybrids such as sodium ethaneoxide appeared, while slightly more chose ionic than covalent as the type of bonding.

Question 7

This question was about sulphur and its compounds. Most attempts at the formula in part (a) involved the symbol S, although with relatively few including the number 8. The idea that I and II represented different types of bonding was understood by most candidates, and a pleasing number gave covalent and van der Waals', or acceptable equivalents such as bonds between atoms and bonds between molecules, respectively, although with a substantial number choosing ionic bonding. In part (b), many candidates recalled the conditions for the Contact process and gave an equation for the reaction, although often unbalanced. The equation in part (c) was poorly attempted, with a variety of errors appearing, including oxygen on the left or right hand side. Some of the effects of acid rain were expressed too strongly, such as "destroys buildings" instead of a reference to limestone reacting with the acid.

Question 8

This question was about magnesium and fluorine. In part (a), although most candidates had some idea of the meaning of **malleable**, the idea of layers of atoms sliding over each other was less well known; the most disappointing answers were to part (a)(i), with many candidates scoring no marks. The existence of delocalised electrons was known by some but the lattice of positive ions by very few. In part (b), the idea of sharing electrons was known by many candidates, although with few referring to a pair, and many answers were spoiled by a reference to electrons being shared between molecules; only the most able mentioned the attraction between the nuclei and the electron pair. The electronic configurations in part (c) were generally correct, as was the diagram of the magnesium ion in part (d), although common errors included the omission of the inner electrons or showing a third shell. Less able candidates referred to molecules or covalent bonding in part (e), while more able ones realised that ionic charges were involved in the explanation; unfortunately there was a lack of precision, such as a statement about the higher charges in MgF_2 without any mention of Mg^{2+} and Na^+.

Question 9
This question was about the manufacture of ammonia and nitric acid. In part (a), the effects of changing conditions on rate and yield were completed correctly only by the most able candidates, with many confusing the two. The explanation in part (b) was poorly done by most candidates, with some not even scoring the mark for stating that the rate would increase. Many thought that increasing the nitrogen concentration would somehow increase the temperature, and so there were many explanation that referred to the increased speed of molecules, or to atoms rather than molecules. The idea of returning the unchanged nitrogen and hydrogen to the reactor was known by many, but some failed to score by not making a clear statement to that effect; answers along the lines of "it is used again" or "it is used to make more ammonia" were not accepted. Parts (d) to (f), about the manufacture of nitric acid and fertilisers, were well attempted, with many high scores from able candidates.

Question 10
Many candidates correctly identified the flame colour and the reagent in parts (a) and (b), but the equation and observation in part (d) were less well known. The calculation in part (c) was well attempted by most candidates, with the more able achieving full marks; others scored several of the 7 marks available, often as the result of consequential marking. It was pleasing to see that many candidates had been taught to make their final answers prominent, often by underlining. This is to be encouraged, and is especially helpful for those who do not show their working in a tidy way.

Question 11
This question was about the electrolysis of dilute sulphuric acid. It was generally poorly answered except by the most able candidates. Most managed to identify the polarity of the electrodes, but identifying the species being reduced proved more of a challenge, with many giving "hydrogen" or "H_2" instead of H^+. Many showed the volume of oxygen as equal to that of hydrogen, making the explanation marks impossible to score. Several of the 6 marks available for calculations in parts (b) and (c) were scored, often consequentially, by many candidates.

Paper 3

Question 1

This question required candidates to select a suitable item of apparatus to measure a certain variable and then state the units of measurement of that variable. While most candidates gain all of the marks for apparatus selection (although a few candidates gave the same item for two different variables), more errors were made in stating the units used. There were common errors in indices (so volume was measured in cm^2).

Question 2

This question concerned the thermal decomposition of some metal carbonates. Many candidates gained both marks for identifying variables that must be kept constant in order to make it a fair test. However, many candidates did not relate their answers to the question and gave general answers such as "the amount" without specifying of what; some stated "time" despite this being the dependent variable. In part (b), most knew that repeating could be used to check reliability. The bar chart in part (c) caused unexpected problems. Candidates often failed to label the vertical scale, and those that did often omitted the appropriate units; bars were often not identified. Part (d) caused few problems. In part (e)(i) a number of candidates thought the gas would not be collected at all while in (ii) vague answers such as "the volume collected will be different" were not credited. Relatively few candidates could name a method of collecting the gas without using water in (iii). Despite making the scales more difficult by printing them as they would be seen if doing the experiment, most candidates gained full marks in part (f)(i); however (ii) proved more challenging with some candidates not being able to work out the time taken; candidates should know the difference between significant figures and decimal places. Part (f)(iii) was, pleasingly, well answered.

Question 3

This question was based on the combustion of a candle in limited supply of oxygen. In part (a) candidates would be well advised to look at the number of marks available. If only 1 mark is available for describing a relationship, then a simple statement along the lines of "as x gets bigger, y gets bigger" should suffice, however, if 2 marks are available then more is required, such as in this case the idea of "direct proportionality" or "doubling one doubles the other". In part (a)(iii) the problem is not air leaving the beaker but air (or more importantly, oxygen) entering the beaker. Measuring the volume of the beaker in part (b) proved difficult for many candidates. Most candidates could identify the most reliable results in part (c), although the reason should have been based on the closeness together of the values – they are not "the same values". Less able candidates experienced problems with the graph in part (e), ranging from non linear graph scales, through careless plotting of points, to graph lines that were either no best fit or were multiple lines. Most could identify the anomalous point but, as is often the case, could not come up with a reasonable explanation of what may have gone wrong in measuring that datum point. The explanation offered must always explain why the value obtained is either too large or two small. In this case time was too long, and so the explanation had to account for this. In part (e)(iv) many candidates, rather than using smaller beakers, wanted to use beakers containing no air or even with a volume of 0 cm^3. In actual fact, the line will not go through (0,0) since the method of measuring volume does not account for the volume of the candle used. Part (f) required a quantitative answer for (i); in (ii) many candidates correctly read a time from their graph but then did not multiply this by 5.

Question 4
Candidates who used the data provided in this question generally scored well, while candidates who relied only on their existing knowledge tended to score very poorly. In part (a) a common (and rather surprising) error was rather than give two possibilities for the identity of the compound ("sodium carbonate" and "sodium hydrogen carbonate") was to come up with one identity and split it into two (so giving, for example, answers of "sodium" and "carbonate"). In part (b) less able candidates gave answers involving varied and often multiple problems and tests, while more able candidates applied the information given and were able to give succinct answers which addressed the question.

COURSEWORK (PAPER 4), PRINCIPAL MODERATOR'S REPORT

Centres who entered candidates for the coursework option have received a report directly from the Principal Moderator.

For general comments about coursework please refer to the Moderator's Report for June 2007.

CHEMISTRY 4335, GRADE BOUNDARIES

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

	A*	A	B	C	D	E	F	G
Foundation Tier				55	44	33	22	11
Higher Tier	82	68	54	41	29	23		

Option 2: with Coursework (Paper 04)

	A*	A	B	C	D	E	F	G
Foundation Tier				N/A	N/A	N/A	N/A	N/A
Higher Tier	84	70	56	43	31	25		

No candidates at foundation tier entered coursework so there are no grade boundaries for this category.

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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