Examiners' Report
November 2012

GCSE Chemistry 5CH2F 01

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Introduction

As expected, there was a wide range in the abilities of the candidates but it was good to see that most questions were at least attempted by the majority of candidates. There was no evidence of time problems.

Some very good answers were seen in response to the free response questions and candidates should be encouraged to always to attempt these questions. However, it was very pleasing to see candidates score full marks on these questions.

Again a significant number of candidates lost marks by not answering the question that had been asked, eg in Q1(e) many suggested that the mass of crystals should be lowered and the volume of water increased, despite being told in the question that this was not permissible.

It was also noticeable that some questions requiring practical experience and knowledge were often not answered well, eg reasons for low yields in Q2(a)(iii) and flame test results and tests for ions in Q6(c).

There still seem to be major problems with balancing simple equations, even when provided with the formulae such as in Q5(b).

This report will provide exemplification of candidates' work, together with tips and/or comments, for a selection of questions. The exemplification will come mainly from questions that required more complex responses from candidates.

Question 1(a)

The majority of candidates answered this question correctly.

Question 1(b)

It was pleasing to see that this word equation was very well answered by the majority of candidates. With 'ironoxide' (one word) being allowed and 'heat' being ignored, most candidates scored 2 marks. The most common error was to put only heat or an equivalent as the product.

Question 1(d)

Many candidates scored 1 mark for mentioning the word 'temperature'. However, relatively few scored the second mark; of those who did, most stated that the temperature would fall or that the water would become colder. Unfortunately, many candidates described the temperature as rising and some even used the word 'endothermic' to describe the change. Very few mentioned a correct change in appearance, with many describing the mixture as becoming cloudy or fizzing.

Question 1(e)

There were a good number of correct answers to both parts of the question, although some candidates responded by suggesting that the mass of crystals should be lowered and the volume of water increased, despite the question clearly stating fixed mass of solid and volume of water. Some gave imprecise answers such as 'change the surface area' or 'change the temperature', and several candidates described what they thought would happen to the crystals and water, rather than how to increase the speed of dissolving.

Question 2(a)(ii)(1)

There were many vague answers to this question, with the most common correct answer being about the product being washed away, described in various ways. Many thought the loss in mass was due to the water lost when the product was dried after being washed. It seemed clear that this was a situation many candidates had not encountered before, with a noticeable number of blank responses.

Question 2(a)(ii)(2)

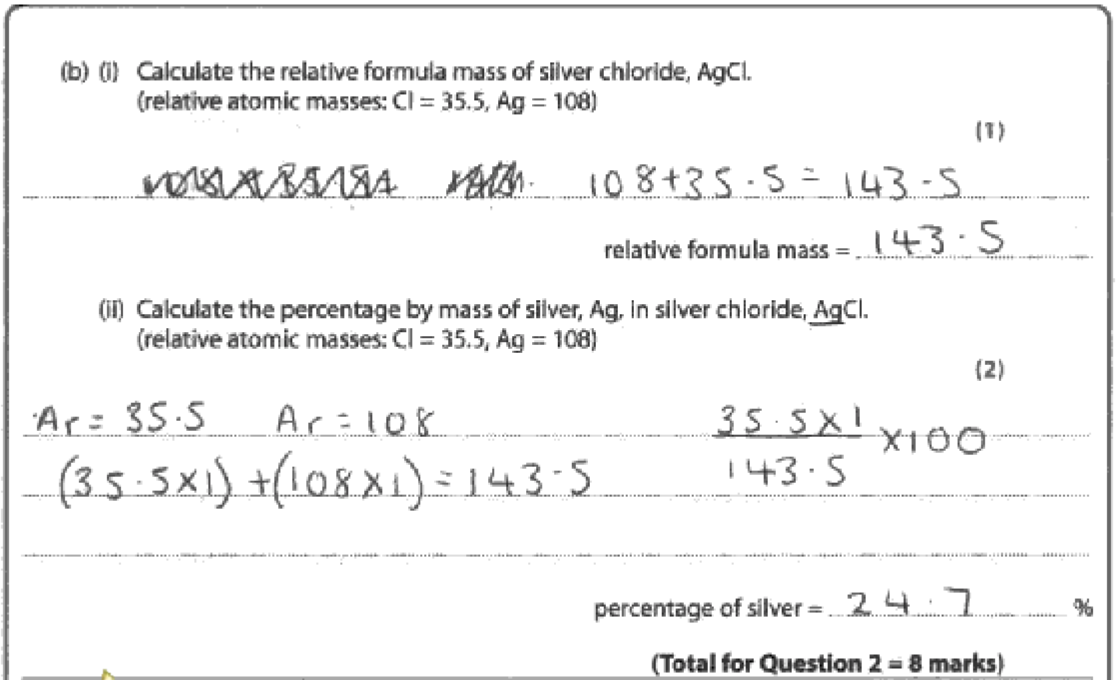
Candidates tended either to be totally correct, which was true of the majority of cases, or else did not know how to attempt the question. Marks were lost for having the fraction upside down, not recognising that 133% was not a sensible yield; others gained only 1 mark as they did not multiply $\frac{3}{4}$ by 100.

Question 2(b)(i)

The majority of candidates gained the mark, with many of the others not attempting to calculate the relative formula mass (M_r).

Question 2(b)(ii)

This question proved to be very challenging, with only the most able candidates gaining both marks. Many tried to find the percentage of chlorine rather than of silver but were able to score 1 mark for multiplying a fraction by 100.



(b) (i) Calculate the relative formula mass of silver chloride, AgCl.
(relative atomic masses: Cl = 35.5, Ag = 108)

(1)

108+35.5 = 143.5

relative formula mass = 143.5

(ii) Calculate the percentage by mass of silver, Ag, in silver chloride, AgCl.
(relative atomic masses: Cl = 35.5, Ag = 108)

(2)

Ar = 35.5   Ar = 108 $\frac{35.5 \times 1}{143.5} \times 100$

(35.5×1) + (108×1) = 143.5

percentage of silver = 24.7 %

(Total for Question 2 = 8 marks)

ResultsPlus
examiner comment

This candidate used the relative atomic mass (M_r) of chlorine rather than of silver but gained 1 mark for multiplying by 100.

(b) (i) Calculate the relative formula mass of silver chloride, AgCl.
(relative atomic masses: Cl = 35.5, Ag = 108)

(1)

Mr = (1 X 108) + (1 X 35.5) = 143.5

relative formula mass = 143.5

(ii) Calculate the percentage by mass of silver, Ag, in silver chloride, AgCl.
(relative atomic masses: Cl = 35.5, Ag = 108)

(2)

~~Mr = 1X108 + 1X35.5 = 143.5~~

$\frac{35.5}{108}$ = 0.328703 X 100 = 32.9 ~~87103~~

percentage of silver = 32.9 %

(Total for Question 2 = 8 marks)

ResultsPlus
examiner comment

This candidate has written the wrong fraction but gained a mark for multiplying by 100.

Question 3(b)

Almost 90% gave correct answers.

Question 3(c)

The majority of candidates scored well on this but a significant number had the properties the wrong way round.

Question 3(d)(i)

About 75% of responses were correct – gloves being the most popular answer, with screens of some sort also very common, indicating that many had seen the experiment performed. Several gave safety precautions that were generic and not specific to this particular experiment, eg putting chairs under benches and standing up for completing practical work. Others failed to gain a mark because they mentioned tongs, which were in the photograph and therefore invalid as an answer, or suggested goggles, which had been given in the stem of the question.

Question 3(d)(ii)

It was disappointing to note that around half the candidates did not score on this question. Many put (l) instead of aqueous but scored 1 mark for (g).

Question 3(d)(iii)

From the responses, it would seem that a majority of candidates had seen potassium reacting with water. However, some did not read, or recognise the importance of, the word 'see' emboldened in the question, and instead named the products of the reaction. Candidates need to be aware of the significance of the word 'see' or 'observations' in a question. It was also clear that, in many cases, where candidates had seen the reaction, the teacher had added some indicator to the water and they described the colour change of the solution – this was not asked for in this question and hence did not gain credit.

(iii) Describe what you **see** when potassium is added to water.

(2)

The Pottasium reacts to the water by setting itself on fire and fissing around the surface of the water

ResultsPlus
examiner comment

This answer was awarded 2 marks for a correct description of what you would observe during this reaction.

Question 3(d)(iv)

Many candidates answered this question well, although some tried to change the formulae of the reactants and products.

Question 4(a)

Many candidates scored well on this question with about two thirds scoring full marks. Others scored a maximum of 2 marks because they failed to mention one of the key terms of 'nucleus' or 'shells'. However, it would seem that some used the words 'nucleus' and 'shell' correctly without a clear understanding of what that meant in terms of positions. One trend that seems to be becoming more prevalent, although not penalised, was noted here: some candidates referred to all electrons being on the 'outer shell(s)'. A diagram was sometimes given and was a good way to answer the question, although it did need to be properly labelled to score fully.

Atoms

4 Most atoms contain electrons, protons and neutrons.

(a) Describe the positions of these particles in atoms.

(3)

Protons and neutrons are found at the nucleus of the atom, while electrons are found in the outer shell

ResultsPlus
examiner comment

A 3-mark response.

Atoms

4 Most atoms contain electrons, protons and neutrons.

(a) Describe the positions of these particles in atoms.

(3)

the protons and neutrons are the inside, in the centre of an atom and electrons go around the atom on the outside.

ResultsPlus
examiner comment

A descriptive answer that was awarded 2 marks but did not gain the third mark as it has not mentioned nucleus or shells.

Question 4(c)(i)

This was often well answered, but some candidates failed to take notice of the significance of 'in terms of electrons' in the question and gave answers about similar reactions or properties. Others mentioned the same number of electrons but omitted to say they were in the outer shell. Some chose to describe the situation in terms of electrons needed to complete the outer shell and could gain full credit.

(c) Chlorine and bromine are in the same group in the periodic table.

(i) Explain, in terms of electrons, why these elements are placed in the same group.

(2)

The both have the same number of electrons in the outer shell (7), also they both need 1 electron to have a full outer shell. Also, the reactions would be similar as they need 1 electron.

ResultsPlus
examiner comment

This is an excellent answer worthy of 2 marks, with some extra information given as well.

(c) Chlorine and bromine are in the same group in the periodic table.

(i) Explain, in terms of electrons, why these elements are placed in the same group.

(2)

Because they have around the same number of electrons in ~~the~~ the atom.

ResultsPlus

examiner comment

No mention of outer shell and also 'around the same number of electrons' is not precise enough. This response failed to gain any marks.

(c) Chlorine and bromine are in the same group in the periodic table.

(i) Explain, in terms of electrons, why these elements are placed in the same group.

(2)

both Chlorine and Bromine elements are in the halogens (group 7) because they are one electron away from having a full outer shell.

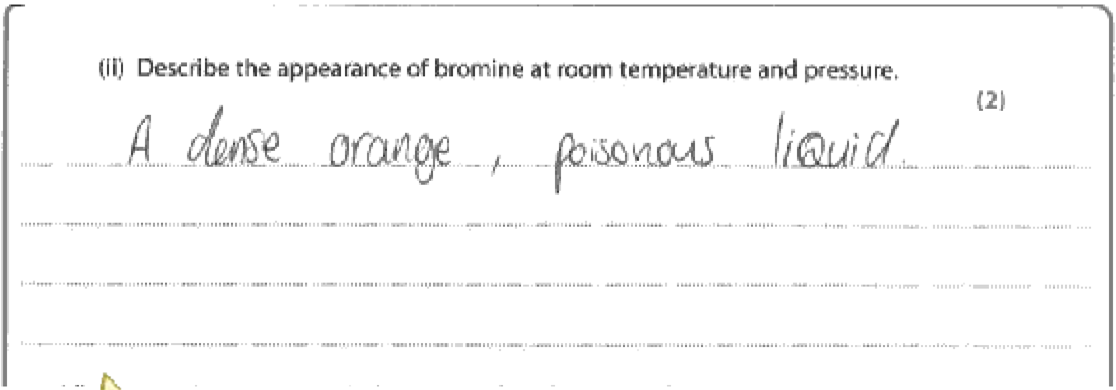
ResultsPlus

examiner comment

An alternative but acceptable way of gaining both marks.

Question 4(c)(ii)

In considering the responses to this question, it would seem that the majority of candidates were not familiar with the appearance of liquid bromine. The 'liquid' mark was often scored but very few described the colour correctly. Many seemed to confuse bromine with bromine water, which they may well have seen or used more frequently. Others may have been confusing the situation with bromine gas diffusion experiments. Many described it as 'a green gas'.


(ii) Describe the appearance of bromine at room temperature and pressure.

(2)

A dense orange, poisonous liquid

ResultsPlus

examiner comment

This is a typical answer worth 1 mark. This candidate correctly describes bromine as a liquid but does not give a correct colour description.

Question 4(d)

This question proved extremely challenging. The responses seemed to suggest that most candidates either were not very familiar with Rutherford's experiment or did not understand it. Few achieved more than 1 mark, and usually that was for indicating the very small size of the nucleus. Most candidates misunderstood the idea behind the question and gave answers that referred to electrons attracting the positive particles or gold already having enough positive charges. Other answers often given concerned the strength of the gold foil or the non-reactivity of gold. Although some knew that positive charges repel, answers often referred to gold being positive rather than the nucleus. Many of those who did achieve 1 mark gave an explanation but did not go on to link this to another point, which could have gained them the second mark.

(d) An experiment was carried out to see how large a nucleus is compared to the overall size of an atom.

In the experiment a very large number of positively charged particles are fired at a thin sheet of gold.
When one of these positively charged particles comes close to the nucleus of a gold atom it is repelled.

Explain why only about 1 in every 20 000 positively charged particles are repelled.

(2)

because the nucleus in very very small it could miss the gold atom gets just and the gold atoms strong.

(Total for Question 4 = 10 marks)

ResultsPlus
examiner comment

This candidate's response is worth 1 mark for mentioning the very small nucleus.

Question 5(a)(i)

About two thirds of candidates were correct, albeit with slight variations on the spelling of 'covalent'.

Question 5(a)(ii)

The majority of candidates failed to score the mark available for this question.

Question 5(b)

Almost half the number of candidates failed to gain at least 1 mark, even though the formulae and active substances involved were given in the equation. The most common error was trying to balance the equation by producing H_2F_2 and hence also losing the first mark for not giving the correct formulae.

Question 5(c)

Responses to this question revealed many candidates' misunderstanding or lack of factual knowledge in this area, which is often the case for 6-mark questions. Many stated that methane has a low boiling point because it is a gas, and that methane doesn't conduct electricity because it is not a metal, or because it is a gas. Candidates at this level also find it difficult to differentiate between covalent bonds (intramolecular forces) and the weak forces between simple molecules (intermolecular forces). Some seemed to think that carbon and hydrogen retained their elemental properties when in methane and said that carbon (incorrectly) and hydrogen both had low boiling points and therefore so would methane, and/or that neither of them would conduct electricity so nor would methane.

*(c) Methane is a gas at room temperature.
It exists as molecules, CH_4.
Methane has a low boiling point.
It does not conduct electricity.

Explain, in terms of the nature of its molecules and the forces between its molecules, why methane has a low boiling point and does not conduct electricity.

(6)

It doesnt conduct electrisicy because it is stable and has the same amount of electrons as protons. it has a low boiling point because the atoms is strong but the inter moleculer forces are weak so it is easy to break up.

(Total for Question 5 = 11 marks)

ResultsPlus
examiner comment

Despite some confusion, this candidate has mentioned weak intermolecular forces and gained Level 1, 2 marks.

*(c) Methane is a gas at room temperature.
It exists as molecules, CH_4.
Methane has a low boiling point.
It does not conduct electricity.

Explain, in terms of the nature of its molecules and the forces between its molecules, why methane has a low boiling point and does not conduct electricity.

(6)

methane is a simple molecular substance. It has weak bonds between its molecules which means it has a low boiling point as it doesn't take much energy to break these bonds. It doesn't conduct electricity because it doesn't contain charged particles, therefor cannot conduct any electricity.

(Total for Question 5 = 11 marks)

ResultsPlus
examiner comment

A very pleasing answer at this level, which was awarded Level 3, 6 marks.

*(c) Methane is a gas at room temperature.
It exists as molecules, CH_4.
Methane has a low boiling point.
It does not conduct electricity.

Explain, in terms of the nature of its molecules and the forces between its molecules, why methane has a low boiling point and does not conduct electricity.
(6)

Methane has a low boiling point as it is turned into a gas at room temperature Although it is a gas its structure doesn't allow Particals to move as its Surface area is full leaving no space for electrical conducts to move around methane produces Carbon and hydrogen which have low melting and boiling Points as they to are gases.
The forces between its molecules have Changed because usually gases do product and electrical conductor allowing it to pass through the Surface area but Methan, Carbon and hydrogen produce a full outer Shell.

(Total for Question 5 = 11 marks)

ResultsPlus
examiner comment

This candidate has not given any creditworthy responses and therefore failed to gain any marks.

Question 6(a)

This question was not answered well despite it being a KS3 idea. Many simply rewrote the question, stating that magnesium reacts with oxygen. Some candidates also seemed to confuse the terms 'atom' and 'element' and loosely used the term 'mixture', which was ignored.

Compounds

6 Magnesium flares provide a bright light in an emergency.

When the magnesium burns it reacts with oxygen to form magnesium oxide.

(a) Explain why magnesium oxide is a compound.

(2)

magnesium oxide is a compound because it is formed when two elements (magnesium, oxygen) react together, it is a mixture of two elements therefore it is a compound

ResultsPlus
examiner comment

Gained 1 mark for mentioning two elements but 'react together' is simply repeating information from the question. The mention of 'mixture' was ignored.

Compounds

6 Magnesium flares provide a bright light in an emergency.

When the magnesium burns it reacts with oxygen to form magnesium oxide.

(a) Explain why magnesium oxide is a compound.

(2)

It is a compound because it reacts with oxygen to form magnesium oxide.

ResultsPlus
examiner comment

A fairly typical answer not worthy of credit.

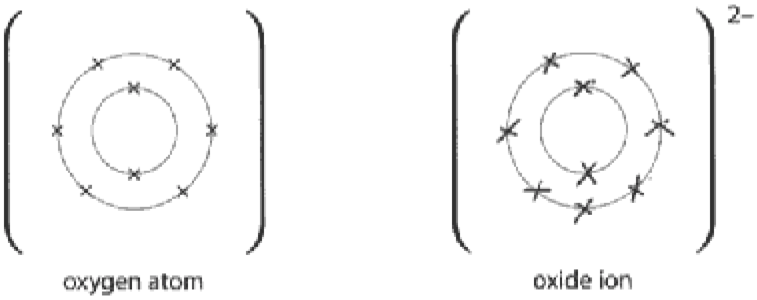
Question 6(b)(i)

The majority of responses to this question were correct. The most common mistake made by candidates involved taking away electrons rather than adding them (2,4 instead of 2,8). A minority of candidates added an extra shell to the diagram for more electrons.

(i) In the diagram below the arrangement of electrons in an oxygen atom is given.

Draw the arrangement of electrons in the oxide ion.

(1)



ResultsPlus
examiner comment

This candidate failed to gain any marks as the outer shell had 7 electrons instead of 8.

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examiner tip

Draw electrons in pairs as they are easier to count, making errors such as counting one twice or not at all less likely.

Question 6(b)(ii)

This question was well answered. However, the common errors all appeared, such as electron transfer being described in the wrong direction; the number of electrons transferred being wrong or not mentioned; and discussion of electrons being shared, unfortunately even sometimes after a good description of electron transfer.

(ii) Explain, in terms of their electrons, how a magnesium atom, Mg, and an oxygen atom, O, react together to form a magnesium ion, Mg^{2+}, and an oxide ion, O^{2-}.

(2)

because the Magnesium atom loses 2 electrons and gives ~~[illegible]~~ the 2 electrons to the oxygen atom.

ResultsPlus
examiner comment

This candidate has given a good answer.

(ii) Explain, in terms of their electrons, how a magnesium atom, Mg, and an oxygen atom, O, react together to form a magnesium ion, Mg^{2+}, and an oxide ion, O^{2-}.

(2)

~~Magnesium has too many electron~~ Oxygen needs to lose 2 electrons. Magnesium needs to gain 2. oxygen gives of it's electons to magnasium, causing an ionic reaction

ResultsPlus
examiner comment

Wrong direction of electron transfer – this was quite common.

Question 6(c)

Flame tests were often described, although some of the descriptions were very poor, including putting the substance to be tested in a test tube or beaker. Other candidates simply stated ‘carry out a flame test on the solid’ or similar, which was not creditworthy. It needs to be emphasised that the correct sodium flame colour is yellow. Carbonate and chloride tests were generally very poorly described, if at all. Many candidates seemed to think that if the salts were mixed, possibly having been dissolved first, and then filtered, somehow this would differentiate between them. While it was clear that some had carried out flame tests, many candidates seemed less familiar with anion tests and seemingly had little understanding of how to carry them out.

*(c) You are given two solid sodium salts, which are unlabelled.

One of the solids is sodium chloride.
The other solid is sodium carbonate.

Describe how you could carry out a flame test to show that they are both sodium salts and describe another test to identify one of the salts completely.

(6)

You will get a loop wire and dip it inside some sodium, you will then hold the wire loop inside the flame of the bunsen burner and if it turns lilac then the solution is sodium. To identify sodium chloride you will have to get blue damp litmus paper, hold it above the solution if chlorine is present it should turn red then bleach white.

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

ResultsPlus
examiner comment

This candidate has given a limited description and has not fully answered the question. This response was awarded Level 1, 2 marks.

*(c) You are given two solid sodium salts, which are unlabelled.

One of the solids is sodium chloride.
The other solid is sodium carbonate.

Describe how you could carry out a flame test to show that they are both sodium salts and describe another test to identify one of the salts completely.

(6)

Sodium chloride (NaCl) in flame test be orange/red
Sodium carbonate (NaC) in flame test be green/blue.

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

ResultsPlus
examiner comment

Some thought the two sodium compounds would give different colours. This response could not be credited with any marks.

*(c) You are given two solid sodium salts, which are unlabelled.

One of the solids is sodium chloride.
The other solid is sodium carbonate.

Describe how you could carry out a flame test to show that they are both sodium salts and describe another test to identify one of the salts completely.

(6)

Firstly, to show that they are both sodium salts, a flame test could be carried out. To start the salts will have to be dissolved in water, seper-ately. Then, with a bunsen burner the salts that are dissolved will need to be tested. A bit of each of the dissolved salts will be put into the flame. If it is sodium, they will both ~~[illegible]~~ ~~up~~ form a coloured flame. This should be a greeny-blue colour. Another test to find out the salt, sodium Chloride would be to use nitric acid and silver nitrate and see if a white precipitate forms. To find what sodium carbonate is, hydrochloric acid could be used. It will be bubbled through Limewater, and if it is present, the Limewater will turn ~~a~~ cloudy or milky.

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

ResultsPlus
examiner comment

Despite giving the wrong colour in the flame test, this is a very good answer and worth Level 3, 6 marks.

Summary

Based on candidates' performance on this paper:

- candidates would be advised to gain more practice in the 6-mark-type questions.
- practical experience should be encouraged as much as possible
- candidates should be given practice in simple equations.

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