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Examiners' Report
June 2016

GCSE Science/Chemistry 5CH1F 01

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Introduction

The format and style of this Unit 1 part of the GCSE Science 2011 course is now firmly established since the first paper in November 2011.

The Foundation Tier paper assesses grades C to G and consists of a mixture of question styles, including objective questions, short answer questions, data analysis questions and extended writing style questions.

Students were assessed on their knowledge and understanding of chemistry of the atmosphere, rocks, acids, electrolysis, metals, fuels, hydrocarbons and polymers.

There were opportunities for them to demonstrate their knowledge and understanding of writing word equations and the practical work they have carried out throughout this unit.

The overall impression of the examiners was that the majority of candidates had been well prepared for the examination. There was clear evidence of a sound understanding of some key concepts across the topic areas, as well as an improvement in the writing of word equations when compared to the previous series.

Successful candidates:

- read the questions carefully and answered the questions as they were set;
- understood and used correct scientific terminology;
- could write word equations;
- could link properties with the uses when discussing metals or polymers;
- could correctly recall the test to show how bromine water is used to distinguish between alkenes and alkanes.

Less successful candidates:

- could not recall the procedures or results for common gases;
- were unable to use simple particle models to explain the properties of alloys;
- had difficulty in answering extended writing tasks, even though there were many ways of accessing the marks;
- could recall the effects of acid rain, but were unable to discuss either the causes and/or methods of reduction in coal-fired power station chimneys.

In future, candidates need to revise the factual content of the specification more carefully, to enhance their subject knowledge, such as the tests and results for common gases in the specification and standard explanations for alloys. All candidates would benefit from working through more past examination questions to practise skills required in extended writing.

The report provides exemplification of candidates' work, together with tips and/or comments for a selection of the questions.

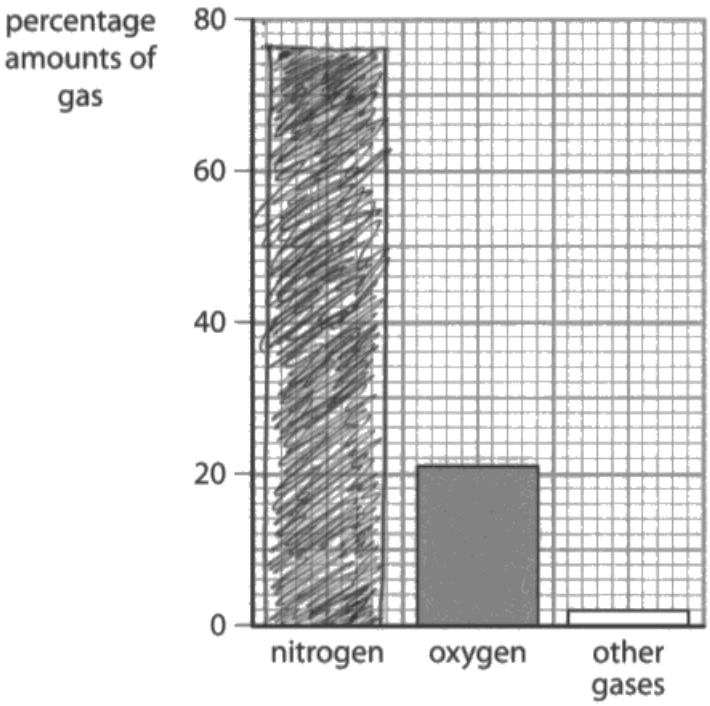
Question 1 (a) (i)

The majority of candidates scored the 1 mark available. They were able to draw a correct bar on the bar chart within the +/ – half small square tolerance, to show that the percentage of nitrogen in today's atmosphere is 78.

A common error noted by examiners was that many candidates showed a lack of understanding of the scaling. Candidates generally failed to recognise that each square in the chart given in the question represents 2 units, rather than 1 unit. Consequently, as a result of this, many candidates drew the bar at 76% rather than at 78%. It was also noted that a significant minority of candidates did not use a ruler to clearly show the height of bars.

1 (a) The bar chart shows the percentages of some gases in a sample of dry air from today's atmosphere.

The bar for the percentage of nitrogen is missing.



(i) The percentage of nitrogen is 78.

Add the bar to the chart to show this.

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Examiner Comments

This was a commonly seen incorrect response, which was out of the permitted tolerance of +/ – half square. Here, the candidate has misread the scale, by not recognising that each square represents 2 units. Consequently, the bar has been incorrectly drawn at 76% rather than at 78%. The mark was not scored.

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Examiner Tip

Take care with drawing graphs by checking the scales used in the question before plotting points or drawing bars.

Question 1 (b)

This was generally well answered, with many candidates giving correct explanations linking '(growth of primitive) plants' and 'photosynthesis' to score both available marks.

Common errors and misconceptions seen by examiners included:

- frequently, despite gaining credit for the first marking point as a result of 'plants' being mentioned, the second point was not scored since candidates incorrectly referred to plants 'breathing' or 'respiring' – a commonly seen misconception;
- whilst correctly focussing on the Earth's early atmosphere, many responses discussed volcanic eruptions and carbon dioxide production, but failed to score since they omitted the key creditworthy concepts, namely plants or what the plants did;
- another commonly seen misconception in responses was that water vapour condensed, which led to carbon dioxide levels decreasing and oxygen levels increasing.

(b) In the Earth's early atmosphere there was little or no oxygen.

Explain what caused the percentage of oxygen in the atmosphere to increase.

(2)

Photosynthesis caused the level of oxygen to rise. Plants gave off oxygen.

ResultsPlus
Examiner Comments

A fully correct explanation. Both references to 'plants' and 'photosynthesis' scored the 2 marks available.

ResultsPlus
Examiner Tip

It is worthwhile revising the key processes involved in the changes in the Earth's atmosphere to ensure candidates are prepared to respond to explanation questions regarding the chemistry of the atmosphere.

(b) In the Earth's early atmosphere there was little or no oxygen.

Explain what caused the percentage of oxygen in the atmosphere to increase.

(2)

When the earth got too hot it condensed and all the water vapour ~~escaped~~ and formed oceans so all the organisms underneath used the oxygen to photosynthesise and breathe sucessfully.

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Examiner Comments

This response did not score. The first marking point was not awarded since there is no mention of 'plants' in the response. Unfortunately, although 'photosynthesis' has been correctly mentioned, the incorrect reference to 'breathing' negates this mark. It is also worthwhile noting that even had the response not incorrectly referred to breathing, it still would not have scored because the description of photosynthesis, namely 'used the oxygen' is incorrect.

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Examiner Tip

Remember that breathing is a physical action carried out by animals where air is inhaled by drawing air into the body and forced out when exhaled. Plants do not breathe.

(b) In the Earth's early atmosphere there was little or no oxygen.

Explain what caused the percentage of oxygen in the atmosphere to increase.

(2)

The respiration of early plant life increased the amount of oxygen ~~and~~ after the cooling of the Earth allowed liquid water to form.

ResultsPlus
Examiner Comments

This answer was typical of a 1 mark response, namely for the correct reference to 'plant life'. The incorrect reference to 'respiration' was rejected for the second marking point.

ResultsPlus
Examiner Tip

Remember not to confuse the process of respiration with photosynthesis.

Question 1 (c) (i)

The majority of responses scored just 1 out of the 2 marks available, for a correct reference to 'carbon' only. Although many fully correct responses were seen, when candidates had obtained the correct answer for both 'carbon' and 'oxygen', they often went further than required and correctly identified the number of each of these atoms (ignored in this particular question, but indicating a good understanding of writing formulae).

Common errors and misconceptions seen by examiners included:

- when 'carbon' was seen, for 1 mark only, this was often incorrectly coupled with 'oxide' or 'dioxide';
- in a few cases, there were responses referring to protons, neutrons and electrons, or sometimes, water, nitrogen and carbonates were described.

(c) Carbon dioxide is one of the other gases in the atmosphere.

(i) The formula of carbon dioxide is CO_2.

Describe what atoms are present in carbon dioxide.

(2)

Carbon and oxygen are two atoms that are present in carbon dioxide.

ResultsPlus
Examiner Comments

A typical, fully correct response for 2 marks. Both the correct atoms present in a molecule of carbon dioxide have been described, namely 'carbon' and 'oxygen'.

ResultsPlus
Examiner Tip

It is worthwhile making sure that you can identify the correct atoms present in the important formulae in this topic, such as carbon dioxide, carbon monoxide and water.

(c) Carbon dioxide is one of the other gases in the atmosphere.

(i) The formula of carbon dioxide is CO_2.

Describe what atoms are present in carbon dioxide.

(2)

~~1 carbon~~ ~~2 oxides~~

1 carbon 2 oxides.

ResultsPlus
Examiner Comments

A commonly seen 1 mark response. The correct reference to 'carbon' scored the 1 mark. The other response, 'oxides', is incorrect.

ResultsPlus
Examiner Tip

'Oxide' is not an element – it simply indicates that oxygen is bonded to another element in a compound.

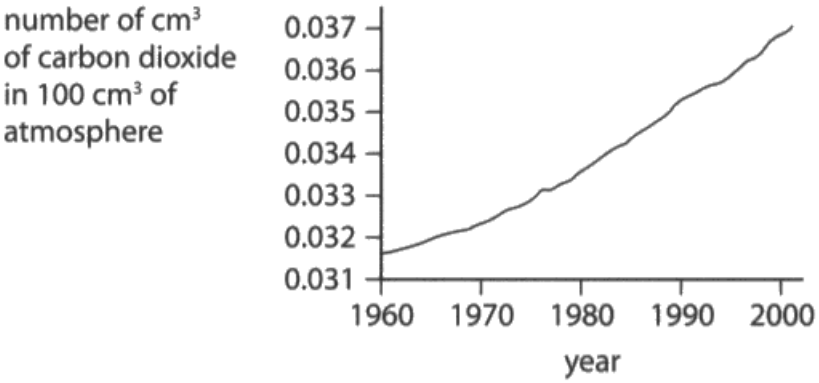
Question 1 (c) (ii)

It was pleasing to see that the majority of candidates were able to explain the trend in the graph, to gain both marks.

Although there were many possible correctly linked pair alternative answers in the mark scheme, the most commonly seen correct answer was for 'burning' and 'fossil fuels'. Occasionally, examiners saw some very good responses linking 'farming' and 'increased respiration'. Quite a few responses correctly referred to 'deforestation', but only scored 1 mark, since they were unable to achieve a reasonable explanation as to why this leads to an increase in carbon dioxide. References to the other suggested correct alternatives, such as 'volcanic eruptions', 'limestone decomposition' or 'dead organisms decaying', were less frequently seen by examiners.

Common errors, omissions and misconceptions seen by examiners included: many failed to read the question properly, so simply discussed the graph and gave insufficiently detailed responses, such as 'more cars/transport', 'more power stations' or 'increased industrialisation' without justification, namely, by not referring to using/burning fuels.

(ii) The graph below shows the volume of carbon dioxide in the atmosphere between the years 1960 and 2000.



Explain one reason why the volume of carbon dioxide increased between the years 1960 and 2000.

(2)

The burning of fossil fuels increased the volume of carbon dioxide in the atmosphere because the population grew and more energy was needed.

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Examiner Comments

A typical fully correct response for two marks, namely for 'burning fossil fuels'. There is also a mention in this response of the correct idea of increased population. This alone would have been creditworthy, but was not explained, so would have only gained 1 mark.

ResultsPlus
Examiner Tip

Answers need to be specific, for example, simply mentioning human activities, like driving cars, building factories, increased pollution, without a reference to combustion, is insufficient to score.

Explain one reason why the volume of carbon dioxide increased between the years 1960 and 2000.

(2)

The volume of carbon dioxide has increased because of humans & using public transport or there own transport such as cars.

ResultsPlus
Examiner Comments

The response did not score. The response mentions a human activity, namely transport/ cars, but this is not explained in terms of burning of fossil fuels.

ResultsPlus
Examiner Tip

Vague answers, such as 'driving cars' cannot score, so remember to explain why the carbon dioxide levels have increased, in terms of 'burning fossil fuels'.

Explain one reason why the volume of carbon dioxide increased between the years 1960 and 2000.

(2)

Live stock farming has become more popular. The number of animals is increasing which means more respiration is occuring producing more CO_2.

ResultsPlus
Examiner Comments

A good response for both marks – much less frequently seen by examiners. Here the candidate has correctly linked the idea of increased livestock farming/idea of increased animal population to increased respiration leading to increased carbon dioxide levels.

ResultsPlus
Examiner Tip

When revising, make sure you can identify alternative pairs of answers, since often one answer may well be given in the stem of the question and an alternative asked for.

Question 2 (b)

2 marks were available for correctly selecting the missing reactant, 'hydrochloric acid', and missing product, 'carbon dioxide', from the box of alternatives. Most candidates typically scored 1 mark only, for giving the correct reactant.

A common error seen in responses was for candidates to state either 'hydrogen' or 'chlorine' as an incorrect product. It was clear to examiners that most candidates were unable to recall the reaction between a metal carbonate and an acid.

(b) Indigestion is caused by excess hydrochloric acid in the stomach.

Calcium carbonate neutralises the excess hydrochloric acid, producing calcium chloride, a gas and water.

Use words from the box to complete the word equation for this reaction.

(2)

calcium hydroxide	calcium oxide	carbon dioxide
chlorine	hydrochloric acid	hydrogen

calcium carbonate + hydrochloric acid → calcium chloride + carbon dioxide + water

ResultsPlus
Examiner Comments

A typical example of a rarely seen correct response for 2 marks, for correctly giving the reactant and product.

calcium hydroxide	calcium oxide	carbon dioxide
chlorine	hydrochloric acid	hydrogen

calcium carbonate + hydrochloric acid → calcium chloride + hydrogen + water

ResultsPlus
Examiner Comments

This response scored 1 mark only for giving the correct reactant, 'hydrochloric acid'. The product given, 'hydrogen', is incorrect.

ResultsPlus
Examiner Tip

Revise the reactions of acids with metals, metal carbonates, metal hydroxides and metal oxides.

calcium hydroxide	calcium oxide	carbon dioxide
chlorine	hydrochloric acid	hydrogen

calcium carbonate + hydrolic acid → calcium chloride + hydrogen + water

ResultsPlus
Examiner Comments

Unfortunately, this response did not score. The incorrect spelling, 'hydrolic acid' given by this candidate on the reactants side of the equation, is insufficient to score. The product given, 'hydrogen', is incorrect.

ResultsPlus
Examiner Tip

Take care with the spellings of compounds, such as hydrochloric acid, especially when copying them from the stem of the question.

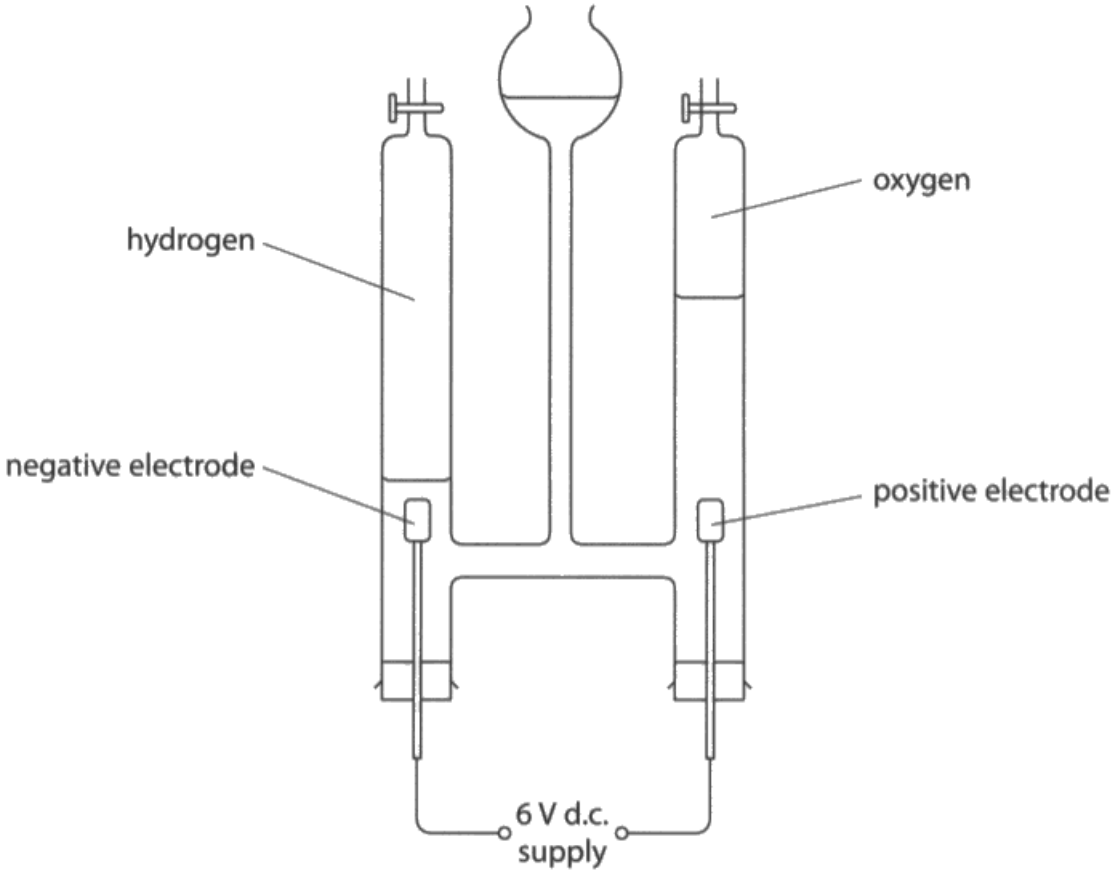
Question 2 (c) (i)

Many responses failed to score either of the two marks available for recalling the test and result for oxygen. There were some excellent responses, concisely writing 'relights' and 'glowing splint'.

Common errors and misconceptions seen by examiners included:

- it would appear that many students did not understand what is meant by 'evolved' in the stem of the question, in relation to gases being given off;
- often both marks were lost by not correctly referring to the use of a 'glowing splint'. Alternatively, 'burned out or blown out splint' was seen which is incorrect;
- many candidates confused the test for oxygen with that for hydrogen, namely the use of a lighted splint and squeaky pop, or with the tests for other gases such as chlorine and carbon dioxide;
- it would appear that for many candidates, misinterpretation of the question was the main issue for not achieving marks. Many appear to have not read the question and described the electrolysis apparatus shown in the diagram and the products or attempted to explain the processes involved in the electrolysis of the water.

(c) Water is electrolysed in the apparatus shown.
The water decomposes to produce hydrogen and oxygen.



(i) Describe the test to show that one of the gases evolved is oxygen.

(2)

If you have a test tube with a gas init and you light a splint, then blow it out

so it is still glowing and put it in the test tube if oxygen is present then it will re-light.

ResultsPlus
Examiner Comments

An example of good response which scored the 2 marks available – a 'textbook' answer. Both the test and result for oxygen have been clearly described.

the 'pop test' would show that Oxygen is present, put a ~~light~~ glowing splint into the test tube with Oxygen in and you will hear a Squeaky pop'.

ResultsPlus
Examiner Comments

An example of a response scoring 1 mark only for the correct use of a 'glowing splint'. The result given in the response, 'squeaky pop', is incorrect and has clearly been confused with the result for the test for hydrogen.

ResultsPlus
Examiner Tip

It is worthwhile, learning the tests and correct results for all the key gases in this course, such as for oxygen, carbon dioxide, hydrogen and chlorine.

You light a splint, blow it out then stick the splint in a test tube and it should reignite if there is oxygen.

ResultsPlus
Examiner Comments

This response did not score because the 'blown out splint' has not been stated to be glowing. The second, result mark, is not scored since it is dependent on the correct test mark.

ResultsPlus
Examiner Tip

When recalling the test for oxygen, 'blown out splint' will not score, unless 'glowing' or an equivalent has been mentioned.

Question 2 (c) (ii)

Most candidates were able to gain the 2 marks available for a correct description of the results shown in the table. By far, the most commonly seen correct responses referred to a quantitative relationship recognising that the volume of hydrogen evolved is always double that of oxygen. Examiners reported having not seen any responses where a candidate had made a reference to the volume (of gas evolved) being directly proportional to time.

Common errors and misconceptions seen by examiners included:

- some candidates did not link the variables. It might be useful for centres to emphasise to candidates that when making comparisons or conclusions they might use the phrase 'as X increases, Y does this...', or words to this effect;
- many candidates simply quoted values from the table without commenting on any relationship;
- some candidates made incorrect statements, such as both (volumes) double every 2 minutes.

(ii) After the experiment has started, the volumes of hydrogen and oxygen collected are measured after 2, 4 and 6 minutes.

The results are shown in the table.

time / minutes	volume of hydrogen / cm^3	volume of oxygen / cm^3
0	0.0	0.0
2	8.0	4.0
4	16.0	8.0
6	24.0	12.0

Describe what the results show about the volumes of hydrogen and oxygen produced during the experiment.

(2)

During the experiment as the time went on volume of oxygen increased by 4 and on the other hand on volume of hydrogen increase by 8

ResultsPlus
Examiner Comments

This response scored both marks for a correct reference to 'as the time went on (the) volume of oxygen increased'. It is also worthwhile noting that although this student has quoted numbers from the table, they have not compared them or given a correct relationship, so this statement alone would not have been creditworthy.

Describe what the results show about the volumes of hydrogen and oxygen produced during the experiment.

(2)

The results ~~results~~ show that there is more volume of hydrogen than oxygen.

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Examiner Comments

This response scored 1 mark only for simply stating that 'there is more volume of hydrogen than oxygen'. Had the response stated a correct quantitative relationship between the volumes, it would have scored the 2 marks available.

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Examiner Tip

Where possible, always try to compare sets of data quantitatively.

Question 2 (d)

This was poorly answered on the whole. Few responses scored the 1 mark available. The impression here of the examiners' was that whilst many candidates did correctly identify 'chlorine', many of the candidates did not know the test for chlorine and there appeared to an element of guesswork.

Common errors and misconceptions seen by examiners included:

- many candidates gave an interesting range of alternative incorrect answers, namely oxygen, carbon dioxide and hydrogen.

(d) When hydrochloric acid is electrolysed a gas is produced which bleaches damp blue litmus paper.

Give the name of this gas.

(1)

Carbon Dixoide

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Examiner Comments

A typical incorrect response in which the candidate has confused the test for chlorine with that of carbon dioxide.

ResultsPlus
Examiner Tip

Learn the standard tests for the gases in the examination and their correct result. The gases covered in this course are: carbon dioxide, hydrogen, oxygen and chlorine.

Question 3 (b) (i)

To score the 2 marks available, candidates had to correctly state the name of the process, as 'fractional distillation'.

Common errors and misconceptions seen by examiners included:

- occasionally, just 1 mark was scored for a correct reference to 'distillation' without mentioning the term 'fractional';
- by far, the most commonly seen incorrect response, confused 'cracking' with fractional distillation. This was closely followed by 'combustion', 'thermal decomposition' and 'electrolysis';
- it was noted that many of the candidates who gave incorrect responses appeared to have simply quoted processes from earlier questions in the paper.

(b) Crude oil is a complex mixture of hydrocarbons.

(i) Give the name of the process used to separate crude oil into simpler mixtures.

(2)

cracking

ResultsPlus
Examiner Comments

A commonly seen incorrect response and misconception which did not score the 1 mark available. The process of cracking has been confused with that of fractional distillation.

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Examiner Tip

Make sure you know the difference between the processes of fractional distillation and cracking.

(b) Crude oil is a complex mixture of hydrocarbons.

(i) Give the name of the process used to separate crude oil into simpler mixtures.

(2)

Distillation

ResultsPlus
Examiner Comments

This response scored 1 mark only for 'distillation'. The term 'fractional' has not been included.

Question 3 (c) (i)

This was generally well answered. Most candidates were able to write the word equation correctly, after having been given all the reactants and products in the stem of the question, to score the 2 marks available.

Errors and misconceptions seen by examiners included:

- commonly, candidates positioned arrows and + signs incorrectly;
- in some responses, candidates did not understand the difference between reactants and products;
- in a few cases, multiple arrows were seen, as if a flow diagram was intended;
- in a few cases, candidates used completely different chemicals to those in the question. It needs to be emphasised in centres that the key to writing most word equations lies in the stem of the question.

(c) Propane reacts with oxygen to form carbon dioxide and water.

(i) Write the word equation for this reaction.

(2)

Propane + Oxygen + Carbon dioxide -> water

ResultsPlus
Examiner Comments

This is a typical example of a response that did not score the 2 marks available. From first impressions, the reactant and product species appear to be in the correct order. However, the '+' sign and arrows have been incorrectly placed which makes both the reactants side and products side in this word equation incorrect.

ResultsPlus
Examiner Tip

Remember to use the correct symbols in chemical equations: a '+' sign is used between reactants (or products) and an 'arrow' is used between the reactants side and the products side of the equation.

Question 3 (c) (ii)

For the 2 marks available, candidates had to recall the correct formula of a molecule of propane, namely C_3H_8. In some cases, the correct structural formula was given and credited. Many candidates recognised that propane is a hydrocarbon with the correct idea of propane containing C and H, for carbon and hydrogen respectively, so they were able to score 1 mark.

This type of question is frequently asked in the examination. It is worthwhile emphasising to students the need to learn the molecular formulae and the structures of the alkanes 'methane', 'ethane' and 'propane', as required in the specification for this unit. Likewise, the need to show the numbers in molecular formulae as correctly subscripted should be emphasised.

Common errors and misconceptions seen by the examining team included:

- the most commonly seen error in responses was for the molecular formula of propene, C_3H_6, to be given, as opposed to propane;
- for many of those candidates who scored just 1 mark, for writing C and H, despite having also shown the correct numbers, the subscripted numbers were not shown correctly. Typically, C3H8, C^3H^8 or a combination of these was seen by examiners;
- in a significant number of incorrect responses, 'P', 'Pr' or 'Ph', was stated as the formula of propane.

(ii) Propane is an alkane.

Give the formula of a molecule of propane.

(2)

C_3H_6

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Examiner Comments

The most commonly seen response which scored just 1 of the 2 available marks. The formula given, scored 1 mark for the C and H, but the numbers although subscripted, are incorrect. The formula has clearly been confused with that of propene, C_3H_6.

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Examiner Tip

Make sure you can recall the correct molecular formulae for simple alkanes, such as methane, ethane and propane.

Question 3 (d)

Many candidates found it difficult to score the 2 marks available on this question.

The most frequently credited responses correctly referred to 'carbon monoxide' and 'toxic'. Examiners commented on the fact that there were some very good explanations regarding the effects of carbon monoxide on haemoglobin. References to 'soot' and its effects, were less commonly seen.

Common errors and misconceptions seen by examiners included:

- in many responses, it was clear that candidates understood the idea that incomplete combustion results from a limited supply of oxygen, but had misread the question and were unable to score since they could not develop this further to complete the answer;
- in many incorrect answers, candidates commonly gave vague responses, typically 'harmful gases released';
- many candidates incorrectly discussed carbon dioxide with the associated environmental problems usually given such as 'global warming' or more vaguely, 'pollution';
- some candidates incorrectly gave simplistic descriptions of the word 'incomplete' or mistakenly described 'cracking', 'fractional distillation' or even 'polymerisation'.

(d) Explain a problem caused by incomplete combustion of hydrocarbons.

(2)

Incomplete combustion releases Carbon monoxide and Carbon which are extremly dangerous Compared to what complete combustion makes Carbon dioxide and water.

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Examiner Comments

This response scored 1 mark only. Although both 'carbon monoxide' and 'carbon' are mentioned as products of incomplete combustion, the problems caused by the effects of either of these have not been explained. The reference to 'dangerous' is not an explanation and is ignored.

(d) Explain a problem caused by incomplete combustion of hydrocarbons.

(2)

Toxic carbon monoxide is produced which when breathed in can cause death as it means less oxygen can flow through your blood.

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Examiner Comments

A fully correct response. The correct reference to 'carbon monoxide' and the linked explanations, 'toxic' or 'can cause death', scored the 2 marks available.

Question 4 (a)

Few candidates scored the 3 marks available for this question. The majority of candidates managed to score just 1 mark.

Many candidates did not link the three metals to their method of extraction from the each metal ore. Once again, this is a frequently asked question, requiring students to recall metals (mainly gold, iron and aluminium) and their method of extraction.

Question 4 (b) (i)

The majority of the candidates scored just 1 of the 2 marks available for completing the word equation for the reduction of zinc oxide by heating with carbon. The mark gained in the question was invariably given for identifying the correct missing reactant, 'carbon'.

Common errors and misconceptions seen by examiners included:

- not reading the question carefully. As with most word equation questions, a significant clue to answering the question lies in the stem of the question. In this case, 'carbon' is mentioned as a reactant, but many candidates failed to use this information and did not score;
- of those candidates who scored the mark for the correct reactant, very few had any idea as to the product formed (either 'carbon dioxide' or 'carbon monoxide'). Examiners reported seeing a range of products given by candidates, such as other metals, hydrogen or water. The incorrect products, 'water' and 'metal', were typically seen in responses;
- in many responses, where the reactant was correctly identified, 'carbon oxide' was also given as the product. This did not score since it is not sufficiently accurate – only carbon monoxide or carbon dioxide are acceptable.

(b) When a mixture of zinc oxide and carbon is heated, zinc metal is formed.

(i) Complete the word equation for this reaction.

(2)

zinc oxide + carbon → zinc + carbon oxide

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Examiner Comments

A commonly seen answer which scored 1 mark. The reactant is correct, but the product 'carbon oxide' is not acceptable as an alternative answer.

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Examiner Tip

Make sure you can identify either 'carbon monoxide' or 'carbon dioxide' when referring to products of the extraction of metals from their metal oxides by heating with carbon.

zinc oxide + carbon → zinc + metal

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Examiner Comments

This was a commonly seen response, scoring 1 mark for the correct reactant, but the product, 'metal', is incorrect.

Question 4 (b) (ii)

Only some candidates could recall 'reduction' as the correct chemical name for the loss of oxygen from a compound.

Common errors and misconceptions seen by the examiners included:

- incorrectly giving 'oxidation' which is the opposite process to reduction;
- many could not remember the correct name of the process, but clearly knew it was the opposite process to oxidation, so attempted to describe reduction as 'deoxidation', 'deoxygenation' or similar words.

(ii) In this reaction zinc oxide has lost oxygen to form zinc.

State the name of the change that occurs when a compound loses oxygen.

(1)

~~oxidisation~~ oxidation

ResultsPlus
Examiner Comments

This response did not score. The candidate has given 'oxidation', which is the opposite process to the reduction process required in the answer.

ResultsPlus
Examiner Tip

Remember that 'reduction is the loss of oxygen' and 'oxidation is the gain of oxygen'.

(ii) In this reaction zinc oxide has lost oxygen to form zinc.

State the name of the change that occurs when a compound loses oxygen.

(1)

deoxidised

ResultsPlus
Examiner Comments

This response did not score. Although the term used by the candidate, 'deoxidised', is a sensible attempt to answer the question, in that it recognises that the reduction process required is the opposite to oxidation, it is incorrect.

ResultsPlus
Examiner Tip

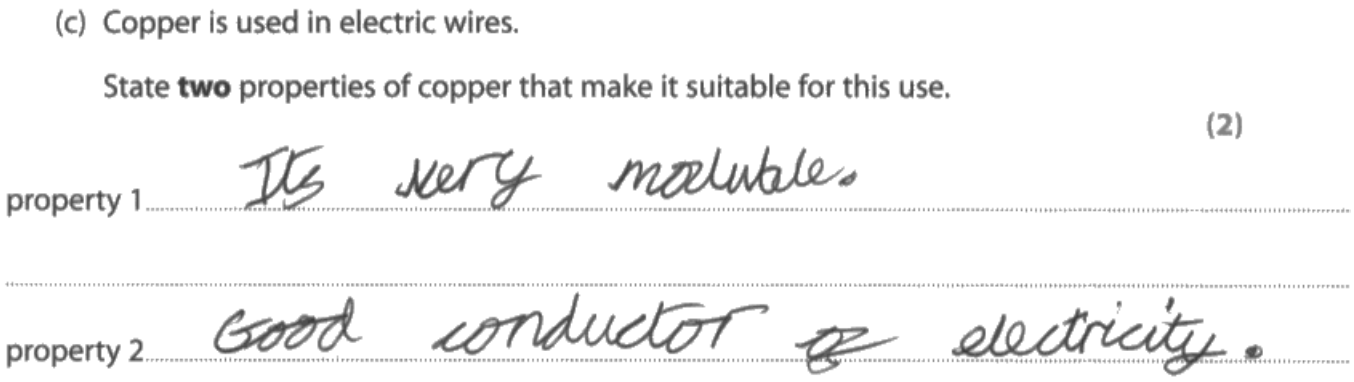
Remember to use the correct words, 'oxidation' and/or 'reduction', when describing the gain or loss of oxygen in a chemical reaction.

Question 4 (c)

This question was well answered on the whole. The majority of candidates scored at least 1 of the 2 marks available, for identifying at least one correct property that makes copper suitable for its use in electric wires. The most common property referred to, for 1 mark, was 'good electrical conductor'. This was often coupled with a correct reference to 'bendable' to score a further second mark. Other relevant properties which were credited by the examiners included: ductile, low reactivity and high melting point/heat resistance.

Common errors and misconceptions seen by examiners included:

- in many responses scoring 1 mark only for references to 'good electrical conductor', candidates also incorrectly referred to 'malleable', which is not a relevant property with regard to the use of copper in electric wires;
- a number of candidates failed to score, since they made reference to copper being a 'good conductor' without specifically stating 'electrical conductor'. Some candidates discussed copper being a 'good thermal conductor', which again is not a relevant property with regard to its use in electric wires;
- as seen in previous examinations for this specification, many candidates mentioned 'resistant to rusting' rather than resistant to corrosion, showing some confusion as to what is meant by rusting, namely corrosion in iron/steel, so this was not creditworthy;
- in some non-creditworthy responses, candidates showed a clear misunderstanding of the properties of copper and incorrectly stated that copper was 'not a conductor of electricity';
- in several responses, it was evident that candidates did not understand the word 'property' and simply discussed further uses of copper, rather than relating uses and properties.


(c) Copper is used in electric wires.

State **two** properties of copper that make it suitable for this use.

(2)

property 1 It's very malluble.

property 2 Good conductor of electricity.

ResultsPlus
Examiner Comments

This response scored 1 mark only for a correct reference to 'good conductor of electricity'. The reference to malleable is incorrect.

ResultsPlus
Examiner Tip

Read the question carefully. Although 'malleable' is property of copper and metals in general, in this case, it is not a relevant property for the use of copper in wires.

(c) Copper is used in electric wires.

State **two** properties of copper that make it suitable for this use.

(2)

property 1 good conductor

property 2 strong

ResultsPlus
Examiner Comments

This response did not score, since 'good conductor' is not specific enough – '(good) electrical conductor' would have to be mentioned to score. Strong is not a relevant property.

ResultsPlus
Examiner Tip

When discussing the conductivity in relation to the use of metals in electric wires, be specific by making sure that it is a metal's 'electrical conductivity' that is referred to.

(c) Copper is used in electric wires.

State **two** properties of copper that make it suitable for this use.

(2)

property 1 It conducts electricity well

property 2 Non reactive

ResultsPlus
Examiner Comments

This response scored 2 marks, since both properties mentioned, electrical conductivity and non-reactivity, are relevant to the use of copper in electric wires.

Question 4 (d)

Candidates who scored the 2 marks available explained why gold alloys are stronger than pure gold. In a few cases there were some excellent explanations, particularly by reference to clear particle diagrams. This is a question that has been asked in previous examination papers for this specification. It is clear that the explanation for alloys is not well understood by candidates or not learned in many cases.

Common errors and misconceptions seen by examiners included:

- the general misconception was for candidates to simply state that alloys are mixtures of metals and therefore stronger as a result of a mixture of the different properties of metals, without reference to any underlying theoretical explanation;
- some candidates could relate strength to particles models, but only discussed particles finding it more difficult to move and not stop/prevents movement of particles;
- most responses failed to refer to atoms (or particles/ions) or to refer to layers, with many simply repeating information from the stem of the question.

(d) Gold jewellery is made of alloys containing gold and copper.
These alloys are stronger than pure gold.

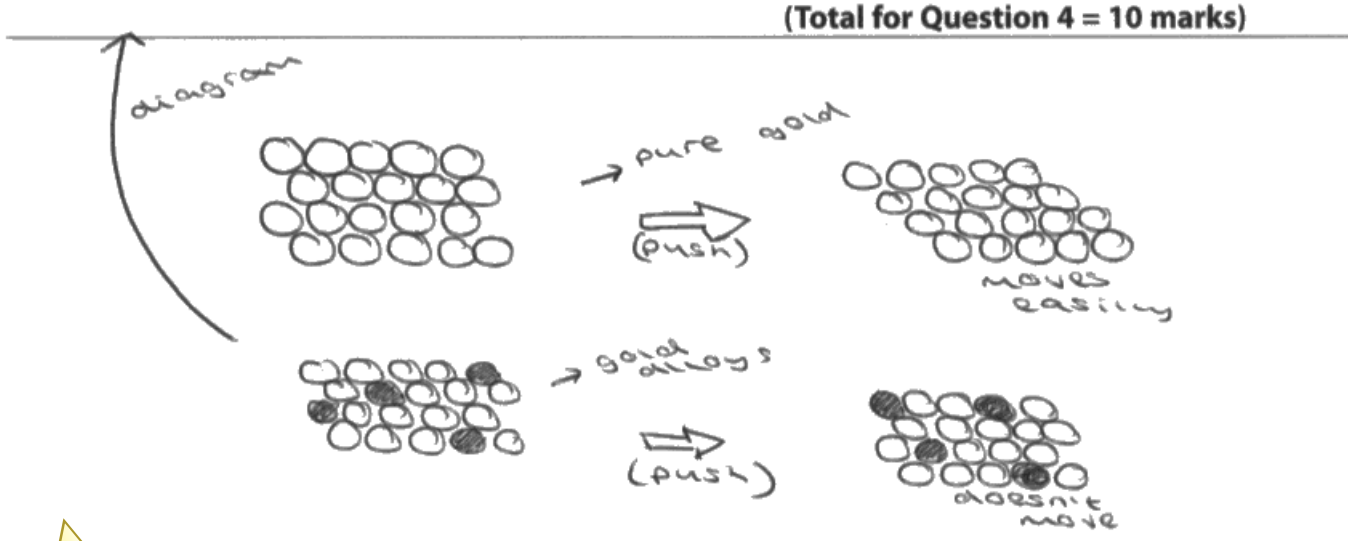
Gold atoms are bigger than copper atoms.

Use this information to explain why these gold alloys are stronger than pure gold.

(2)

gold alloys compared to pure gold atoms are much stronger as they hard the compounds shape in place.

(Total for Question 4 = 10 marks)



ResultsPlus
Examiner Comments

An example of rarely seen fully correct response which scored 2 marks. The use of diagrams helps to gain the marks. The diagram scored the first marking point, namely that in pure gold the layers of atoms are able to move easily. Likewise, the last marking point is scored, since it can be seen that in the alloy, the layers are prevented from moving over one another.

ResultsPlus
Examiner Tip

When explaining the increased strength of alloys compared to pure metals, it is useful to draw particle diagrams to help explain the properties.

Use this information to explain why these gold alloys are stronger than pure gold.

(2)

Becase pure gold is too soft and if you add copper atoms it will stop the atoms from sliding because it fills in the gaps.

ResultsPlus
Examiner Comments

This response scored 1 mark only for a correct reference to copper atoms stopping the gold atoms from sliding.

Use this information to explain why these gold alloys are stronger than pure gold.

(2)

Gold alloys are stronger than pure gold because there is a mixture of other elements making it stronger. Pure ~~ee~~ gold is uncombined and is quite a ~~weeK~~ weak metal. mixing it adds other properties to the Gold.

(Total for Question 4 = 10 marks)

ResultsPlus
Examiner Comments

A typical example of a response that did not score. There are no creditworthy points made by this candidate since there are no references to the particles or layers.

Question 5 (a) 1

This was very well answered by the majority of candidates. Most correctly drew the displayed formula of ethene to score the 1 mark available.

Common errors seen by examiners included:

- some candidates did not draw a double covalent bond between the two carbon atoms, but incorrectly drew a single covalent bond;
- some candidates carelessly used a lower case 'h' instead of the correct 'H' for hydrogen, when all other aspects of the structure were correct.

5 (a) This table showing the names, molecular formulae and structures of the three alkenes is incomplete.

Complete the table.

(3)

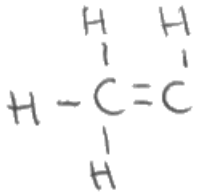
name of alkene	molecular formula	structure
ethene	C_2H_4	

ResultsPlus
Examiner Comments

This response did not score since, although there are the correct type and number of atoms shown in this structure, a single covalent bond has been drawn between the carbon atoms, instead of the correct double bond.

ResultsPlus
Examiner Tip

Remember that alkenes must contain at least one double covalent bond in their structure.

name of alkene	molecular formula	structure
ethene	C_2H_4	

ResultsPlus
Examiner Comments

This response did not score, since although the structure drawn contains the correct type and number of atoms, coupled with a double covalent bond between the carbon atom, three hydrogen atoms have been incorrectly shown bonded to one of the carbon atoms and only one hydrogen atom to the other carbon atom.

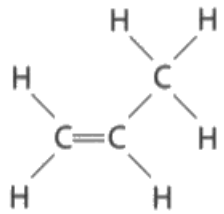
ResultsPlus
Examiner Tip

Check structures of alkanes and alkenes to ensure that there are only four covalent bonds in total shown to each carbon atom.

Question 5 (a) 2

Although many correct responses were seen for the 1 mark available, many of candidates were unable to correctly name the alkene, as propene.

By far the most commonly given incorrect answer was 'propane'.

Propane	C_3H_6	

ResultsPlus
Examiner Comments

A typical response that did not score the mark since 'propane' has been given, instead of the correct response, 'propene'.

ResultsPlus
Examiner Tip

Remember when naming alkenes, they end in – ene.

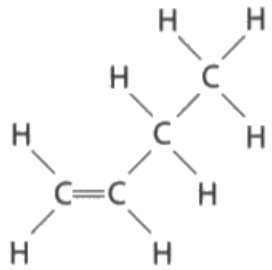
Question 5 (a) 3

This question was very well answered, with the majority of candidates scoring the 1 mark available, for writing the correct molecular formula for butene, namely C_4H_8.

Common errors and misconceptions seen by examiners included:

- the most common error seen in the incorrect responses related to the writing of the numbers in the formula which, more often than not, were not correctly subscripted;
- in a few cases, candidates managed to miscount the number of carbon and/or hydrogen atoms in the formula.

It seems likely that the relative success of the majority of candidates in arriving at the correct formula might well be down to the close proximity of comparative structures shown in the table.

butene	C4 H8 ~~C8 H10~~	

ResultsPlus
Examiner Comments

A common example of a response which did not score. Unfortunately, the '8' shown immediately after the hydrogen has not been subscripted.

ResultsPlus
Examiner Tip

When writing out molecular formulae for compounds make sure you always correctly subscript the numbers. As a rule of thumb, the number must be approximately half way down or lower than the letter, otherwise it will be considered to be incorrect.

Question 5 (b)

Few candidates were able to score the 2 marks available, with many scoring just 1 or no mark. It was very pleasing to see some excellent responses, indicating that students had been able to recall the test and results for unsaturation, namely that bromine water turns from orange to colourless.

Common errors and misconceptions seen by examiners included:

- the most common response seen was 'goes colourless' for 1 mark only, since candidates often failed to mention the starting colour for bromine water, namely 'orange'(or permitted alternatives);
- many failed to score since they gave 'goes clear/transparent', instead of the correct observation 'goes colourless' or 'decolourises'. This is a common mistake seen throughout previous examination series. It needs to be emphasised in centres that when teaching this test, students should not only write the starting colour but should also use the term 'goes colourless'. Colourless is not the same as clear.
- in several incorrect responses, candidates incorrectly mentioned 'turns orange' (confusing the result for that of bromine water with alkanes) or vaguely mentioned 'changes colour'.

(b) Describe what is **seen** when bromine water is added to a sample of a liquid alkene and the mixture is shaken.

(2)

The bromine water goes from brown to colourless.

ResultsPlus
Examiner Comments

A typical example of a good and fully correct response. The correct references to '...goes from brown' and '...to colourless' scored 2 marks.

The brown/yellow to bromine water will turn clear and transparent as the alkene is added.

ResultsPlus
Examiner Comments

This response scored 1 mark only for a correct reference to the starting colour of bromine water, namely 'brown/yellow'.

Unfortunately, the colour change given '...turn clear and transparent' is not creditworthy, since clear and/or transparent are not equivalent to the correct observation, colourless.

ResultsPlus
Examiner Tip

When describing the result for the bromine water test for alkenes/ unsaturation, always use 'goes colourless' as the observation, never refer to 'goes clear' or 'goes transparent'.

(b) Describe what is **seen** when bromine water is added to a sample of a liquid alkene and the mixture is shaken.

(2)

The bromine water goes colourless.

ResultsPlus
Examiner Comments

This was typical of a response which scored 1 mark only, for the correct observation, namely 'goes colourless'. The candidate has not stated the starting colour of the bromine water, namely 'orange' (or permitted alternative colour).

ResultsPlus
Examiner Tip

When describing qualitative tests, such as the test for alkenes/unsaturation, always remember to write down the starting colour as well as the colour change, if any.

Question 5 (d)

On the whole candidates found this extended writing question challenging, but were able to access the available marks, essentially relating specific uses of polymers to their properties and describing problems with polymer disposal.

Many candidates did access Level 1 (1-2 marks) by reference to either a property linked to uses of specific polymers or to a specific problem with method of disposal. At Level 2 (3-4 marks), responses referred to several properties linked to uses of specific polymers and/or problems with disposal. At Level 3 (5-6 marks), there were fewer candidates, many of who gave excellent responses – with detailed responses, including both properties related to uses of specific polymers and specific problems with a method or methods of polymer disposal.

Despite several ways of accessing marks, some candidates perhaps did not understand what the question was asking them or found the amount of information given as guidance hard to analyse.

Common errors and misconceptions seen by examiners included:

- there was often a great deal of re-working of the information given in the stem of the question, with weaker candidates unable to relate properties of polymers to their uses. However, quite often these candidates did manage to score at Level 1, by a correct reference to a problem of polymer disposal;
- a common misconception was for candidates to make reference to properties of metals which are, relatively, well understood and learned, but not relevant to this question. Consequently, polymers were often incorrectly described as good conductors, malleable, ductile etc.;
- problems with the disposal of polymers were often correctly mentioned, but 'do not break down/non-biodegradable' was not always related specifically to landfill, as required in order to be credited;
- when attempting to discuss the burning of plastic waste giving toxic gases, in some cases polymers were incorrectly alleged to produce toxic gases without a reference to burning, so this could not be credited.

*(d) The uses of polymers are related to their properties.

The uses of some common polymers are shown in the table.

polymer	uses
poly(ethene)	plastic bags, plastic bottles, insulation for electrical wires
poly(chloroethene) (PVC)	window frames, gutters, insulation for electrical wires
poly(tetrafluoroethene) (PTFE)	coating for pans and skis, stain-proofing fabrics and carpets, containers for corrosive substances

A problem with polymers is that it is difficult to dispose of them after use.

Describe how the uses of these polymers are related to their properties, explaining the problems of disposing of these polymers.

(6)

Polythene is used for plastic bags, plastic bottles and insulation of electrical wires. One reason it is difficult to dispose of it is because it doesn't decompose as it is plastic. The only way to dispose of them is by burning them, but the plastic emits a harmful gas when burned.

Polychloroethene (PVC) is used for window frames, guttering and insulation for electrical wires. It is hard to dispose of, again because it doesn't decompose and when burned, it emits harmful gases. PVC plastic is made from different components which have different properties.

Polytetrafluoroethene (PTFE) is used for coating pans and skis, stain proofing fabrics and carpets and containers for corrosive substances. One reason

it is hard to dispose of ~~the~~ is because they are on another material and to seperate them from each other would take ~~a~~ long time and a lot of money.

ResultsPlus
Examiner Comments

This response was awarded a **Level 1** (2 out of 6 marks).

There is only one creditworthy reference to a correct method of disposal of polymer waste, namely the correct idea of burning polymers releasing harmful gases.

The problem of the need to separate out the polymers is mentioned, but has not been linked specifically to recycling as a method of polymer disposal.

The problem of polymer waste not decomposing has been discussed, but has not been specifically linked to landfill as a method of polymer disposal.

The uses of specific polymers have not been linked to a property.

A problem with polymers is that it is difficult to dispose of them after use.

Describe how the uses of these polymers are related to their properties, explaining the problems of disposing of these polymers.

(6)

Polymers are dissicult to ~~decompose~~ this is because some ~~of~~ them when burnt release toxic ~~gases~~. A diffeent way to decompose them would be to landfill them however, landfills takeup a lot of space ~~so~~ and can take ages to breakaway / corrode. The ~~positives~~ advantages of these are that ~~polym~~ products are very good and helpsuls to us. As without them most items would not be as good or easily made.

ResultsPlus
Examiner Comments

This response was awarded a **Level 2** (4 out of 6 marks).

Two creditworthy points relating to two different methods of disposal have been discussed: the correct idea that burning polymer waste releases toxic gases and also the correct idea that polymer waste takes up space in landfill sites.

No links have been made to the use of a specific polymer and a property.

A problem with polymers is that it is difficult to dispose of them after use.

Describe how the uses of these polymers are related to their properties, explaining the problems of disposing of these polymers.

(6)

Different forms of polymers are used for different purposes/uses. polyethene is used for plastic bags, bottles and wire insulation. poly ethene is a very flexible and mallable material ~~when~~ when melts at very high temperatures. meaning that it is easy to form different thicknesses and shapes. it is also not an electrical conductor, making it prime for wire insulation. polychloroethene can be over rated, although passing many similar traits is harder and slightly more durable when hardened. It, again, has a high melting point and is easily to form things such as frame like and pipe like shapes. ~~Poly~~ poly tetrafluoroethene can be made into a liquid like substance. It is a heat conductor therefore making it perfect for things such as frying pans and

is also steam proof and non stick. Its non stick / stain proof qualities make the substance harder to corrode ~~erect~~, blocking and keeping out the harmful chemicals. On the down side these sorts of plastic cannot decompose, creating huge problems. One problem is that you would have to melt the plastics down, releasing harmful toxins such as carbon dioxide and polluting the earth. Another problem is that all plastic either do-na or take thousands of years to corrode / decompose, many landfill sites would become full, creating less land in order to grow food / for housing and basic needs.

ResultsPlus
Examiner Comments

This response was awarded a **Level 3** (6 out of 6 marks) and represents a very good example of a typical higher level response.

Three creditworthy uses of specific polymers linked to properties have been discussed: polythene bags (flexible), wire insulation (non electrical conductor) and PTFE on pans (non-stick).

Two problems of disposal using landfill have been discussed: the correct ideas of polymers not decomposing and filling up landfill sites.

Although there is a reference to producing carbon dioxide, melting is not creditworthy and burning has not been specifically mentioned.

Although, hard is mentioned as a property in relation to pvc, it has not been linked to window frames/gutters, so is not creditworthy.

Question 6 (a)

The majority of candidates correctly identified 'fossils' as being the evidence in the photograph that limestone is a sedimentary rock, to score the 1 mark available.

In a significant minority of responses, some candidates simply discussed 'layers' (not visible in the photograph) or the presence of 'shells' and the 'formation of sedimentary rocks', thus effectively not having answered the question or not used the correct terminology.

6 (a) The photograph shows a sample of limestone.

State what evidence in the photograph shows that the limestone is a sedimentary rock.

(1)

limestone is a sedimentary rock because it's got layers

ResultsPlus
Examiner Comments

This response did not score the 1 mark available since 'fossils' has not been mentioned. Although 'layers' are a correct general feature of sedimentary rocks, this does not answer this particular question since layers are not discernible in the photograph of the limestone sample.

Question 6 (c) (i)

Some candidates scored the 2 marks available by correctly giving the name of the process, as 'thermal decomposition'. Some candidates did get the general idea that decomposition was involved.

Common errors and misconceptions seen by examiners included:

- it was very common for students to refer to 'fractional distillation' or 'cracking' or 'electrolysis' rather than the correct term, thermal decomposition. Occasionally, 'thermal combustion' was seen by examiners;
- on the whole it was clear that many candidates did not know this reaction, despite this being an asked for process in previous examinations, in the context of limestone and metal carbonates. It is worthwhile making sure that students learn the names of key chemical reactions and their definitions as part of their examination preparation.

(c) (i) When limestone is heated it breaks down to form calcium oxide and carbon dioxide.

Give the name of the process in which a substance is broken down by heating.

(2)

ResultsPlus
Examiner Comments

A commonly seen incorrect response which did not score. The incorrect response given, 'combustion', is often confused with the correct process of 'thermal decomposition'. Both these key reactions are part of this particular unit of the specification.

ResultsPlus
Examiner Tip

Remember to learn the difference between 'combustion' and 'thermal decomposition'.

Combustion is the chemical reaction when a substance burns, combining with oxygen to produce heat and waste products, such as carbon dioxide. Thermal decomposition is reaction in which one substance breaks down when heated to form two or more new substances.

(c) (i) When limestone is heated it breaks down to form calcium oxide and carbon dioxide.

Give the name of the process in which a substance is broken down by heating.

(2)

decomposition

ResultsPlus
Examiner Comments

This response scored 1 mark only. The correct term 'decomposition' partially answers this question, but the word 'thermal' has not been mentioned (the term which effectively refers to the process of 'heating').

ResultsPlus
Examiner Tip

A simple clue here as to the number of words required in naming this process, might lie in the number of marks awarded to the question – 2 marks in this case, for thermal and decomposition respectively. A 'naming question' worth 1 mark is often simply looking for a process with one word in its name.

Remember to learn the key reactions and their definitions as part of your revision, *e.g.* some of the key reactions in this chemistry unit are neutralisation, electrolysis, combustion (complete and incomplete), precipitation, thermal decomposition, fractional distillation and cracking.

Question 6 (c) (ii)

This was well answered on the whole. The majority of candidates were able to score the 2 marks available for writing the word equation correctly. As with Q3(c)(i) earlier in the paper, candidates were given all the names of the reactants and product in the stem of the question, so the task was a relatively straightforward one, if not easier than Q3(c)(i).

Common errors and misconceptions seen by examiners included:

- commonly, candidates positioned arrows and + signs incorrectly and occasionally a hyphen was incorrectly used instead of an arrow or equals sign;
- in a few cases, multiple arrows were seen, as if a flow diagram was intended;
- often, examiners saw the addition of 'extra' incorrect products to the right hand side of the equation, such as 'oxygen', 'carbon dioxide' and/or 'water'. Once again, it needs to be emphasised in centres that the key clue to writing most word equations lies in the stem of the question;
- many examiners reported that some candidates attempted to write balanced symbol equations successfully, but in most cases the candidates usually did not score, owing to an inability to recall the formula for calcium hydroxide.

(ii) Calcium hydroxide is formed when water is added to calcium oxide.

Write the word equation for this reaction.

(2)

water + calcium + oxygen → calcium hydroxide

ResultsPlus
Examiner Comments

This was a typical example of a response which was awarded 1 mark only. The right hand side of this word equation, the product side, is correct and scored 1 mark. The left hand side, the reactants side, is incorrect since, as well as water which is a correct product, there are two incorrect reactants given, namely 'calcium' and oxygen', so this did not score the reactants mark.

ResultsPlus
Examiner Tip

Read the question carefully, the clue as to how to answer this correctly lies in the stem of the question, especially when all the reactants and products have been given.

calcium oxide + water → calcium hydroxide + carbon dioxide.

ResultsPlus
Examiner Comments

This response scored 1 mark only. On the left hand side of the word equation, both reactants, 'calcium oxide' and 'water', have been shown correctly, which scored 1 mark. On the right hand side, the product side, an additional incorrect product has been given, namely 'carbon dioxide', so this did not score.

Question 6 (d)

On the whole candidates found this extended writing question more straightforward than in the previous question, in that they were able to access the question more easily. The question effectively comprised three components, namely the causes of acid rain, the effects and a discussion of the use of limestone in chimneys reducing its effects.

Most candidates were able to achieve Level 1 (1-2 marks) to Level 2 (3-4 marks), by discussing the effects of acid rain. References to causes and reduction of acid rain were the least well developed areas in the overall responses. Higher achieving candidates were able to discuss all three components of this question to achieve Level 3 (5-6 marks).

Common errors and misconceptions seen by examiners included:

- a common misconception was for candidates not to make the link between sulfur dioxide and acid rain, but to incorrectly state that sulfur causes acid rain;
- another misconception, given that the question specifically mentions the presence of sulfur in the first line, was for candidates to incorrectly cite carbon dioxide and carbon monoxide as the causes of acid rain;
- many of the weaker candidates often repeated the stem of the question and did not expand on any of the ideas;
- most candidates failed to score marks for the use of limestone to reduce acid rain, although a few candidates were aware that limestone neutralises acid and some made correct references to this lowering the acidity by reacting with the acidic gases, such as sulfur dioxide;
- when discussing the effects of acid rain, some candidates confused erosion with corrosion.

*(d) Sulfur impurity can be present in the coal used in coal-fired power stations.
As a result of the presence of the sulfur impurity, the gases from the chimneys of these power stations can produce acid rain.
Limestone can be used to reduce the emission of these harmful gases from the chimneys of coal-fired power stations.

Explain how acid rain is formed, the environmental problems caused by acid rain and how the use of limestone in the chimneys of coal-fired power stations reduces these problems.

(6)

Acid rain is formed by environmental problems but it can have serious problems, it effects cliffs and houses ~~by~~ of with a process called weathering and in time it will wear things away but the use of limestone in the chimneys of coal fired power stations reduces these problems

ResultsPlus
Examiner Comments

This response was awarded a **Level 1** (2 marks).

No details regarding the causes of acid rain have been given in the response.

One creditworthy effect, namely the correct idea that acid rain causes weathering to cliffs and houses, has been discussed.

No details of how limestone in chimneys reduces the effects of acid rain have been given in the response.

Acid rain is formed ✓ when sulfur is released through the combustion of coal in power, the sulfur then mixes with the water in the atmosphere, lowering the PH level of the water, hence the name acid rain. when it rains, the acidic water can have a huge negative impact of the eco-system. The acidity kills small Organisms in lakes and rivers, which leaves the larger organisms, like fish, without a source of food, therefore decreasing the population. This also lowers the amount of food available for ~~bir~~ fish eating animals such as birds and otters etc. Acid rain also wears down buildings, especially old limestone and sandstone walls, making them structurally unsafe. Tree populations are also ~~effected~~ as acid rain eventually kills the leaves of the trees. This means that the trees are unable to produce food and will eventually die. This negatively

impacts tree-dwelling organisms as the acid rain kills their habitats.

ResultsPlus
Examiner Comments

This response was awarded a **Level 2** (4 marks).

A cause of acid rain has been discussed, namely the correct idea that the combustion of coal leads to the lowering of pH (forming acidic solutions). Unfortunately, sulfur has been incorrectly referred to instead of sulfur dioxide.

The effects of acid rain have been discussed in some detail, namely the correct ideas of the acidification of lakes, killing of aquatic organisms, killing trees and damaging buildings.

There is no discussion as to how limestone reduces the effects of acid rain in the chimneys of coal-fired power stations.

Acid rain is formed when fossil fuels are burnt which releases sulfer dioxide into the atmosphere. The clouds absorb the sulfur dioxide and makes rain water acidic. The acid rain can damage buildings, and enviroment and living oraganisms. The sulfer reacts with the stone of buildings and makes it erode. The acid rain damages the enviroment and living organisms by makeing lakes and riers more acidic. These living organisms live and drink from lakes and rivers. Limestone in chimneys of coal-fired power stations reduces these problems by because lime stone is mostly made up of calcium carbonate which doesnt erode and

limestone makes, cement, glass and concrete. The limestone cement can be used for chimneys which would reduce the amount of eroded buildings.
Limestone or Chimneys of coal fired power stations can reduce the amount of sulfur dioxide in the the atmosphere. This can be reduced by reacting ~~with the sulfur dioxide~~ coal with calcium carbonate making it less acidic, when fossic fuels are burnt.

* the atmosphere.

ResultsPlus
Examiner Comments

This response was awarded a **Level 3** (6 out of 6 marks) and represents a good example of a typical higher level response.

The causes of acid rain have been discussed, namely the correct ideas of sulfur dioxide (released by burning) and clouds absorbing the sulfur dioxide.

The effects of acid rain have been discussed, namely the correct ideas of damages buildings and acidification of lakes.

The method of reduction of acid rain has been discussed and developed, namely the correct mentioning of calcium carbonate in limestone and the idea of neutralisation.

All three aspects (causes, effects, method of reduction) have been adequately discussed. It is worth noting that although the sulfur dioxide has been replaced by coal towards the end of the answer, this does not detract from the method of reduction mark already credited.

Paper Summary

In order to improve their performance, candidates should:

- read all the information in the question carefully and use this to help them answer the question;
- learn the key scientific words, formulae for common compounds, such as carbon dioxide, water and alkanes, and reactions in the specification and ensure they can write the word equations for these correctly;
- learn the tests and results for the common gases, namely, carbon dioxide, oxygen, hydrogen and chlorine;
- with extended writing questions, check their responses to ensure that they have actually answered the question and not simply repeated the stem of the question.

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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