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Examiners' Report

June 2016

GCSE Applied Science Chemistry
5CH2F 01

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Introduction

This paper is now well established and it is clear that candidates are well prepared for the format. The paper contains six questions with a total of 60 marks. The final two questions contain the 6 mark extended writing questions.

The Foundation Tier assesses grades G to C. The candidates are challenged with a variety of question styles, including objective, short answer, data analysis and extended writing questions.

Successful candidates:

- read the questions carefully and answered them as they were set and did not repeat the stem of the question
- understood electronic configurations and were able to relate the group and period number of elements to the electronic configuration
- used scientific terms correctly
- were able to describe experiments
- were able to explain given results of experiments, in terms of the chemistry taking place.

Less successful candidates:

- did not read the questions carefully, and gave answers to questions that they thought were there rather than the question actually posed
- did not know the definitions of key scientific words and phrases
- could not carry out calculations from the specification
- were not able to describe experiments, use of equipment or explain the results of given experiments.

In future, candidates need more experience of practical techniques and procedures. They need to be able to explain the detail of the method and recall why it is carried out in the way that it is. They also need to be able to explain the theory and chemistry behind the experiments that are completed. Candidates should also revise the factual content of the specification carefully to increase their subject knowledge, learn how to write scientific word equations and practice the calculations detailed in the specification.

Question 1 (a)(iii)

Many candidates seemed to struggle to gain marks in this question. While they were aware of the use of chromatography to separate coloured substances, many candidates seemed unaware of the procedure involved in obtaining the chromatogram in the question. A large number of candidates stated that the paper should be placed in different drinks, rather than dots of the drinks being placed on the paper. Those that had knowledge of the practical left key detail out of their answers. They simply stated that the dots should be put on paper and then the paper placed in the solvent. Few stated that the solvent should be below the dots of drink.

(iii) Starting with a piece of chromatography paper and the four drinks, describe how an experiment would be set up to produce the chromatogram in the diagram.

(3)

You would draw a pencil line and on that pencil line you would add one drop of each drink. Next you would put the bottom of the paper in water (not touching the pencil line) and wait.

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Examiner Comments

A good answer, that scored full marks. The candidate has described drawing the line on the paper, adding a drop of each drink and then placing the paper in the water, they understand that the water line should not touch the initial pencil line.

(iii) Starting with a piece of chromatography paper and the four drinks, describe how an experiment would be set up to produce the chromatogram in the diagram.

(3)

The experiment would be set up with a beaker full of water the chromatography paper will have the information about the drinks. The chromatography paper is then dipped in the water and that's when you get your chromatogram results.

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Examiner Comments

In this example, whilst the candidate has some understanding of how the experiment should be carried out, key details are lacking, such as the need to dot the sample on the paper, and how far the paper should be allowed to be 'dipped' into the water.

Question 1 (b)

In question 1b it was felt that many candidates had not seen a separating funnel, with many making comments relating to filter funnels and paper rather than a separating funnel and thinking that because liquid X is dense it would not filter through the paper. Those that had practical experience of the separating funnel usually gained full marks, although in some cases candidates showed a misconception that the more dense liquid formed a layer on top of the less dense liquid.

(b) Liquid **X** and liquid **Y** are immiscible.
Liquid **X** is denser than liquid **Y**.

Describe how you could use a separating funnel to obtain a pure sample of liquid **X** and a pure sample of liquid **Y** from a mixture of the two liquids.

(2)

put both liquids in the separating funnel. Then leave. Now both liquids will be separated. open tap to let out liquid x and then close. ~~to~~ ~~close~~

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Examiner Comments

This concise answer gained both marks for understanding that the liquids separate and the tap can be opened to allow liquid X out.

(b) Liquid **X** and liquid **Y** are immiscible.
Liquid **X** is denser than liquid **Y**.

Describe how you could use a separating funnel to obtain a pure sample of liquid **X** and a pure sample of liquid **Y** from a mixture of the two liquids.

(2)

You would open the tap at the bottom to let liquid X out. Then you would let Liquid Y out through the top

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Examiner Comments

Some candidates understood that liquid X could be released from the bottom of the separating funnel which then allowed liquid Y to be poured from the top. This response scored both marks.

(b) Liquid **X** and liquid **Y** are immiscible.
Liquid **X** is denser than liquid **Y**.

Describe how you could use a separating funnel to obtain a pure sample of liquid **X** and a pure sample of liquid **Y** from a mixture of the two liquids.

(2)

You can put paper inside the funnel which will seperate one liquid and the other liquid will go through it

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Examiner Comments

A common answer seen, where the candidate confuses the separating funnel with a filter funnel, which gained no credit.

Question 1 (c)

Candidates found recalling the name of the process used to separate liquid air difficult. Only the strongest candidates scored these marks. Many candidates made reference to other scientific processes such as photosynthesis or electrolysis.

(c) Oxygen and nitrogen are two gases present in the air.

Give the name of the process used to obtain oxygen and nitrogen from liquid air.

(2)

fractional distillation

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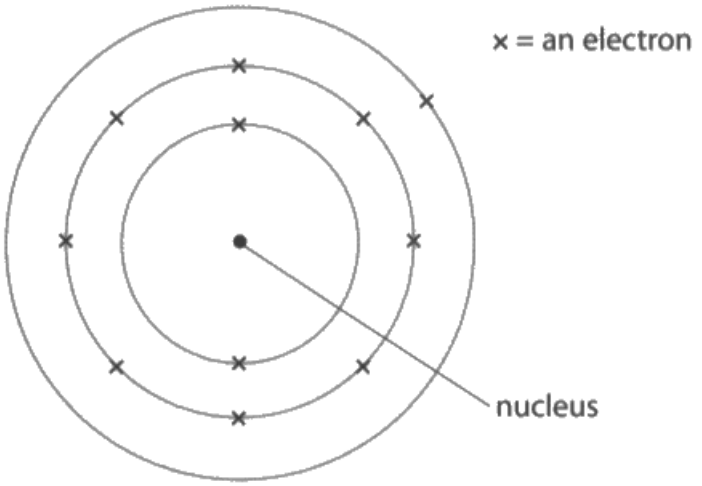
Examiner Comments

The correct answer that scored 2 marks.

Question 2 (c)(i)

The majority of candidates were able use the diagram of the sodium atom to give the electronic configuration of sodium and gain the mark. In some cases students gave the total number of electrons as opposed to breaking them down into shells.

(c) The diagram shows the arrangement of electrons in a sodium atom.



(i) State the electronic configuration of sodium.

(1)

2.8.1

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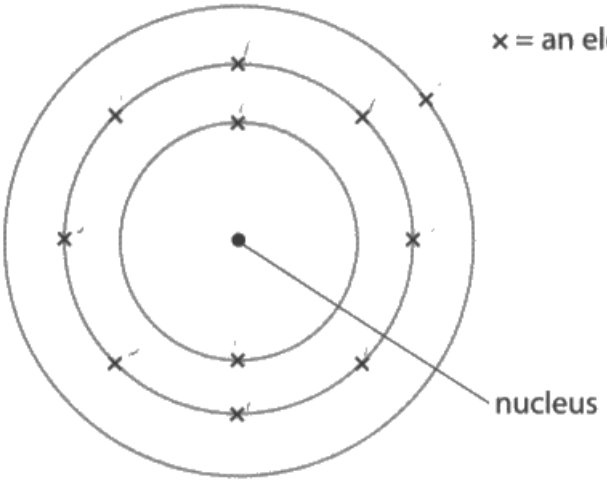
Examiner Comments

A fully correct answer that scored the mark.

(c) The diagram shows the arrangement of electrons in a sodium atom.



(i) State the electronic configuration of sodium.

(1)

11

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Examiner Comments

Many candidates gave the number of electrons in the sodium atom rather than the electronic configuration of sodium and so did not gain this mark.

Question 2 (c)(ii)

The majority of candidates were able to explain, in terms of its electronic configuration, why sodium is placed in group 1 of the periodic table. Some candidates did not read the question carefully and gave properties of alkali metals.

(ii) Explain, in terms of its electronic configuration, why sodium is placed in group 1 of the periodic table.

(2)

Because it has one electron on the outer shell.

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Examiner Comments

A good answer that scored both marks.

(ii) Explain, in terms of its electronic configuration, why sodium is placed in group 1 of the periodic table.

(2)

Because its a metal, and because its soft, and is reactive.

ResultsPlus
Examiner Comments

Some candidates did not read the question carefully and gave some properties of sodium rather than answering in terms of its electronic configuration.

Question 2 (d)(ii)

Many candidates misread and confused this question, giving an answer in terms of how many electrons there are in the outer shell, rather than the number of shells. A common incorrect answer seen was a reference to the same number of outer shells.

(ii) Elements are arranged in the periodic table in order of increasing atomic number.

In terms of electronic configurations, describe a similarity between elements in the same period.

(1)

The group which an elecatin then the number of electrons it would have on the outer shell.

ResultsPlus
Examiner Comments

A common misconception seen was to relate the number of electrons in the outer shell to elements in the same period, rather than the number of shells.

(ii) Elements are arranged in the periodic table in order of increasing atomic number.

In terms of electronic configurations, describe a similarity between elements in the same period.

(1)

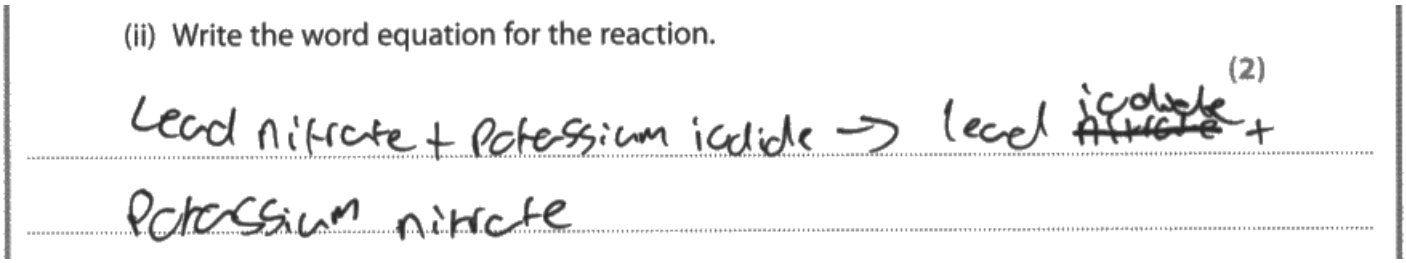
Elements in the same period have the same amount of ~~e~~ shells

ResultsPlus
Examiner Comments

A good answer that gained the mark.

Question 3 (a)(ii)

In general question 3a(ii) was answered well by the majority of candidates. Common errors seen were where candidates forgot that potassium nitrate was also a product. In some cases, candidates added additional products such as carbon dioxide or water. Some candidates tried to write symbol equations which were, in the main, incorrect.



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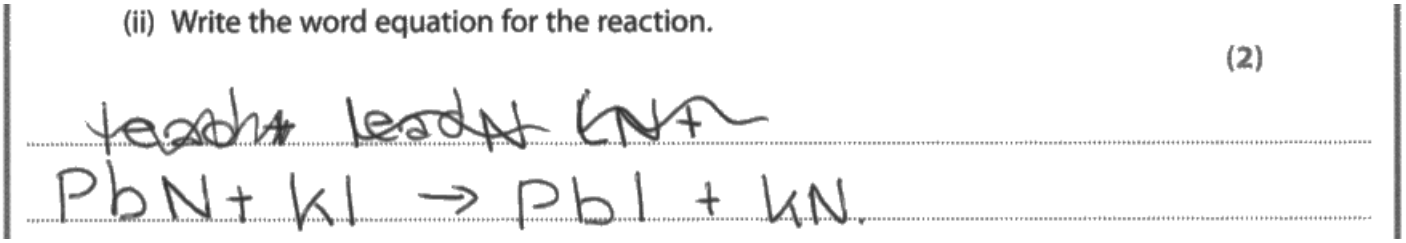
Examiner Comments

A fully correct equation that scored both marks.



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Examiner Comments

Some candidates tried, unsuccessfully, to write the symbol equation. Where this was the case unless all formulae on each side were correct no credit could be scored.

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Examiner Tip

Where questions ask for word equations, no attempt should be made to write a symbol equation, as this more challenging skill is often incorrectly attempted and even if fully correct would score no more credit than simply writing the words.

(ii) Write the word equation for the reaction.

(2)

Lead nitrate + potassium iodide → Lead iodide.

ResultsPlus
Examiner Comments

Although all reactants and products were given in the stem of the question, many candidates forgot to include the potassium nitrate on the products side and so scored just 1 mark for the reactants.

Question 3 (a)(iii)

The majority of candidates were able to correctly sequence at least three of the steps to prepare a pure, dry insoluble salt to gain one mark. Many candidates confused the last two steps and thought that solid should be washed after it was dried and therefore lost a mark.

(iii) Two solid, soluble salts were used to make an insoluble salt in a precipitation reaction.

The statements below show the steps used in an experiment to make a pure, dry insoluble salt from the two solid, soluble salts.

They are not in the correct order.

A filter the mixture

B dissolve each of the soluble salts in water

C put in an oven to dry

D wash the solid with distilled water

E mix the solutions together

Write the letters in the boxes to put the steps in the correct order.

B is the first step.

(2)

ResultsPlus
Examiner Comments

A common answer that scored just 1 mark as the last two steps have been placed in the incorrect order.

(2)

ResultsPlus
Examiner Comments

The correct sequence that scored full marks.

Question 3 (c)(ii)

Many candidates were able to score 1 mark in this question for understanding that one electron was involved in the formation of the chloride ion. However, fewer gained the second marks as there was confusion as to whether the chlorine atom lost or gained the electron.

(ii) Explain how a chlorine atom, Cl, forms a chloride ion, Cl^-.

(2)

An electron is added to the Chlorine atom making it negative.

ResultsPlus
Examiner Comments

A good answer that scored both marks.

(ii) Explain how a chlorine atom, Cl, forms a chloride ion, Cl^-.

(2)

it has one electron taken away when joining with another

ResultsPlus
Examiner Comments

Although the direction of electron transfer is incorrect, the candidate has understood that it is one electron that is involved and so gained one mark.

(ii) Explain how a chlorine atom, Cl, forms a chloride ion, Cl^-.

(2)

Gains / Losses 1s electrons.

ResultsPlus
Examiner Comments

Whilst the candidate has stated here that the atom gains its electrons, they have also stated that it has lost electrons. As it is not clear which the candidate thinks is correct, credit cannot be awarded. As they have also stated electrons rather than 'an' or 'one' electron, the second mark point cannot be scored either.

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Examiner Tip

A notable number of candidates stated that the atom loses or gains electrons to form the ion. Candidates should be made aware that they should not give two alternative answers in their answer as the contradicting wrong answer will negate the mark for the correct answer.

Question 4 (a)

Whilst some candidates were able to calculate the relative formula mass of calcium carbonate to gain the mark, a large proportion lost the mark as they did not appreciate that they should multiply the relative atomic mass of oxygen by 3, therefore giving an answer of 68. Other candidates had the misconception that the 3 meant that all the masses should be multiplied and many also thought presence of the 3 meant that the 16 should be cubed and gave answer of 4148.

Quantitative chemistry

4 (a) Calculate the relative formula mass of calcium carbonate, $CaCO_3$.

(relative atomic masses: C = 12, O = 16, Ca = 40)

(1)

40 + 12 + (16 x 3)

relative formula mass = 100

ResultsPlus
Examiner Comments

A good example, the candidate has clearly shown their working to come to the correct answer.

Quantitative chemistry

4 (a) Calculate the relative formula mass of calcium carbonate, $CaCO_3$.

(relative atomic masses: C = 12, O = 16, Ca = 40)

(1)

Ca + C + O^3 ~~x3~~
40 + 12 + 16^3 ~~x3~~ = 4148

relative formula mass = 4148

ResultsPlus
Examiner Comments

A common error was to think that the subscript 3 on the oxygen means that the relative atomic mass of oxygen should be cubed rather than multiplied by 3.

4 (a) Calculate the relative formula mass of calcium carbonate, $CaCO_3$.

(relative atomic masses: C = 12, O = 16, Ca = 40)

(1)

40 + 12 + 16 = 68

relative formula mass = 68

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Examiner Comments

The most common error was to simply add every number, which scored no credit.

Question 4 (c)

Question 4c proved difficult for some students with many simply giving the ratio, with no element symbols, that was stated in the question, either for the aluminium chloride or aluminium oxide. The most common error was to repeat the empirical formula for aluminium chloride that was also given in the question, which gained no credit.

(c) The simplest ratio of aluminium atoms to chlorine atoms in aluminium chloride is 1 : 3.

The empirical formula of aluminium chloride is $AlCl_3$.

The simplest ratio of aluminium atoms to oxygen atoms in aluminium oxide is 2 : 3.

Give the empirical formula of aluminium oxide.

(1)

Al_2O_3

ResultsPlus
Examiner Comments

The correct answer that scored the mark.

(c) The simplest ratio of aluminium atoms to chlorine atoms in aluminium chloride is 1 : 3.

The empirical formula of aluminium chloride is $AlCl_3$.

The simplest ratio of aluminium atoms to oxygen atoms in aluminium oxide is 2 : 3.

Give the empirical formula of aluminium oxide.

(1)

Al_2Cl_3

ResultsPlus
Examiner Comments

Many candidates did not read the question carefully and gave the empirical formula of aluminium chloride, given in the stem of the question, rather that the empirical formula of aluminium oxide.

Question 4 (e)(i)

The calculation of the theoretical yield was generally well attempted by candidates. However where candidates lost marks, it was because they had the fraction upside down dividing the theoretical yield by the actual yield. Weaker candidates simply added or multiplied the two numbers together showing their lack of understanding of this concept.

(e) Zinc oxide is formed by decomposition of zinc carbonate

zinc carbonate → zinc oxide + carbon dioxide

(i) In an experiment to decompose some zinc carbonate, the actual yield of zinc oxide was 7.2 g.

The theoretical yield of zinc oxide for this experiment is 9.0 g.

Calculate the percentage yield of zinc oxide.

(2)

$\frac{9.0}{7.2} = 1.25 \times 100 =$

percentage yield = ... %

ResultsPlus
Examiner Comments

In some cases candidates divided the theoretical yield by the actual yield and multiplied by 100 rather than the actual yield by the theoretical yield. This candidate did score 1 mark however as they showed their working and it was clear that they had a fraction multiplied by 100.

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Examiner Tip

It is very important to show your working on calculation questions. Marks are awarded for parts of the working even if the answer you end up with is incorrect.

Calculate the percentage yield of zinc oxide.

(2)

7.2 ÷ 9.0 = 0.8

percentage yield = ... %

ResultsPlus
Examiner Comments

A common error was to forget to multiply by 100. In this case the candidate scored just 1 mark for dividing the actual yield by the theoretical yield.

Calculate the percentage yield of zinc oxide.

(2)

$\frac{7.2}{9} \times 100 = 80$

percentage yield = 80 %

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Examiner Comments

A good response, with clear working that scored both marks.

Question 4 (e)(ii)

This question was generally poorly answered. Many candidates have the misconception that the theoretical yield is simply a guess or estimate and so therefore the actual yield is less as the guess is not accurate. Other candidates seemed to misread the question and gave the definition of a theoretical or actual yield or restated the question and said that actual yield is less than the theoretical yield. Candidates that knew this often gave all three alternatives on the mark scheme.

(ii) Explain why the actual yield of a product in an experiment is usually lower than the theoretical yield.

(2)

Some may be lost during the experiment or not all of it reacted with the other products.

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Examiner Comments

A good answer that scored both marks.

(ii) Explain why the actual yield of a product in an experiment is usually lower than the theoretical yield.

(2)

because the Actual yeald is what you get in the product, where as the theoretical yeild is an estimate that has been rounded up

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Examiner Comments

A common misconception seen was that the theoretical yield is just an estimate or guess. In this case the candidate has also defined what is meant by the actual yield. Neither idea gains credit.

Question 4 (e)(iii)

Some candidates found the calculation of the percentage by mass of zinc difficult. Many candidates added or subtracted the atomic masses rather than calculating a percentage. Some candidates focused on the incorrect element and calculated the percentage by mass of oxygen rather than of zinc, these did however score 1 mark where working was shown for understanding the need to multiply by 100. A large proportion simply re-stated the relative formula mass.

(iii) Calculate the percentage by mass of zinc in zinc oxide, ZnO.

(relative atomic masses: O = 16, Zn = 65
relative formula mass of ZnO = 81)

(2)

$\frac{65}{81} \times 100 = 80.2\%$

percentage by mass of zinc = 80.2 %

ResultsPlus
Examiner Comments

A good response, with workings and the correct answer that scored both marks.

(iii) Calculate the percentage by mass of zinc in zinc oxide, ZnO.

(relative atomic masses: O = 16, Zn = 65
relative formula mass of ZnO = 81)

(2)

81 ÷ 65 = 1.2461538 x 100%

percentage by mass of zinc = 1.2461538 %

ResultsPlus
Examiner Comments

Although the candidate has arrived at the wrong answer, because they have shown their working, 1 mark can be awarded for the fraction multiplied by 100.

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Examiner Tip

It is very important to show your working on calculation questions. Marks are awarded for parts of the working even if the answer you end up with is incorrect.

You should be aware that, when working out a percentage composition, if your answer is over 100 then you have done something wrong.

Question 5 (a)(i)

The majority of candidates were able to describe at least one correct observation of the reaction between lithium and water. In some cases, candidates stated that a gas would be formed or hydrogen is produced; whilst this is true, the question asks what would be seen and as this is something that would not be seen, then no credit could be scored. Many candidates gave lots of different words for the same observation such as bubbling, fizzing, effervescence and so gained just one mark. Many candidates confused lithium with potassium and stated that a lilac flame would be produced.

5 (a) (i) When lithium is placed in water it reacts to form lithium hydroxide and hydrogen gas.

Describe what you would **see** during this reaction.

(2)

You will see it fizzing on the surface of the water.

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Examiner Comments

A good response that scored 2 marks.

5 (a) (i) When lithium is placed in water it reacts to form lithium hydroxide and hydrogen gas.

Describe what you would **see** during this reaction.

(2)

You would see a purple flame
You would see sparks, bubbling
You would see smoke

ResultsPlus
Examiner Comments

Many candidates confused the reaction of lithium with that of potassium and stated that a purple or lilac flame would be seen. However, credit was awarded for understanding that the lithium would bubble.

5 (a) (i) When lithium is placed in water it reacts to form lithium hydroxide and hydrogen gas.

Describe what you would **see** during this reaction.

(2)

You will see a gas being given off - smoke and bubbling.

ResultsPlus
Examiner Comments

There was no credit awarded for the gas being given off as this cannot be seen, what can be seen is the bubbling as the gas is given off. A mark was awarded in this example for the lithium bubbling.

ResultsPlus
Examiner Tip

Candidates should be taught that when asked for what would be seen, conclusions such as hydrogen is produced or that a gas is given off will not gain credit. Remember to think about what you would see.

5 (a) (i) When lithium is placed in water it reacts to form lithium hydroxide and hydrogen gas.

Describe what you would **see** during this reaction.

(2)

fizzing and bubbles.

ResultsPlus
Examiner Comments

Many candidates thought that they had given two observations by stating that fizzing and bubbles would be seen. Unfortunately, as this is just a different description of the same observation, just 1 mark could be awarded.

Question 5 (b)(i)

Some candidates were able to correctly explain how metals conduct electricity. Some candidates used incorrect scientific terms, with many stating that ions, protons or neutrons were moving. Other candidates misread the question and confused the conduction of electricity with conduction of heat, answering in terms of particle vibrations.

(b) Magnesium and iron are both metals.

(i) They both conduct electricity.

Explain, in terms of their structures, how metals conduct electricity.

(2)

Their electrons are free to move around.

ResultsPlus
Examiner Comments

A good answer that scored 2 marks.

(b) Magnesium and iron are both metals.

(i) They both conduct electricity.

Explain, in terms of their structures, how metals conduct electricity.

(2)

Metals can conduct electricity because they have high melting and boiling points. They are malluble and ductile.

ResultsPlus
Examiner Comments

Everything that this candidate has written is correct but does not answer the question and so does not gain any credit.

ResultsPlus
Examiner Tip

Candidates should be reminded to read the question and then read it again in conjunction with their answer to ensure that the two correlate.

Question 5 (b)(ii)

Some candidates were able to correctly recall that colour was a difference between the magnesium salt and iron salt. However, others gave an answer that related to the size or texture of the crystals. Some misread the question and stated that magnesium was shiny, whereas the iron salt was not.

(ii) Magnesium is in group 2 of the periodic table.

Iron is a transition metal.

Both magnesium and iron can form salts.

State a difference in the appearance of magnesium salts and iron salts.

(1)

colour

ResultsPlus
Examiner Comments

A short, to the point, answer that gained the mark.

(ii) Magnesium is in group 2 of the periodic table.

Iron is a transition metal.

Both magnesium and iron can form salts.

State a difference in the appearance of magnesium salts and iron salts.

(1)

The size of each salt.

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Examiner Comments

A common answer that was not acceptable was the size of the salt or crystals.

Question 5 (c)

Candidates found the first of the two 6 mark extended answer questions difficult. Many candidates simply described the table, stating where there was a reaction and where there was not. Candidates should be reminded not to re-state information from the stem of the question as no credit will awarded for this.

Many did not understand the difference between the salts and the alkali metals, stating that potassium is very reactive and described reactions of the alkali metals such as fizzing, sparks and a lilac flame. Those that read the question regarding relative reactivities often talked about the relative reactivity of the salts rather than the halogens themselves. A large percentage of candidates gave the properties of the halogens such as chlorine being a green gas, which gained no credit. Stronger candidates scored for giving a correct order of reactivity for the given halogens and correctly describing what would be seen in the reactions, few were able to discuss the relative displacements of the ions.

*(c) The three halogens chlorine, bromine and iodine are mixed with solutions of their potassium salts.

The table shows the results.

solution of	chlorine	bromine	iodine
potassium chloride		×	×
potassium bromide	✓		×
potassium iodide	✓	✓	

The three ticks in the table show where there are reactions.

Describe and explain what you would **see** in each of these three reactions and what it would tell you about the relative reactivity of the halogens, bromine, chlorine and iodine.

(6)

Halogens that are more reactive displace the least reactive halogens. So in the reaction between potassium bromide and chlorine, chlorine is more reactive than bromide so a displacement reaction would occur:

potassium bromide + chlorine → potassium chloride + bromine

In this reaction chlorine ~~which is a green gas~~ there will be a more ~~at room~~ vigorous reaction as they both are highly reactive. Chlorine at room temperature is a green gas, and bromine is a orange/brown liquid. The reaction between potassium iodide and chlorine

you would also see a displacement reaction as chlorine is more reactive than iodide:

potassium + chlorine → potassium + iodine
iodide chloride

This reaction wouldn't be as vigorous has iodide is ~~least~~ less reactive than chlorine.

The reaction between potassium iodide will and bromine will be a very vigorous reaction as they ~~are~~ both have similar reactivities. So the bromine will displace the iodide:

potassium + bromine → potassium + iodine
iodide bromide

This tells us the similar the properties and reactivity the more vigorous the reaction

(Total for Question 5 = 12 marks)

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Examiner Comments

In this example, the candidate has started by giving an overall analysis that the more reactive halogen will displace the least reactive halogen.

They then go on to describe each reaction in detail. There are some errors but there is sufficient for 6 marks to be awarded.

*(c) The three halogens chlorine, bromine and iodine are mixed with solutions of their potassium salts.

The table shows the results.

solution of	chlorine	bromine	iodine
potassium chloride		×	×
potassium bromide	✓		×
potassium iodide	✓	✓	

The three ticks in the table show where there are reactions.

Describe and explain what you would **see** in each of these three reactions and what it would tell you about the relative reactivity of the halogens, bromine, chlorine and iodine.

(6)

These reactions have taken place because in the potassium bromide reaction, the chlorine has displaced the bromine. ~~leaving~~ leaving the bromine with a metal and leaving the chlorine on its own. With the potassium iodide, there were two reactions taking place. One of them reacted with chlorine and one of them reacted with bromine and both of those chemicals displace iodine and leave it with a metal.

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Examiner Comments

The candidate showed an understanding that chlorine has displaced the bromine, there is a slight slip when referring to the bromide, however, this was ignored at this level. The products are given but are poorly described.

The candidate has then gone on to state that the bromine and chlorine have displaced the iodide. The candidate was awarded 4 marks in level 2 for weakly describing the three reactions.

*(c) The three halogens chlorine, bromine and iodine are mixed with solutions of their potassium salts.

The table shows the results.

solution of	chlorine	bromine	iodine
potassium chloride		x	x
potassium bromide	✓		x
potassium iodide	✓	✓	

The three ticks in the table show where there are reactions.

Describe and explain what you would **see** in each of these three reactions and what it would tell you about the relative reactivity of the halogens, bromine, chlorine and iodine.

(6)

Potassium Chloride does not react with chlorine as it already contains the substance it does however react with bromine and iodine as they add to the potassium Chloride.

Potassium bromide does not react with bromine because again nothing is added when put together so therefore there is no reaction. It does react with £ iodine and Chlorine however.

Potassium iodine does not react with iodine as nothing is added and so it only is seen to react with both ~~Chlorine~~ Chlorine and bromine.

Overall you can see that Chlorine, bromine and iodine do not react with a Solution that already has them in it.

ResultsPlus
Examiner Comments

The candidate has repeated what is in the table.

The question asks for the candidate to describe and explain what is seen in the three reactions, not why the reactions are not occurring in the 'x' boxes.

The question states where there is a reaction and where there is not so therefore no credit could be awarded for candidates that re-state this.

*(c) The three halogens chlorine, bromine and iodine are mixed with solutions of their potassium salts.

The table shows the results.

solution of	chlorine	bromine	iodine
potassium chloride		x	x
potassium bromide	✓		x
potassium iodide	✓	✓	

The three ticks in the table show where there are reactions.

Describe and explain what you would **see** in each of these three reactions and what it would tell you about the relative reactivity of the halogens, bromine, chlorine and iodine.

(6)

The solution of potassium bromide and potassium iodide shows that it reacted with chlorine which suggests that in the periodic table chlorine is at the top which may suggest that it is more reactive.

The potassium chloride and potassium iodide show that the potassium chloride didnt react with bromine however the potassium iodide did. Bromine is a ~~little~~ ~~bit~~ lower than the chlorine suggesting that it doesnt always react.

Potassium chloride and potassium bromide did not react all with the iodine. This shows that iodine is less on the reactivity series and that it doesnt react that much.

ResultsPlus
Examiner Comments

The candidate has stated which combinations have reacted and which have not. This is in the question and no credit is awarded for it. However, throughout the work, they have stated that chlorine is the more reactive, that bromine is less reactive than chlorine and that iodine is less on the reactivity series.

Putting the halogens in this correct order of reactivity is worthy of level 1, 2 marks.

Question 6 (a)

In general, candidates performed well on this question with many being able to identify Q as the exothermic reaction. Of those that could identify the reaction correctly, most were able to explain why the reaction was exothermic. A common answer was that P was the exothermic reaction because the temperature went down because heat was given out, these answers gained just 1 mark for showing an understanding that exothermic reactions gave out heat. In some cases, candidates simply stated, as their explanation, that Q had the highest final temperature, which was insufficient for credit. There was some confusion between the terms heat and temperature with them often being used interchangeably.

Question 6 (c)

Although some candidates confused large surface area with the lumps of coal, many knew that it was the powdered coal that had a larger surface area than the lumps. However, few were able to link this to more collisions and most simply copied the rest of the question stem, that it would increase the rate of reaction. Scientific language let many candidates down in this question, where larger particles rather than larger surface area were discussed.

(c) Powdered coal is burnt in coal-fired power stations.

Explain why powdered coal burns in air at a faster rate than lumps of coal.

(2)

Powdered coal has a much larger surface area and the lump of coal has a very small surface area.

ResultsPlus
Examiner Comments

In this example, the candidate has correctly stated that the powdered coal has a larger surface area which was worthy of 1 mark. They then give the reverse argument which can gain no further credit. There is no idea given of more collisions for the second mark.

Question 6 (d)

Many candidates did not attempt this question. Of those that did, many simply re-stated the information in the question and gave the properties of a catalyst. Some recognised the need to measure the volume of the gas with and without the use of the catalyst or the need to weigh the catalyst before and after the experiment to gain some credit but gave little practical detail of how this should be done. Some candidates repeated information from previous exam papers such as the use of catalytic converters in cars or giving an answer related to how to change a reaction rate by changing the temperature, concentration or surface area of the reactants.

*(d) At room temperature, hydrogen peroxide decomposes slowly to form water and oxygen gas.
The equation for the reaction is

hydrogen peroxide → water + oxygen

The progress of the reaction can be followed by measuring the volume of gas given off.

This reaction can be catalysed by the addition of solid manganese(IV) oxide.

Two properties of a catalyst are

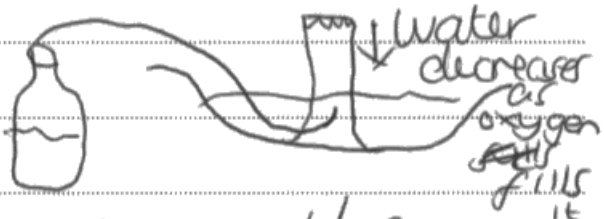
- it increases the rate of a reaction
- its mass is unchanged at the end of the reaction.

Using hydrogen peroxide solution and manganese(IV) oxide, describe experiments to show that manganese(IV) oxide has these properties when used as a catalyst in this reaction.

(6)

hydrogen peroxide and manganese oxide mix in a beaker but before that, get a tub of water and a full tube (measuring cylinder) of water which stand in the middle. Put a tube in the cyclinder of water in the tub of water and connect it to the beaker which has the mixture in. it should fizz

and oxygen should be produced which can be seen in the cylinder which the water level decreases - this shows how much oxygen is being produced and a stop watch can also see how fast the reaction is going.



Also seeing how long the reaction takes before the catalyst is added and after - mass is measured to see if the manganese is used up or not.

ResultsPlus
Examiner Comments

The candidate has given a reasonable description of how to carry out an experiment to see how fast the gas is produced. They state that this should be carried out with and without the catalyst.

There is a basic comment on measuring the mass towards the end of the answer and some basic comments regarding the results.

The answer was awarded 5 marks in level 3.

*(d) At room temperature, hydrogen peroxide decomposes slowly to form water and oxygen gas.
The equation for the reaction is

hydrogen peroxide → water + oxygen

The progress of the reaction can be followed by measuring the volume of gas given off.

This reaction can be catalysed by the addition of solid manganese(IV) oxide.

Two properties of a catalyst are

- it increases the rate of a reaction
- its mass is unchanged at the end of the reaction.

Using hydrogen peroxide solution and manganese(IV) oxide, describe experiments to show that manganese(IV) oxide has these properties when used as a catalyst in this reaction.

(6)

Conical flasks

Set up two ~~beakers~~, one with hydrogen peroxide in and the other with a mix of hydrogen peroxide and manganese (IV) oxide. Have both of them hooked up to separate gas syringes with cotton wool in the top of the flasks so no oxygen escapes. Leave both flasks alone for a set amount of time in order for the reaction to take place. After the time is done measure the amount of oxygen and water produced to see if the manganese(IV) ~~oxd~~ oxide sped up the process.

ResultsPlus
Examiner Comments

The candidate has described the experiment to see if the catalyst increases the rate of reaction with some detail.

There is no discussion of what the expected results would be and so therefore a mark of 4 in level 2 was awarded.

*(d) At room temperature, hydrogen peroxide decomposes slowly to form water and oxygen gas.
The equation for the reaction is

hydrogen peroxide → water + oxygen

The progress of the reaction can be followed by measuring the volume of gas given off.

This reaction can be catalysed by the addition of solid manganese(IV) oxide.

Two properties of a catalyst are

- it increases ~~the rate~~ of a reaction
- its mass is unchanged at the end of the reaction.

Using hydrogen peroxide solution and manganese(IV) oxide, describe experiments to show that manganese(IV) oxide has these properties when used as a catalyst in this reaction.

(6)

you should weigh its ~~begin~~ initial and final ~~weights~~ mass which will tell you if the mass is unchanged like a catalyst.

Then do an experiment to see if the ~~a~~ rate increase of a reaction happens and that will ~~to~~ tell you if manganese ~~is~~ has the same properties ~~as a~~ when used as a catalyst.

ResultsPlus
Examiner Comments

In this example, the candidate has given some practical details stating that you should weigh its initial and final mass which will tell you if the mass is unchanged.

The candidate has not made it clear that they are talking about the catalyst so this response was awarded just 1 mark in level 1.

*(d) At room temperature, hydrogen peroxide decomposes slowly to form water and oxygen gas.
The equation for the reaction is

hydrogen peroxide → water + oxygen

The progress of the reaction can be followed by measuring the volume of gas given off.

This reaction can be catalysed by the addition of solid manganese(IV) oxide.

Two properties of a catalyst are

- it increases the rate of a reaction
- its mass is unchanged at the end of the reaction.

Using hydrogen peroxide solution and manganese(IV) oxide, describe experiments to show that manganese(IV) oxide has these properties when used as a catalyst in this reaction.

(6)

Because manganese is a catalyst that speeds up reaction without being used up itself. You could use it in car convertors to reduce the pollution so if it works then it has one of the properties.

ResultsPlus
Examiner Comments

There was no credit for the description of a catalyst as this was given in the question. The use of catalysts in other contexts is also not relevant and therefore gained no credit.

ResultsPlus
Examiner Tip

Candidates should be warned that re-writing the stem of the question gains no credit.

Paper Summary

In general, candidates need more practice in answering questions that involve describing experiments. Some candidates would benefit from practising simple calculations.

Based on their performance on this paper, candidates are offered the following advice. They should:

- read the question carefully and make sure that they are answering the question asked not a question that they think is there
- ensure that when answering the question they are not simply copying the stem
- learn the links between the electronic configurations and group numbers and period numbers
- practise the calculations in the specification
- ensure that they are familiar with the experiments detailed in the specification and that they can describe them
- spend more time trying to understand why the experiments are carried out and what the chemistry is that the experiment is trying to exemplify.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx

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