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Examiners' Report
March 2012

GCSE Chemistry 5CH1H 01

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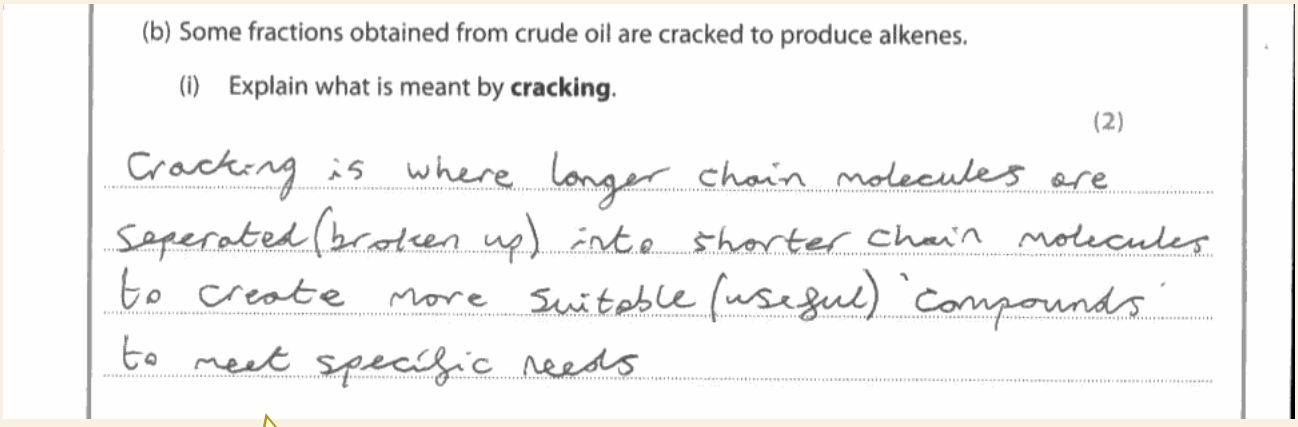
Introduction

This is the second time that this paper has been offered. The paper consists of six questions. Each question is set around a broad area, and two of the questions contain an extended writing (6 mark) part.

Question 1 (b) (i)

This part was well answered on the whole. The main error was a confusion with fractional distillation. The use of poor language by some candidates reduced the marks they could have gained, with answers including "separating molecules", use of "cracking" without explaining what that meant, or "chains of molecules".



(b) Some fractions obtained from crude oil are cracked to produce alkenes.

(i) Explain what is meant by **cracking**.

(2)

Cracking is where longer chain molecules are seperated (broken up) into shorter chain molecules to create more suitable (useful) 'compounds' to meet specific needs

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Examiner Comments

This answer had the idea of longer molecules being changed into shorter ones, but the splitting up of each long molecule was not well expressed. Only the "broken up" comment enabled the second mark to be awarded.

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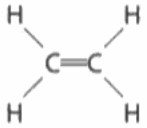
Examiner Tip

Use precise and unambiguous language when answering questions.

Question 1 (b) (ii)

Question 1 (b) (ii) was straightforward but many candidates missed out on marks. The question was carefully worded and "unsaturated hydrocarbon" was emboldened, but some candidates only explained one part of this term. Terms such as "spare bonds" are not accepted. Many answers noted the presence of hydrogen and carbon, but not that these were the only elements in a hydrocarbon.

(ii) One alkene obtained is ethene.
The diagram shows the structure of a molecule of ethene.



Ethene is unsaturated.
Ethene is a hydrocarbon.

Explain why ethene is described as an **unsaturated hydrocarbon**.

(3)

Ethene is a hydrocarbon as it consist of Hydrogen and Carbon atoms only. It's unsaturated as it has a spare bond, meaning it can react with other (form bonds with) alkenes ~~or substances~~.

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Examiner Comments

The candidate has explained a hydrocarbon well, but has not used the correct term to explain unsaturated.

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Examiner Tip

Use proper scientific terms - in this case "double bond" and not spare bond.

Question 1 (b) (iii)

The bromine test should be very well known. However marks were lost for failing to describe the change, i.e. not giving the initial colour of bromine water. Candidates must also learn that neither clear and colourless nor decolourised and discoloured, are synonyms.

(iii) Describe what you would **see** when a sample of ethene is shaken with bromine water.

(2)

When you mix ethene with a sample of bromine water it will turn colourless, this is because the double bond has broken and joined up with the bromine water

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Examiner Comments

This candidate has not given the full observations.

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Examiner Tip

Always give the original colour of the bromine water.

Question 2 (a) (i)

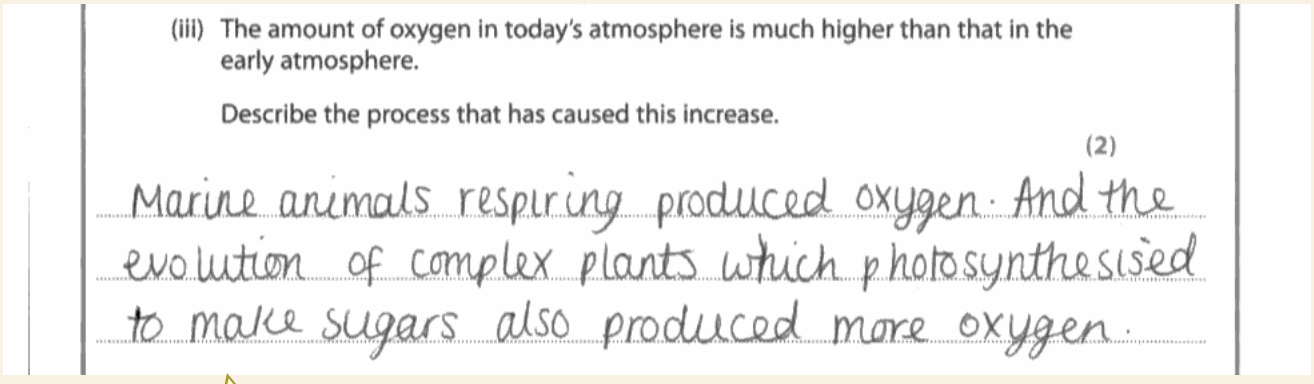
Most responses to 2 (a) (i) gave the expected correct answer, but some just mentioned that the oceans came from water vapour without explaining how. A few also had condensing carbon dioxide or air.

Question 2 (a) (ii)

Many candidates ignored the role of the oceans here and simply talked about photosynthesis.

Question 2 (a) (iii)

The process of photosynthesis was very well understood, but some candidates failed to use this term. Unfortunately, some answers talked about respiration of plants (or even animals).



(iii) The amount of oxygen in today's atmosphere is much higher than that in the early atmosphere.

Describe the process that has caused this increase.

(2)

Marine animals respiring produced oxygen. And the evolution of complex plants which photosynthesised to make sugars also produced more oxygen.

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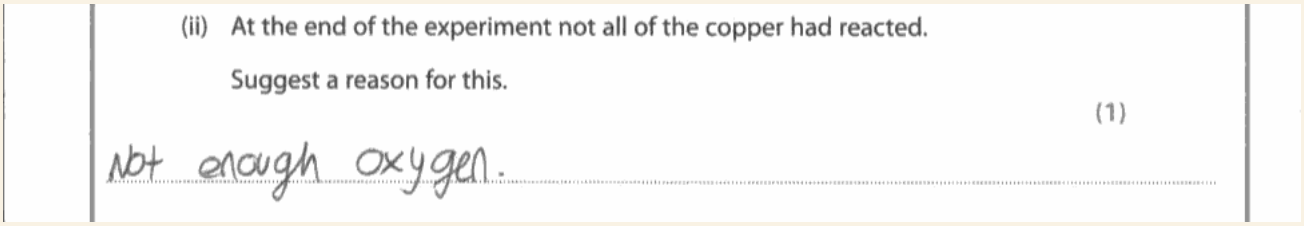
Examiner Comments

The answer correctly identifies photosynthesis which adds oxygen, but incorrectly mentions respiration which uses oxygen. No marks are awarded where an answer contradicts itself.

Question 2 (b) (ii)

This question was simply answered, but it appeared that some candidates had not read the introductory text. The experiment used copper powder, and the copper was heated until there was no further change. Therefore, answers involving not enough heat, not enough time, or oxygen not getting to all of the copper were rejected.


(ii) At the end of the experiment not all of the copper had reacted.

Suggest a reason for this.

(1)

Not enough oxygen.

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Examiner Comments

This candidate got the point and got the mark, but risked not saying enough to score the mark.

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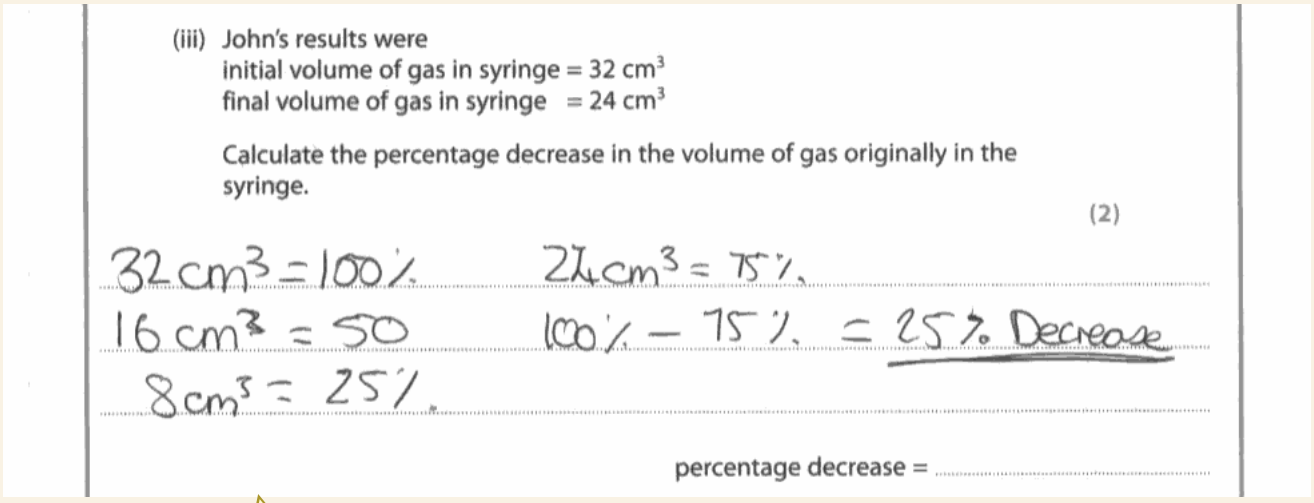
Examiner Tip

Explain your answers carefully - this candidate would have been safer saying that "There was not enough oxygen in the syringe to react with all of the copper".

Question 2 (b) (iii)

This was a straightforward calculation, but candidates are strongly advised to show their working.



(iii) John's results were
initial volume of gas in syringe = 32 cm^3
final volume of gas in syringe = 24 cm^3

Calculate the percentage decrease in the volume of gas originally in the syringe.

(2)

$32\ cm^3 = 100\%$ $24\ cm^3 = 75\%$.
$16\ cm^3 = 50$ $100\% - 75\% = 25\%$ Decrease
$8\ cm^3 = 25\%$.

percentage decrease = ...

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Examiner Comments

Although this is an unusual method, the working is clear so the candidate scored both marks.

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Examiner Tip

Show your working.
Change in volume = 32 - 24 = 8
% decrease = 8 / 32 = 25%

Question 2 (b) (iv)

This question proved to be very challenging, with many thinking that oxygen levels varied wildly (with the presence of plants).

(iv) The percentage of oxygen in air at room temperature is 21%.
John thought the answer to part (iii) was the percentage of oxygen in air and was surprised that the value was too high.

John confirmed that he had not made an error when doing his experiment.
Suggest why the answer calculated in part (iii) is higher than John expected.

(1)

the Air in the syringe was calculated but did not include the air in the test tube, Maybe the

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Examiner Comments

This candidate has understood where the error came from, although it has not been explained very clearly. This scored one mark.

Question 3 (b)

It was pleasing to see that, although not required, many answers were explained in terms of the reactivity series. Sadly, electrolysis was mentioned by some. Another common error was simply to heat the ore (with no reducing agent).

(b) Describe how iron is extracted from its ore.

(2)

Iron is bonded with oxygen.
Iron is reacted with Carbon to ~~he~~ extract it as carbon is more reactive and iron is less reactive than carbon so the carbon takes the oxygen leaving iron pure Iron Oxide + carbon → carbon di

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Examiner Comments

The candidate has identified the use of carbon, but not that the mixture has to be heated.

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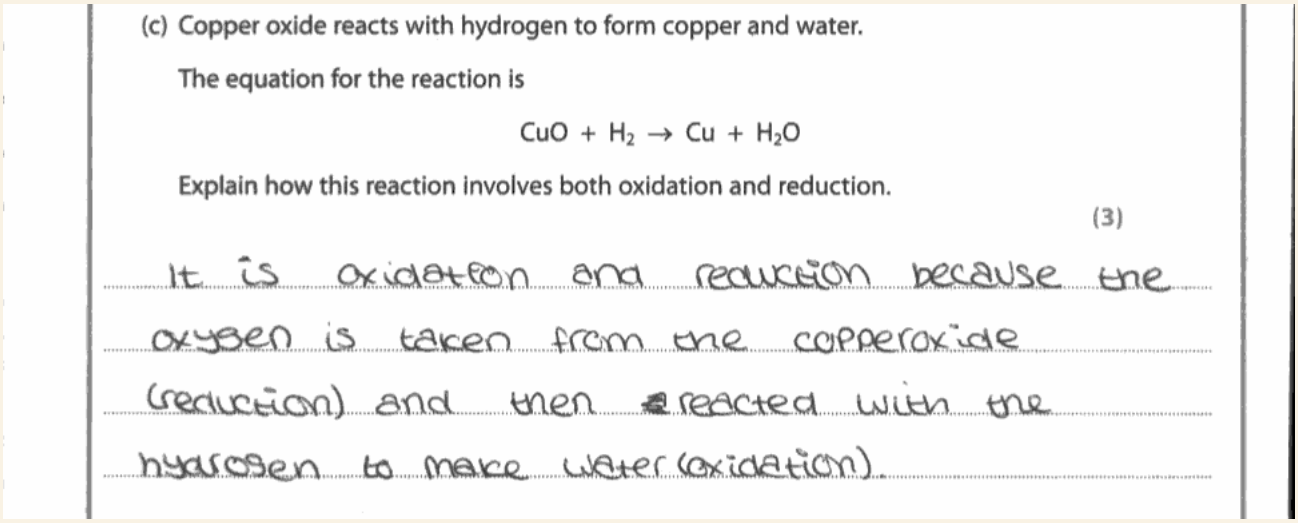
Examiner Tip

Look at the number of marks - a description is likely to require two points, in this case "heat with" and "carbon".

Question 3 (c)

The vast majority of candidates had a good understanding of redox. With stronger candidates expressing their ideas clearly and systematically. Able candidates answered the questions quickly and attained all three marks in a single sentence, e.g. copper oxide is reduced because it has lost oxygen which goes to the hydrogen that has been oxidised.

Less concise answers showed a good understanding by the description of changes to each of the reactants and products. Weaker candidates had issues with the key vocabulary – answers included distortions of the key words e.g. reducted, oxidated.



(c) Copper oxide reacts with hydrogen to form copper and water.

The equation for the reaction is

$$CuO + H_2 \rightarrow Cu + H_2O$$

Explain how this reaction involves both oxidation and reduction.

(3)

It is oxidation and reduction because the oxygen is taken from the copperoxide (reduction) and then reacted with the hydrogen to make water (oxidation).

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Examiner Comments

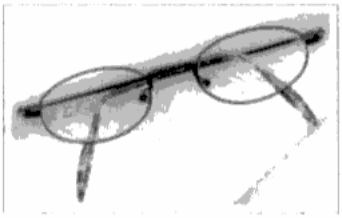
A good succinct answer.

Question 3 (d)

This question was fairly well answered although often not clearly expressed. Many answers referred to the ease of shaping the alloy to fit the face. Quite a number of candidates seemed to think that if shape-memory alloys were broken (rather than bent), then they would also return to their original shape.

Many candidates suggested that heating the metal was necessary to return the alloy to its original shape (which is true for some applications). Some even suggested that bent spectacles could repair themselves.

(d) Some modern spectacle frames are made of shape memory alloys.



Explain why shape memory alloys are better than other alloys for making spectacle frames.

(2)

If the spectacle frame breaks then it can be heated and will go back to its original shape.

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Examiner Comments

If the frame is bent it can be returned to its original shape, but not if it breaks.

Question 4 (a)

That limestone is sedimentary is very well known.

Question 4 (b) (i)

Many candidates failed to identify limestone as the precursor to marble but at least they were able to link the conditions of heat and pressure on a sedimentary rock to the formation of marble, which was identified as a metamorphic rock. Some candidates lost marks because they incorrectly stated that granite can be made from limestone or marble, or that granite turns into marble. Candidates tended to write at length about every aspect of rock formation and should try to be more concise and relevant in their answers to these types of question.

(b) Granite is an igneous rock formed from magma.

(i) Explain how the marble has formed above the granite.

(2)

Marble has formed above granite as it is a metamorphic rock that is formed from intense heat and pressure from sedimentary rock.

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Examiner Comments

This answer identifies heat and pressure as factors involved in marble formation, but "from" sedimentary rock is incorrect - the magma that formed granite would have been the heat source.

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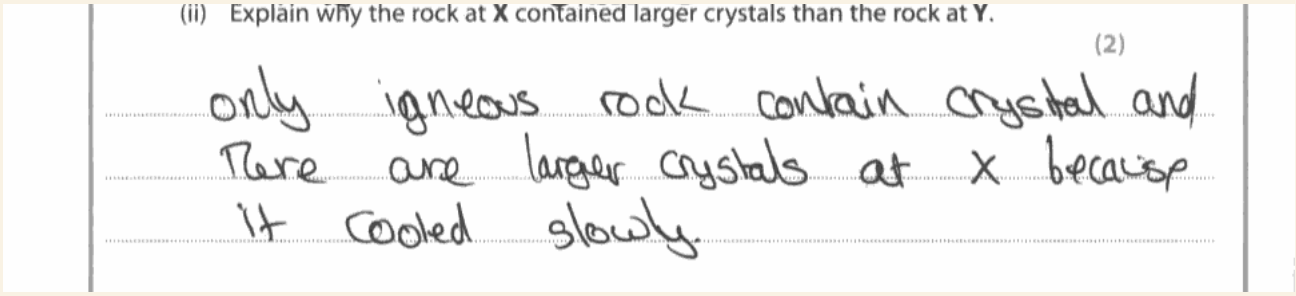
Examiner Tip

Don't forget to say that marble was formed by limestone being changed by heat and pressure.

Question 4 (b) (ii)

Many answers linked crystal size to the rate of cooling. Better candidates were able to compare the rate of cooling of X and Y in a single sentence. Good answers also included an explanation of the proximity of the rock type to either high or low temperature areas or included depth reasons / insulation reasons as to why the crystals were either large or small. Many candidates incorrectly referred to intrusive or extrusive rocks.



(ii) Explain why the rock at **X** contained larger crystals than the rock at **Y**.

(2)

only igneous rock contain crystal and there are larger crystals at X because it cooled slowly.

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Examiner Comments

The answer has explained only why large crystals are found at X.

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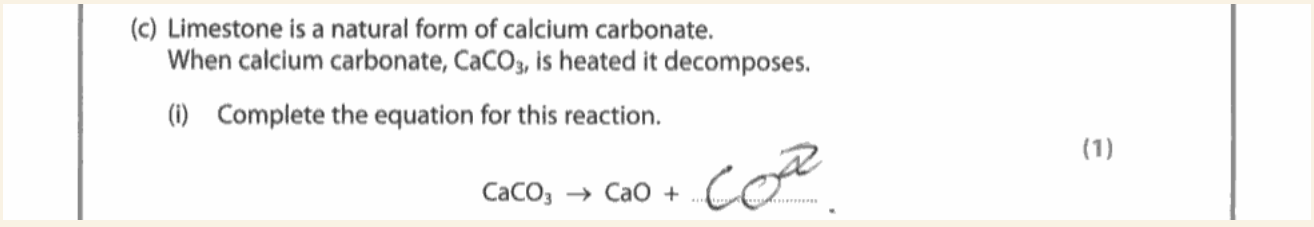
Examiner Tip

In a question involving a contrast (here between X and Y) make sure that both aspects are mentioned.

Question 4 (c) (i)

Although the majority of responses were correct, even this very simple equation caused some difficulties for a significant minority. Incorrect formulae included $CaCO_3$, Ca_3, C, C_3, CO_3, O and H_2O. In addition, some candidates lost this mark due to poor differentiation between letter size and subscripts, for example CO^2, Co_2 and CO2.



(c) Limestone is a natural form of calcium carbonate.
When calcium carbonate, $CaCO_3$, is heated it decomposes.

(i) Complete the equation for this reaction.

(1)

$CaCO_3 \rightarrow CaO +$ CO2 .

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Examiner Comments

This answer did not score.

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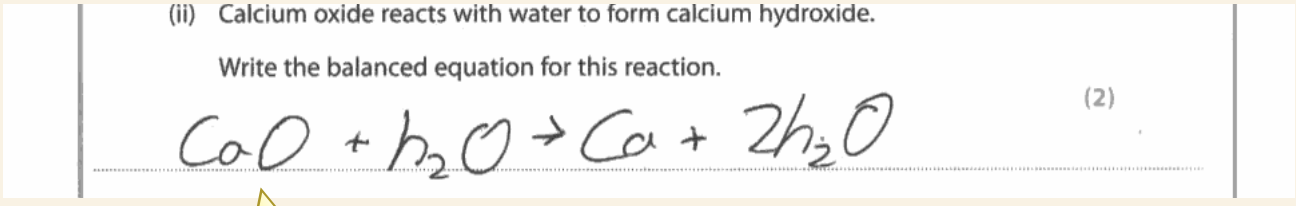
Examiner Tip

Formulae must be written correctly, using subscripts and superscripts.

Question 4 (c) (ii)

Most candidates scored one mark because either the product was incorrect or because the equation was not balanced correctly. Many also wrote word equations or a mixture of symbol and word equations. The most common error was not knowing the formula of calcium hydroxide.


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

Write the balanced equation for this reaction. (2)

$CaO + h_2O \rightarrow Ca + 2h_2O$

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Examiner Comments

This answer would have scored 1 for the formulae of the reactants, but h_2O is not acceptable as an alternative to H_2O.

Question 4 (c) (iii)

Most candidates knew that calcium hydroxide was used to neutralise acidic soils, although a few thought it was a fertiliser or a pesticide.

Question 5 (b)

Most answers here referred to electricity, and many said that it involved decomposition. However there was careless use of terms so that the like of "splitting atoms" or decomposing elements appeared. Several just described production of reactive metals, without explaining what electrolysis actually did.

(b) Chlorine is manufactured by electrolysis.

Explain what is meant by **electrolysis**.

(2)

Electrolysis is splitting a compound using electricity

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Examiner Comments

This is just enough for the two marks.

Question 5 (c)

Although this is not a straightforward equation, all of the substances were named and one formula was given. Candidates are expected to know simple formulae, and chlorine, sodium hydroxide, sodium chloride and water fall into this category. The main problem was that many put 2Cl rather than Cl_2 although some could not write a correct formula of NaOH with $Na(OH)_2$ being common (as was $NaCl_2$).

(c) Chlorine gas reacts with sodium hydroxide solution to form sodium chlorate(I), NaOCl, sodium chloride and water.

Write the balanced equation for this reaction.

(3)

$Cl_2 + 2NaOH \rightarrow NaOCl + H_2O + NaCl$

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Examiner Comments

NaOH is not written Na(OH) but this was overlooked on this occasion.

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Examiner Tip

Have a strategy for equations:

1. Learn the formulae of substances in the specification
2. Write down reactant and product formulae [these must not be changed]
3. Balance the atoms

Question 5 (d)

This question generated a fairly even spread of marks across the range. Most candidates correctly mentioned acid rain and sulfur dioxide to access lower marks. Many were able to develop their answers to discuss the effects of acid rain on (limestone) statues and stonework and /or lakes etc. Fewer responses went on to discuss methods of reduction and to deal with sulfur dioxide emissions through neutralisation etc, but coupled with well developed discussions of the causes and effects to reach the highest marks. Many excellent pieces of work were seen.

Other general points to note about this question are:

- In the weakest responses seen, candidates simply mentioned bare facts such as 'acid rain' without any elaboration
- Some candidates seemed to think that it is sulfur (rather than sulfur dioxide) that escapes into the atmosphere and forms acid rain
- The strongest candidates were able to name sulfuric acid
- Some very weak answers included descriptions of how the gases contributed to the depletion of the ozone layer or the greenhouse effect
- A more limited number of candidates scored well on the reduction of damage
- Some candidates suggested that catalytic converters could process SO2 into less harmful products
- The quality of communication was good overall

*(d) Sulfur is an impurity in some fossil fuels.

Explain how the presence of sulfur in fossil fuels can lead to damage to the environment and how the amount of damage can be reduced.

(6)

During the combustion of fossil fuels the sulfur impurity will react with the oxygen forming compounds like sulfur dioxide gas. This gas is acidic and will enter the clouds and acidify the rain. This causes acid rain. Acid rain is harmful to the environment as it acidifys lakes causing there to be less life as it can not handle the acid. Secondly the acid rain will corrode limestone buildings and statues leading to structure damage. To prevent the effects of acid rain you can use acid gas scrubbers at power stations. These are alkaline like limestone and neutralise the emissions. Secondly you could add alkalines like Calcium Carbonates to lakes to neutralise the acidity. Finally another way to reduce the effect of acid rain is to decrease the burning of fossil fuels as this means that less Sulfur dioxide is produced from the impurities

(Total for Question 5 = 12 marks)

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Examiner Comments

This is included as an example of a six mark answer.

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Examiner Tip

Ensure that a question is answered fully - in this question what happens to the sulfur, the damage caused by acid rain and how this can be reduced.

Question 6 (b)

Many candidates scored the first mark by referring to carbon dioxide, but there were many candidates that found it difficult to attain the second mark. There were many references to the ozone layer. Very few had a good understanding of how carbon dioxide leads to global warming. Some mentioned absorption of the Sun's rays or light rays.

(b) The complete combustion of fossil fuels releases gases into the atmosphere.

Explain how these gases could cause an increase in the temperature of the Earth.

(2)

Carbon Dioxide and Water vapour is released by hydrocarbons such as methane. Carbon Dioxide creates a blanket over the Earth causing global warming and the greenhouse effect.

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Examiner Comments

This scored one mark but "creates a blanket" is not an adequate scientific answer.

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Examiner Tip

Learn how carbon dioxide causes global warming.

Question 6 (c) (i)

There were many candidates who related their answers to energy efficiency or costs. Candidates should be aware that major benefits of using biofuels are related to either conserving stocks of non-renewables or being able to generate self sustaining stocks of fuel (not that they "won't run out") which limit atmospheric loading of carbon (carbon neutral).

(c) Biofuels, made from plants, can be used as alternatives to fossil fuels.

(i) State an advantage of replacing fossil fuels with biofuels made from plants. (1)

it is eco friendly

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Examiner Comments

This statement is too vague to be awarded the mark.

Question 6 (c) (ii)

This was answered well. The majority of students grasped the fact that land was required to grow the crops for biofuel and that this would mean less land for growing food crops. However some students forgot to state that land was required to grow the crops for biofuels despite hinting at it in their answer and some mentioned land for crops but were not specific in their answer as to whether they were talking about biofuel crops or food crops. Most incorrect answers were about cost or efficiency of fuels.

Question 6 (d)

As with 5 (d), this question produced a good spread of marks with some excellent answers. Most candidates demonstrated an understanding of the lack of oxygen leading to the production carbon monoxide and soot. Many went on to develop the effects of CO (or soot) at a basic level with regards to its toxicity to access further marks. Of the many full mark responses seen, most gave full and well written accounts of the action of CO on red blood cells.

Other general points to note about this question are:

- In the weakest responses many thought that it was methane that was actually released, or discussed problems associated with carbon dioxide
- Many used vague terms like harmful or dangerous when discussing the effects of CO
- Carbon monoxide was usually known but carbon/soot was less common
- Good answers connected lack of oxygen with poor ventilation or the effects of soot/ carbon build up
- Some weaker candidates wrote their answers in one long unpunctuated sentence
- Some answers went off at a tangent and gave detailed accounts of the dangers of carbon dioxide

*(d) Incomplete combustion of methane can occur in gas heaters such as the one shown in the photograph.

Explain how incomplete combustion occurs and the problems it can cause.

(6)

Incomplete combustion occurs when there is an insufficient amount of oxygen. Incomplete combustion releases carbon monoxide into the air and ~~the~~ if this is breathed in by humans it attacks red blood cells. When this happens oxygen can not flow round the body which causes people to go to sleep and then die. When incomplete combustion occurs a yellow flame is shown on a gas heater. CO_2 is also released in combustion and this contributes to global warming.

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Examiner Comments

This answer scored four marks out of six. It mentions lack of oxygen and that carbon monoxide is formed. It does not clearly explain why carbon monoxide is toxic. The mention of carbon dioxide is irrelevant.

Paper Summary

The candidates overall seemed to be getting used to this new style of paper. There were many good responses and few very poor scripts, which indicates candidates are being correctly entered for the appropriate tier. The response to the extended writing parts was pleasing, with many coherent, well argued answers. In contrast, the balanced equations were not well tackled.

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