edexcel

ResultsPlus

Examiners' Report
November 2011

GCSE Chemistry/Science 5CH1H/01

Edexcel is one of the leading examining and awarding bodies in the UK and throughout the world. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers.

Through a network of UK and overseas offices, Edexcel's centres receive the support they need to help them deliver their education and training programmes to learners.

For further information, please call our GCE line on 0844 576 0025, our GCSE team on 0844 576 0027, or visit our website at www.edexcel.com.

If you have any subject specific questions about the content of this Examiners' Report that require the help of a subject specialist, you may find our **Ask The Expert** email service helpful.

Ask The Expert can be accessed online at the following link:
http://www.edexcel.com/Aboutus/contact-us/

Alternatively, you can contact our Science Advisor directly by sending an email to Stephen Nugus on ScienceSubjectAdvisor@EdexcelExperts.co.uk.
You can also telephone 0844 576 0037 to speak to a member of our subject advisor team.

November 2011

Publications Code UG029805

Introduction

This was the first chemistry examination for the new GCSE science specification. The new C1 unit 'Chemistry in our world' is designed to give students a knowledge and understanding of some simple chemistry found in everyday life and to prepare them to make responsible decisions as knowledgeable members of society. It is also designed to provide a good foundation for further study of chemistry.

The unit is assessed through a one hour, 60 mark, written examination containing a mixture of question styles, including objective questions, short answer questions and extended writing questions. The quality of the candidates' written communication is assessed in the extended writing questions.

Some excellent answers were seen from the more successful candidates. Despite the fact that this paper was taken early in the GCSE course the quality of these answers was similar to those produced at the end of a GCSE course including clear use of correct scientific terms. It was pleasing to see that most candidates attempted the new style extended writing questions.

Less successful candidates:

- used generalisations without explanation e.g. environmentally friendly, carbon neutral, pollution etc,
- used chemical formulae as short hand for the names of substances; these were often incorrect e.g. CO^2,
- could not write balanced chemical equations,
- showed confusion in language e.g. clear instead of colourless and molecules instead of atoms,
- did not fully attempt the extended writing questions e.g. explained the formation of limestone but did not attempt to explain the formation of the cliff.

Candidates need to be discouraged from using generalisations and chemical formulae as shorthand. They should be encouraged to think carefully about their use of language and scientific terminology. They should also be encouraged to plan their answers to extended writing questions ensuring that a well structured answer that fully answers the question is produced.

Question 1 (a) (i)

This question was generally well answered but there was some confusion between corrosion and erosion.

(a) (i) Suggest why the 1 cent coin is coated with copper.

(1)

To protect it

ResultsPlus
Examiner Comments

This was a vague answer which did not indicate the nature of the protection.

ResultsPlus
Examiner Tip

Correct use of scientific language is very important. This answer should have indicated in what way the coin was being protected i.e. to protect the steel from rusting.

Question 1 (b)

Whilst some excellent answers were seen to this question many candidates only scored two marks by failing to mention that in the pure metal **layers** of particles slide.

(b) The diagrams show the structure of a pure metal and an alloy it forms with another metal.

pure metal alloy

Use these diagrams to help you explain why alloying increases the strength of the pure metal.

(3)

Alloying makes the metal stronger as it bonds two or more metals together. This will make it stronger because it has the combined strength of two metals.

ResultsPlus

Examiner Comments

This was a weak response suggesting that in an alloy the properties of the two metals add together.

(b) The diagrams show the structure of a pure metal and an alloy it forms with another metal.

pure metal alloy

Use these diagrams to help you explain why alloying increases the strength of the pure metal.

(3)

An alloy particle is much bigger than a pure metal particle which makes the strength of the pure metal increase.

ResultsPlus
Examiner Comments

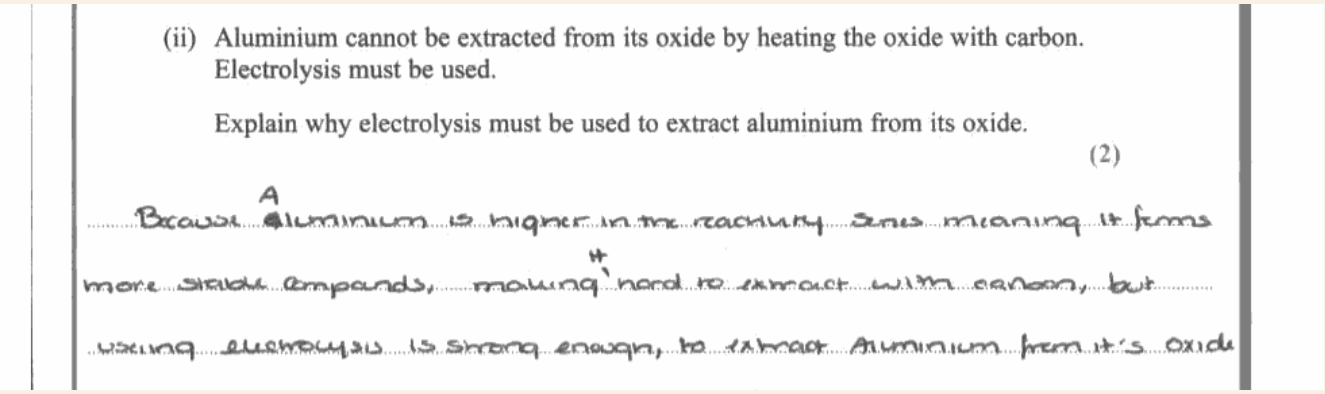
This was a fairly common misconception that the larger particles were alloy particles suggesting a lack of understanding of the nature of an alloy. This answer did however score one mark for the idea of different sized particles.

ResultsPlus
Examiner Tip

It is important to understand the meaning of scientific words and use them correctly. It is also important in questions worth more than one mark that a sufficiently detailed answer has been given.

Question 1 (c) (ii)

Many candidates achieved one mark for a reference to aluminium being higher than carbon in the reactivity series. It was rare for them to add to this sufficiently for a second mark.



(ii) Aluminium cannot be extracted from its oxide by heating the oxide with carbon. Electrolysis must be used.

Explain why electrolysis must be used to extract aluminium from its oxide.

(2)

Because Aluminium is higher in the reactivity series meaning it forms more stable compounds, making it hard to extract with carbon, but using electrolysis is strong enough, to extract Aluminium from it's oxide

ResultsPlus
Examiner Comments

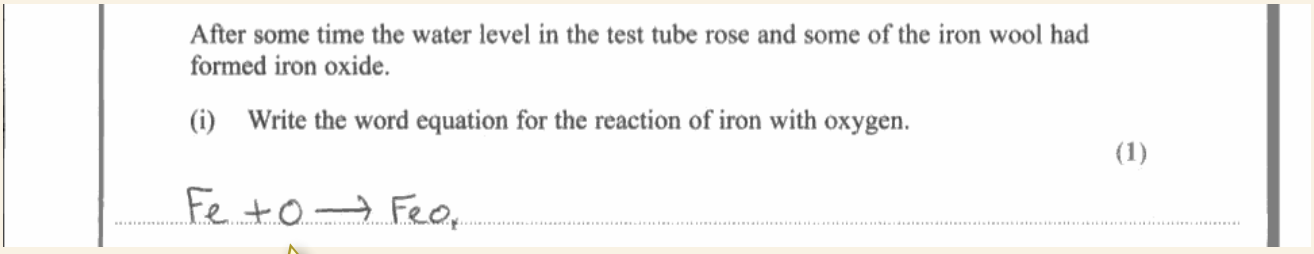
This is a good answer which in addition to stating that aluminium is higher in the reactivity series also states that it forms more stable compounds.

ResultsPlus
Examiner Tip

Ensure that if the question is worth two marks, two separate points are made.

Question 2 (a) (i)

A significant number of candidates thought that water was produced in this reaction in addition to iron oxide.



After some time the water level in the test tube rose and some of the iron wool had formed iron oxide.

(i) Write the word equation for the reaction of iron with oxygen.

(1)

Fe + O → FeO

ResultsPlus
Examiner Comments

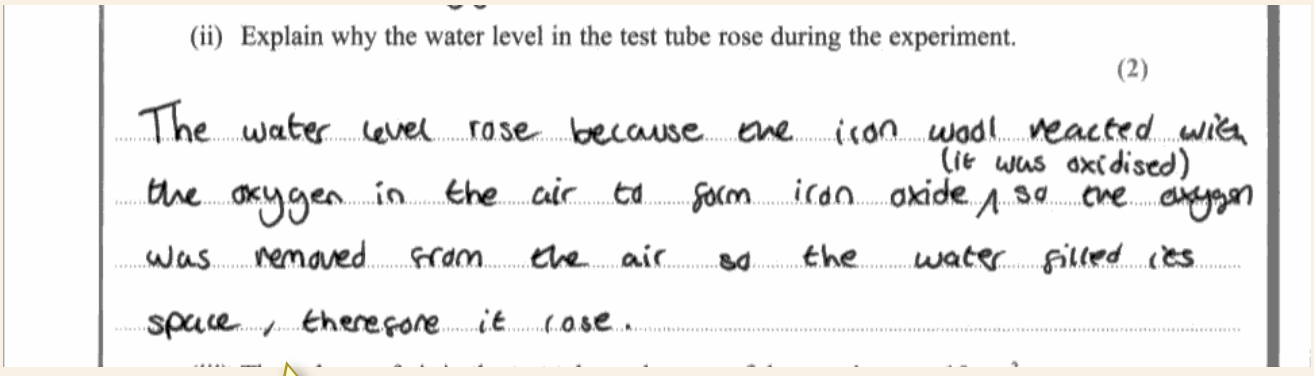
Candidates should not attempt a symbol equation when asked for a word equation. In this case the oxide produced is not FeO. If a symbol equation is given it is only credited if fully correct.

ResultsPlus
Examiner Tip

Read the question carefully and make sure what type of equation is required.

Question 2 (a) (ii)

Many candidates scored the first mark for the idea of iron reacting with oxygen but failed to gain a second mark. A few referred to iron absorbing the oxygen which was judged to be not creditworthy.



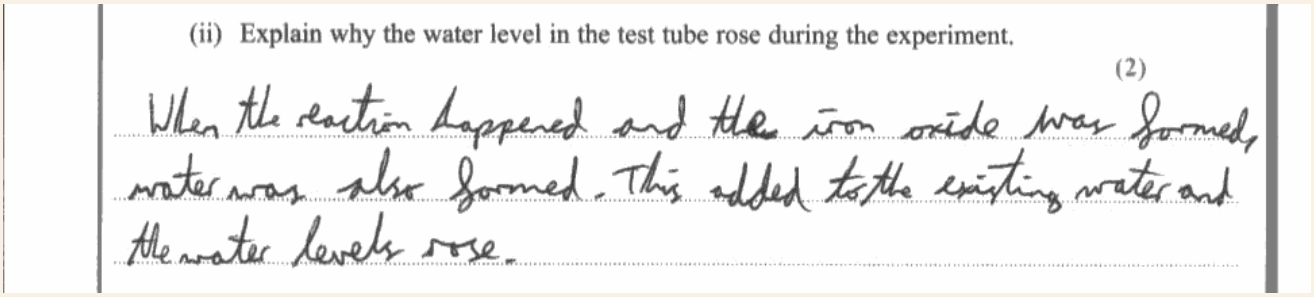
(ii) Explain why the water level in the test tube rose during the experiment.

(2)

The water level rose because the iron wool reacted with the oxygen in the air to form iron oxide (it was oxidised), so the oxygen was removed from the air so the water filled its space, therefore it rose.

ResultsPlus
Examiner Comments

This is a good answer which goes on to gain a second mark.



(ii) Explain why the water level in the test tube rose during the experiment.

(2)

When the reaction happened and the iron oxide was formed, water was also formed. This added to the existing water and the water levels rose.

ResultsPlus
Examiner Comments

This was a common misconception seen both here and in the equation in part 2(a)(i).
One mark awarded for iron oxide formed.

Question 2 (a) (iii)

Many correct answers were seen but often with no working.

(iii) The volume of air in the test tube at the start of the reaction was 10 cm^3.

Calculate the volume of gas that should be present in the test tube at the end of the reaction.

(2)

Oxygen is 30% of ~~air~~ air - 30% of $10cm^3 = 7cm^3$

answer = $7cm^3$

ResultsPlus
Examiner Comments

This is an example which clearly illustrates the need to show working. An answer of 7 cm^3 would score zero, but since it can clearly be seen that the answer is arrived at from the wrong initial percentage of oxygen, this answer scores one.

(iii) The volume of air in the test tube at the start of the reaction was 10 cm^3.

Calculate the volume of gas that should be present in the test tube at the end of the reaction.

(2)

$10cm^3$ you will never lose or gain mass (Conservation of mass)

answer = $10 cm^3$

ResultsPlus
Examiner Comments

This was a common misconception. The answer 10 cm^3 was common with no explanation but here the confusion with conservation of mass is clear.

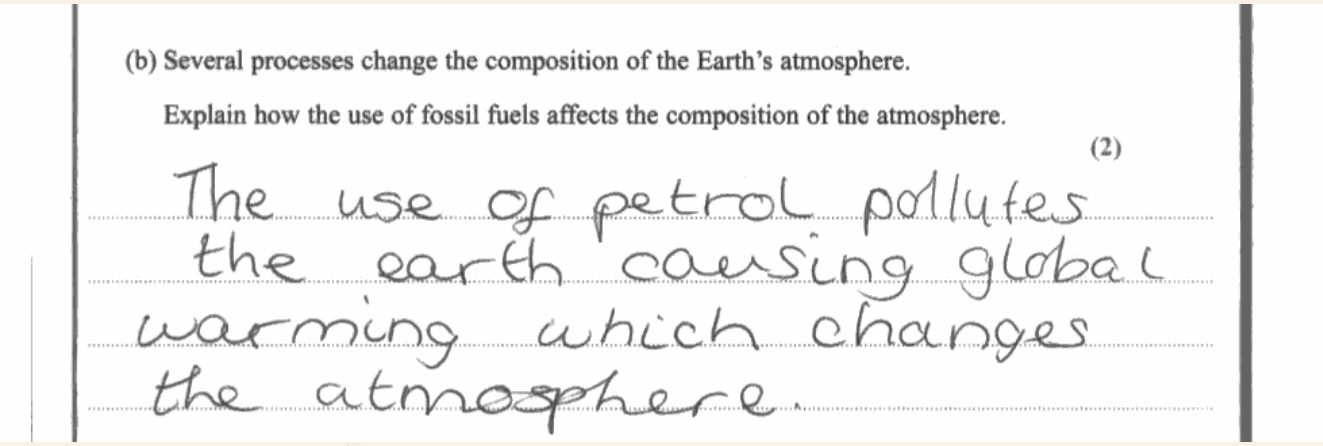
ResultsPlus
Examiner Tip

Ensure the idea of conservation of mass is correctly understood.

Question 2 (b)

Many candidates scored two marks for stating that the burning of fossil fuels adds carbon dioxide. A few referred to adding carbon. Those scoring one mark usually failed to mention combustion or burning. Many examples were seen where CO_2 and even CO^2 were used as shorthand for carbon dioxide. This is incorrect practice and should be discouraged.

A few candidates believe that the carbon dioxide is trapped in the fossil fuel.



(b) Several processes change the composition of the Earth's atmosphere.

Explain how the use of fossil fuels affects the composition of the atmosphere.

(2)

The use of petrol pollutes the earth causing global warming which changes the atmosphere.

ResultsPlus
Examiner Comments

This is a vague answer scoring zero. Other incorrect answers made references to the ozone layer.

ResultsPlus
Examiner Tip

Do not write chemical formulae instead of the names of substances.

Question 3 (b)

This question was poorly answered with many answers containing double bonds.

Question 3 (c)

The test for a double bond was well known with many candidates scoring two marks. Some lost a mark by using the word clear instead of colourless.

(c) Describe a test that shows that molecules of propene contain carbon to carbon double bonds.

(2)

mix the substance with bromene water

ResultsPlus
Examiner Comments

This answer names the correct reagent but does not give the result of the test.

ResultsPlus
Examiner Tip

When asked about a chemical test the result of the test should always be stated.

(c) Describe a test that shows that molecules of propene contain carbon to carbon double bonds.

(2)

If you get some ~~propene~~ and put it in ~~water~~ bromene and it ~~changes~~ changes colour ~~then~~ it has ~~got a double~~ double bond but if not ~~then~~ it hasn't

ResultsPlus
Examiner Comments

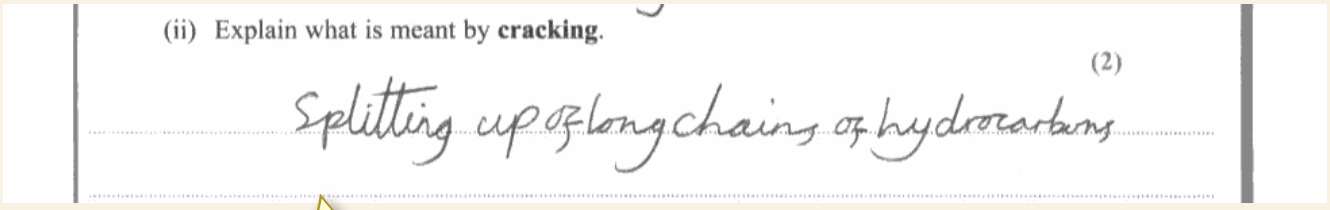
The correct answer is bromine water not bromine, but bromine was accepted. This answer does not state what the colour change is.

ResultsPlus
Examiner Tip

When asked about a chemical test the full result of the test should always be stated.

Question 3 (d) (ii)

Poor expression prevented some candidates scoring marks. There was some misunderstanding of hydrocarbon chains and some confusion with fractional distillation.



ResultsPlus
Examiner Comments

This answer incorrectly refers to chains of hydrocarbons instead of hydrocarbon chains.

ResultsPlus
Examiner Tip

Make sure that the meaning of a hydrocarbon chain is fully understood and that it refers to a single molecule not multiple molecules.

ResultsPlus
Examiner Comments

This answer talks about separating molecules rather than the breaking down of molecules.

ResultsPlus
Examiner Tip

Choose words carefully: separation is a physical process.

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

(2)

Cracking is the process in which long-chain (large) hydrocarbons are broken into more useful (small) short-chain hydrocarbons through the use of thermal decomposition.

ResultsPlus
Examiner Comments

A reasonable two mark answer.

Question 3 (d) (iii)

Candidates often scored well on this question. Many gained a mark for the relative usefulness of the fractions and/or the idea that there is more demand for the smaller fractions.

(iii) Explain why it is necessary to crack crude oil fractions that contain large molecules.

(2)

It is necessary as the longer chain molecules are not in high demand compared to shorter chain molecules, such as petrol and kerosene. By cracking we can obtain shorter chain molecules which are in higher demand. **(Total for Question 3 = 10 marks)**

ResultsPlus
Examiner Comments

This answer has the idea that there is more demand for the fractions containing smaller molecules and has correctly stated that the fractions are petrol and kerosene. This scores both marks.

(iii) Explain why it is necessary to crack crude oil fractions that contain large molecules.

(2)

Because the long chain of hydrocarbons need to be broken down to make it easier to use.

ResultsPlus
Examiner Comments

A common misconception is that the fractions containing smaller molecules are **easier** to use instead of being more useful.

Question 4 (a) (i)

(i) Write the balanced equation for water decomposing to form hydrogen and oxygen.

(3)

$H_2O_2 \rightarrow H_2 + O_2$

ResultsPlus
Examiner Comments

This candidate has probably changed the formula of water to H_2O_2 to balance the equation.

ResultsPlus
Examiner Tip

Never change formulae to balance equations.

(i) Write the balanced equation for water decomposing to form hydrogen and oxygen.

(3)

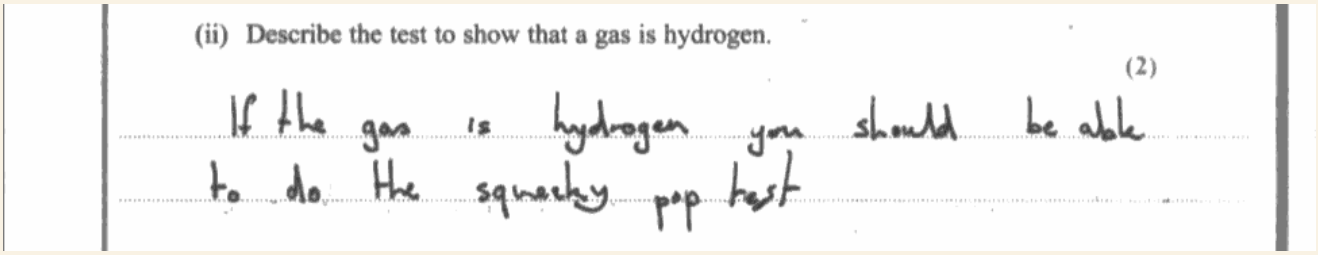
$2H_2O \rightarrow 4H_2 + O_2$

ResultsPlus
Examiner Comments

Incorrect formulae do not score.

Question 4 (a) (ii)

Many candidates scored full marks but mention of the need for air was rare.



(ii) Describe the test to show that a gas is hydrogen.

(2)

If the gas is hydrogen you should be able to do the squeaky pop test

ResultsPlus
Examiner Comments

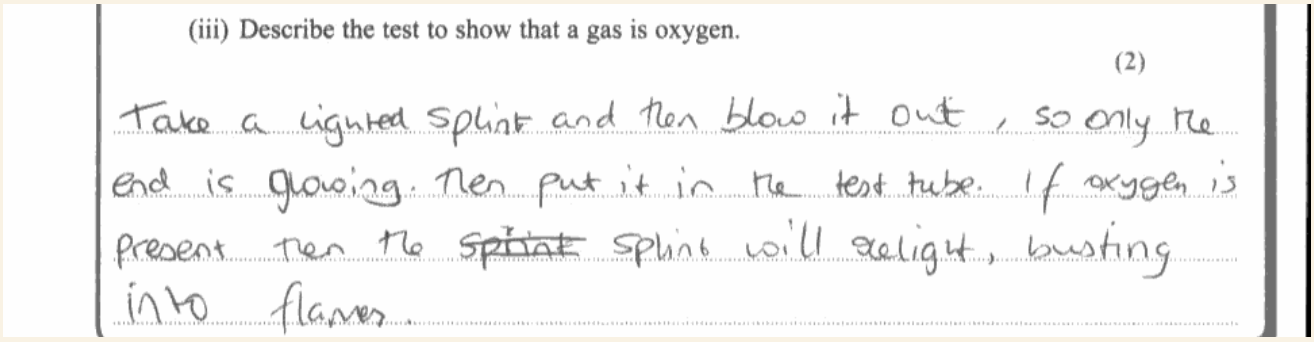
An imprecise answer.
There is no mention of ignition or of burning with a squeaky pop.

ResultsPlus
Examiner Tip

Any chemical test must be fully described including the result.

Question 4 (a) (iii)

Whilst many good answers were seen, too many candidates used a blown-out splint rather than a glowing splint.



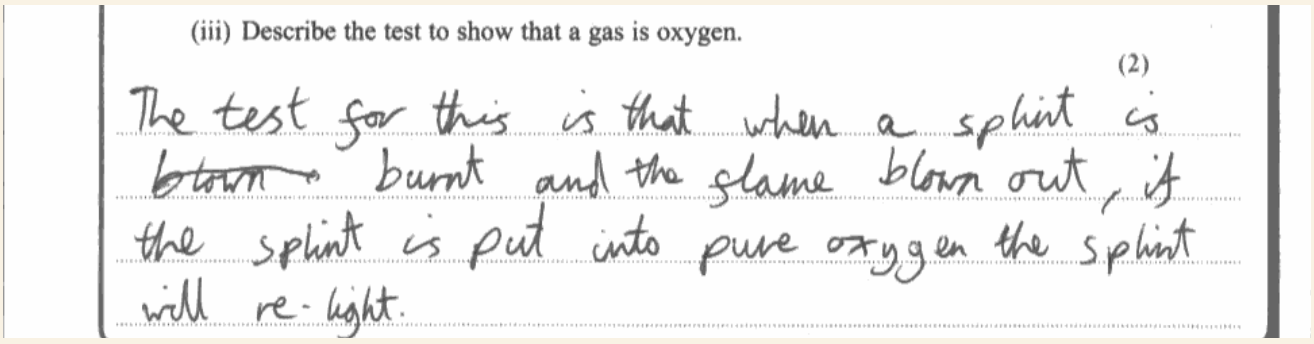
(iii) Describe the test to show that a gas is oxygen.

(2)

Take a lighted splint and then blow it out, so only the end is glowing. Then put it in the test tube. If oxygen is present then the ~~splint~~ splint will relight, bursting into flames.

ResultsPlus
Examiner Comments

This answer clearly states that the end of the splint is glowing so scores both marks.



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

(2)

The test for this is that when a splint is ~~blown~~ burnt and the flame blown out, if the splint is put into pure oxygen the splint will re-light.

ResultsPlus
Examiner Comments

A blown-out splint is not a glowing splint.

ResultsPlus
Examiner Tip

It is important that terms such as blown-out or put out are not used to describe a glowing splint.

Question 4 (b) (ii)

Many candidates correctly answered the question but some candidates were not specific about the type of mask. Others suggested not breathing the gas in without stating how this would be achieved. Some gave general safety precautions such as goggles which were not specific to a toxic gas.

(ii) Give a safety precaution that should be taken when collecting this toxic gas.

(1)

~~Safety goggles~~ make sure you have protective clothing on.

ResultsPlus
Examiner Comments

This is a vague answer, even the crossed out answer would not score.

(ii) Give a safety precaution that should be taken when collecting this toxic gas.

(1)

It can cause death if breathed in, drank or absorbtion of the skin so wear protection.

ResultsPlus
Examiner Comments

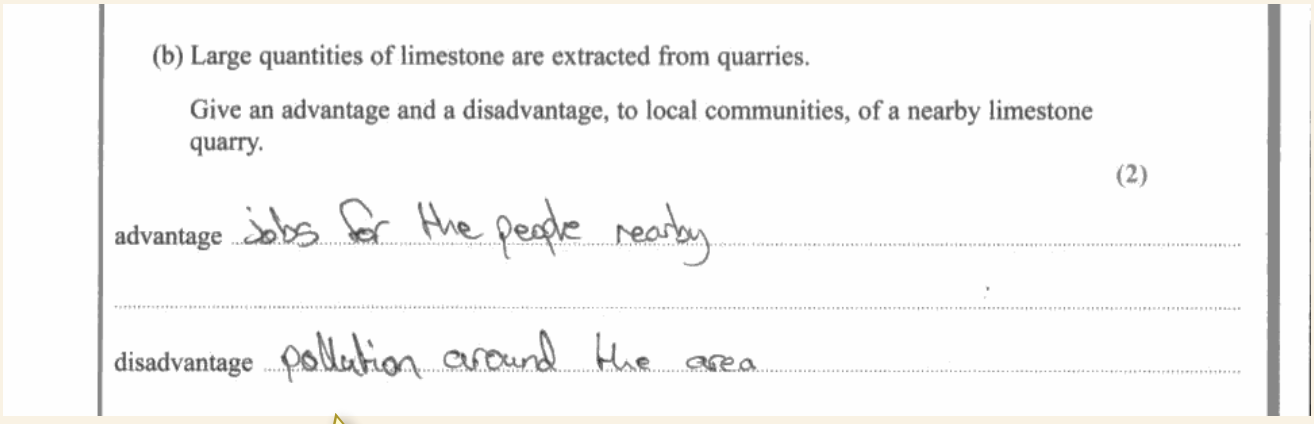
The candidate knows the problem but is not specific with the answer.

ResultsPlus
Examiner Tip

When discussing safety precautions always ensure that the answer is specific to the hazard.

Question 5 (b)

This question was generally well answered with jobs and noise being common correct answers. Some answers were vague e.g. pollution. Some confused money for the community with profit for the company.



(b) Large quantities of limestone are extracted from quarries.

Give an advantage and a disadvantage, to local communities, of a nearby limestone quarry.

(2)

advantage jobs for the people nearby

disadvantage pollution around the area

ResultsPlus
Examiner Comments

The disadvantage answer is too vague to score.

ResultsPlus
Examiner Tip

Try to be specific when discussing environmental problems and don't use terms such as environmental damage or pollution without adding further detail.

Question 5 (c)

Some good answers were seen but many weak answers were also present. Some gained the first mark because they knew that calcium carbonate had to be heated, but they didn't know how to continue. Others just added water or hydrochloric acid to calcium carbonate. Some suggested reaction with hydrogen presumably to change from carbonate to hydroxide. The filtration of the limewater was very rarely mentioned.

(c) Limestone is a natural form of calcium carbonate.
Limewater is calcium hydroxide solution.

Describe how limewater can be made from calcium carbonate.

(3)

Calcium Carbonate must first be thermally decomposed, to produce Calcium oxide and Carbon dioxide. You then add water to the Calcium oxide to form Calcium hydroxide.

ResultsPlus
Examiner Comments

Although this answer does not describe the later stages of the process. The first four points from the mark scheme are stated so this answer scores the maximum mark of three.

(c) Limestone is a natural form of calcium carbonate.
Limewater is calcium hydroxide solution.

Describe how limewater can be made from calcium carbonate.

(3)

First heat limestone so it thermally decomposes to make calcium oxide and giving off carbon dioxide. Then add water until it forms Calcium hydroxide. Then add more water until the substance becomes a liquid that is a calcium hydroxide solution.

ResultsPlus
Examiner Comments

This is a good answer scoring full marks.

(c) Limestone is a natural form of calcium carbonate.
Limewater is calcium hydroxide solution.

Describe how limewater can be made from calcium carbonate.

(3)

To make limewater from calcium carbonate you heat the calcium carbonate with hydrogen causing it to break down. Then turn into calcium hydroxide solution.

ResultsPlus
Examiner Comments

This is a common misconception that hydrogen is reacted to obtain the **hydroxide**.

Question 5 (d)

Apart from those very few candidates who had limited knowledge, most had some idea about sediments. Some excellent descriptions of the formation of sedimentary rocks were seen. Better candidates went on to describe changes in land and sea level and the erosion of the limestone to form the cliff face. Those candidates that produced a reasonable account of sedimentary rock formation but did not discuss the formation of the cliff were limited to a level 2.

Most candidates were able to express their ideas reasonably clearly with only the very weakest being unable to articulate their ideas in a clear and structured way.

*(d) Limestone is a sedimentary rock.

The limestone shown in the photograph was originally formed beneath the sea and then earth movements forced the rock upwards to form the cliff.

Describe how the limestone was originally formed and has become the cliff face shown in the photograph.

(6)

Dead sea creatures including shell organisms fell to the bottom of the ocean in layers. More and more layers of sediment built up on top causing the layers underneath to be compressed. The water is pushed out of the layers and decomposers can get in to breakdown the dead matter. The organisms with shells, their shell are made of calcium carbonate. This is why most of limestone is calcium carbonate. Under intense pressure and over millions of years sedimentary rock is forms. Convection Currents in the mantle cause the tectonic plates to move forcing the rock up to the surface. It has then been eroded by acid rain and the waves crashing against it to form a cliff.

ResultsPlus

Examiner Comments

A reasonable description of the formation of limestone is followed by an explanation of the cliff formation. Whilst not perfect this is a good example of an answer worthy of six marks.

*(d) Limestone is a sedimentary rock.

The limestone shown in the photograph was originally formed beneath the sea and then earth movements forced the rock upwards to form the cliff.

Describe how the limestone was originally formed and has become the cliff face shown in the photograph.

(6)

Erosion caused bits of rock and mountain to fall away into streams and rivers. The sediment is suspended in the river flowing along with it until it reaches the sea. Here the water slows down, and the sediment drops to the bottom of the sea to form a layer of sediment called strata. As different rocks are eroded, new layers of strata form. After millions of years there is so much weight and pressure from the many layers of strata above that all of the water in the sediment gets squeezed out and a mineral 'cement' seeps in. The sediment is so tightly packed and cemented it becomes solid, forming sedimentary rock.

(Total for Question 5 = 12 marks)

ResultsPlus
Examiner Comments

This answer makes a very good attempt to describe the formation of a sedimentary rock but does not continue to include the formation of the cliff.

This limits the answer to level 2 and four marks have been awarded.

ResultsPlus
Examiner Tip

Make sure that the answer provided answers all of the question that is asked.

*(d) Limestone is a sedimentary rock.

The limestone shown in the photograph was originally formed beneath the sea and then earth movements forced the rock upwards to form the cliff.

Describe how the limestone was originally formed and has become the cliff face shown in the photograph.

(6)

As sea levels rose & droped th waves collided with th cliffe eroding away at it building it higher & higher

ResultsPlus
Examiner Comments

This is an example where the candidate has shown some very limited knowledge. They have stated something that is correct and relevant to the question and thus made a start to answer the question.

One mark awarded.

ResultsPlus
Examiner Tip

Even very limited knowledge may gain important marks. All questions should be attempted.

Question 6 (a)

Some excellent answers were seen but a common mistake was to misinterpret the question and think that the fuels had to be burnt at the same time.

(a) Suggest **two** reasons why it is usually difficult to burn different hydrocarbon fuels efficiently in the same appliance.

(2)

reason 1 the longer the hydrocarbon chain the harder it is to ignite so all hydrocarbons have different ignition points.

reason 2 different fuels require diferent amounts of oxygen in order to ~~completely~~ completely combust.

ResultsPlus
Examiner Comments

This gives the idea of different ease of ignition and different amounts of oxygen.

Question 6 (c)

This question was found challenging, with many candidates forgetting that oxygen is a reactant. Some of those that did add oxygen did not know that it is diatomic. Candidates scoring one mark often scored this for the correct product formulae. As with the earlier equation poorly written formulae were penalised.

(c) Ethane, C_2H_6, is present in crude oil.

Write the balanced equation for the complete combustion of ethane.

(3)

$C_2H_6 + 7O \rightarrow 2CO_2 + 3H_2O$

ResultsPlus
Examiner Comments

Lack of diatomic oxygen means only one mark.

ResultsPlus
Examiner Tip

Remember the rule that gaseous elements apart from the noble gases are diatomic.

(c) Ethane, C_2H_6, is present in crude oil.

Write the balanced equation for the complete combustion of ethane.

(3)

$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

ResultsPlus
Examiner Comments

This answer was given full credit but answers changed in this way are unclear and liable to be penalised.

ResultsPlus
Examiner Tip

Any corrections made to answers must be clear, preferably by crossing out the original and then writing the new answer.

Question 6 (d)

This question was not answered as well as the other extended writing question. Statements made were often lacking scientific fact and expressed in a confused way rather than in a logical sequence.

A common misconception was that hydrogen is a bio-fuel.

*(d) Petrol is the fuel used in many car engines.
Research is being carried out into the use of hydrogen instead of petrol.

Evaluate the advantages and disadvantages of using hydrogen rather than petrol as a fuel for cars.

(6)

Hydrogen when used in a fuel cell react with oxygen to produce pure water which is ~~c~~ isn't a pollutant. when petrol is burnt it produces carbon dioxide which is a greenhouse gas. the disadvantages of using Hydrogen is that it is often supplied by taking Hydrogen out of Hydrocarbons which come from fossil fuels which are a finite resource and will run out. A disadvantage of using petrol is that it is a Hydrocarbon which are non-renewable energy resources. Hydrogen can be obtained from electrolysis by using water as the electrolyte this is a better way of obtaining it if the ~~ee~~ electricity is produced from a renewable source.

ResultsPlus
Examiner Comments

This answer covers many of the expected points. It does not cover the problems of hydrogen storage but is deemed to contain sufficient information for six marks.

*(d) Petrol is the fuel used in many car engines.
Research is being carried out into the use of hydrogen instead of petrol.

Evaluate the advantages and disadvantages of using hydrogen rather than petrol as a fuel for cars.

(6)

Petrol has more power than hydrogen so it is more efficient but petrol is a fossil fuel that is running out and is non-renewable whereas hydrogen is renewable. It costs more money to extract hydrogen than petrol and also alot of cars can't be powered by hydrogen so it would cost money to modify the cars to be powered by hydrogen. Overall hydrogen is better to use for the long as it is renewable but in the short term it will cost more to make useable for vehicles.

ResultsPlus
Examiner Comments

This answer makes several valid points but the statement that petrol is more efficient because it has more power is weak.

The answer is fairly well constructed although the word 'term' appears to be missing from the last sentence after 'long'.

This is deemed to be a good level 2 answer.

ResultsPlus
Examiner Tip

Try to ensure that all statements made are factually correct and based on correct science.

An advantage for using hydrogen instead of petrol is because petrol is a fossil fuel that is being burned when someone drives their car. This causes it to release carbon dioxide and carbon monoxide, carbon monoxide is a poisonous gas that can cause death, blurred vision, nausea which isn't very good for humans.

ResultsPlus

Examiner Comments

This answer makes a weak attempt to discuss advantages but no attempt at disadvantages. A good answer that only discussed advantages would be limited to a level 2. There is only a weak attempt to discuss advantages and this is awarded one mark.

ResultsPlus

Examiner Tip

Make sure that the question is fully answered, in this case with both advantages and disadvantages.

Paper Summary

In order to improve their performance candidates should:

- avoid vague terms such as environmentally friendly
- not use chemical symbols as shorthand for the names of substances
- learn to write balanced chemical equations
- remember that gaseous elements that will be met in equations are diatomic,
- learn carefully the meaning of scientific terms such as molecule and atom
- plan answers to extended writing questions so that they are logically ordered

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

Further copies of this publication are available from
Edexcel Publications, Adamsway, Mansfield, Notts, NG18 4FN

Telephone 01623 467467
Fax 01623 450481
Email publication.orders@edexcel.com
Order Code UG029805 November 2011

For more information on Edexcel qualifications, please visit
www.edexcel.com/quals

Ofqual

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

Rewarding Learning