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Examiners' Report
November 2012

GCSE Chemistry 5CH1H 01

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Introduction

This is the fourth examination in the GCSE Science 2011 course, so teachers and candidates have had the benefit of using three previous papers. The Higher Tier paper assesses grades A* to D and consists of a mixture of question styles, including objective questions, short answer questions, data analysis questions and extended writing questions. There was evidence that candidates were well-prepared for the examination and many of them approached the questions with a good understanding of the topics and answered in detail.

Successful candidates:

- read the questions carefully and answered the questions as they were set
- used correct scientific terminology
- could analyse tables of data and graphs
- could carry out simple calculations
- could write correct formulae and balanced equations.

Some answers were of a lower standard. Less successful candidates:

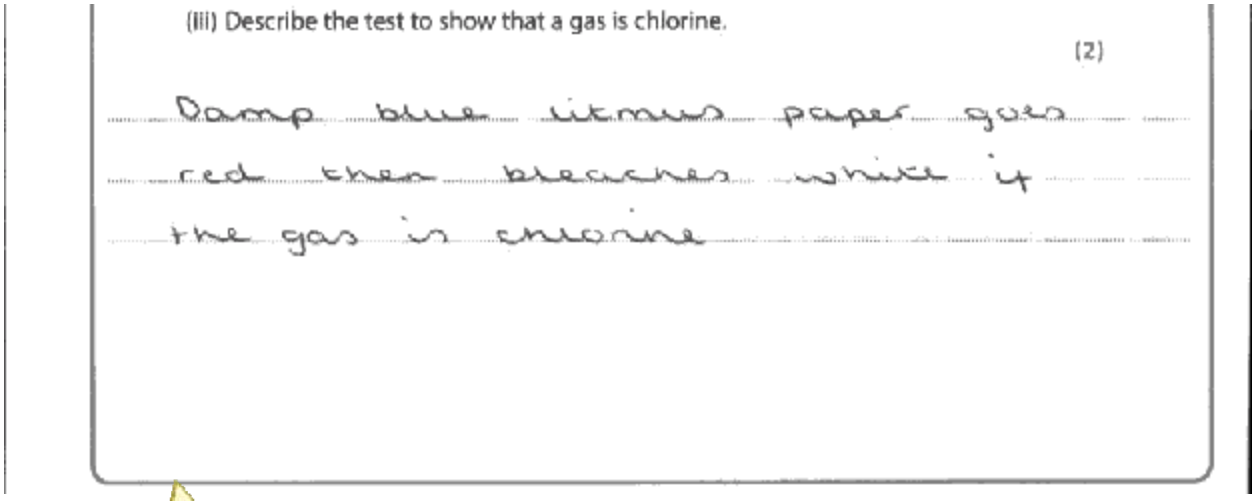
- did not read the questions carefully and gave answers that were related to the topic being tested, but did not answer the question
- could not describe patterns shown in graphs
- could not select relevant properties of metals and relate them to a use of the metal
- could not carry out simple calculations
- could not write correct formulae.

In future, some candidates need more practice in answering questions where they have to describe patterns shown in graphs and explain a conclusion. Some candidates also need more practice in writing concise answers to the extended writing answers by being selective about the information they include in their answer. Some candidates also need more practice in writing correct formulae and in balancing equations.

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)(iii)

The majority of candidates could describe the test for chlorine using damp litmus paper, although the spelling of litmus was not always correct. A few candidates mentioned that the litmus paper turned colourless. Although that would have been an acceptable answer for litmus solution, candidates should be encouraged to write that the litmus paper is bleached or turns white. A small number of candidates were confused between the different gas tests and suggested using glowing or lighted splints or even limewater or bromine water.


(iii) Describe the test to show that a gas is chlorine.

(2)

Damp blue litmus paper goes red then bleaches white if the gas is chlorine

ResultsPlus
examiner comment

This is an example of a very good answer.

(iii) Describe the test to show that a gas is chlorine.

(2)

dip it in litmus paper if it changes colour then it's chlorine

ResultsPlus
examiner comment

This answer states what must be used for the test but 'changes colour' is not good enough for the second mark.

ResultsPlus
examiner tip

When candidates are asked to describe a test for a substance, they should describe how to carry out the test and the result of the test.

Question 1(d)

The majority of the candidates performed well on this question as they could complete the balanced equation. A few candidates lost a mark by adding incorrect additional balancing numbers. A few candidates also included incorrect additional formulae in the gaps in the equation. Candidates should write the correct formulae for substances. Using lower case letters for elements such as hydrogen will not score the marks. Similarly, using superscripts or full size numbers instead of subscripts will not score. A periodic table is included in every examination paper and candidates should use that for any symbols they do not know.

(d) Acids also react with metal oxides.

Complete and balance the equation for the reaction between copper oxide, CuO, and dilute hydrochloric acid, HCl.

(2)

$CuO + \underline{2}\ HCl \rightarrow CuCl_2 + \underline{H_2O}$

(Total for Question 1 = 8 marks)

ResultsPlus
examiner comment

This is a clear example of a correct answer, using correct symbols and a subscript.

(d) Acids also react with metal oxides.

Complete and balance the equation for the reaction between copper oxide, CuO, and dilute hydrochloric acid, HCl.

(2)

$CuO + \underline{2}\ HCl \rightarrow CuCl_2 + \underline{H_2O_2}$

(Total for Question 1 = 8 marks)

ResultsPlus
examiner comment

This candidate scored 1 mark for the correct balancing number. The formula for water is incorrect.

ResultsPlus
examiner tip

A balanced equation has the same number of each type of atom on each side of the equation. There is 1 oxygen atom on the left of this equation so the candidate should have just 1 oxygen atom on the right. The final product is water, not hydrogen peroxide.

Question 2(c)(i)

It was encouraging to see many candidates writing this balanced equation correctly. Some candidates wrote all the correct formulae and scored 2 marks, even if they did not balance the equation or balanced it incorrectly. Candidates should write the formulae correctly, using the correct symbols for the elements, for example, Ch_4 is not acceptable as the formula for methane as the symbol for hydrogen is H not h. Numbers in formulae should be shown as subscripts, not superscripts, so the formula for water must be written as H_2O not H^2O. Some candidates ignored the question and wrote a word equation, which did not score any marks. There were a few candidates who use O as the formula for oxygen gas and they should learn that it is always O_2.

(c) (i) Methane, CH_4, is a gas that can be used as a fuel.

During complete combustion, it burns in oxygen to produce carbon dioxide and water.

Write the balanced equation for the complete combustion of methane.

(3)

$CH_4 + O_2 \rightarrow CO_2 + H_2O$

ResultsPlus
examiner comment

This candidate scored 2 marks for writing the correct formulae for the reactants and products.

ResultsPlus
examiner tip

If candidates find it difficult to balance equations, they should still write the correct formulae of the reactants and products to score some marks. The names of all the reactants and products were given in the question.

(c) (i) Methane, CH_4, is a gas that can be used as a fuel.

During complete combustion, it burns in oxygen to produce carbon dioxide and water.

Write the balanced equation for the complete combustion of methane.

(3)

$CH_4 + 2O_2 \rightarrow CO_2 + O_2$

ResultsPlus
examiner comment

This candidate scored 1 mark for the correct formulae of the reactants. The question stated that carbon dioxide and water are produced but the candidate has written the formula for oxygen instead of water so scores no mark for the products.

ResultsPlus
examiner tip

Candidates should read the question carefully and make sure that they use all the information given.

Question 2(c)(iii)

Some candidates stated two clear factors that make a good fuel, but others gave vague statements such as it does not cause pollution. Some candidates stated that a good fuel produces a lot of energy or burns for a long time but failed to link these to the mass or volume of fuel that is burned. A few candidates contradicted themselves by stating that a good fuel was not flammable. There was a long list of acceptable answers and all were seen during the marking of the scripts. Some candidates did not score the marks for this question as they presented their answers in the form of questions, for example, 'How easy is it to ignite?' Although ease of ignition is an important factor, they do need to state that the fuel should be easy to ignite.

(iii) State **two** factors that make a good fuel.

(2)

A good fuel would be biodegradable so it wont harm the environment and doesnt release too much heat energy

(Total for Question 2 = 8 marks)

ResultsPlus
examiner comment

This is an example of an answer that did not receive any marks. Biodegradable is not relevant to fuels as we need to burn them to release energy. A good fuel should release a lot of energy for the amount burnt, so the last statement is incorrect.

(iii) State **two** factors that make a good fuel.

(2)

A good fuel should be easy to ignite and keep alight. Not produce much ash or polluting gas/smoke.

A good fuel should release a lot of energy per kg.

(Total for Question 2 = 8 marks)

ResultsPlus
examiner comment

This is an excellent answer that scored 2 marks. This candidate wrote more than two factors but as they were all correct they were not penalised.

ResultsPlus
examiner tip

When candidates write about the energy released by a fuel, it is important to refer to the amount of fuel that is burnt. In this example the candidate has included energy per kg.

(iii) State **two** factors that make a good fuel.

(2)

Is the flame clear, [redacted] e.g. is there any smoke.

Is it runny, e.g. does it move freely and staying in a gloop.

(Total for Question 2 = 8 marks)

ResultsPlus
examiner comment

This candidate has shown that they know the factors to consider for fuels, but they have written them as questions. This question asks for the factors that make a good fuel and this candidate would have scored marks if they had stated that a good fuel burns with a clean flame and has a low viscosity.

ResultsPlus
examiner tip

When candidates are asked to state something, they should not write their answer as questions.

Question 3(b)(i)

Candidates performed very well on this question, with most gaining both marks by giving at least one of the correct responses. There were just a small number of candidates who confused respiration with photosynthesis and a very small number who mentioned plants 'breathing'.

(b) The concentration of carbon dioxide in the Earth's atmosphere depends on the balance between the processes that remove carbon dioxide from the atmosphere and those that release carbon dioxide into the atmosphere.

(i) Explain how carbon dioxide is removed from the atmosphere.

(2)

Green plants photosynthesise. This is a process where plants take in Carbon dioxide and replace it with oxygen so they produce energy

ResultsPlus examiner comment

This was a very common correct answer. This response was awarded 2 marks.

(b) The concentration of carbon dioxide in the Earth's atmosphere depends on the balance between the processes that remove carbon dioxide from the atmosphere and those that release carbon dioxide into the atmosphere.

(i) Explain how carbon dioxide is removed from the atmosphere.

(2)

Carbon dioxide is removed from the atmosphere by Photosynthsis. This proccess uses carbon dioxide and water to produce glucose and oxygen

ResultsPlus examiner comment

This candidate has a good understanding of photosynthesis but has omitted that it is plants that photosynthesise. This response was awarded 1 mark.

Question 3(b)(ii)

This question was also answered correctly by the vast majority of candidates. A few candidates stated that cars produce carbon dioxide but omitted that petrol needs to be burnt for this to happen. A few also just stated respiration without any mention of what respires. The question did ask candidates to explain how carbon dioxide is released into the atmosphere so they should include some details.

(ii) Explain how carbon dioxide is released into the atmosphere.

(2)

Thraugh volcanoes erupting, everytime a volcano erupts it releases carbon dioxide into the atmosphere, it can cause an ash cloud as it reacts with sunlight.

ResultsPlus
examiner comment

This is one example of a correct answer.

(ii) Explain how carbon dioxide is released into the atmosphere.

(2)

CO_2 is released in the atmosphere by deforestation; where all the trees are being cut down so they give of CO_2.

ResultsPlus
examiner comment

This candidate has misunderstood the question. Deforestation will prevent as many trees taking in carbon dioxide by photosynthesis but will not **release** carbon dioxide, unless the trees are then burnt.

(ii) Explain how carbon dioxide is released into the atmosphere.

(2)

carbon dioxide is released into the atmosphere by cars, vans, lorries etc and this is called pollution.

ResultsPlus
examiner comment

This candidate has given an incomplete answer. Carbon dioxide is released into the atmosphere by cars etc, but only when the fuel is burnt.

Question 3(c)

This question was answered well by many candidates, but it is disappointing that there is still a significant minority who think that the test for carbon dioxide is that it extinguishes a flame. There are many other gases that also extinguish a flame, so this is not an acceptable test. A small number of candidates still confuse the tests for the different gases in the specification.

(c) Describe the test to show that a gas is carbon dioxide.

(2)

The test used to identify if CO_2 is present is you bubble the gas into limewater if it turns milky CO_2 is present.

ResultsPlus
examiner comment

This is an example of a commonly seen correct answer. This response was awarded 2 marks.

(c) Describe the test to show that a gas is carbon dioxide.

(2)

By putting your finger ~~up~~ over the top of a testtube, lighting a splint. if there is carbon dioxide in the tube when you take your finger off and place the lit splint at the entrance there should be a pop/squeek.

ResultsPlus
examiner comment

This candidate has confused carbon dioxide with hydrogen. This response failed to gain any marks.

ResultsPlus
examiner tip

Candidates should learn the tests for the gases in the specification.

(c) Describe the test to show that a gas is carbon dioxide.

(2)

if you burn any form of flammable material, if CO_2 has released the material will become black or you can use limewater

ResultsPlus
examiner comment

This candidate knows that limewater can be used to test for carbon dioxide but has not described what happens to the limewater. This response was awarded 1 mark.

ResultsPlus
examiner tip

When candidates are asked to describe a test to show that a substance is present they should also give the result of the test.

Question 3(d)

This was a slightly different style of question and, although some candidates found it challenging, it was encouraging to see the large number of responses with a correct description of the graphs and a relevant conclusion. Some candidates gave a list of reasons why humans release carbon dioxide and reasons for global warming but they failed to link this to the graphs. A number of candidates mentioned the Industrial Revolution taking place in the 1960s. Other candidates incorrectly referred to an increase in carbon in the atmosphere, rather than carbon dioxide.

year year

Explain whether or not these graphs provide evidence that human activity is causing the Earth's temperature to rise.

(3)

No because the temperature increases and decreases but overall it has ~~become~~ risen which could show these. ~~were~~ is a link ~~because the carbon~~

ResultsPlus
examiner comment

This candidate has described the pattern in the temperature graph but has not mentioned the carbon dioxide graph. This response was awarded 1 mark.

ResultsPlus
examiner tip

When candidates are given two graphs to consider, they should write a comment about each of them.

Some candidates would benefit from more practice in answering questions that involve data analysis from graphs and tables.

year year

Explain whether or not these graphs provide evidence that human activity is causing the Earth's temperature to rise.

(3)

These graphs show that as the concentration of carbon dioxide in the atmosphere increases, so does the mean global temperature. For example, in 1960 the mean temperature was under 14·1°C, and concentration of CO_2 was under 320 ppm. However in 2000 this concentration had increased to around 365ppm and the temperature rose to over 14·4°C.

(Total for Question 3 = 10 marks)

ResultsPlus
examiner comment

This candidate has given a good description of the patterns shown in the graphs, but has not explained whether they provide evidence that human activity is causing the Earth's temperature to rise. This response was awarded 2 marks.

ResultsPlus
examiner tip

To gain full marks for a question, candidates must write about all parts of the question. In this question candidates needed to write about the pattern shown in each graph and explain whether they think that the graphs provide evidence that human activity is causing the Earth's temperature to rise.

year year

Explain whether or not these graphs provide evidence that human activity is causing the Earth's temperature to rise.

[3]

The graphs do not show human activity is causing the earth's temperature to rise. They show that as time has gone along the amount/concentration of carbon dioxide has risen and so has the temperature. Nothing shows anything about human activity

(Total for Question 3 = 10 marks)

ResultsPlus
examiner comment

This is an example of a good 3-mark answer. The candidate has commented on both graphs and has correctly stated that they show nothing about human activity.

ResultsPlus
examiner tip

Good answers do not need to be long. A concise answer that has all the relevant points can score all the marks.

Question 4(b)(ii)

Many candidates found this to be a challenging question and only a small minority scored both marks. Candidates were not expected to know the answer to this question but they were expected to apply their knowledge of practical and quantitative chemistry to suggest an answer. The most common answer that scored 1 mark was to heat the solid again, but the candidates did not then state that the final mass will be the same if it had all decomposed.

(ii) It is possible that not all of the calcium carbonate decomposed when it was heated.

Suggest what could be done to confirm that the decomposition was complete.

(2)

~~Do a test Carbon dioxide test~~

You could try heating it again for 5 minutes then see if the mass has changed if it has continue heating if it hasn't changed then you know its done.

ResultsPlus
examiner comment

This is an example of a rare correct answer that scored 2 marks.

(ii) It is possible that not all of the calcium carbonate decomposed when it was heated.

Suggest what could be done to confirm that the decomposition was complete.

(2)

You could reheat the calcium carbonate again, to ensure that the rest of the substance can properly decompose

ResultsPlus
examiner comment

This candidate has made a good suggestion to reheat the calcium carbonate, so has scored 1 mark. The candidate should have also stated how they would know when the decomposition is complete.

(ii) It is possible that not all of the calcium carbonate decomposed when it was heated.

Suggest what could be done to confirm that the decomposition was complete.

(2)

Repeat the experiment to check if the results were similar and see if the decomposition was complete.

ResultsPlus
examiner comment

This is a common incorrect answer. For this experiment, repeating it will not confirm that the original solid had completely decomposed.

Question 4(b)(iii)

All candidates should have scored 1 mark for the formulae of the reactants as CaO was given at the start of part (b) and they should know the formula for water, but a significant number ignored the CaO and wrote CaO_2. The formulae for calcium hydroxide is more difficult but it was pleasing to see how many candidates knew it or could work it out from the formulae of the reactants.

(iii) Calcium oxide reacts with water to form calcium hydroxide.

Write the balanced equation for this reaction.

(2)

$CaO + H_2O \rightarrow Ca(HO)_2$

ResultsPlus
examiner comment

This answer was given full marks, although candidates should be encouraged to write hydroxide as OH.

(iii) Calcium oxide reacts with water to form calcium hydroxide.

Write the balanced equation for this reaction.

(2)

$CaO + H_2O \longrightarrow CaH_2O_2$

ResultsPlus
examiner comment

This candidate scored the mark for the formulae of the reactants but not the product. Although the correct numbers of atoms are present in the product, it should be written as $Ca(OH)_2$.

ResultsPlus
examiner tip

Candidates should revise the correct formulae for the substances in the specification.

(iii) Calcium oxide reacts with water to form calcium hydroxide.

Write the balanced equation for this reaction. (2)

$2CaO + 2H_2O \rightarrow 2Ca(OH)^{2}_{4}$

ResultsPlus
examiner comment

This candidate scored a mark for the correct formulae of the reactants, but the superscript shown in the formula for calcium hydroxide should have been written as a subscript.

ResultsPlus
examiner tip

Candidates must take care when writing formulae. Any numbers needed in a formula must be shown as subscripts.

Question 4(c)

A large number of candidates scored both marks for this question as they knew that the total mass of reactants is equal to the total mass of products. Many candidates treated calcium carbonate as a product and added 1.00 g to the mass of the reactants. Answers were seen in which the candidates, added, subtracted, multiplied and divided the masses, showing that some candidates do not have a clear understanding of what is happening during a chemical reaction.

(c) In an experiment, calcium chloride solution reacted with sodium carbonate solution to produce solid calcium carbonate and sodium chloride solution.

$$CaCl_2(aq) + Na_2CO_3(aq) \rightarrow CaCO_3(s) + 2NaCl(aq)$$

mass of calcium chloride solution used = 11.00 g

mass of sodium carbonate solution used = 10.50 g

mass of calcium carbonate solid produced = 1.00 g

Calculate the mass of the solution left at the end of the reaction.

(2)

11.00 + 10.50 − 1.00 = 20.5

11.00 + 10.50 = 21.5 21.5 − 1.00 = 20.5

mass of remaining solution = 20.5 g

ResultsPlus
examiner comment

This was a good answer for 2 marks.

(c) In an experiment, calcium chloride solution reacted with sodium carbonate solution to produce solid calcium carbonate and sodium chloride solution.

$$CaCl_2(aq) + Na_2CO_3(aq) \rightarrow CaCO_3(s) + 2NaCl(aq)$$

mass of calcium chloride solution used = 11.00 g

mass of sodium carbonate solution used = 10.50 g

mass of calcium carbonate solid produced = 1.00 g

Calculate the mass of the solution left at the end of the reaction.

(2)

11.00g + 10.50g = 21.5

mass of remaining solution = ... g

ResultsPlus
examiner comment

This candidate has worked out the total mass of reactants so scores 1 mark. They would need to subtract 1.00 g to find the mass of solution left.

Question 4(d)

Many candidates scored both marks for this question. However, a significant number did not explain their answer and just stated that calcium carbonate reacts with the waste gases, omitting to state that the waste gases are acidic. Some candidates knew that sulfur is an impurity in coal and produces sulfur dioxide when burnt, but some thought that sulfur was the waste gas.

(d) Calcium carbonate is used to treat waste gases produced in coal-fired power stations.

Explain why calcium carbonate is used in this way.

(2)

Because it's a natural resource, which doesn't effect the environment or produce any harmful gases that could be released into the atmosphere.

(Total for Question 4 = 10 marks)

ResultsPlus
examiner comment

This candidate knows that calcium carbonate occurs naturally but they have not explained why it is used to treat the waste gases. This response failed to gain any marks.

(d) Calcium carbonate is used to treat waste gases produced in coal-fired power stations.

Explain why calcium carbonate is used in this way.

(2)

Because it can neutralize gases and it doesn't react a lot.

ResultsPlus
examiner comment

This candidate has stated it neutralise gases but they have not explained that the gases are acidic, so this answer scores 1 mark.

(d) Calcium carbonate is used to treat waste gases produced in coal-fired power stations.

Explain why calcium carbonate is used in this way.

(2)

Calcium carbonate neutralises the acidic sulfur dioxide. if this does not happen the sulfur dioxide would cause more acid rain.

(Total for Question 4 = 10 marks)

ResultsPlus
examiner comment

This is a very good answer, giving a clear explanation.

Question 5(a)(ii)

There were some good answers to this question, in which candidates showed a good understanding of metal extraction and the reactivity series of metals. However, there were quite a lot of vague answers that did not answer the question. Some candidates just stated that aluminium is reactive and did not compare its reactivity with iron or carbon. A few candidates thought the method of extraction was related to the melting points of the metals.

(ii) Aluminium is extracted from its oxide by electrolysis.

Explain why iron can be extracted from iron oxide by heating it with carbon but electrolysis has to be used to extract aluminium from its oxide.

(2)

Aluminium is more reactive than iron so therefore aluminium needs more power to seperate it from its oxides using electricity

ResultsPlus
examiner comment

This is a very clear answer that compares the reactivity of aluminium and iron and the consequence of this on the method of extraction. This response was awarded 2 marks.

(ii) Aluminium is extracted from its oxide by electrolysis.

Explain why iron can be extracted from iron oxide by heating it with carbon but electrolysis has to be used to extract aluminium from its oxide.

(2)

Electrolysis has to be used because Aluminium is higher up in the reactivity series than Iron so it is harder to extract from its oxide.

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examiner comment

This candidate has compared the reactivity of the two metals but has not explained carefully enough why electrolysis has to be used to extract aluminium. This response was awarded 1 mark.

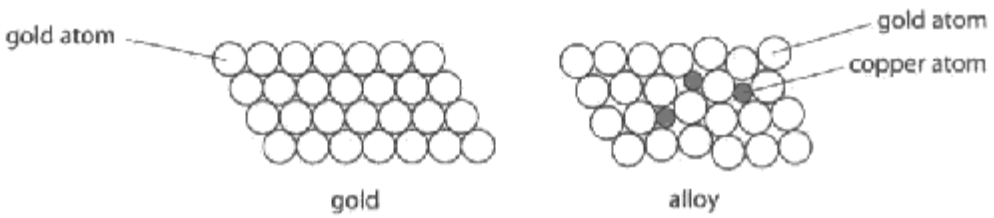
ResultsPlus
examiner tip

Candidates must remember that electrolysis is a more powerful method than heating with carbon for the extraction of metals from their ores.

Question 5(b)

Many candidates found it difficult to explain why the alloy is stronger than pure gold. Many candidates did not use the information that was given in the diagrams of pure gold and the alloy. The different sizes of the gold and copper atoms were clearly shown, as was the disruption to the structure, but comparatively few candidates used those points in their answers. There were many answers that just mentioned the atoms moving, rather than being specific and stating that the **layers** of atoms can slide over each other in the pure metal but not in the alloy. There were many vague answers referring to the higher reactivity or higher strength of copper.

atoms of copper.



Explain how the presence of copper atoms results in an alloy with a higher strength than pure gold.

(3)

because Copper is a stronger metal and will hold the atoms together whereas gold isn't very high in strength so the atoms could break apart

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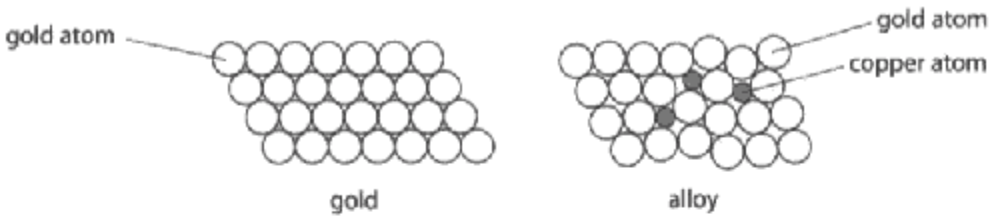
examiner comment

This is an example of a vague answer that refers to strength but gives no details about the atoms of gold and copper. This response failed to gain any marks.

ResultsPlus
examiner tip

Candidates should use the information given in the question. The diagrams clearly show that gold atoms are all the same size but the copper atoms are smaller and disrupt the structure.

atoms of copper.



Explain how the presence of copper atoms results in an alloy with a higher strength than pure gold.

(3)

pure metal is weak because the atoms are in a regular pattern causing them to move, Howevre if you add copper atoms that makes the alloys have different sized particles making an irregular pattern, meaning that the copper and gold atoms are more restricted and can not move causing the alloy to have a greater strength than a pure metal.

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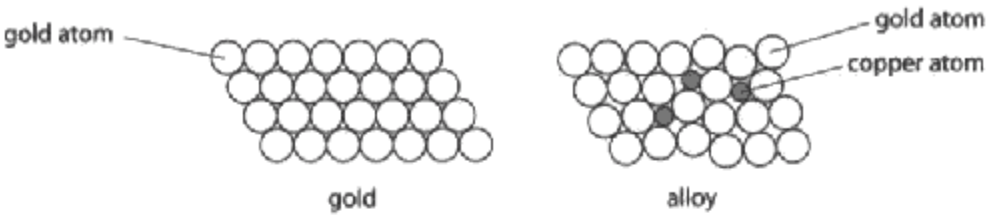
examiner comment

This candidate has had a good attempt at answering the question. The answer refers to the atoms moving in gold and not moving in the alloy. If it had included the phrase **layers of atoms**, it would have scored full marks. This response was awarded 2 marks.

atoms of copper.



Explain how the presence of copper atoms results in an alloy with a higher strength than pure gold.

(3)

The gold atoms in pure gold are neatly arranged in a regular form which creates layers. This means it can be easily bent because the layers can easily slide over one another. However adding copper atoms to the gold atom upsets the arrangement which there are no longer layers to slide over one another. This makes it hard to bend making the gold and copper ~~alloy~~ alloy stronger than pure gold.

ResultsPlus
examiner comment

This is an example of a very good answer, scoring 3 marks.

Question 5(c)

Many excellent answers were seen to this question. A large number of candidates were able to state at least one use of each metal and relate this to the properties given in the table. However, many candidates wrote about all of the properties given in the table and tried to relate all of them to the use they stated, even where some of the properties were not relevant to that use. This took them a long time and made some very long answers. Candidates should be informed that it is better for them to just select the relevant material from any data they are given. For example, if they state that copper is used for water pipes because it has a good resistance to corrosion and it is a very good conductor of electricity, the conduction of electricity is not relevant to this use. Some candidates did not read the question and just wrote compared the properties of the metals, without suggesting any uses, and they did not score any marks for this. Candidates usually communicated their answers well and it was rare to find a candidate who did not score the higher mark for the level they achieved.

metal	cost of 1 kg / £	density / g cm^{-3}	relative strength	resistance to corrosion	electrical conductivity
aluminium	1	2.70	high	good	good
copper	5	8.92	high	good	very good
gold	33000	19.3	low	excellent	excellent
silver	620	10.5	low	very good	excellent

Use the data in the table to explain some uses of each of these metals in relation to their individual properties.

(6)

aluminium only costs £1 for 1kg whereas gold costs £3300 for 1kg. Aluminium has a density of 2.70gcm^{-3} and a high relative strength whereas gold has 19.3gcm^{-3} density and a low relative strength. Copper has a high relative strength a good resistance to corrosion and a very good electrical conductivity. Gold has ~~go~~ excellent resistance to corrosion and ~~very good~~ excellent electrical conductivity therefore the table shows ~~gold~~ even though gold is very expensive it is also the ~~best~~ metal in ~~[illegible]~~ resistance to corrosion and electrical conductivity.

(Total for Question 5 = 12 marks)

ResultsPlus
examiner comment

This answer describes the properties given in the table but it does not answer the question as it does not mention any uses of the metals.

ResultsPlus
examiner tip

Candidates must read the question carefully and make sure that they know what they have been asked to do. This question asked them to explain some **uses of the metals** and relate them to the properties.

metal	cost of 1 kg / £	density / g cm^{-3}	relative strength	resistance to corrosion	electrical conductivity
aluminium	1	2.70	high	good	good
copper	5	8.92	high	good	very good
gold	33000	19.3	low	excellent	excellent
silver	620	10.5	low	very good	excellent

Use the data in the table to explain some uses of each of these metals in relation to their individual properties.

(6)

Aluminium is the best metal because not only is it cheap but also, it is a good electrical conductor and it has a good resistance to corrosion. Copper is also very cheap like aluminium and is a more stronger electrical conductor, this is because most electrical wires are made from copper. However gold is very expensive costing £33000 just for 1kg however its density is extremely high and its electrical conductivity is better than aluminium and copper. lastly Silver is an alright metal however it is still extremely expensive costing £620 but like gold its still a better electrical conductor than copper and aluminium.

(Total for Question 5 = 12 marks)

ResultsPlus
examiner comment

This is an example of a level 1 answer. Although this candidate has written a lot, most of it is just restating the properties that are given in the table. The only use mentioned is electrical wires made from copper.

ResultsPlus
examiner tip

Before candidates start writing, they must read the question carefully and underline what they have to do. They could also make a short plan and check that it answers the question. This could save them a lot of time in writing statements that do not answer the question.

metal	cost of 1 kg / £	density / g cm^{-3}	relative strength	resistance to corrosion	electrical conductivity
aluminium	1	2.70	high	good	good
copper	5	8.92	high	good	very good
gold	33000	19.3	low	excellent	excellent
silver	620	10.5	low	very good	excellent

Use the data in the table to explain some uses of each of these metals in relation to their individual properties.

(6)

aluminium is used for cans as its a very cheap and light metal while still being strong it doesnt rust therefore its good to store and hold liquids
Copper is used for electrical wiring as its relativly cheap, its strong doesnt rust and conducts electric.
Gold is used for making jewelry. ans

ResultsPlus
examiner comment

This candidate started the answer very well by explaining the uses of aluminium and copper but did not give a reason for gold being used to make jewellery. This is a level 2 answer.

metal	cost of 1 kg / £	density / g cm^{-3}	relative strength	resistance to corrosion	electrical conductivity
aluminium	1	2.70	high	good	good
copper	5	8.92	high	good	very good
gold	33000	19.3	low	excellent	excellent
silver	620	10.5	low	very good	excellent

Use the data in the table to explain some uses of each of these metals in relation to their individual properties.

(6)

Aluminium can be used to make air crafts. This is because it is ~~very~~ low density so easier to keep in the air and is strong. It will also be outside alot so its good that it's corrosieve resistant and a lot will be used so they've also chosen the aluminium because it's cheap. Copper is very good at conducting electricity so they make electrical ~~wire~~ wires out of it. They also make electrical wires out of the copper because it's fairly cheap and is strong.
Gold can be used to make jewllery. This is because it's expensive which makes the gold jewllery more special. It also doesn't corrode easily so lasts longer. ~~The~~ Gold ~~is~~ is excellent at being resistant to corrosion because it is low on the reactivy series which means it doesn't react with much.
Silver can be used it jewllery aswell but corrodes more easily than gold because it's higher on the reactivity series.

(Total for Question 5 = 12 marks)

ResultsPlus
examiner comment

This is a very good answer that is level 3 as it explains how uses of all the metals are related to their properties.

Question 6(a)(i)

Many candidates found it difficult to draw the correct structure of a propene molecule. Some realised there was a double bond present as they were told it is an alkene but they added two hydrogen atoms to each carbon atom. Others included two double bonds.

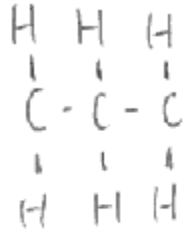
Propene

6 Propene is an alkene.

The formula of its molecule is C_3H_6.

(a) (i) Draw the structure of a propene molecule, showing all of the bonds.

(2)



ResultsPlus
examiner comment

This was a common incorrect answer that included the correct numbers of atoms, but did not have a double bond. This response failed to gain any marks.

ResultsPlus
examiner tip

All alkenes contain a double bond between two of the carbon atoms.

Each carbon atom should have a total of four bonds.

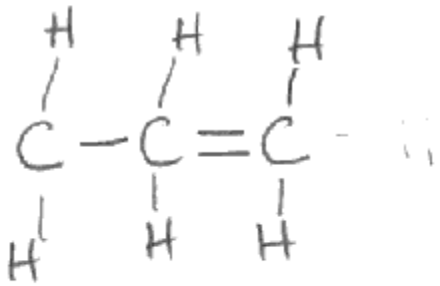
Propene

6 Propene is an alkene.

The formula of its molecule is C_3H_6.

(a) (i) Draw the structure of a propene molecule, showing all of the bonds.

(2)



ResultsPlus
examiner comment

This candidate has drawn a double bond in the structure. However, the carbon atom on the left only has 3 bonds and the carbon in the centre has 5 bonds. This response was awarded 1 mark.

ResultsPlus
examiner tip

Make sure that all carbon atoms have 4 bonds.

Question 6(b)

Many candidates were familiar with the use of bromine to distinguish between alkanes and alkenes, although a small number confused the observations. Candidates should be reminded that 'clear' is not a colour so they should state that bromine water turns colourless in the presence of an alkene.

(b) Propane is an alkane.

Propane and propene are both gases.

Given a sample of each gas, describe a test to show which gas is propane and which gas is propene.

(3)

To test these you would use bromine water. You would mix both gasses with bromine water individually. The one that ~~does~~ decolourises the bromine water is the propene (double bonds join with bromine bonds). The one which doesn't change at all is propane (all bonds are already used).

ResultsPlus
examiner comment

This is an example of a good answer that scored 3 marks.

(b) Propane is an alkane.

Propane and propene are both gases.

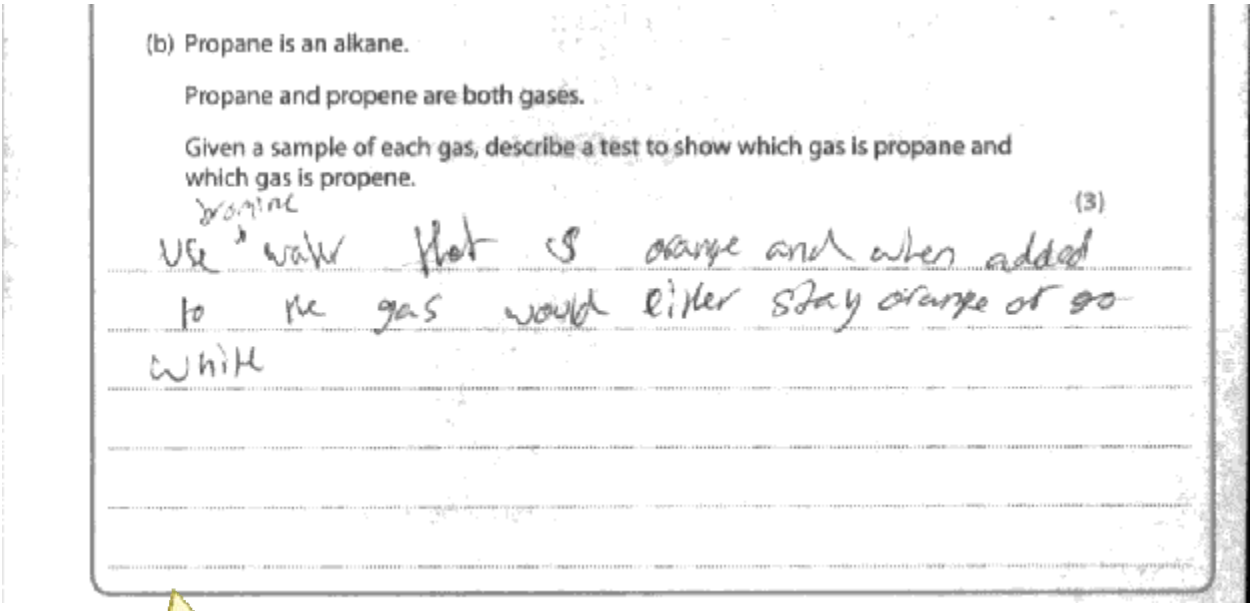
Given a sample of each gas, describe a test to show which gas is propane and which gas is propene.

(3)

propane is an alkane so therefore it will have a double bond whereas propene won't. Also you can tell that propane is an alkane because all alkanes end in ane and have the formula C_nH_2

ResultsPlus
examiner comment

This candidate knows some facts about alkanes and alkenes, but these do not describe a test. This response failed to gain any marks.



(b) Propane is an alkane.

Propane and propene are both gases.

Given a sample of each gas, describe a test to show which gas is propane and which gas is propene.

(3)

bromine

Use water that is orange and when added to the gas would either stay orange or go white

ResultsPlus
examiner comment

This candidate knows that bromine water is used in the test but has not stated which gas will make it stay orange. This response was awarded 1 mark.

Question 6(c)

Candidates generally found this extending writing question more difficult than Q5(c) as it relied on them using some specific knowledge from Topic 5 in the C1 specification about polymers. However, many excellent answers were seen that included very good descriptions of polymerisation, using correct terminology. Common errors included using the phrase that propene molecules are cracked instead of explaining that the double bond in the monomers breaks. There was also a lot of confusion between poly(propene), PVC, polyester and polystyrene in terms of uses and properties.

*(c) Propene is used to make the polymer poly(propene).

Explain how poly(propene) molecules are formed from propene molecules and relate the properties of poly(propene) to its uses.

(6)

Propene molecules are formed in the proces of cracking Propene molecule are double bonded, these double bonds can be cracked making the hydrocarbon chain longer and more usefi. Polypropene

ResultsPlus
examiner comment

This candidate has not written very much but has stated that there is a double bond in propene, so this is a level 1 answer.

ResultsPlus
examiner tip

Even if candidates do not know much about the topic in the question, they should try to write something about it as they may include enough to achieve level 1.

*(c) Propene is used to make the polymer poly(propene).

Explain how poly(propene) molecules are formed from propene molecules and relate the properties of poly(propene) to its uses.

(6)

Propene is an alkene & therefore ~~more~~ are double bonded in ~~the~~ & hydrocarbons, Polymers are created by the double bond splitting and joining on to another hydrocarbon and many others to create a long chain of hydrocarbons to create the Polymers. The Polymer Poly(Propene) ~~is then~~ now is a Alkane because it no longer has a double bond. depending on how long the hydrocarbon is it can be fractioned and broken down into different chain lengths of hydrocarbon to be used for something more useful.

ResultsPlus
examiner comment

This is a very good description of making poly(propene) but there is no mention of a use or property of the polymer, so it is a level 2 answer.

ResultsPlus
examiner tip

To achieve level 3, candidates need to write about each part of the question.

*(c) Propene is used to make the polymer poly(propene).

Explain how poly(propene) molecules are formed from propene molecules and relate the properties of poly(propene) to its uses.

(6)

Many propene molecules are bonded together to form a single poly(propene) molecule. In this reaction, the double bond between the two carbons is lost. Due to the absense of a double bond, the carbon can form more bonds to more propene molecules and incidentally this cycle carries on* until there are enough carbon and hydrogen atoms (only) to form a polymer. Poly(propene) is a long chained polyme so it is less reactive than the alkenes used in its manufacture. As it is less reactive, it will take longer to break down. This is why it is used in the manufacter of plastic as plastic is an everyday item in most peoples lines of work. This property also relates to its use in plastic bags for shopping, as since they don't break down, the bags can be used over and over again as if they are left in a landfill they take 500 years to decompose and also we can save energy as no new polymes are needed so the energy from fossil fuels used in their manufacture is preseved.

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

*as the double bonds are continuously broken

ResultsPlus
examiner comment

This candidate has given a very good explanation of polymerisation and some uses and properties of poly(propene). This is a level 3 answer.

Paper Summary

Based on their performance in this paper, in order to improve their performance, candidates should:

- read all of the information in the question carefully and use it to help them to answer the question
- learn and use correct scientific terminology
- practice writing correct formulae for the substances in the specification and not use lower case letters for symbols and superscripts instead of subscripts
- practice writing balanced equations for the reactions in the specification
- learn the tests for all of the gases in the specification
- practise describing patterns shown in graphs
- practise simple calculations
- practise writing concise answers to the extended writing questions by not including information that is not relevant.

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