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Examiners' Report
March 2013

GCSE Chemistry 5CH1F 01

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March 2013

Publications Code UG035097

Introduction

This paper has now been offered for several sessions and it is pleasing to see many candidates managing well with the style requiring more detailed explanations, offering good responses to these longer questions. The paper was thought by the examiners to have accessible language and there was no evidence that candidates did not understand the questions. However, the quality of some candidates' language did limit their achievement. It was notable in the extended writing Q6(b) that some candidates' 'general knowledge' was a disadvantage in that they reported often incorrect information and did not seem to refer to what they must have learned in class. Word equations were a particular issue with which candidates struggled and will be referred to in more detail later on.

This report provides 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.

Gases in the atmosphere

Question 1(a)(ii)

Most candidates knew that oxygen was produced by photosynthesis, the most common wrong answer to this question being carbon dioxide.

Question 1(b)

There were many well-expressed answers to this question. A good proportion of candidates understood that the Earth had cooled, and the consequences of this. However, a significant number of candidates wrote answers that focused on volcanoes. Some candidates who did not score failed to understand the timescales involved and discussed photosynthesis, global warming, human activity or industrial output – it was not uncommon to read that global warming had heated the water up and caused it to evaporate. The words 'evaporation' and 'condensation' were sometimes confused.

Question 1(c)

For this part it was surprising that under half of candidates scored both marks in the table, and one fifth scored no mark at all.

Question 1(d)

There were some very good answers here, but some common confusions occurred:

- respiration of trees giving out carbon dioxide so there would be a reduction in carbon dioxide by cutting down trees
- photosynthesis producing carbon dioxide
- trees 'breathing in' carbon dioxide
- some answers concerned oxygen and not carbon dioxide
- the major effect on carbon dioxide levels was the carbon dioxide emitted by the machinery used to cut down trees.

It was a pity that some good answers failed to state clearly that carbon dioxide levels would rise.

(d) Explain why cutting down forests affects the amount of carbon dioxide in the atmosphere.

(2)

Because the treas take in ~~carbon~~ carbon dioxide and give out oxygen so if the trees are gone the carbon dioxide levels rise

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This is a 2-mark response that describes photosynthesis (without naming it) and states the overall effect on the carbon dioxide level.

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Give the name of the process being described – photosynthesis.

Limestone

Question 2(b)(i)

There were some clear and precise answers to this part, with some candidates extending their answer to explain the products of the thermal decomposition of calcium carbonate. The main error was the use of the word 'decompose' to explain decomposition. Heating and burning were confused, and some answers unfortunately decomposed elements. Some biology crept in, with decomposing being equated with rotting.

(b) Limestone is mainly calcium carbonate.

When calcium carbonate is heated, the reaction that occurs is

calcium carbonate → calcium oxide + carbon dioxide

(i) This reaction is a thermal decomposition.

Explain what is meant by **thermal decomposition**.

(2)

Thermal decomposition is when a chemical is broken down using heat

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A clear 2-mark answer, referring to both **thermal** ('using heat') and **decomposition** ('broken down').

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The candidate could usefully have referred to calcium carbonate to exemplify their answer.

(b) Limestone is mainly calcium carbonate.

When calcium carbonate is heated, the reaction that occurs is

calcium carbonate → calcium oxide + carbon dioxide

(i) This reaction is a thermal decomposition.

Explain what is meant by **thermal decomposition**.

(2)

thermal decomposition is when you are burning something, and to get rid of it.

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examiner comment

No marks were awarded here.

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Do not confuse heating with burning; they are not interchangeable.

Question 2(b)(ii)

A majority of responses to this question were correct. Candidates who gave incorrect answers fell into one of the following categories:

- those who knew what to do, but could not correctly subtract 44 from 100 (mainly getting 66 kg)
- those who performed random calculations, adding, multiplying and dividing the numbers
- those who had no idea and left a blank.

(ii) When 100 kg of calcium carbonate was completely decomposed, 44 kg of carbon dioxide was given off.

Calculate the mass of calcium oxide produced in the reaction.

(1)

100 x 44 = 4400 kg

mass of calcium oxide = 4400 kg

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examiner comment

An answer showing no understanding of conservation of mass.

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Think about numerical answers – does it make sense that 100 kg of reactant makes 4400 kg of product?

(ii) When 100 kg of calcium carbonate was completely decomposed, 44 kg of carbon dioxide was given off.

Calculate the mass of calcium oxide produced in the reaction.

(1)

66 kg of Calcium Oxide 100 - 44 = 66

mass of calcium oxide = 66 kg

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examiner comment

An example of incorrect subtraction.

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You are expected to use a calculator in this paper.

Question 2(c)(i)

Fewer than half the candidates had learned this information. Chalk was a common error.

Question 2(c)(ii)

There were some good answers here, but there were a lot of descriptions of sedimentary rock formation (sedimentation/compaction being muddled with application of pressure in metamorphic rock formation). In addition, when heating the rock, some candidates melted it, which would lead to an igneous rock. The use of clear language was important in this part.

Metals

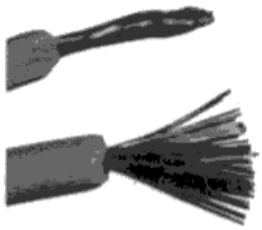
Question 3(a)

This straightforward part had a majority of correct answers, the most common choice unsurprisingly being that copper is a good electrical conductor. There were some waffly answers that would have been much better expressed (and therefore more likely to score) using the scientific terms 'malleable' and 'ductile'.

Incorrect answers included that copper was a good conductor of heat, and that copper does not rust. Centres should note that only iron (and steel) can be described as rusting and that copper, for example, must be described as 'not corroding'. Some answers gave uses of copper rather than the property required.

3 Many everyday items are made of metal.

The picture shows four objects made of metals or alloys.



electrical wire

aeroplane

jewellery

knife

(a) The electrical wire is made of copper.

Give a property of copper that makes it suitable for this use.

(1)

* Doesn't corrode * good insulator

* Bad conductor of heat

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'Doesn't corrode' was allowed, but 'good insulator' cancels out the mark.

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When **one**/**a** property is asked for, beware of giving a list, because incorrect answers cancel out correct ones.

Question 3(c)

The best answers here linked the properties of gold to its use in jewellery and clearly explained their ideas. Errors included (as above) references to 'rusting' (or even 'erosion') when candidates meant 'corrosion'; vague answers that might have scored if they had used the word 'malleable'; and 'gold is strong'. Candidates should explain carefully in this sort of question (worth 2 marks), with many explanations being not detailed enough for the second mark.

(c) Explain why gold is a suitable metal to make jewellery.

(2)

Because when heated it can shaped in alot of types of jewellery. Furthermore because it's shiny and hard so it won't break or corrode.

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This is not a perfect answer, but the candidate has thought about the properties of gold specifically in relation to its use in jewellery.

Question 3(d)

This question has been asked before and the response was disappointing. Many candidates had no idea what an alloy was (except for the inevitable car wheels). It was a pity that so many answers were unclear or talked about compounds or combining or joining, or about mixtures of elements or non-metals. Some candidates just gave properties of alloys, even explaining alloy strength in great detail, but to no avail. The examiners' favourite example of an alloy was 'alloyminium'.

(d) The knife is made of stainless steel.

Stainless steel is an alloy.

Explain what is meant by an **alloy**.

(2)

Alloy is two metals combined together.

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The idea of two metals gains 1 mark, but what does 'combined' mean? Two metals mixed? Two metal pieces joined? A compound of two metals?

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Use correct terminology – alloys are best described as **mixtures** of metals.

Question 3(e)

Word equations proved very tricky in this paper. Some candidates did not understand at all the concept of a word equation, ie showing reactants that form products. There were quite a few with an equals sign rather than → (unhelpful, although not in this case penalised), or examples where there was more than one arrow in a single equation.

About half of candidates gained 1 mark for the reactants, surprisingly low given that both were stated, but very few got the second mark. The main reason was that the iron was completely omitted.

(e) An ore of iron contains iron oxide.

Iron is extracted from this ore.

In the extraction process, the iron oxide reacts with carbon monoxide and carbon dioxide is formed.

Write the word equation for this reaction.

(2)

[redacted] iron oxide + carbon monoxide → carbon dioxide

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A typical 1-mark response.

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Remember that the reactants and products in a word equation will not always all be stated in the question.

Question 3(f)

Unfortunately, this question produced a stream of random generalised answers expounding the general goodness of recycling with almost no scientific backing or thought (which was similar to Q6(b)).

There were vague references to:

- pollution
- the environment
- saving money
- saving time
- 'it's easier'
- it is 'eco-friendly'.

Responses meriting 2 marks were rare, but there were good answers seen in terms of, for example, fewer quarries – but not going on to develop this point to get the second mark. Far too many candidates focused on pollution or economic issues with no science to back these ideas up.

Acids

Question 4(a)(i)

This part was well answered, with a few very sophisticated answers (eg ‘produces the correct pH for enzymes to work’). Unfortunately, ‘killing bacteria’ or ‘stopping infection’ was a regular answer even though it was in the stem.

Question 4(b)

Although many candidates were able to name the reactants, very few could name even one of the products correctly (some even put ‘salt’ as an answer).

Incorrect products included:

- oxide sulphate
- zinc oxide
- zinc sulphur
- zinc sulphide
- zinc sulphite
- sulphuric oxide
- dilute oxide
- sulphur oxide.

Any attempts at balanced symbol equations were destined for failure and should not be tried. In this word equation, too, multiple arrows appeared in some answers.

Question 4(c)(ii)

This question was generally well done, although candidates must give a description – 'the squeaky pop test' does not earn 2 marks.

The most common error was 'using a glowing splint', but others included:

- electrolysis
- use of limewater
- use of litmus
- unlit splints.

Candidates should note that examiners often ask for tests and these are well worth learning carefully.

(ii) The water decomposes to form hydrogen and oxygen.

Describe a test to show that a gas is hydrogen.

(2)

To test a gas to shaw it is hydrogen light a splint and put it in the test tube that contains the gas and if the flame goes out and makes a pop noise it is hydrogen.

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A decent answer giving the test and the result.

Question 4(d)(i)

Most candidates, it seemed, got the point of this question but many were unable to express themselves clearly enough. Chlorine was described as being dangerous, harmful or even flammable, without using the term ‘toxic’. Some candidates did not realise that the fume cupboard prevented the release of chlorine into labs etc, some even thinking that it stopped air from getting in to interfere with the reaction or even that it makes a reaction go quicker/is warm/keeps things safe.

Question 4(d)(ii)

There were some correct PVC answers and a very few poly(chloroethene). Incorrect answers included the popular polychlorine, but also bleach, swimming pools, polythene, cement, calcium, or giving uses for polymers, eg plastic bags.

Crude oil

Question 5(a)

Most candidates pointed out that the molecule contained carbon and hydrogen, but many fewer knew that they were the only elements in the compound. There was confusion with mentions of double bonds, and the imaginative compounds of 'hydro' (or even 'hydroxide') and 'carbon'. Some approached the question by explaining why A and C were not hydrocarbons, rather than why B was.

Question 5(b)(ii)

Amazingly, only just over a quarter of candidates assembled the given information and identified water to score 1 mark. Very few noted that oxygen was required for combustion and scored both marks.

Question 5(c)

Although many candidates scored no marks at all – they did not even identify, for example, petrol as one of the missing fractions – there were some excellent 6-mark answers. There were, of course, lots of errors but a common one appeared to be that fuel oil is a fuel in cars. Some candidates lost marks by listing too many uses, eg petrol for cars, bikes and lorries. Bitumen appears to be the best-studied fraction and was well described.

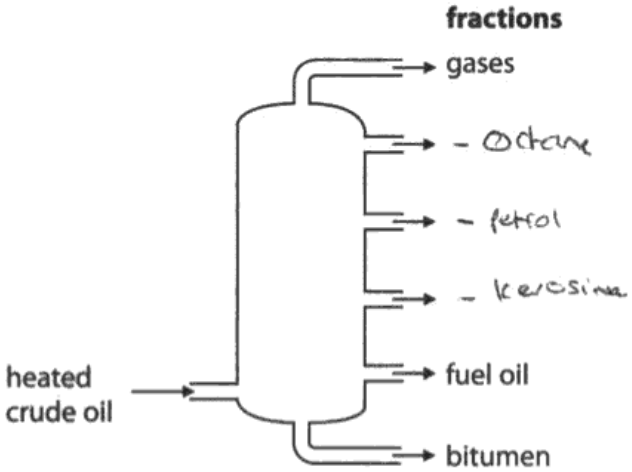
The nature of the question meant that candidates were able to express themselves clearly and coherently, and some very good answers used bullet points to structure their response.

Kerosene and diesel were frequently spelt incorrectly.

Candidates must direct their responses to the question – a description of how fractional distillation works was irrelevant.

*(c) Crude oil is separated into fractions by fractional distillation.

The diagram shows a fractional distillation tower that has been partly labelled.



Complete the identification of the fractions that are obtained from crude oil and describe uses for the six fractions.

(6)

- Petrol which can be used as fuel for cars.
- Fuel oil which can be used as a lubricant for chains ect.
- kerosine is used as fuel for airplanes.
- Bitumen; used to make roads.
- Gases can be used as fuel for cars which run on gas.
- Octane used as fuel for ships

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Although this answer is not faultless, it is sufficient for 4 marks. The use of bullet points helps to structure the answer.

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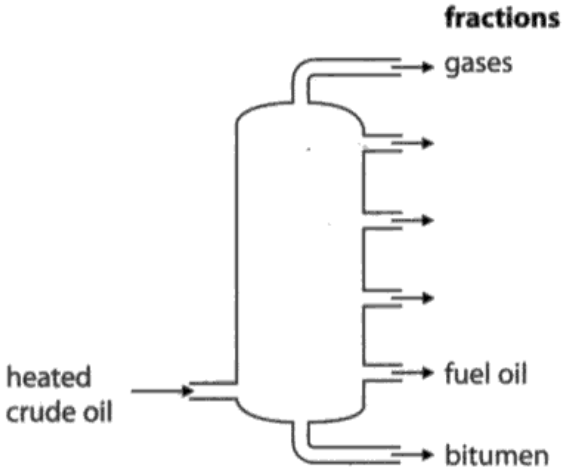
Use bullet points where helpful.

*(c) Crude oil is separated into fractions by fractional distillation.

The diagram shows a fractional distillation tower that has been partly labelled.



Complete the identification of the fractions that are obtained from crude oil and describe uses for the six fractions.

(6)

Crude oil ~~makes~~ can be made into gases that can produce heat, Oil for factorys and power stations to run. Fuel oil so it can be made into diels and petrol for airoplanes and cars. It also turnes into bitumen for lighters.

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examiner comment

This answer is not carefully directed to the question. It mentions oil – does this mean 'fuel oil'? If 'gases that can produce heat' had been better explained – domestic heating – it might have scored some marks.

Alkanes and alkenes

Question 6(a)(ii)

Propane and the molecular formula were often correct here, but it was rare to see a correct propene structure, many molecules having two double bonds or 3- or 5-valent carbons.

Question 6(a)(iii)

This common question was disappointingly answered. There seemed to be less penalty for using ‘clear’ instead of ‘colourless’ in some answers, but many candidates had no idea, or described the molecules (‘the alkene is the one with a double bond’) rather than giving a chemical test.

Question 6(b)

This question had fewer good responses than Q5(c), with vagueness being the order of the day (‘environmentally friendly’, ‘cause pollution’ etc). Good answers referred to landfills (the avoidance of) and (for burning) toxic gases. Few mentioned that energy could be released on burning plastics – more often a disadvantage was given as energy being required.

There is much confusion about what recycling plastics actually involves – many referring to reuse, not recycling. Many did not specify whether the advantages or disadvantages they were writing about referred to recycling or burning. Few candidates thought there were any disadvantages to recycling (one marker said they ought to live near him). Some gave cost as a benefit of recycling but this is a tricky statement to justify and was not credited.

Most answers were poorly structured, and candidates are recommended to use bullet points to assist them. Some candidates helpfully used tables as an alternative.

*(b) Many plastic bags are used by shoppers and then thrown away.

Most of these plastic bags are sent to landfill sites.

Two ways of reducing the amount of plastic in landfill sites are to recycle the plastic or to burn it.

Describe the possible environmental advantages and disadvantages of recycling and of burning plastics.

(6)

The Advantages of Burning and Recycling Plastic is that instead of digging up More ground for More plastic, recycling and burning it Means that you Wont be wasting more ground and it will be melted and turned into Something new that will be more useful each time it is used. The disadvantages of burning and recycling Plastic is that the smoke from burning the Plastic may have toxic fumes in it which will mean the Pollution in the air will increase, meaning it will cause damage to animals and humans. ~~This~~ Another disadvantage is that the bad Pollution in the air will destroy animals and their habitats.

(Total for Question 6 = 12 marks)

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An example of an answer with some merit but not clearly expressed. 'Toxic fumes' is good terminology but 'bad pollution in the air' is not.

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Most of these plastic bags are sent to landfill sites.

Two ways of reducing the amount of plastic in landfill sites are to recycle the plastic or to burn it.

Describe the possible environmental advantages and disadvantages of recycling and of burning plastics.

(6)

Advantages are that if we recycle plastic bags we can re-use them and harm won't be done to the environment. Also that we won't run out of the rescources we need to make plastic bags with. The advantages of burning them, we could use for a power source. The disadvatages ~~of~~ are that when we burn them, gases with be given off, ~~h~~ harming the environment.

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This example at least mentions an advantage of recycling (preserves resources – preserves oil would have been better) and an advantage of burning (power source) but the disadvantage (gases will harm the environment) is too vague to be creditworthy. The candidate has some good ideas but has not developed any of them clearly.

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Most of these plastic bags are sent to landfill sites.

Two ways of reducing the amount of plastic in landfill sites are to recycle the plastic or to burn it.

Describe the possible environmental advantages and disadvantages of recycling and of burning plastics.

(6)

it is good so we don't need to make more plastic, and so we do something good for the environment also it is not that good because when you burn plastic the smoke is very harmful also the smoke is not good for the environment,

, think it is good because it is always better than making new plastics.

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An example of a very vague response, giving no clear answer at all.

Summary

- The best candidates had carefully learned their science and explained it using the correct terminology.
- The extended writing questions could have been organised in bullet points or tables.
- Candidates are advised to learn tests thoroughly and to practise word equations.

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