AQA GCSE CHEMISTRY (4402)

# CHEMISTRY



## EXAM QUESTION PACK

UNIT C1 FOUNDATION TIER CH1FP PAPERS

STEMUP

# These questions belong to AQA, not to us.

The examination questions, mark schemes and examiner reports in this pack were written and published by AQA. They are past assessment materials, reproduced here so that students can revise from them.

## What we do not own

STEMUP is not affiliated with AQA and does not own, and makes no claim to own, any of the question, mark scheme or examiner report material in this pack. AQA has not endorsed, approved or been involved in the production of it. AQA and the qualification titles used here belong to their respective owners and appear for identification only.

## Where to find the originals

AQA publishes its past papers, mark schemes and examiner reports free of charge. Always check the current specification at aqa.org.uk before you revise, because content and wording can change between series.

If you hold the rights to any material in this pack and would like it amended or removed, contact admin@stemup.co.uk and we will act on it.

AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

# GCSE
# SCIENCE A
# CHEMISTRY

**F**

## Foundation Tier Unit Chemistry C1

Thursday 19 May 2016 Morning Time allowed: 1 hour

**Materials**

For this paper you must have:
- a ruler
- the Chemistry Data Sheet (enclosed).

You may use a calculator.

**Instructions**
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

**Information**
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 5(c) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

**Advice**
- In all calculations, show clearly how you work out your answer.



STEMUP.CO.UK

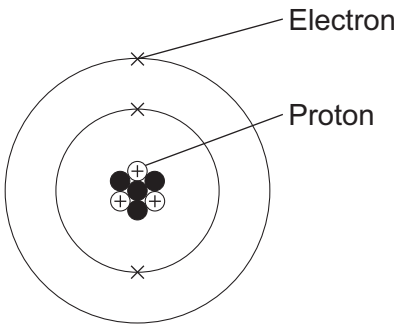
Do not write outside the box

Answer **all** questions in the spaces provided.

**1** There are eight elements in the second row (lithium to neon) of the periodic table.

**1 (a)** **Figure 1** shows a lithium atom.

**Figure 1**




**1 (a) (i)** What is the mass number of the lithium atom in **Figure 1**?

**[1 mark]**

Tick (✓) **one** box.

3 ☐

4 ☐

7 ☐

**1 (a) (ii)** What is the charge of an electron?

**[1 mark]**

Tick (✓) **one** box.

–1 ☐

0 ☐

+1 ☐

Do not write outside the box

**1 (a) (iii)** Protons are in the nucleus.

Which other sub-atomic particles are in the nucleus?

**[1 mark]**

Tick (✓) **one** box.

ions ☐

molecules ☐

neutrons ☐

**1 (b)** What is **always** different for atoms of different elements?

**[1 mark]**

Tick (✓) **one** box.

number of neutrons ☐

number of protons ☐

number of shells ☐

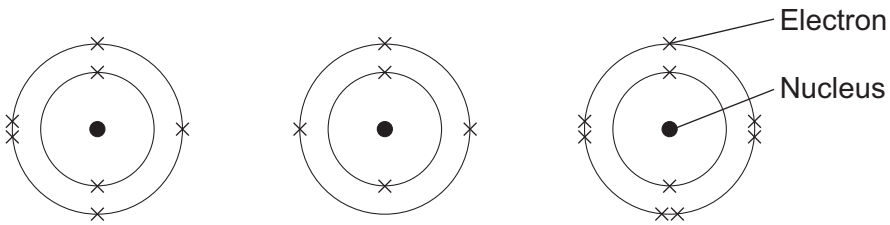
**Question 1 continues on the next page**

*Do not write outside the box*

**1 (c)** **Figure 2** shows the electron arrangements of three different atoms, **X**, **Y** and **Z**.

These atoms are from elements in the second row (lithium to neon) of the periodic table.

**Figure 2**




**Atom X** **Atom Y** **Atom Z**

Which atom is from an element in Group 3 of the periodic table?

**[1 mark]**

Tick (✓) **one** box.

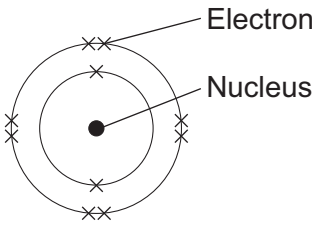
**Atom X** ☐

**Atom Y** ☐

**Atom Z** ☐

**1 (d)** **Figure 3** shows the electron arrangement of a different atom from an element in the second row of the periodic table.

**Figure 3**




**1 (d) (i)** Give the chemical symbol of this element.

**[1 mark]**

_____

**1 (d) (ii)** Why is this element unreactive?

**[1 mark]**

_____

_____

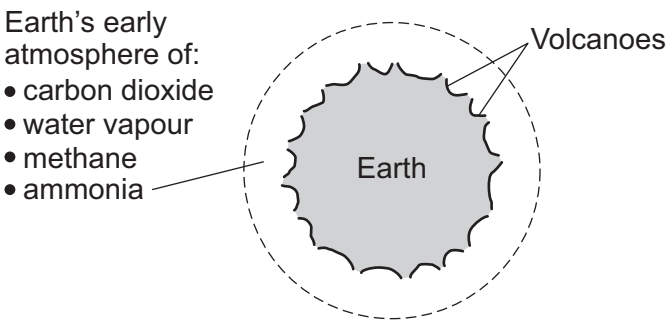
7

Do not write outside the box

**2** This question is about the Earth and its atmosphere.

**2 (a)** **Figure 4** shows the Earth and its atmosphere billions of years ago.

**Figure 4**




**2 (a) (i)** The boiling point of water is 100 °C.

Suggest **one** reason why there was no liquid water on the Earth's surface billions of years ago.

**[1 mark]**

_____

_____

**2 (a) (ii)** Complete the sentence.

**[1 mark]**

On the Earth today, volcanic eruptions happen at the boundaries between

tectonic _____ .

**Question 2 continues on the next page**

Do not write outside the box

**2 (b)** The Earth's atmosphere today contains nitrogen, oxygen, argon, carbon dioxide and other gases.

**2 (b) (i)** Draw **one** line from each substance to a description of the substance.

**[3 marks]**

| Substance | Description of the substance |
|---|---|
| air | compound |
| carbon dioxide | element |
| argon | hydrocarbon |
| | metal |
| | mixture |

**2 (b) (ii)** Which gas in the Earth's atmosphere is used when hydrocarbons burn?

**[1 mark]**

Tick (✓) **one** box.

- carbon dioxide ☐
- nitrogen ☐
- oxygen ☐

**2 (b) (iii)** What percentage of the Earth's atmosphere is nitrogen?

**[1 mark]**

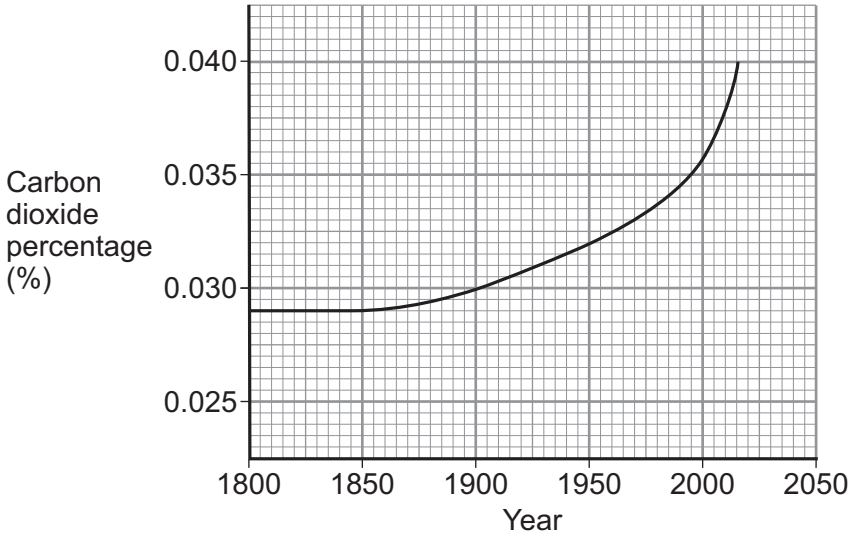
Tick (✓) **one** box.

- about 40% ☐
- about 60% ☐
- about 80% ☐

Do not write outside the box

**2 (c)** **Figure 5** shows the carbon dioxide percentage (%) in the Earth's atmosphere since the year 1800.

**Figure 5**




**2 (c) (i)** What was the carbon dioxide percentage in 1900?

**[1 mark]**

_____ %

**2 (c) (ii)** Describe, in detail, how the carbon dioxide percentage changed from 1900 to 2015.

**[2 marks]**

_____

_____

_____

_____

**2 (c) (iii)** Suggest **two** reasons for the change in the carbon dioxide percentage from 1900 to 2015.

**[2 marks]**

1 _____

_____

2 _____

_____

12

**Turn over ▶**

Do not write outside the box

**3** Metals are extracted from ores in the Earth's crust.

**3 (a)** Why is copper used in the manufacture of computers?

**[1 mark]**

Tick (✓) **one** box.

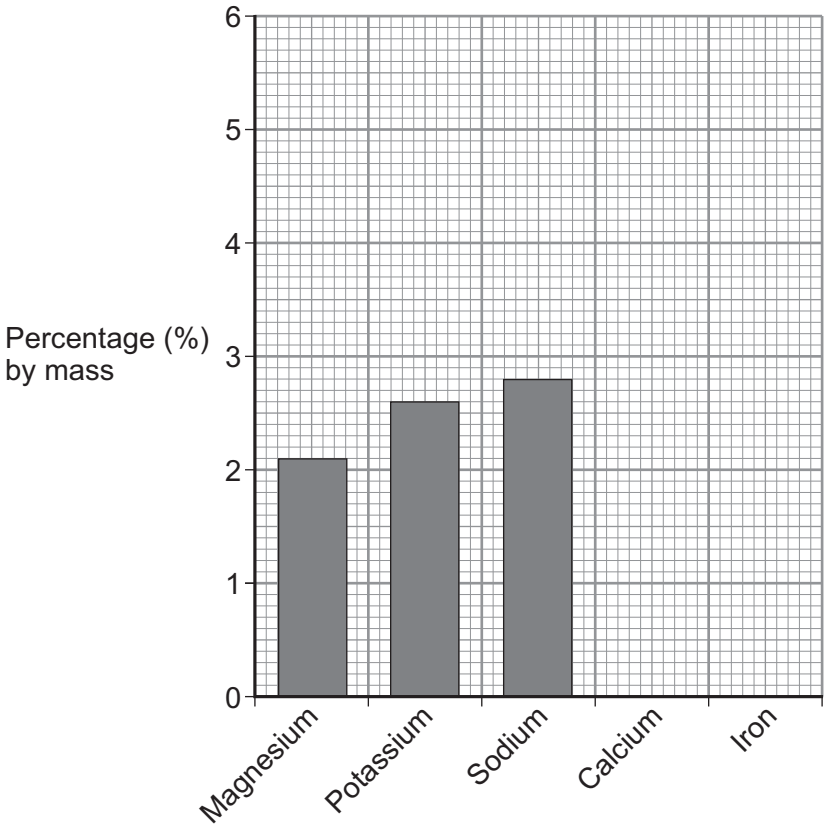
Because it has a high density. ☐

Because it does not react with water. ☐

Because it is a good conductor of electricity. ☐

**3 (b)** **Figure 6** shows the percentage (%) by mass of some metals in the Earth's crust.

**Figure 6**



Do not write outside the box

**3 (b) (i)** What is the percentage by mass of magnesium in the Earth's crust?

**[1 mark]**

_____ %

**3 (b) (ii)** On **Figure 6** draw the bars for:

- calcium at 3.6% by mass
- iron at 5.0% by mass.

**[2 marks]**

**3 (c)** An ore of zinc contains zinc carbonate.

The equation for the reaction when zinc carbonate is heated is:

$$\underset{\text{zinc carbonate}}{ZnCO_3} \longrightarrow \underset{\text{zinc oxide}}{ZnO} + \underset{\text{carbon dioxide}}{CO_2}$$

**3 (c) (i)** What is the name of this type of reaction?

**[1 mark]**

Tick (✓) **one** box.

corrosion ☐

decomposition ☐

electrolysis ☐

**3 (c) (ii)** Which substance in the equation is a gas at room temperature (20 °C)?

**[1 mark]**

Tick (✓) **one** box.

zinc carbonate ☐

zinc oxide ☐

carbon dioxide ☐

**Question 3 continues on the next page**

Do not write outside the box

**3 (c) (iii)** Complete **Table 1** to show the number of atoms of carbon and oxygen in the formula of zinc carbonate.

**[2 marks]**

**Table 1**

| **Element** | **Number of atoms in the formula $ZnCO_3$** |
|---|---|
| zinc, Zn | 1 |
| carbon, C | |
| oxygen, O | |

**3 (c) (iv)** When 125 g zinc carbonate is heated, 81 g zinc oxide is produced.

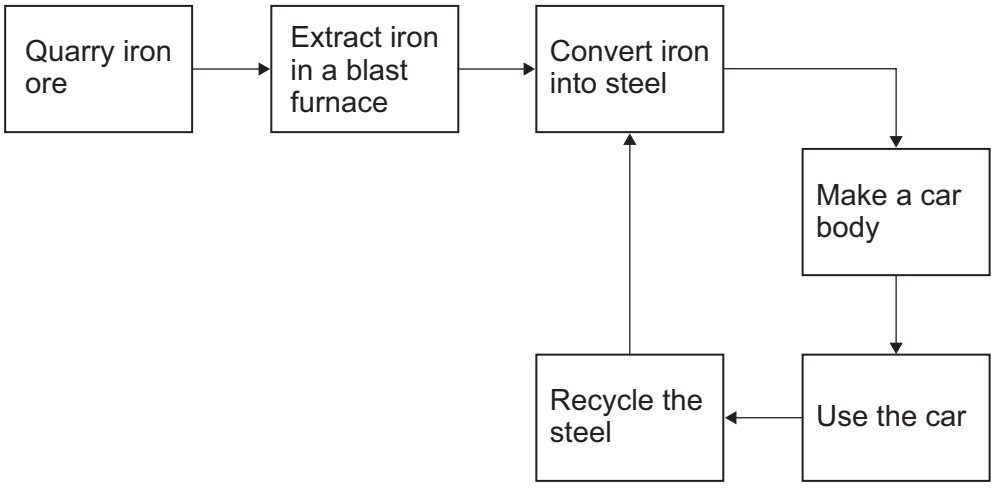
Calculate the mass of carbon dioxide produced.

**[1 mark]**

Mass of carbon dioxide = _____ g

**3 (d)** **Figure 7** shows a simple life cycle of a car body.

**Figure 7**



Do not write outside the box

**3 (d) (i)** What is **one** reason why iron from the blast furnace is converted into steel?

**[1 mark]**

Tick (✓) **one** box.

To make the iron pure. ☐

To make the iron more brittle. ☐

To make alloys for specific uses. ☐

**3 (d) (ii)** Apart from cost, give **three different** reasons why steel should be recycled.

**[3 marks]**

1 _____

_____

2 _____

_____

3 _____

_____

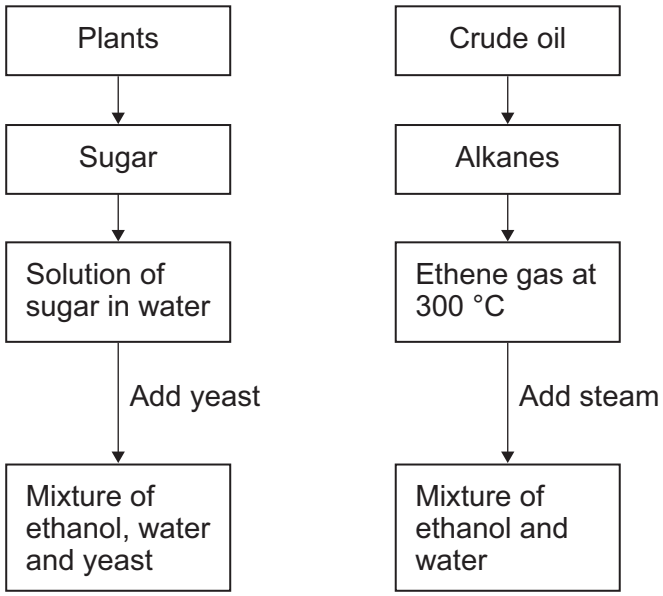
13

**Turn over for the next question**

Do not write outside the box

**4** **Figure 8** shows how ethanol is made from plants and from crude oil.

**Figure 8**




**4 (a) (i)** What is the name of the reaction to produce ethanol from sugar?

**[1 mark]**

Tick (✓) **one** box.

fermentation ☐

polymerisation ☐

reduction ☐

**4 (a) (ii)** What is the name of the reaction to produce ethanol from ethene?

**[1 mark]**

Tick (✓) **one** box.

bioleaching ☐

displacement ☐

hydration ☐

Do not write outside the box

**4 (a) (iii)** A lot of the ethanol produced is used as a fuel for cars.

What are **two** reasons why most of this ethanol is made from plants and **not** from crude oil?

**[2 marks]**

Tick (✓) **two** boxes.

Resources of crude oil are non-renewable. ☐

Ethanol from plants is more flammable. ☐

Producing ethanol from plants is not sustainable. ☐

Ethanol from plants has a different formula. ☐

Producing ethanol from plants uses less energy. ☐

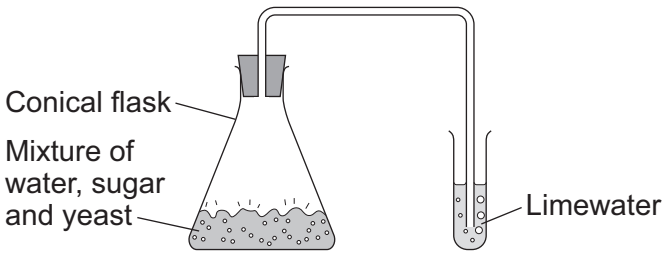
**Question 4 continues on the next page**

Do not write outside the box

**4 (b)** A student made ethanol from sugar.

**Figure 9** shows the apparatus used.

**Figure 9**




**4 (b) (i)** What change is seen in the limewater?

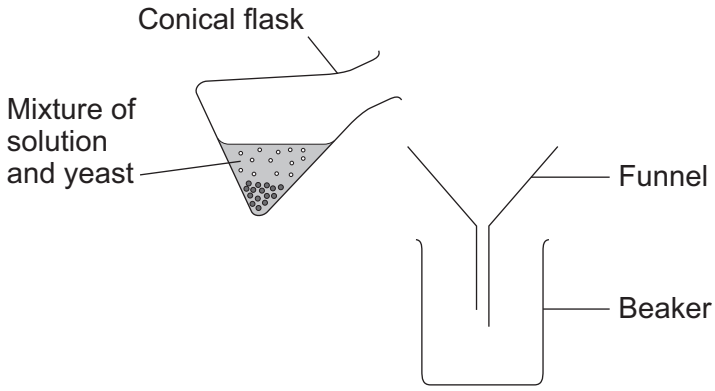
Give a reason for your answer.

**[2 marks]**

**4 (b) (ii)** The student wanted to separate the solid yeast from the solution.

**Figure 10** shows the apparatus used.

**Figure 10**




What is missing from the apparatus in **Figure 10**?

**[1 mark]**

Do not write outside the box

**4 (c)** Vegetable oils are made from plants.

**4 (c) (i)** Which statement is correct?

**[1 mark]**

Tick (✓) **one** box.

Vegetable oils have lower boiling points than water. ☐

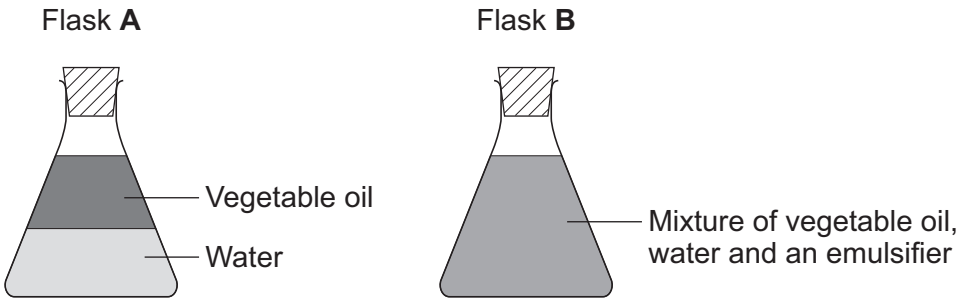
Vegetable oils cook foods at higher temperatures than boiling water. ☐

Cooking in vegetable oils decreases the energy content of the food. ☐

**4 (c) (ii)** A student puts different mixtures into two flasks, **A** and **B**. The student shakes the flasks.

**Figure 11** shows the two flasks after they have been shaken and left to stand for one minute.

**Figure 11**




Complete the sentences.

**[2 marks]**

The mixture in flask **A** separates because _____

_____

The mixture in flask **B** does not separate because _____

_____

10

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

Do not write outside the box

**5** This question is about hydrocarbons.

**5 (a)** Most of the hydrocarbons in crude oil are alkanes.

**5 (a) (i)** Large alkane molecules can be cracked to produce more useful molecules.

The equation shows the cracking of dodecane.

$$\underset{\text{dodecane}}{C_{12}H_{26}} \longrightarrow \underset{\text{butane}}{C_4H_{10}} + \underset{\text{hexene}}{C_6H_{12}} + \underset{\text{ethene}}{C_2H_4}$$

Give **two** conditions used to crack large alkane molecules.

**[2 marks]**

1 _____

2 _____

**5 (a) (ii)** The products hexene and ethene are alkenes.

Complete the sentence.

**[1 mark]**

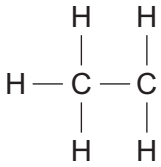
When alkenes react with bromine water the colour changes

from orange to _____ .

**5 (a) (iii)** Butane ($C_4H_{10}$) is an alkane.

Complete the displayed structure of butane.

**[1 mark]**



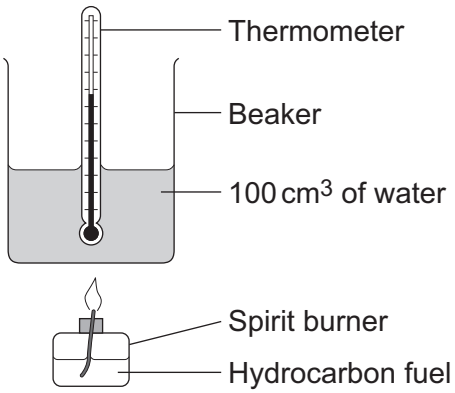
**Question 5 continues on the next page**

Do not write outside the box

**5 (b)** A group of students investigated the energy released by the combustion of four hydrocarbon fuels.

**Figure 12** shows the apparatus used.

**Figure 12**




Each hydrocarbon fuel was burned for two minutes.

**Table 2** shows the students' results.

**Table 2**

| | After two minutes | | | | |
|---|---|---|---|---|---|
| **Name and formula of hydrocarbon fuel** | **Mass of fuel used in g** | **Temperature increase of water in °C** | **Energy released by fuel in kJ** | **Energy released by 1.0 g of fuel in kJ** | **Relative amount of smoke in the flame** |
| Hexane, $C_6H_{14}$ | 0.81 | 40 | 16.80 | 20.74 | very little smoke |
| Octane, $C_8H_{18}$ | 1.10 | 54 | 22.68 | 20.62 | some smoke |
| Decane, $C_{10}H_{22}$ | 1.20 | 58 | 24.36 | | smoky |
| Dodecane, $C_{12}H_{26}$ | 1.41 | 67 | 28.14 | 19.96 | very smoky |

Do not write outside the box

**5 (b) (i)** Calculate the energy released by 1.0 g of decane in kJ.

**[2 marks]**

Energy released = _____ kJ

**5 (b) (ii)** Suggest **one** improvement to the apparatus, or the use of the apparatus, that would make the temperature increase of the water for each fuel more accurate.

Give a reason why this is an improvement.

**[2 marks]**

**5 (b) (iii)** The students noticed that the bottom of the beaker became covered in a black substance when burning these fuels.

Name this black substance.

Suggest why it is produced.

**[2 marks]**

**5 (b) (iv)** A student concluded that hexane is the best of the four fuels.

Give **two** reasons why the results in **Table 2** support this conclusion.

**[2 marks]**

1 _____

2 _____

**Question 5 continues on the next page**

Do not write outside the box

**5 (c)** **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Most car engines use petrol as a fuel.

- Petrol is produced from the fractional distillation of crude oil.
- Crude oil is a mixture of hydrocarbons.
- Sulfur is an impurity in crude oil.

Car engines could be developed to burn hydrogen as a fuel.

- Hydrogen is produced from natural gas.
- Natural gas is mainly methane.

**Table 3** shows information about petrol and hydrogen.

**Table 3**

| | **Petrol** | **Hydrogen** |
|---|---|---|
| State of fuel at room temperature | Liquid | Gas |
| Word equation for combustion of the fuel | petrol + oxygen ⟶ carbon dioxide + water | hydrogen + oxygen ⟶ water |
| Energy released from combustion of 1 g of the fuel | 47 kJ | 142 kJ |

Describe the **advantages** and **disadvantages** of using hydrogen instead of petrol in car engines.

Use the information given and your knowledge and understanding to answer this question.

**[6 marks]**

*Do not write outside the box*

Extra space

**18**

**END OF QUESTIONS**

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

**Copyright information**

For confidentiality purposes, from the November 2015 examination series, acknowledgements of third party copyright material will be published in a separate booklet rather than including them on the examination paper or support materials. This booklet is published after each examination series and is available for free download from www.aqa.org.uk after the live examination series.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team, AQA, Stag Hill House, Guildford, GU2 7XJ.

Copyright © 2016 AQA and its licensors. All rights reserved.

AQA

# GCSE

# Science A / Chemistry

CH1FP

Mark scheme

4405 / 4402

June 2016

Version 1.0: Final Mark Scheme

STEMUP.CO.UK

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from aqa.org.uk

Copyright © 2016 AQA and its licensors. All rights reserved.
AQA retains the copyright on all its publications. However, registered schools/colleges for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to schools/colleges to photocopy any material that is acknowledged to a third party even for internal use within the centre.

## Information to Examiners

### 1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded
- the Assessment Objectives and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

### 2. Emboldening

**2.1** In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

**2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.

**2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

**2.4** Any wording that is underlined is essential for the marking point to be awarded.

### 3. Marking points

#### 3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of errors / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)



STEMUP.CO.UK

| Student | Response | Marks awarded |
|---|---|---|
| 1 | green, 5 | 0 |
| 2 | red*, 5 | 1 |
| 3 | red*, 8 | 0 |

Example 2: Name two planets in the solar system. (2 marks)

| Student | Response | Marks awarded |
|---|---|---|
| 1 | Neptune, Mars, Moon | 1 |
| 2 | Neptune, Sun, Mars, Moon | 0 |

### 3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

### 3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

### 3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

### 3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

### 3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

### 3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.



STEMUP.CO.UK

### 3.8 Accept / allow

Accept is used to indicate an equivalent answer to that given on the left-hand side of the mark scheme. Allow is used to denote lower-level responses that just gain credit.

### 3.9 Ignore / Insufficient / Do not allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

## 4. Quality of Communication and levels marking

In Question **5(c)** students are required to produce extended written material in English, and will be assessed on the quality of their communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

**Level 1: basic**

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

**Level 2: clear**

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

**Level 3: detailed**

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.



STEMUP.CO.UK

**Question 1**

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **1(a)(i)** | 7 | | 1 | AO2 1.1.1g |
| **1(a)(ii)** | -1 | | 1 | AO1 1.1.1d |
| **1(a)(iii)** | neutrons | | 1 | AO1 1.1.1c |
| **1(b)** | number of protons | | 1 | AO1 1.1.1f |
| **1(c)** | atom **Y** | | 1 | AO2 1.1.1 h; 1.1.2a |
| **1(d)(i)** | Ne | allow neon | 1 | AO2 1.1.2a/b |
| **1(d)(ii)** | has a full outer shell<br>**or**<br>full outer energy level<br>**or**<br>has 8 electrons in its outer shell | allow in Group 0<br>allow a noble gas<br>allow the shells are full<br>ignore in Group 8 | 1 | AO2 1.1.2b; 1.1.3a |
| **Total** | | | **7** | |



STEMUP.CO.UK

**Question 2**

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **2(a)(i)** | the Earth's (surface) temperature was high **or** at/above 100 $^{o}$C | allow the Earth's (surface) temperature was too/very hot **or** water evaporated/ boiled **or** turned to steam/gas<br>allow because of heat from volcanoes<br>ignore the Earth's (surface) was covered by volcanoes<br>ignore water turned to water vapour | 1 | AO3 1.7.2b |
| **2(a)(ii)** | plates | allow plate | 1 | AO1 1.7.1d |
| **2(b)(i)** | air ——— mixture<br>carbon dioxide ——— compound<br>argon ——— element | allow only one line from each substance | 1<br>1<br>1 | AO1 1.1.1a; 1.1.3a; 1.7.2a |
| **2(b)(ii)** | oxygen | | 1 | AO1 1.4.3b |
| **2(b)(iii)** | about 80 % | | 1 | AO1 1.7.2a |
| **2(c)(i)** | 0.03(0) (%) | | 1 | AO2 1.7.2 c |
| **2(c)(ii)** | increased<br>slowly then rapidly | allow figures from graph to indicate increase | 1<br>1 | AO2 1.7.2i |
| **2(c)(iii)** | any **two** from:<br>• use of fossil fuels<br>• deforestation<br>• cars/transport<br>• industry/factories | ignore more people<br>allow less trees / plants | 2 | AO3 1.7.2i |
| **Total** | | | **12** | |



STEMUP.CO.UK

**Question 3**

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **3(a)** | because it is a good conductor of electricity. | | 1 | AO1 1.3.3b |
| **3(b)(i)** | 2.1 (%) | | 1 | AO2 1.3.1c |
| **3(b)(ii)** | correct bar for calcium at 3.6 %<br>correct bar for iron at 5.0 % | allow error of +/- 0.05%<br>allow error of +/- 0.05% | 1<br>1 | AO2 1.3.1c |
| **3(c)(i)** | decomposition | | 1 | AO1 1.1.3b; 1.2.1b/c |
| **3(c)(ii)** | carbon dioxide | | 1 | AO1 1.2.1c |
| **3(c)(iii)** | carbon = 1<br>oxygen = 3 | allow one<br>allow three | 1<br>1 | AO2 1.1.3 a |
| **3(c)(iv)** | 44 (g) | allow forty four | 1 | AO2 1.1.3 c |
| **3(d)(i)** | to make alloys for specific uses. | | 1 | AO1 1.3.2a/b/c |
| **3(d)(ii)** | any **three** from:<br>• to conserve resources of iron or iron ore<br>• to avoid the need for quarrying/mining<br>• to conserve energy resources or fossil fuels<br>• to limit the amount of carbon dioxide produced or to reduce global warming<br>• to reduce the amount of landfill | "it" = steel<br>ignore cost and reuse and time and waste<br>allow steel instead of iron or iron ore<br>allow limited resource or non-renewable | 3 | AO1 1.3.1j |
| **Total** | | | **13** | |



STEMUP.CO.UK

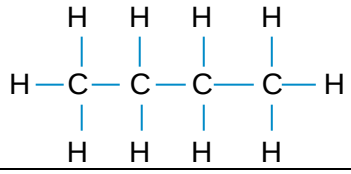
**Question 4**

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **4(a)(i)** | fermentation | | 1 | AO1 1.5.3b |
| **4(a)(ii)** | hydration | | 1 | AO1 1.5.3a |
| **4(a)(iii)** | resources of crude oil are non-renewable<br>producing ethanol from plants uses less energy | | 1<br>1 | AO3 1.4.3e; 1.5.3b |
| **4(b)(i)** | turns cloudy / milky / white<br>because carbon dioxide is produced | ignore bubbles<br>allow $CO_2$ produced | 1<br>1 | AO1 1.2.1e |
| **4(b)(ii)** | filter paper | | 1 | AO3 1.5.3b; 4.3 |
| **4(c)(i)** | vegetable oils cook foods at higher temperatures than boiling water | | 1 | AO1 1.6.1c |
| **4(c)(ii)** | (flask **A**) vegetable oil and water <u>do not mix</u> or are immiscible<br>**or** vegetable oil <u>does not dissolve</u> in water<br>(flask **B**) vegetable oil, water and an emulsifier form an emulsion **or** a suspension or a stable mixture | <br><br>allow correct description using hydrophilic and/or hydrophobic | 1<br><br>1 | AO2+AO3 1.6.2a |
| **Total** | | | **10** | |



STEMUP.CO.UK

**Question 5**

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **5(a)(i)** | high temperature<br><br>catalyst or steam | allow heating / hot / 250-900 °C<br><br>allow named catalyst eg zeolite, $Al_2O_3$, silica, ceramic<br>allow in the absence of air / oxygen<br><br>ignore any references to pressure | 1<br><br>1 | AO1<br>1.5.1a |
| **5(a)(ii)** | colourless | allow decolourised<br>ignore clear / discoloured | 1 | AO1<br>1.5.1d |
| **5(a)(iii)** |  | | 1 | AO2<br>1.4.2a |
| **5(b)(i)** | 20.3(0) (kJ) | if answer incorrect allow **1** mark for 24.36/1.2 | 2 | AO2<br>1.4.3b |
| **5(b)(ii)** | use a lid<br><br>reduce energy / heat loss | allow insulate beaker or use draught shield<br><br>ignore references to thermometer or repeats or distance of flame or loss of water vapour<br>allow stir (1) to distribute energy / heat (1)<br>allow use a metal can (1) as it's a better conductor (1) | 1<br><br>1 | AO3<br>4.3.2b/c/d |
| **5(b)(iii)** | carbon/soot<br>(produced by) incomplete combustion | ignore tar, smoke<br>allow from a limited supply of oxygen/air | 1<br>1 | AO1+AO2<br>1.4.3a/b |
| **5(b)(iv)** | hexane gives out the greatest energy (per 1.0 g)<br>hexane produces the least smoke / carbon / soot | ignore more energy<br><br>allow has the cleanest flame<br>ignore less smoke / carbon / soot | 1<br><br>1 | AO3<br>1.4.2c;<br>1.4.3a/b |



STEMUP.CO.UK

**QWC Mark Scheme**

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **5(c)** | | | 6 | AO1+AO2+ AO3 1.1.3b; 1.4.1b/c; 1.4.3a/b/c/d ;1.7.2h/i |

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5 and apply a 'best-fit' approach to the marking.

| 0 marks | Level 1 (1–2 marks) | Level 2 (3–4 marks) | Level 3 (5–6 marks) |
|---|---|---|---|
| No relevant content | Statements made from the information that indicate whether at least one statement is an advantage **or** a disadvantage<br>**or** a linked advantage or disadvantage | Descriptions of an advantage **and** a disadvantage with some use of their knowledge to add value. | Descriptions of advantages **and** disadvantages that are linked to their own knowledge. |

**Examples of the added value statements and links made in the response could include:**
**Note that link words are in bold; links can be either way round.**
**Accept reverse arguments and ignore cost throughout.**

**Advantages of using hydrogen:**

- Combustion only produces water **so** causes no pollution
- Combustion does not produce carbon dioxide **so** this does not contribute to global warming or climate change
- Combustion does not produce sulfur dioxide **so** this does not contribute to acid rain
- Incomplete combustion of petrol produces carbon monoxide **that is** toxic
- Incomplete combustion of petrol produces particulates **that** contribute to global dimming
- Petrol comes from a non-renewable resource **but** there are renewable/other methods of producing hydrogen
- Hydrogen releases more energy **so** less fuel needed or more efficient

**Disadvantages of using hydrogen:**

- Hydrogen is a gas **so** is difficult to store or transfer to vehicles
- Hydrogen gas is very flammable **so** leaks cause a greater risk of explosion
- Most hydrogen is produced from fossil fuels **which** are running out
- Cannot be used in existing car engines **so** modification / development or replacement is needed
- Lack of filling stations **so** difficult to refuel your vehicle

| Total | | | 18 |
|---|---|---|---|



STEMUP.CO.UK

| Centre Number | | | | | | Candidate Number | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Surname | | | | | | | | | | |
| Other Names | | | | | | | | | | |
| Candidate Signature | | | | | | | | | | |

| For Examiner's Use | |
|---|---|
| Examiner's Initials | |
| Question | Mark |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| TOTAL | |

General Certificate of Secondary Education
Foundation Tier
June 2015

# Science A
**Unit Chemistry C1**

**CH1FP**

**F**

# Chemistry
**Unit Chemistry C1**

Tuesday 9 June 2015 1.30 pm to 2.30 pm

**For this paper you must have:**
- a ruler
- the Chemistry Data Sheet (enclosed).

You may use a calculator.

A

## Time allowed
- 1 hour

## Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

## Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 6(b) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

## Advice
- In all calculations, show clearly how you work out your answer.



STEMUP.CO.UK

Do not write outside the box

Answer **all** questions in the spaces provided.

**1** This question is about metals.

**1 (a)** Which unreactive metal is found in the Earth as the metal itself?

**[1 mark]**

Tick (✓) **one** box.

aluminium ☐

gold ☐

magnesium ☐

**1 (b)** Complete the sentence.

**[1 mark]**

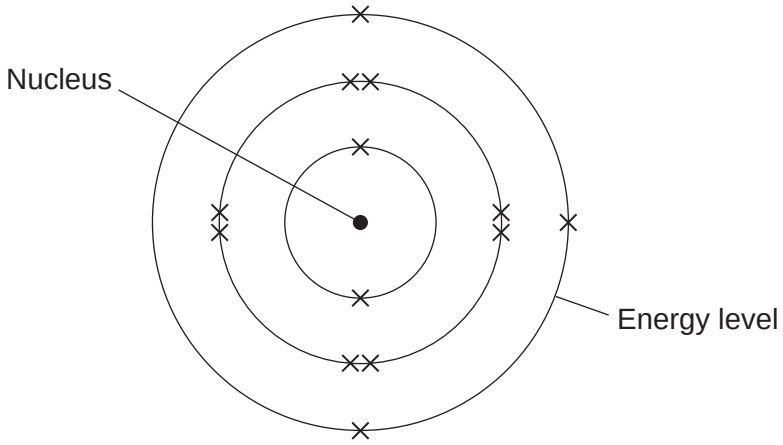
Aluminium is an element because aluminium is made of

only one type of ..... .

Do not write outside the box

**1 (c)** **Figure 1** shows the electronic structure of an aluminium atom.

**Figure 1**




**1 (c) (i)** Use the correct words from the box to complete the sentence.

**[2 marks]**

| | | | | |
|---|---|---|---|---|
| **electrons** | **ions** | **protons** | **neutrons** | **shells** |

The nucleus of an aluminium atom contains ..... and ..... .

**1 (c) (ii)** Complete the sentence.

**[1 mark]**

In the periodic table, aluminium is in Group ..... .

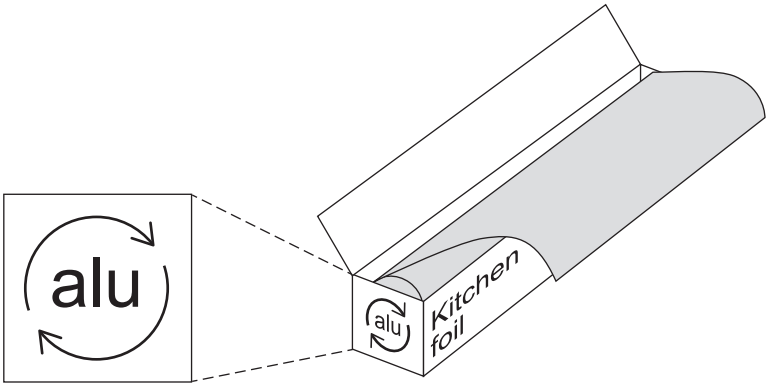
**Question 1 continues on the next page**

Do not write outside the box

**1 (d)** Aluminium is used for kitchen foil.

**Figure 2** shows a symbol on a box of kitchen foil.

**Figure 2**




The symbol means that aluminium can be recycled. It does not show the correct chemical symbol for aluminium.

**1 (d) (i)** What is the correct chemical symbol for aluminium? ..... .

**[1 mark]**

**1 (d) (ii)** Give **two** reasons why aluminium should be recycled.

**[2 marks]**

.....

.....

.....

.....

**1 (e)** Aluminium has a low density, conducts electricity and is resistant to corrosion.

Which **one** of these properties makes aluminium suitable to use as kitchen foil? Give a reason for your answer.

**[2 marks]**

.....

.....

.....

.....

10

*Do not write outside the box*

**Turn over for the next question**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

Do not write outside the box

**2** Copper is a transition metal.

**2 (a) (i)** Where is copper in the periodic table?

**[1 mark]**

Tick (✓) **one** box.

in the central block ☐

in Group 1 ☐

in the noble gas group ☐

**2 (a) (ii)** What is a property of copper?

**[1 mark]**

Tick (✓) **one** box.

breaks easily ☐

conducts electricity ☐

does not conduct heat ☐

Do not write outside the box

**2 (b)** Copper ores are quarried by digging large holes in the ground, as shown in **Figure 3**.

**Figure 3**



Give **two** reasons why quarrying is bad for the environment.

**[2 marks]**

.....

.....

.....

.....

**Question 2 continues on the next page**

*Do not write outside the box*

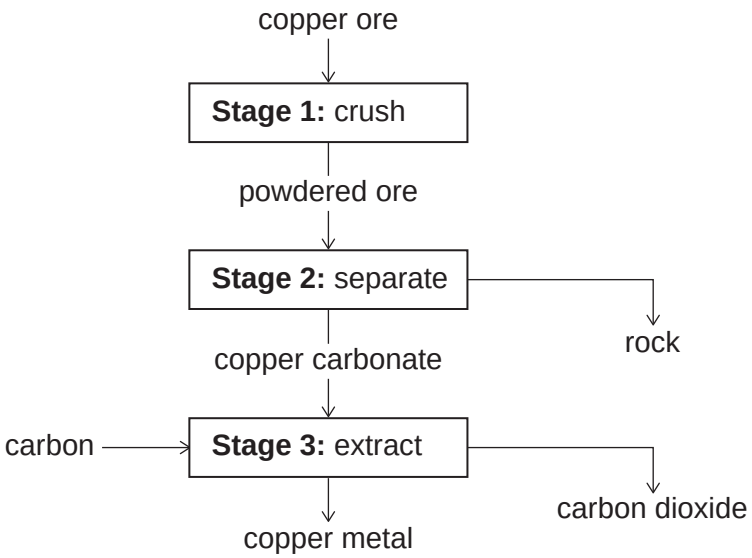
**2 (c)** Some copper ores contain only 2% copper.

Most of the ore is rock that is not needed.

In one ore, the main compound is copper carbonate ($CuCO_3$).

**Figure 4** shows the stages used in the extraction of copper from this ore.

**Figure 4**




**2 (c) (i)** Why is **Stage 2** important?

**[1 mark]**

.....

.....

Do not write outside the box

**2 (c) (ii)** The equation for the reaction in **Stage 3** is:

$$2\,CuCO_3 + C \longrightarrow 2\,Cu + 3\,CO_2$$

From the symbol equation a company calculated that 247 tonnes of copper carbonate are needed to produce 127 tonnes of copper and 132 tonnes of carbon dioxide are released.

Calculate the mass of carbon needed to make 127 tonnes of copper.

**[2 marks]**

| copper carbonate | + | carbon | ⟶ | copper | + | carbon dioxide |
|---|---|---|---|---|---|---|
| 247 tonnes | | ..... tonnes | | 127 tonnes | | 132 tonnes |

.....

.....

**2 (c) (iii)** Suggest **one** reason why it is important for the company to calculate the mass of reactants in **Stage 3**.

**[1 mark]**

.....

.....

8

**Turn over for the next question**

Do not write outside the box

**3** Crude oil is a fossil fuel.

**3 (a)** To make crude oil more useful it is separated into fractions.

Use the correct word from the box to complete each sentence.

| | | | |
|---|---|---|---|
| **boiling** | **compound** | **decomposition** | **distillation** |
| **filtration** | **mixture** | **molecule** | |

**3 (a) (i)** Crude oil is a ..... of different substances.

**[1 mark]**

**3 (a) (ii)** The substances in crude oil have different ..... points.

**[1 mark]**

**3 (a) (iii)** Crude oil is separated by fractional ..... .

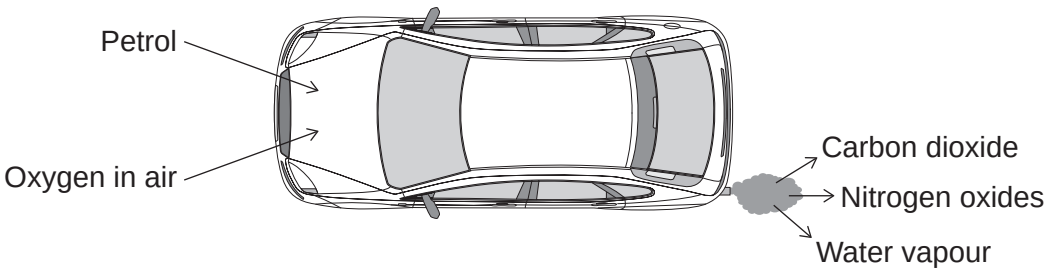
**[1 mark]**

**3 (b)** Petrol is one of the fractions produced from crude oil.

Car engines use a mixture of petrol and air.

**Figure 5** shows some of the gases produced.

**Figure 5**



Do not write outside the box

**3 (b) (i)** What type of reaction happens to petrol in a car engine?

**[1 mark]**

Tick (✓) **one** box.

combustion ☐

decomposition ☐

neutralisation ☐

**3 (b) (ii)** Petrol contains octane ($C_8H_{18}$).

Complete the word equation for the reaction of octane with oxygen.

**[2 marks]**

octane + ..... ⟶ ..... + .....

**3 (b) (iii)** Cars use sulfur-free petrol as a fuel.

Describe why sulfur should be removed from petrol.

**[2 marks]**

.....

.....

.....

.....

**Question 3 continues on the next page**

Do not write outside the box

**3 (c)** Some fractions from crude oil contain large hydrocarbon molecules.

These molecules can be cracked to produce smaller, more useful molecules.

An equation for cracking decane is:

$$\underset{\text{decane}}{C_{10}H_{22}} \longrightarrow \underset{\text{propane}}{C_3H_8} + \underset{\text{ethene}}{C_2H_4} + \underset{\text{pentene}}{C_5H_{10}}$$

**3 (c) (i)** Why is propane useful?

**[1 mark]**

Tick (✓) **one** box.

Propane is a polymer. ☐

Propane is an alloy. ☐

Propane is a fuel. ☐

**3 (c) (ii)** Draw bonds to complete the displayed structure of ethene.

**[1 mark]**



Do not write outside the box

**3 (c) (iii)** What is the colour change when bromine water reacts with ethene?

**[1 mark]**

Tick (✓) **one** box.

Orange to colourless ☐

Orange to green ☐

Orange to red ☐

**3 (c) (iv)** Complete the sentence.

**[1 mark]**

Pentene is useful because many pentene molecules can join together to form ..... .

12

**Turn over for the next question**

*Do not write outside the box*

**4** Polymers and fuels can be produced from crude oil and from plants.

**4 (a)** There are many types of polymer. Each polymer has different properties.

**4 (a) (i)** Poly(chloroethene) is a polymer produced from crude oil.

Why is poly(chloroethene) used for water pipes?

**[2 marks]**

Tick (✓) **two** boxes.

The polymer is not biodegradable. ☐

The polymer is made from crude oil. ☐

The polymer decomposes when heated. ☐

The polymer is waterproof. ☐

The polymer does not conduct electricity. ☐

**4 (a) (ii)** Some shopping bags are made from a biopolymer.

Biopolymers are produced from plants.

Suggest **one** advantage of using a biopolymer.

**[1 mark]**

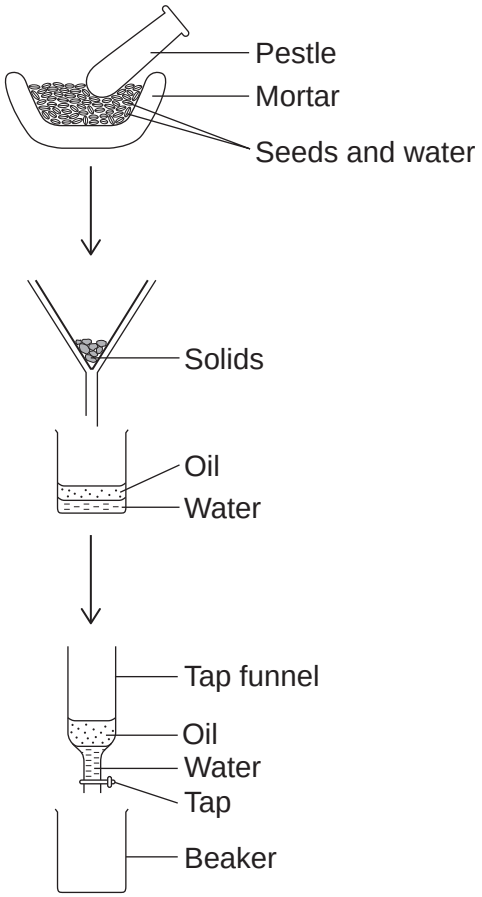
.....

.....

Do not write outside the box

**4 (b)** Some plants have seeds that contain vegetable oils.
The flow diagram in **Figure 6** shows how the oil can be extracted.

**Figure 6**




**4 (b) (i)** Use the correct word from the box to complete each sentence.

**[2 marks]**

| | | | |
|---|---|---|---|
| **burning** | **crushing** | **distilling** | **filtering** |

Oil is released from the seeds by..... .

Solids are removed from the oil and water by ..... .

**4 (b) (ii)** Describe how the tap funnel can be used to separate the oil from the water.

**[2 marks]**

.....

.....

.....

.....

**Turn over ▶**

Do not write outside the box

**4 (c)** Vegetable oils are used as foods and fuels.

**4 (c) (i)** Why are vegetable oils important foods and fuels?

**[1 mark]**

Tick (✓) **one** box.

They are used as emulsifiers. ☐

They have high boiling points. ☐

They provide a lot of energy. ☐

**4 (c) (ii)** Burning fossil fuels made from crude oil increases the overall percentage of carbon dioxide in the atmosphere.

Burning biofuels made from vegetable oil does **not** increase the overall percentage of carbon dioxide in the atmosphere.

Explain why.

**[2 marks]**

.....

.....

.....

.....

10

Do not write outside the box

**5** Limestone is used to make many different materials.

**5 (a)** Heating limestone produces calcium oxide and carbon dioxide.

Complete the sentences.

**5 (a) (i)** The main compound in limestone is calcium ..... .

**[1 mark]**

**5 (a) (ii)** The reaction to produce calcium oxide from limestone is thermal ..... .

**[1 mark]**

**5 (a) (iii)** Calcium hydroxide is produced when calcium oxide reacts with ..... .

**[1 mark]**

**5 (a) (iv)** Calcium hydroxide is used to neutralise acids because it is an ..... .

**[1 mark]**

**Question 5 continues on the next page**

Do not write outside the box

**5 (b)** Cement is made from limestone and clay.

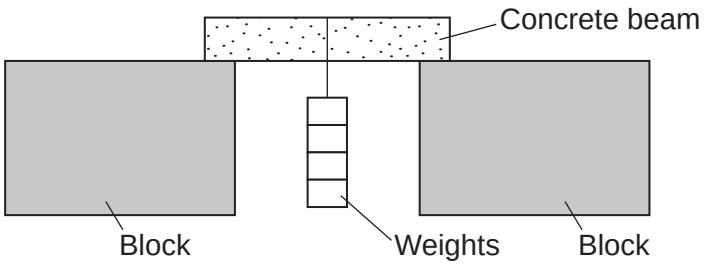
Concrete is made by mixing cement with water, sand and aggregate (small pieces of rock).

A group of students did an investigation on the amount of aggregate needed to make the strongest concrete beam.

The students used this method:

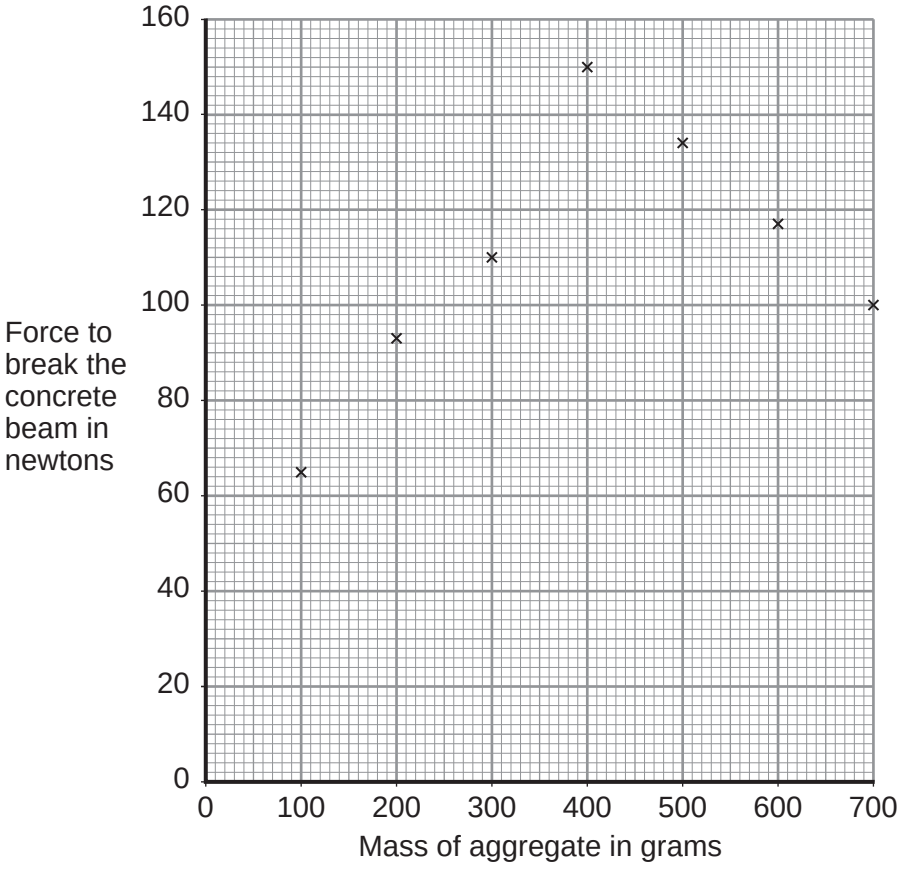
- use the same mass of cement and the same mass of sand but change the mass of aggregate to make seven different concrete mixtures
- use the different concrete mixtures to make beams of the same size
- add weights, as shown in **Figure 7**, until the concrete beam breaks.

**Figure 7**




The students' results are plotted on the graph in **Figure 8**.

**Figure 8**



Do not write outside the box

**5 (b) (i)** One of the points is anomalous.

Complete the graph in **Figure 8** by drawing **two** straight lines of best fit.

**[2 marks]**

**5 (b) (ii)** Describe **one** way the students could improve the method so that their results are more accurate for each graph point.

**[2 marks]**

.....

.....

.....

.....

**5 (b) (iii)** What force is needed to break a concrete beam containing no aggregate?

Show your working on the graph.

**[2 marks]**

Force = ..... newtons

**5 (b) (iv)** One of the students concluded that:

'The force needed to break a concrete beam increases as the mass of aggregate increases.'

The student's conclusion is **not completely** correct. Use values from the graph to explain why.

**[3 marks]**

.....

.....

.....

.....

.....

.....

13

Do not write outside the box

**6** This question is about life, the Earth and its atmosphere.

**6 (a)** There are many theories about how life was formed on Earth.

Suggest **one** reason why there are many theories.

**[1 mark]**

.....

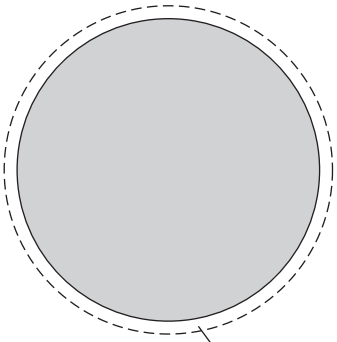
.....

**6 (b)** **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

This Earth and its atmosphere today are not like the early Earth and its atmosphere.

**The early Earth**

Most of the surface was covered by volcanoes



Most of the atmosphere was carbon dioxide and water vapour

**The Earth today**

Most of the surface is covered by oceans



Most of the atmosphere is nitrogen and oxygen

Describe and explain how the surface of the early Earth and its atmosphere have changed to form the surface of the Earth and its atmosphere today.

**[6 marks]**

.....

.....

.....

.....

.....

.....

*Do not write outside the box*

.....

.....

.....

.....

.....

.....

Extra space .....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

7

**END OF QUESTIONS**

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

Do not write outside the box

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

Acknowledgement of copyright-holders and publishers

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements in future papers if notified.

Question 2: Figure 3 Photograph © Thinkstock

Copyright © 2015 AQA and its licensors. All rights reserved.

GCSE

# Science A / Chemistry

CH1FP

Mark scheme

4405 / 4402

June 2015

Version/Stage: 1.0 Final

STEMUP.CO.UK

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available from aqa.org.uk

Copyright © 2015 AQA and its licensors. All rights reserved.
AQA retains the copyright on all its publications. However, registered schools/colleges for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to schools/colleges to photocopy any material that is acknowledged to a third party even for internal use within the centre.

## Information to Examiners

### 1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded
- the Assessment Objectives and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

### 2. Emboldening and underlining

**2.1** In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

**2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.

**2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

**2.4** Any wording that is underlined is essential for the marking point to be awarded.

### 3. Marking points

#### 3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

| Student | Response | Marks awarded |
|---|---|---|
| 1 | green, 5 | 0 |
| 2 | red*, 5 | 1 |
| 3 | red*, 8 | 0 |

Example 2: Name two planets in the solar system. (2 marks)

| Student | Response | Marks awarded |
|---|---|---|
| 1 | Neptune, Mars, Moon | 1 |
| 2 | Neptune, Sun, Mars, Moon | 0 |

### 3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

### 3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

### 3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

### 3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

### 3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

### 3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

### 3.8 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient are used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

**Quality of Written Communication and levels marking**

In Question 6(b) students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

**Level 1: basic**

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

**Level 2: clear**

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

**Level 3: detailed**

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **1(a)** | gold | | 1 | 1 / 1.3.1c |
| **1(b)** | atom (s) | | 1 | 1 / 1.1.1a |
| **1(c)(i)** | protons<br>neutrons | any order<br>allow proton<br>allow neutron | 1<br>1 | 1 / 1.1.1c/h |
| **1(c)(ii)** | 3 / three | | 1 | 2 / 1.1.1e/g / 1.1.2a |
| **1(d)(i)** | Al | ignore any numbers / charges | 1 | 2 / 1.1.1b |
| **1(d)(ii)** | any **two** from:<br>• limited resource<br>• expensive in terms of energy / mining<br>• effects on the environment, such as, landfill, atmospheric pollution, quarrying | allow uses a lot of energy to extract | 2 | 1 / 1.3.1e/i/j |
| **1(e)** | resistant to corrosion<br>does not react (with water or food) | allow **one** mark for low density with a suitable reason given | 1<br>1 | 2+3 / 1.3.3c |
| **Total** | | | **10** | |



STEMUP.CO.UK

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **2(a)(i)** | central block | | 1 | 1 / 1.3.3a |
| **2(a)(ii)** | conducts electricity | | 1 | 1 / 1.3.3a |
| **2(b)** | any **two** from:<br>• visual pollution<br>• noise pollution<br>• dust pollution<br>• habitat destruction | | 2 | 2 / 1.3.1b |
| **2(c)(i)** | to concentrate the ore/copper carbonate<br>**or**<br>to remove / separate the rock | | 1 | 2 / 1.3.1b |
| **2(c)(ii)** | 12 (tonnes) | If answer is incorrect allow one mark for (127 + 132) – 247 or<br>259 - 247 | 2 | 2 / 1.1.3c |
| **2(c)(iii)** | any **one** from:<br>• so no reactant is wasted/left unreacted<br>• so they know how much product they will make<br>• need to record/compensate for the carbon dioxide produced | allow so they can work out their carbon footprint | 1 | 3 / 1.1.3c |
| **Total** | | | **8** | |



STEMUP.CO.UK

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **3(a)(i)** | mixture (of different substances) | | 1 | 1 / 1.4.1a |
| **3(a)(ii)** | boiling (points) | | 1 | 1 / 1.4.2c |
| **3(a)(iii)** | distillation | | 1 | 1 / 1.4.1b |
| **3(b)(i)** | combustion | | 1 | 1 / 1.4.3b |
| **3(b)(ii)** | (reactant)<br>oxygen<br><br>(products)<br>carbon dioxide<br>**and**<br>water | allow correct formulae<br><br><br><br>products in any order<br>allow carbon or carbon monoxide<br><br>allow water vapour or steam or hydrogen oxide | <br>1<br><br><br>1 | 2 / 1.4.3b |
| **3(b)(iii)** | (burning sulfur) produces sulfur dioxide / $SO_2$<br><br>causes acid rain | allow it/sulfur reacts with oxygen<br>ignore sulfur oxide | 1<br><br>1 | 1+2 / 1.4.3c/d |
| **3(c)(i)** | propane is a fuel | | 1 | 2 / 1.5.1e |
| **3(c)(ii)** | double bond drawn between carbon atoms | do not allow any other bonds or symbols | 1 | 1 / 1.5.1c |
| **3(c)(iii)** | orange to colourless | | 1 | 1 / 1.5.1d |
| **3(c)(iv)** | poly(pentene) | allow polymer(s) | 1 | 1 / 1.5.1d |
| **Total** | | | **12** | |



STEMUP.CO.UK

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **4(a)(i)** | the polymer is not biodegradable<br>the polymer is waterproof | | 1<br>1 | 2 / 1.5.2b/c |
| **4(a)(ii)** | any **one** from:<br>• made from a renewable/sustainable resource<br>• is biodegradable | ignore releases less carbon dioxide<br>allow decomposes | 1 | 3 / 1.5.2c/d |
| **4(b)(i)** | crushing<br>filtering | in the correct order | 1<br>1 | 1 / 1.6.1a |
| **4(b)(ii)** | open the tap<br>to allow only water to flow out<br>**or**<br>close the tap to leave the oil in the funnel | allow close tap then allow oil to flow out into a separate container | 1<br>1 | 2 / 1.6.1a |
| **4(c)(i)** | They provide a lot of energy | | 1 | 1 / 1.6.1b |
| **4(c)(ii)** | because the vegetable/plant absorbs / uses carbon dioxide<br>which is released when the biofuel burns | second marking point is dependent on first marking point<br>allow a fossil fuel releases locked up carbon dioxide/carbon<br>if no other mark awarded allow carbon neutral for **one** mark | 1<br>1 | 1 / 1.5.2a |
| **Total** | | | **10** | |



STEMUP.CO.UK

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **5(a)(i)** | (calcium) carbonate | ignore $CaCO_3$ | 1 | 1 / 1.2.1a |
| **5(a)(ii)** | (thermal) decomposition | | 1 | 1 / 1.2.1b |
| **5(a)(iii)** | water | allow $H_2O$<br>allow hydrogen oxide | 1 | 1 / 1.2.1d |
| **5(a)(iv)** | alkali | allow base | 1 | 1 / 1.2.1d |
| **5(b)(i)** | straight line through the first, second and fourth points<br>straight line through the last four points | <br>allow a straight line through the last three points if the first straight line extrapolates below point four | 1<br>1 | 2+3 / 1.2.1g |
| **5(b)(ii)** | repeat the experiment (at each mass of aggregate)<br>(use the results to) calculate a mean / average value (for each mass of aggregate) | do not allow repeat at other masses | 1<br>1 | 3 / 1.2.1g |



STEMUP.CO.UK

| Question | Answers | Extra information | Mark | AO / Spec. Ref. |
|---|---|---|---|---|
| **5(b)(iii)** | line drawn to y axis showing extrapolation | | 1 | 2+3 / 1.2.1g |
| | correct value read from graph | allow +/- one small square<br>do not allow 0<br>award 1 mark for a value of<br>34-40 if no extrapolation shown | 1 | |
| **5(b)(iv)** | at first, the force needed to break a concrete beam increases | allow values<br>allow at first the statement is correct | 1 | 3 / 1.2.1g |
| | but the force needed to break a concrete beam then decreases | allow values | 1 | |
| | mention of 400 g as the point at which the force needed changes or value from graph | allow 400g if there is no intercept on graph | 1 | |
| **Total** | | | **13** | |



STEMUP.CO.UK

| Question | Answers | Extra information | Mark | AO / Spec. Ref. | |
|---|---|---|---|---|---|
| **6(a)** | any **one** from:<br>• not enough evidence or proof<br>• (life and the Earth were created) billions of years ago | allow no evidence or no proof<br>allow a long time ago<br>ignore different beliefs or no one was there | 1 | 2 / 1.7.2d | |

**6(b)** Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a 'best-fit' approach to the marking.

1+2+3 / 1.7.1a/b/c / 1.7.2a/b/c/f/g/h

| 0 marks | Level 1 (1–2 marks) | Level 2 (3–4 marks) | Level 3 (5–6 marks) |
|---|---|---|---|
| No relevant content | Statements based on diagrams | Description of how one change occurred | Descriptions of how at least two changes occurred |

**Examples of chemistry points made in the response could include:**

**Main changes**

- oxygen increased because plants / algae developed and used carbon dioxide for photosynthesis / growth producing oxygen; carbon dioxide decreased because of this
- carbon dioxide decreased because oceans formed and dissolved / absorbed carbon dioxide; carbon dioxide became locked up in sedimentary / carbonate rocks and / or fossil fuels
- oceans formed because the Earth / water vapour cooled and water vapour in the atmosphere condensed
- continents formed because the Earth cooled forming a supercontinent / Pangaea which formed the separate continents
- volcanoes reduced because the Earth cooled forming a crust

**Other changes**

- nitrogen has formed because ammonia in the Earth's early atmosphere reacted with oxygen / denitrifying bacteria

| Total | | | 7 |
|---|---|---|---|



STEMUP.CO.UK

| Centre Number | | | | | | Candidate Number | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Surname | | | | | | | | | | |
| Other Names | | | | | | | | | | |
| Candidate Signature | | | | | | | | | | |

| For Examiner's Use | |
|---|---|
| Examiner's Initials | |
| Question | Mark |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| TOTAL | |

AQA

General Certificate of Secondary Education
Foundation Tier
June 2014

# Science A
**Unit Chemistry C1**

**CH1FP**

**F**

# Chemistry
**Unit Chemistry C1**

Tuesday 10 June 2014 1.30 pm to 2.30 pm

**For this paper you must have:**
- a ruler
- the Chemistry Data Sheet (enclosed).

You may use a calculator.

A

## Time allowed
- 1 hour

## Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

## Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 7(b) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

## Advice
- In all calculations, show clearly how you work out your answer.



STEMUP.CO.UK

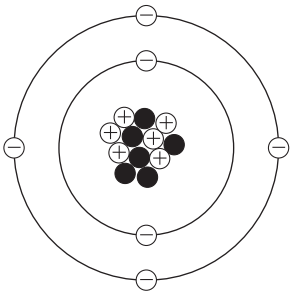
Do not write outside the box

Answer **all** questions in the spaces provided.

**1** Fossil fuels contain carbon.

**1 (a)** **Figure 1** represents a carbon atom.

**Figure 1**



Draw a ring around the correct answer to complete each sentence.

**1 (a) (i)** The name of the particle with a positive charge is

an electron.

a neutron.

a proton.

**[1 mark]**

**1 (a) (ii)** The centre of the atom is called the

energy level.

molecule.

nucleus.

**[1 mark]**

**1 (a) (iii)** Use the Chemistry Data Sheet to help you to answer this question.

Use the correct number from the box to complete each sentence.

**[2 marks]**

| 4 | 6 | 8 | 10 | 12 |
|---|---|---|---|---|

The mass number of this carbon atom is ☐

In the periodic table, carbon is in Group ☐

Do not write outside the box

**1 (b)** Coal is a fossil fuel.

A piece of coal contains:

- 80% carbon
- 9% oxygen
- 1% sulfur
- 5% hydrogen.

The rest of the coal is other elements.

**1 (b) (i)** What is the percentage of other elements in this piece of coal?

**[1 mark]**

..... %

**1 (b) (ii)** Coal burns in air to produce carbon dioxide, sulfur dioxide and water.

Draw **one** line from each product to the type of pollution caused by each product.

**[3 marks]**

| Product | Type of pollution |
|---|---|
| Carbon dioxide | Acid rain |
| Sulfur dioxide | Global dimming |
| Water | Global warming |
| | No pollution |

8

Do not write outside the box

**2** Some theories suggest that the Earth's early atmosphere was the same as Mars' atmosphere today.

**Table 1** shows the percentage of four gases in the atmosphere of Mars today and the atmosphere of Earth today.

**Table 1**

| Gases | The atmosphere of | |
|---|---|---|
| | **Mars today** | **Earth today** |
| Carbon dioxide | 95.00% | 0.04% |
| Nitrogen | 3.50% | 78.00% |
| Argon | 1.00% | 0.96% |
| Oxygen | 0.50% | 21.00% |

**2 (a)** Which **one** of the gases in **Table 1** is a noble gas?

**[1 mark]**

.....

**2 (b)** Draw a ring around the correct answer to complete each sentence.

**2 (b) (i)** Noble gases are in Group

0

1

7

**[1 mark]**

**2 (b) (ii)** Noble gases are

slightly reactive.

unreactive.

very reactive.

**[1 mark]**

Do not write outside the box

**2 (c)** The percentage of carbon dioxide in the Earth's early atmosphere was 95.00%.
It is 0.04% in the Earth's atmosphere today.

**2 (c) (i)** Calculate the decrease in the percentage of carbon dioxide in the Earth's atmosphere.
**[1 mark]**

.....

.....

Decrease in percentage = .....%

**2 (c) (ii)** Give **two** reasons for this decrease.
**[2 marks]**

.....

.....

.....

.....

6

**Turn over for the next question**

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

Do not write outside the box

**3** Limestone is used for statues and buildings.

Limestone contains calcium carbonate ($CaCO_3$).

**3 (a)** **Figure 2** shows a limestone quarry.

**Figure 2**



**3 (a) (i)** Suggest **one** problem quarrying limestone will cause for people living nearby.

**[1 mark]**

.....

.....

**3 (a) (ii)** Suggest **one** benefit of quarrying limestone for people living nearby.

**[1 mark]**

.....

.....

**3 (a) (iii)** Why are limestone statues and buildings damaged by rain?

**[1 mark]**

.....

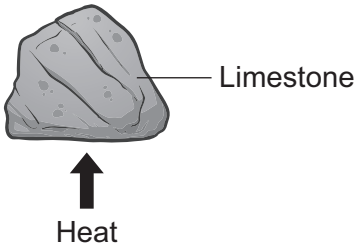
.....

**Question 3 continues on the next page**

Do not write outside the box

**3 (b)** A student investigated what happens when limestone is heated, as shown in **Figure 3**.

**Figure 3**




This is the method the student used:

- measure the mass of limestone before heating
- measure the mass of solid product after heating
- repeat the experiment two more times.

The student's results are shown in **Table 2**.

**Table 2**

| | **Experiment 1** | **Experiment 2** | **Experiment 3** |
|---|---|---|---|
| Mass of limestone before heating in g | 5.0 | 5.0 | 5.0 |
| Mass of solid product after heating in g | 3.6 | 3.4 | 3.8 |
| Mass lost in g | 1.4 | 1.6 | |

**3 (b) (i)** Calculate the mass lost in experiment **3**.

**[1 mark]**

.....

.....

Mass lost = ..... g

**3 (b) (ii)** Calculate the mean mass lost in the three experiments.

**[1 mark]**

.....

.....

Mean mass lost = ..... g

Do not write outside the box

**3 (b) (iii)** Suggest **one** reason why the mass lost was **not** the same for the three experiments.

**[1 mark]**

.....

.....

**3 (c)** The word equation for the reaction when calcium carbonate is heated is:

calcium carbonate ⟶ calcium oxide + carbon dioxide

**3 (c) (i)** Complete the sentence.

**[1 mark]**

The reaction when calcium carbonate is heated is called

thermal ..... .

**3 (c) (ii)** Heating 5.0 g of calcium carbonate produces 2.8 g of calcium oxide.

Calculate the mass of carbon dioxide produced.

**[1 mark]**

.....

.....

Mass of carbon dioxide = ..... g

**3 (c) (iii)** Describe how to test a gas to show that it is carbon dioxide.

**[2 marks]**

Test .....

.....

Result .....

.....

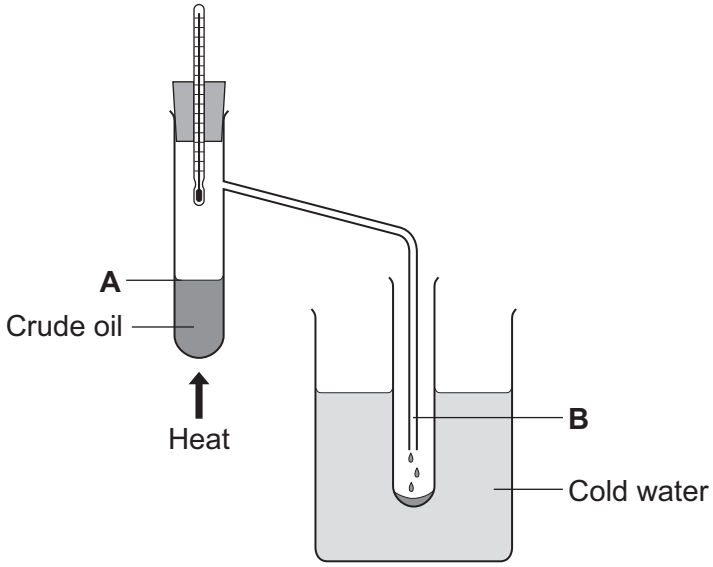
10

Do not write outside the box

**4** Crude oil is a mixture of a very large number of compounds.

**Figure 4** shows a laboratory experiment to separate crude oil.

**Figure 4**




**4 (a)** Complete the sentence.

**[1 mark]**

The name for compounds that contain only hydrogen and

carbon is ..... .

**4 (b)** Use the correct word from the box to complete each sentence.

| | | |
|---|---|---|
| **condensation** | **decomposition** | **distillation** |
| **evaporation** | **reduction** | |

**4 (b) (i)** The process of separating crude oil is fractional ..... .

**[1 mark]**

**4 (b) (ii)** The process taking place at **A** is ..... .

**[1 mark]**

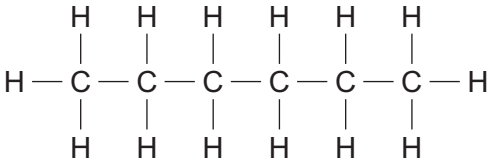
**4 (b) (iii)** The process taking place at **B** is ..... .

**[1 mark]**

Do not write outside the box

**4 (c)** One of the compounds in crude oil is hexane. The displayed structure of hexane is shown in **Figure 5**.

**Figure 5**



Complete the sentences.

**4 (c) (i)** Each line between the atoms in hexane represents a covalent ..... .

**[1 mark]**

**4 (c) (ii)** Complete the chemical formula for hexane.

**[1 mark]**

$C_6H$.....

**4 (c) (iii)** Hexane can be broken down into smaller molecules by a process called ..... .

**[1 mark]**

**4 (d)** Small molecules, called alkenes, are used to make polymers.

**4 (d) (i)** Name the polymer made from butene.

**[1 mark]**

.....

**4 (d) (ii)** Incinerators are used to burn waste polymers, such as plastic bags.

Tick (✓) **one** advantage and tick (✓) **one** disadvantage of burning plastic bags.

**[2 marks]**

| | **Advantage Tick (✓)** | **Disadvantage Tick (✓)** |
|---|---|---|
| Energy is released. | | |
| More recycling is needed. | | |
| Carbon dioxide is produced. | | |

10

Do not write outside the box

**5** Where copper ore has been mined there are areas of land that contain very low percentages of copper compounds.

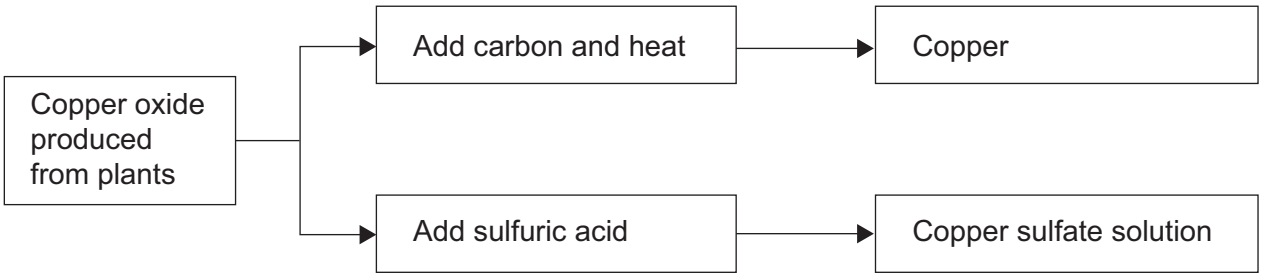
One way to extract the copper is to grow plants on the land.

The plants absorb copper compounds through their roots.

The plants are burned to produce copper oxide.

The copper oxide produced from plants can be reacted to produce copper or copper sulfate solution, as shown in **Figure 6**.

**Figure 6**




**5 (a)** Draw a ring around the correct answer to complete each sentence.

**5 (a) (i)** Copper ores contain enough copper to make extraction of the metal

carbon neutral.

economical.

reversible.

**[1 mark]**

**5 (a) (ii)** Using plants to extract metals is called

photosynthesis.

phytomining.

polymerisation.

**[1 mark]**

**5 (a) (iii)** Copper oxide reacts with carbon to produce copper and

carbon dioxide.

oxygen.

sulfur dioxide.

**[1 mark]**

Do not write outside the box

**5 (b)** Copper is produced from copper sulfate solution by displacement using iron or by electrolysis.

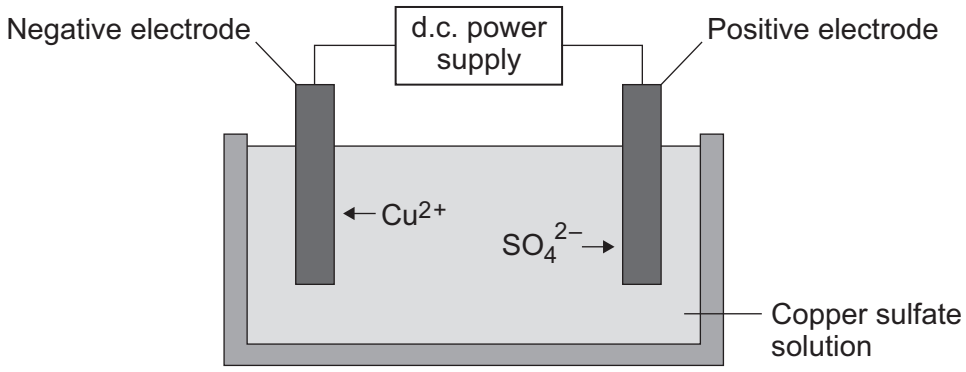
**5 (b) (i)** Complete the word equation.

**[2 marks]**

copper sulfate + iron ⟶ ..... + .....

**5 (b) (ii)** **Figure 7** shows the electrolysis of copper sulfate solution.

**Figure 7**




Why do copper ions go to the negative electrode?

**[1 mark]**

.....

.....

**5 (c)** Suggest **two** reasons why copper should **not** be disposed of in landfill sites.

**[2 marks]**

.....

.....

.....

.....

8

Do not write outside the box

**6** Cooking oils contain unsaturated fats. Unsaturated fats are more healthy than saturated fats.

Unsaturated fats change bromine water from orange to colourless.

A scientist from a food company called Vegio wanted to find the amount of unsaturated fat in cooking oils.

The scientist tested Vegio's own brand of oil and oils from four other companies, **A**, **B**, **C** and **D**.

The scientist used the same volume of oil for each test.

The scientist's results are shown in **Table 3**.

**Table 3**

| **Company** | **Number of drops of bromine water that reacted** | | |
|---|---|---|---|
| | **Test 1** | **Test 2** | **Test 3** |
| Vegio | 14 | 13 | 16 |
| **A** | 25 | 17 | 27 |
| **B** | 17 | 18 | 16 |
| **C** | 5 | 6 | 4 |
| **D** | 10 | 9 | 7 |

**6 (a) (i)** Describe how the bromine water is used to obtain these results.

**[3 marks]**

.....

.....

.....

.....

.....

.....

.....

.....

Do not write outside the box

**6 (a) (ii)** Choose **one** result from **Table 3** that should be tested again.

Result: Company ..... Test .....

Why did you choose this result?

**[2 marks]**

.....

.....

**6 (a) (iii)** The same volume of each oil was used for each test.

Suggest **one** other variable that should be controlled in these tests.

**[1 mark]**

.....

.....

**6 (b)** The Vegio food company claims that its cooking oil has more unsaturated fat than other cooking oils.

Compare the results for Vegio's cooking oil with the results of the other companies, **A**, **B**, **C** and **D**.

Give **three** conclusions that can be made from the results.

**[3 marks]**

.....

.....

.....

.....

.....

.....

.....

.....

9

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

Do not write outside the box

**7** Ethanol and vegetable oil are used as fuels.

**7 (a)** There are two different ways to produce ethanol:

- using ethene from crude oil
- using sugar from plants.

**7 (a) (i)** Ethanol is produced from ethene by **hydration** in the presence of a catalyst.

What is **hydration**?

**[1 mark]**

.....

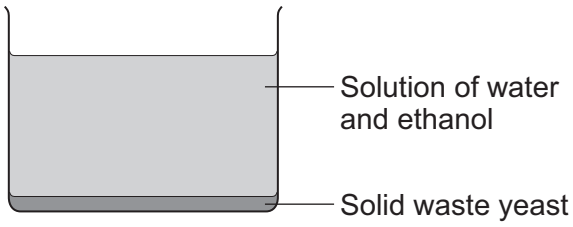
.....

**7 (a) (ii)** Fermentation is used to produce ethanol from sugar by:

- dissolving the sugar in water
- adding yeast to the sugar solution
- leaving the mixture for three days.

**Figure 8** shows the substances after three days.

**Figure 8**




Suggest:

- how the solid waste yeast is removed
- how ethanol is obtained from the solution.

**[2 marks]**

.....

.....

.....

.....

**Turn over ▶**

Do not write outside the box

**7 (b)** **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Crude oil is separated to produce the fraction petroleum diesel.

Worries about low supplies of crude oil have led to the growing of large areas of crops to produce vegetable oil.

Vegetable oils are used to produce biodiesel.

There are economic, ethical and environmental issues about the use of biodiesel.

Biodiesel and petroleum diesel are used as a fuel for cars. In a car engine the fuel burns and releases waste products through the car exhaust system.

**Table 4** shows the amount of waste products formed by biodiesel compared with the amount of waste products formed by petroleum diesel.

(Note that ppm is parts per million.)

**Table 4**

| | **Carbon dioxide in ppm** | **Nitrogen oxides in ppm** | **Sulfur dioxide in ppm** | **Particulates in g per $m^3$** |
|---|---|---|---|---|
| Biodiesel | 20 000 | 760 | 0 | 0.3 |
| Petroleum diesel | 80 000 | 700 | 300 | 0.6 |

Use this information and your knowledge and understanding to give advantages and disadvantages of using biodiesel instead of petroleum diesel.

**[6 marks]**

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

*Do not write outside the box*

.....

.....

.....

.....

Extra space .....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

9

**END OF QUESTIONS**

Do not write outside the box

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

Acknowledgement of copyright-holders and publishers

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements in future papers if notified.

Question 3: Figure 2 Photograph © Thinkstock

Copyright © 2014 AQA and its licensors. All rights reserved.

# GCSE

# SCIENCE A / CHEMISTRY

CH1FP

Mark scheme

4405 / 4402

June 2014

Version 1.0 Final

STEMUP.CO.UK

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available from aqa.org.uk

Copyright © 2014 AQA and its licensors. All rights reserved.
AQA retains the copyright on all its publications. However, registered schools/colleges for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to schools/colleges to photocopy any material that is acknowledged to a third party even for internal use within the centre.

## Information to Examiners

### 1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded
- the Assessment Objectives and specification content that each question is intended to cover.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

### 2. Emboldening and underlining

**2.1** In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

**2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.

**2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

**2.4** Any wording that is underlined is essential for the marking point to be awarded.

### 3. Marking points

#### 3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

| Student | Response | Marks awarded |
|---|---|---|
| 1 | green, 5 | 0 |
| 2 | red*, 5 | 1 |
| 3 | red*, 8 | 0 |

Example 2: Name two planets in the solar system. (2 marks)

| Student | Response | Marks awarded |
|---|---|---|
| 1 | Neptune, Mars, Moon | 1 |
| 2 | Neptune, Sun, Mars, Moon | 0 |

### 3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

### 3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

### 3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

### 3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

### 3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

### 3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

### 3.8 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient are used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.

**Quality of Written Communication and levels marking**

In Question 7(b) students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

**Level 1: basic**

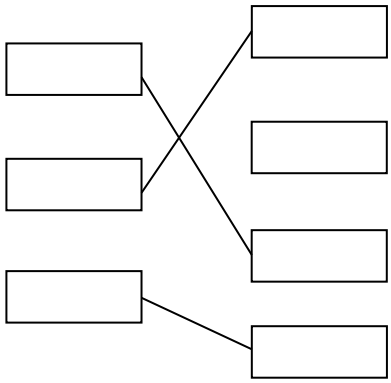
- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

**Level 2: clear**

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

**Level 3: detailed**

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.

| Question | Answers | Extra information | Mark | AO / Spec. Ref. | ID |
|---|---|---|---|---|---|
| **1(a)(i)** | a proton | | 1 | 1 / 1.1.1d | A |
| **1(a)(ii)** | nucleus | | 1 | 1 / 1.1.1c | A |
| **1(a)(iii)** | 12<br>4 | order must be correct | 1<br>1 | 2 / 1.1.1g | G |
| **1(b)(i)** | 5 / five (%) | | 1 | 1 / 1.4.3a | G |
| **1(b)(ii)** | Carbon dioxide>global warming<br>Sulfur dioxide>acid rain<br>Water>no pollution<br> | | 1<br>1<br>1 | 1 / 1.4.3a/c | G |
| **Total** | | | **8** | | |



STEMUP.CO.UK

| Question | Answers | Extra information | Mark | AO / Spec. Ref. | ID |
|---|---|---|---|---|---|
| **2(a)** | argon / Ar | | 1 | 1 / 1.1.2b | G |
| **2(b)(i)** | 0 | | 1 | 1 / 1.1.2b | A |
| **2(b)(ii)** | unreactive | | 1 | 1 / 1.1.2b | A |
| **2(c)(i)** | 94.96(%) | | 1 | 2 / 1.7.2c | E |
| **2(c)(ii)** | any **two** from:<br>• plants or photosynthesis<br>• absorbed in oceans / *seas*<br>• locked up in *(*sedimentary*)* rocks<br>• locked up in fossil fuels | allow oceans store **or** take in **or** dissolve carbon dioxide | 2 | 2 / 1.7.2f/g/h | E |
| **Total** | | | **6** | | |



STEMUP.CO.UK

| Question | Answers | Extra information | Mark | AO / Spec. Ref. | ID |
|---|---|---|---|---|---|
| **3(a)(i)** | any **one** from:<br>• destruction of habitats<br>• fewer plants/trees to absorb carbon dioxide<br>• dust / noise / air / visual *(pollution)*<br>• more traffic | *allow breathing problems* | 1 | 3 / 1.2 | E |
| **3(a)(ii)** | any **one** from:<br>• provides employment<br>• local business make more profit<br>• new transport links | ignore future use of quarry | 1 | 3 / 1.2 | E |
| **3(a)(iii)** | (rain water is) acidic | | 1 | 1 / 1.2.1f | E |
| **3(b)(i)** | 1.2(g) | | 1 | 2 / 1.2.1b | E |
| **3(b)(ii)** | 1.4(g) | allow ecf from (b)(i) | 1 | 2 / 1.2.1b | E<br>view with (b)(i) |
| **3(b)(iii)** | any **one** from:<br>• temperature of the flame varied<br>• different purity of the limestone<br>• incorrect measurement of mass<br>• heated for different times | allow flame was too hot or not hot enough | 1 | 3 / 1.2.1b | E |
| **3(c)(i)** | decomposition | | 1 | 1 / 1.2.1b | G |
| **3(c)(ii)** | 2.2(g) | | 1 | 2 / 1.1.3c | E |



STEMUP.CO.UK

| | | | | | |
|---|---|---|---|---|---|
| **3(c)(iii)** | | test must be correct to gain second mark | | 1 / 1.2.1e | E |
| | limewater | | 1 | | |
| | turns cloudy | allow turns milky or white (precipitate) | 1 | | |

| | | | |
|---|---|---|---|
| **Total** | | | **10** |



STEMUP.CO.UK

| Question | Answers | Extra information | Mark | AO / Spec. Ref. | ID |
|---|---|---|---|---|---|
| **4(a)** | hydrocarbons **or** hydrocarbon | | 1 | 1 / 1.4.1c | G |
| **4(b)(i)** | distillation | | 1 | 1 / 1.4.2b | G |
| **4(b)(ii)** | evaporation | | 1 | 2 / 1.4.2b | G |
| **4(b)(iii)** | condensation | | 1 | 2 / 1.4.2b | G |
| **4(c)(i)** | bond | | 1 | 1 / 1.4.2a | G |
| **4(c)(ii)** | $(C_6H)_{14}$ | | 1 | 2 / 1.4.2a | G |
| **4(c)(iii)** | cracking | | 1 | 1 / 1.5.1a | G |
| **4(d)(i)** | poly(butene) | allow with or without brackets | 1 | 1 / 1.5.2a | E |
| **4(d)(ii)** | Advantage=energy is released<br><br>Disadvantage=carbon dioxide is produced | do **not** accept more than one tick in the advantage column<br><br>do **not** accept more than one tick in the disadvantage column | 1<br><br>1 | 3 / 1.5 | G |
| **Total** | | | **10** | | |



STEMUP.CO.UK

| Question | Answers | Extra information | Mark | AO / Spec. Ref. | ID |
|---|---|---|---|---|---|
| **5(a)(i)** | economical | | 1 | 1 / 1.3.1a | A |
| **5(a)(ii)** | phytomining | | 1 | 1 / 1.3.1g | A |
| **5(a)(iii)** | carbon dioxide | | 1 | 1 / 1.3.1d/f | A |
| **5(b)(i)** | copper / Cu<br>iron sulfate / $FeSO_4$ | | 1<br>1 | 2 / 1.3.1h | E |
| **5(b)(ii)** | copper/ ions have a positive charge | it = copper ions<br>allow copper ions have a different charge<br>accept copper / ions are free to move<br>accept to gain electrons<br>accept copper / ions are attracted to the negative electrode **or** opposite charges attract | 1 | 1 / 1.3.1h | E |
| **5(c)** | any **two** from:<br>• copper ores are limited / running out<br>• copper can be recycled<br>• copper can be reused<br>• copper is expensive<br>• landfill sites are filling up<br>• copper compounds are toxic | ignore not biodegradable or does not decay<br>allow copper is running out<br>allow copper is toxic | 2 | 3 / 1.3.1j | E |
| **Total** | | | **8** | | |



STEMUP.CO.UK

| Question | Answers | Extra information | Mark | AO / Spec. Ref. | ID |
|---|---|---|---|---|---|
| **6(a)(i)** | add bromine (water) *to the oil*<br>*one drop at a time / dropwise* ***or*** *count / record number of drops*<br>until the bromine (water) no longer decolourises **or** until bromine water remains orange | *it = bromine water*<br>*allow shake / mix / stir*<br>*ignore clear* | 1<br>1<br>1 | 1+2 / 1.6.3a | E |
| **6(a)(ii)** | A 2<br>anomalous result ***or*** *explanation* | both need to be correct<br>*allow A 17*<br>*ignore does not fit pattern / trend*<br>*independent marking points* | 1<br>1 | 3 / 1.6.3a | E |
| **6(a)(iii)** | any **one** from:<br>• temperature<br>• concentration of bromine water<br>• (same) *dropper / pipette* | *ignore references to time*<br>*allow same bromine water*<br>*allow (same) drop size* | 1 | 3 / 1.6.3a | E |



STEMUP.CO.UK

| | | | | | |
|---|---|---|---|---|---|
| **6(b)** | any **three** from:<br>• A's oil has more unsaturated fat (than Vegio) **or** has the most unsaturated fat<br>• B's oil has more unsaturated fat (than Vegio)<br>• C's oil has less unsaturated fat (than Vegio) **or** has the least unsaturated fat<br>• D's oil has less unsaturated fat (than Vegio)<br>• Vegio is in 3rd position | *comparison must be to Vegio*<br>allow *healthier **or** better (for you)* for *more* unsaturated fat<br>*ignore references to bromine water*<br>*allow <u>only</u> A and B have more unsaturated fat than Vegio **or** <u>only</u> C and D have less unsaturated fat than Vegio for **3** marks* | 3 | 3 / 1.6.3a | E |
| **Total** | | | **9** | | |



STEMUP.CO.UK

| Question | Answers | Extra information | Mark | AO / Spec. Ref. | ID |
|---|---|---|---|---|---|
| **7(a)(i)** | reaction with water / steam | allow add water / steam *(to produce ethanol)*<br>*allow $H_2O$ or hydrogen oxide for water*<br>*ignore mix* | 1 | 1 / 1.5.3a | E |
| **7(a)(ii)** | filter / decant (to remove the yeast)<br><br>*(fractional) distillation / distil* | *allow answers in either order*<br>*accept description of decanting*<br>*ignore sieve*<br><br>*accept evaporation then condensation* | 1<br><br>1 | 2 / 1.5.3b | E |



STEMUP.CO.UK

**7(b)** Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a 'best-fit' approach to the marking.

| 0 marks | Level 1 (1–2 marks) | Level 2 (3–4 marks) | Level 3 (5–6 marks) |
|---|---|---|---|
| No relevant content | There is a stated advantage **or** disadvantage of using biodiesel ***or*** petroleum diesel. | There is a stated advantage **or** disadvantage of using biodiesel **or** petroleum diesel with a linked consequence. | There is at least one stated advantage **and** at least one stated disadvantage of using biodiesel **or** petroleum diesel with a linked consequence for each. |

**Examples of points made in the response could include:**

**Advantages *of biodiesel*:**

- Produces less carbon dioxide
- Produces no sulfur dioxide
- Produces less particulates
- Sustainable / renewable
- Growing crops absorb carbon dioxide
- Carbon neutral
- Produces less acid rain
- Conserves the limited amount of petroleum diesel

**Disadvantages *of biodiesel*:**

- Produces more nitrogen oxides
- Deforestation for land
- Destruction of habitats for land
- Uses land that could be used for food crops
- Creates food shortages
- Crops are not reliable

1+2+3 / 1.4.3e

E

| | | | |
|---|---|---|---|
| **Total** | | | **9** |



STEMUP.CO.UK

| Centre Number | | | | | | Candidate Number | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Surname | | | | | | | | | | |
| Other Names | | | | | | | | | | |
| Candidate Signature | | | | | | | | | | |

| For Examiner's Use | |
|---|---|
| Examiner's Initials | |
| Question | Mark |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| TOTAL | |

General Certificate of Secondary Education
Foundation Tier
June 2013

# Science A
**Unit Chemistry C1**

**CH1FP**

**F**

# Chemistry
**Unit Chemistry C1**

**Monday 10 June 2013 1.30 pm to 2.30 pm**

**For this paper you must have:**
- a ruler
- the Chemistry Data Sheet (enclosed).

You may use a calculator.

**Time allowed**
- 1 hour

**Instructions**
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

**Information**
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 8(b) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

**Advice**
- In all calculations, show clearly how you work out your answer.

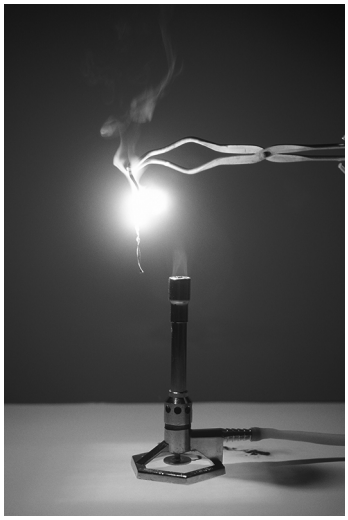


STEMUP.CO.UK

Do not write outside the box

Answer **all** questions in the spaces provided.

**1** Magnesium burns in oxygen.



**1 (a)** Use the Chemistry Data Sheet to help you to answer this question.

The word equation for magnesium burning is:

magnesium + oxygen ⟶ magnesium oxide

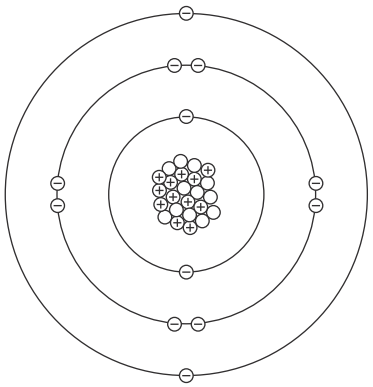
Draw **one** line from each substance to its correct description.

| Substance | Description |
|---|---|
| magnesium | compound |
| magnesium oxide | metal |
| oxygen | mixture |
| | non-metal |

*(3 marks)*

Do not write outside the box

**1 (b)** The diagram represents a magnesium atom.



Complete the table to show the name of each particle and the charge of each particle in the magnesium atom.

| Name of particle | Charge |
|---|---|
| proton | +1 |
| neutron | ..... |
| ..... | –1 |

*(2 marks)*

**1 (c)** Use the Chemistry Data Sheet to help you to answer these questions.

Draw a ring around the correct answer to complete each sentence.

**1 (c) (i)** In a magnesium atom, the protons and neutrons are in the

core.

nucleus.

shell.

*(1 mark)*

**1 (c) (ii)** The number of protons in a magnesium atom is the

atomic number.

mass number.

group number.

*(1 mark)*

**1 (c) (iii)** The sum of the protons and neutrons in a magnesium atom is the

atomic number.

mass number.

group number.

*(1 mark)*

8

Do not write outside the box

**2** Barbecues are heated by burning charcoal or burning hydrocarbons.



**2 (a)** Use the Chemistry Data Sheet to help you to answer this question.

The chemical equation for charcoal burning is:

$$C + O_2 \longrightarrow CO_2$$

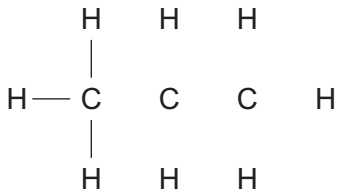
Complete the word equation for this reaction.

carbon + ..... ⟶ carbon dioxide

*(1 mark)*

**2 (b)** Propane is a hydrocarbon.

**2 (b) (i)** Complete the displayed structure of propane. Draw in the missing bonds.



*(1 mark)*

**2 (b) (ii)** Write the chemical formula of propane. .....

*(1 mark)*

Do not write outside the box

**2 (b) (iii)** Draw a ring around the correct answer to complete the sentence.

Propane burns in air to produce carbon dioxide and

| |
|---|
| hydrogen. |
| hydroxide. |
| water. |

*(1 mark)*

**2 (c)** The table shows information about six hydrocarbons.

| Hydrocarbon | State at room temperature (20 °C) | Boiling point in °C |
|---|---|---|
| Ethane ($C_2H_6$) | gas | –89 |
| Ethene ($C_2H_4$) | gas | –104 |
| Butane ($C_4H_{10}$) | gas | –1 |
| Butene ($C_4H_8$) | gas | –6 |
| Hexane ($C_6H_{14}$) | liquid | +69 |
| Hexene ($C_6H_{12}$) | liquid | +64 |

Tick (✓) **two** correct statements about the six hydrocarbons.

| Statement | Tick (✓) |
|---|---|
| Ethane and butane boil at temperatures less than 20 °C. | |
| Hexene and butene are alkanes. | |
| Butane and hexane are liquid at 0°C. | |
| Ethene and hexene each have a carbon-carbon double bond. | |

*(2 marks)*

6

Do not write outside the box

**3** Carbon dioxide is produced when metal carbonates are heated.

**3 (a) (i)** Draw a ring around the correct answer to complete the word equation.

magnesium carbonate ⟶ [magnesium / magnesium hydroxide / magnesium oxide] + carbon dioxide

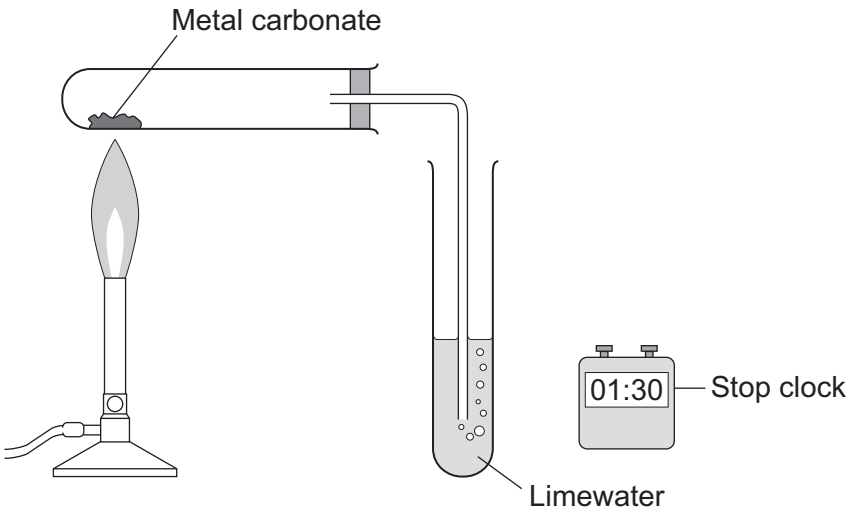
*(1 mark)*

**3 (a) (ii)** Draw a ring around the correct answer to complete the sentence.

The reaction to produce carbon dioxide from magnesium carbonate is [combustion. / decomposition. / fermentation.]

*(1 mark)*

**3 (b)** A student investigated what happens when metal carbonates are heated.




The student:

- used the apparatus to investigate heating four metal carbonates
- started the stop clock at the same time as he began to heat the metal carbonate
- stopped the stop clock when carbon dioxide was produced.

Do not write outside the box

The student's results are shown in the table.

| Metal carbonate | Time taken for the production of carbon dioxide to start in seconds |
|---|---|
| Calcium carbonate | 163 |
| Copper carbonate | 24 |
| Magnesium carbonate | 92 |
| Zinc carbonate | 67 |

**3 (b) (i)** Tick (✓) the type of graph the student should draw from these results.

| Type of graph | Tick (✓) |
|---|---|
| Bar chart | |
| Line graph | |
| Scatter graph | |

*(1 mark)*

**3 (b) (ii)** Use the Chemistry Data Sheet to help you to answer this question.

Draw a ring around the correct answer to complete the sentence.

The more reactive the metal in the carbonate the [ less / more / same ] time is taken for the production of carbon dioxide to start.

*(1 mark)*

**3 (b) (iii)** How did the student know that carbon dioxide was produced?

Use the diagram of the apparatus to help you to answer this question.

.....

.....

.....

.....

*(2 marks)*

6

Do not write outside the box

**4** Some fruits, seeds and nuts are sources of vegetable oils.

The table gives some information about three types of vegetable oil.

| | Corn oil | Olive oil | Rapeseed oil |
|---|---|---|---|
| Saturated fat in % | 14.4 | 14.3 | 6.6 |
| Unsaturated fat in % | 81.2 | 81.2 | 88.6 |
| Melting point in °C | –18 to –5 | –12 to –6 | –10 to +5 |
| Smoke point in °C | 229 to 268 | 204 to 210 | 230 to 240 |

The smoke point is the temperature range at which the oil begins to produce smoke when heated.

**4 (a)** Use information from the table above to answer these questions.

**4 (a) (i)** Tick (✓) **one** correct reason why a vegetable oil has a range for the melting point.

| Reason | Tick (✓) |
|---|---|
| A vegetable oil has a high percentage of unsaturated fat. | |
| A vegetable oil has a range for the smoke point. | |
| A vegetable oil has a mixture of fats. | |

*(1 mark)*

**4 (a) (ii)** Complete the sentence.

The type of vegetable oil with the largest temperature range of smoke point is

..... .

*(1 mark)*

**4 (b)** Bromine water was added drop by drop to 5 $cm^3$ of each type of vegetable oil.

**4 (b) (i)** Draw a ring around the correct answer to complete the sentence.

The colour of the first drop of bromine water changes from orange to

colourless.

green.

white.

*(1 mark)*

Do not write outside the box

**4 (b) (ii)** Which type of vegetable oil will react with the most drops of bromine water?

Give a reason for your answer.

.....

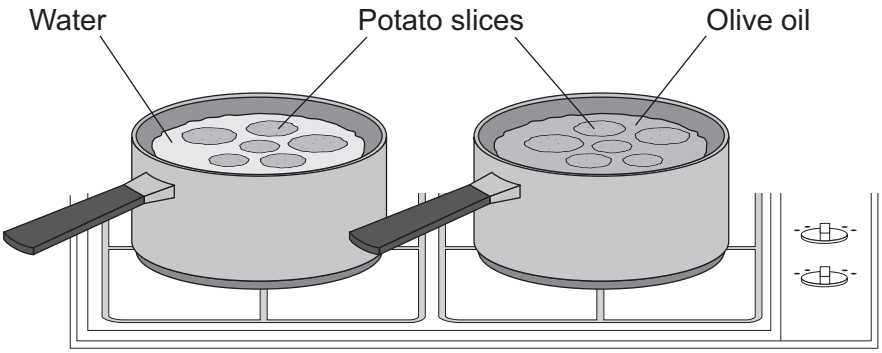
.....

.....

.....

*(2 marks)*

**4 (c)** Potato slices can be boiled in water or fried in olive oil.




**4 (c) (i)** Olive oil starts to produce smoke when heated to 204 °C.
The smoke contains carbon particles.

Suggest what happens to molecules in olive oil to produce carbon particles.

.....

.....

*(1 mark)*

**4 (c) (ii)** Potato slices boiled in water will be different from potato slices fried in olive oil.

Describe **two** differences.

.....

.....

.....

.....

*(2 marks)*

8

**Turn over ▶**

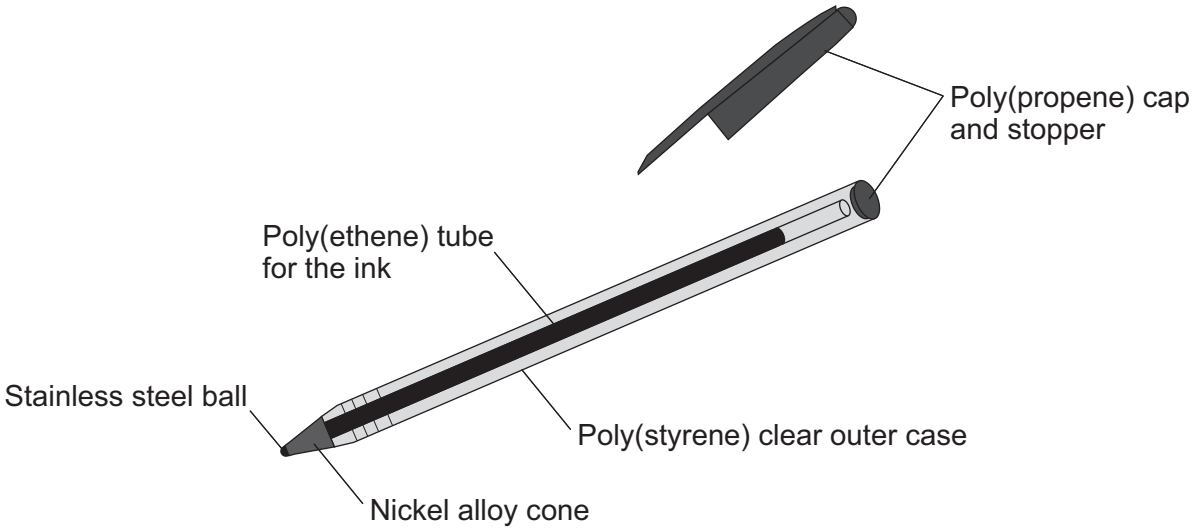
*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

Do not write outside the box

**5** The diagram shows a ballpoint pen.




**5 (a)** Polymers are used to make the ballpoint pen.

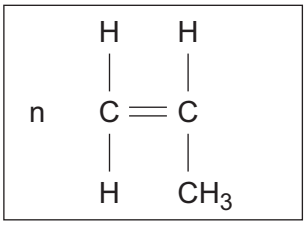
**5 (a) (i)** Name the monomer used to make poly(ethene).

.....

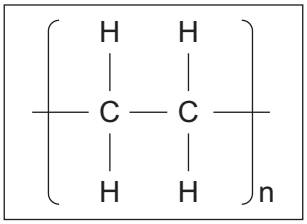
*(1 mark)*

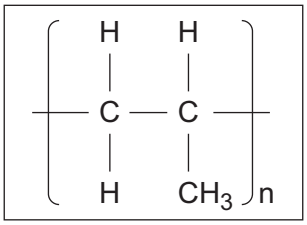
**5 (a) (ii)** Draw **one** line from the monomer propene to its polymer poly(propene).

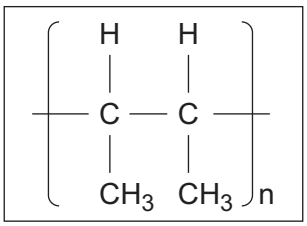
**Monomer**




**Polymer**



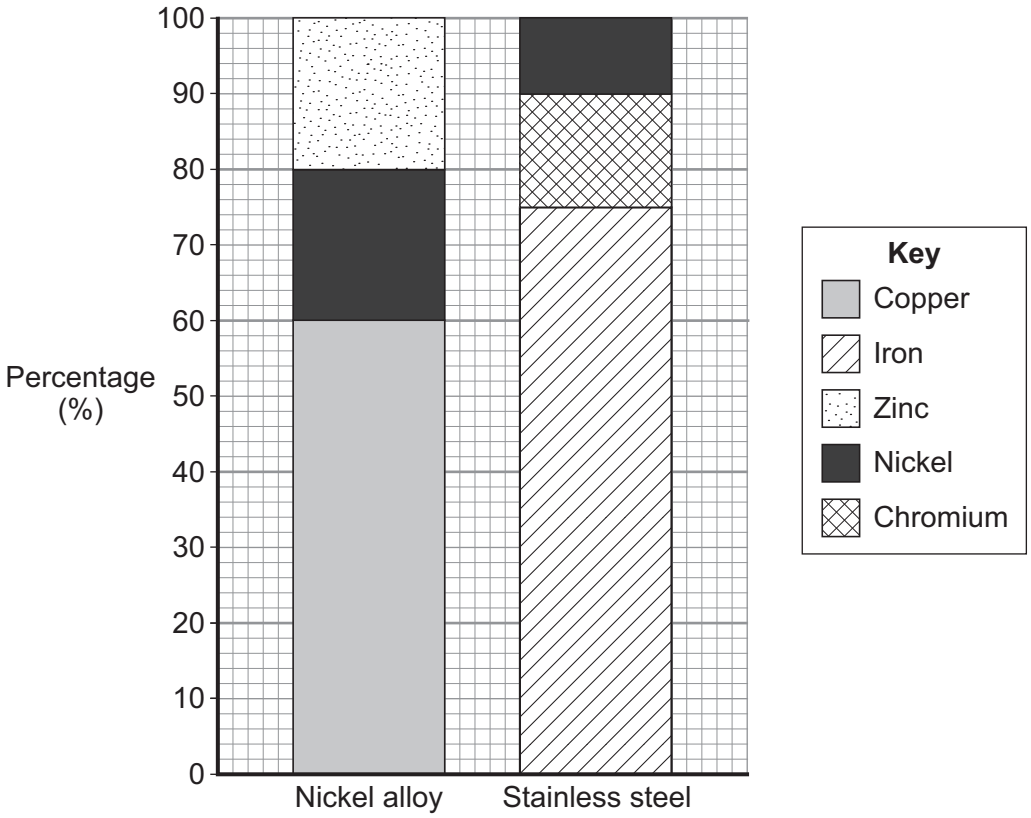




*(1 mark)*

**Turn over ▶**

Do not write outside the box

**5 (b)** Two alloys are used to make the ballpoint pen.




Use the bar chart to answer these questions.

**5 (b) (i)** Which metal is in both of these alloys? .....

*(1 mark)*

**5 (b) (ii)** What is the percentage of iron in the stainless steel? ..... %

*(1 mark)*

Do not write outside the box

**5 (b) (iii)** The alloy stainless steel is used instead of pure iron for the ball of the pen.
Give **two** reasons why.

.....

.....

.....

.....

*(2 marks)*

**5 (c)** Tick (✓) **one** advantage and tick (✓) **one** disadvantage of **recycling** this type of ballpoint pen.

| | **Advantage Tick (✓)** | **Disadvantage Tick (✓)** |
|---|---|---|
| Can be refilled and reused | | |
| Conserves resources of crude oil and ores | | |
| High cost of separating materials | | |
| Polymers and alloys are not expensive | | |

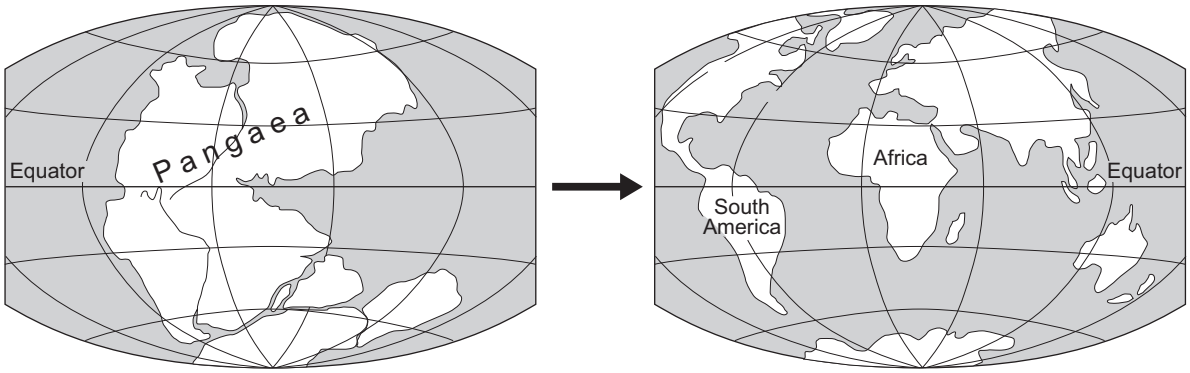
*(2 marks)*

8

**Turn over for the next question**

Do not write outside the box

**6** In 1912 Wegener suggested his theory of continental drift.




In 1912, many scientists did not accept Wegener's theory because he could not explain:

- how Pangaea had split into continents
- how the continents had moved apart.

**6 (a)** Wegener used evidence to support his theory.

Give **two** pieces of evidence Wegener used.

.....

.....

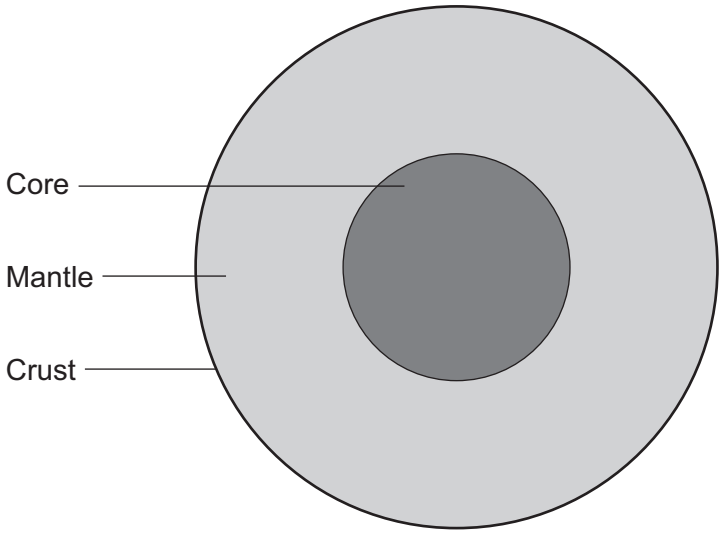
.....

.....

*(2 marks)*

Do not write outside the box

**6 (b)** Scientists have discovered that the Earth is made up of layers.




Complete the sentences by writing **one** word in each space.

Scientists now accept Wegener's theory because they know that

the Earth's ..... and upper part of the mantle are cracked into tectonic plates.

The tectonic plates move at relative speeds of a few centimetres per year because of convection currents in the Earth's ..... .

These convection currents are driven by ..... released from natural radioactivity.

A volcanic eruption or an ..... can happen at the boundaries between tectonic plates.

*(4 marks)*

6

Do not write outside the box

**7** Metals are extracted from their ores.

Many copper ores contain only 2% of copper compounds.

**7 (a)** Copper is now extracted from ores containing a low percentage of copper compounds.

Suggest **two** reasons why.

.....

.....

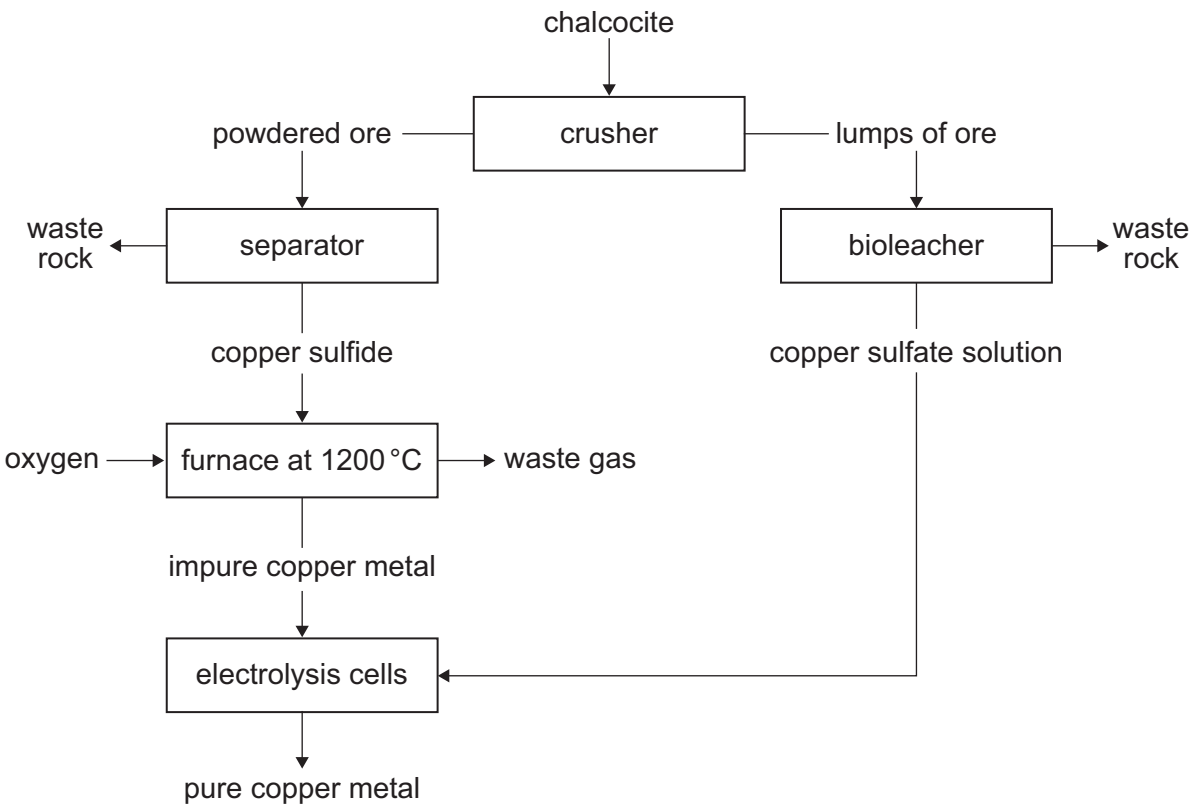
.....

.....

*(2 marks)*

**7 (b)** Chalcocite, an ore of copper, contains copper sulfide.

The flow diagram shows how copper metal is extracted from chalcocite.






STEMUP.CO.UK

Do not write outside the box

**7 (b) (i)** Suggest **one** reason why it is difficult to dispose of the waste rock.

.....

.....

*(1 mark)*

**7 (b) (ii)** The reaction in the furnace could cause environmental pollution.
Explain how.

.....

.....

.....

.....

*(2 marks)*

**7 (b) (iii)** The extraction of pure copper is expensive.
Give **one** reason why.

.....

.....

*(1 mark)*

**7 (b) (iv)** Pure copper is produced by electrolysis of copper sulfate solution.

Which electrode do the copper ions move towards?
Give a reason for your answer.

.....

.....

.....

.....

*(2 marks)*

**7 (b) (v)** Large areas of land are contaminated with copper compounds.
Phytomining can be used to remove these copper compounds from the land.

What is used in phytomining to remove copper compounds from the land?

.....

.....

*(1 mark)*

**9**

**Turn over ▶**



STEMUP.CO.UK

Do not write outside the box

**8** Crude oil is a mixture of many different chemical compounds.

**8 (a)** Fuels, such as petrol (gasoline), can be produced from crude oil.

**8 (a) (i)** Fuels react with oxygen to release energy.

Name the type of reaction that releases energy from a fuel.

.....

*(1 mark)*

**8 (a) (ii)** Fuels react with oxygen to produce carbon dioxide.
The reaction of a fuel with oxygen can produce a different oxide of carbon.

Name this different oxide of carbon and explain why it is produced.

.....

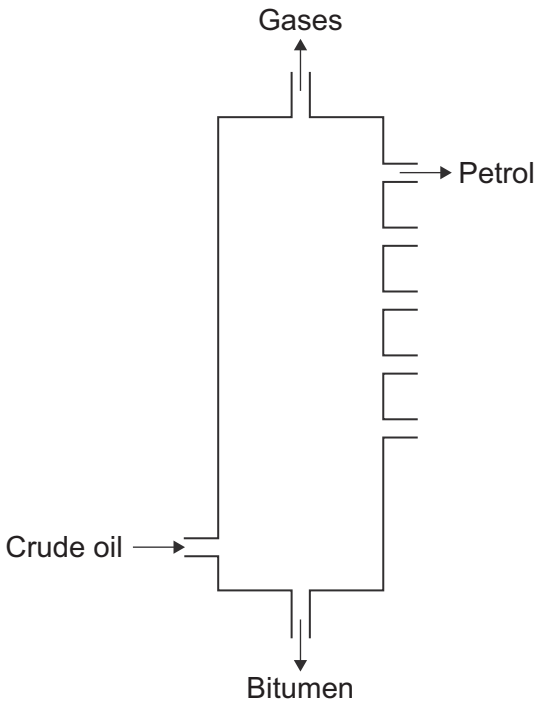
.....

.....

.....

*(2 marks)*

**8 (b)** Most of the compounds in crude oil are hydrocarbons.
Hydrocarbons with the smallest molecules are very volatile.






STEMUP.CO.UK

Do not write outside the box

*In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Describe and explain how **petrol** is separated from the mixture of hydrocarbons in crude oil.

Use the diagram and your knowledge to answer this question.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

*(6 marks)*

9

**END OF QUESTIONS**

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

ACKNOWLEDGEMENT OF COPYRIGHT-HOLDERS AND PUBLISHERS

Question 1 Photograph © Science photo library

Copyright © 2013 AQA and its licensors. All rights reserved.

Version 1.0



**General Certificate of Secondary Education**
**June 2013**

# Science A / Chemistry CH1FP

# (Specification 4405 / 4402)

# Unit 1: Chemistry 1

# Final

# *Mark Scheme*

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available from: aqa.org.uk

Copyright © 2013 AQA and its licensors. All rights reserved.

**Copyright**
AQA retains the copyright on all its publications. However, registered schools/colleges for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to schools/colleges to photocopy any material that is acknowledged to a third party even for internal use within the centre.

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).
Registered address: AQA, Devas Street, Manchester M15 6EX.

## Information to Examiners

### 1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

### 2. Emboldening

**2.1** In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

**2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.

**2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. Different terms in the mark scheme are shown by a / ; e.g. allow smooth / free movement.

### 3. Marking points

### 3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

| Student | Response | Marks awarded |
|---|---|---|
| 1 | green, 5 | 0 |
| 2 | red*, 5 | 1 |
| 3 | red*, 8 | 0 |


STEMUP.CO.UK

Example 2: Name two planets in the solar system. (2 marks)

| Student | Response | Marks awarded |
|---|---|---|
| 1 | Neptune, Mars, Moon | 1 |
| 2 | Neptune, Sun, Mars, Moon | 0 |

### 3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

### 3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

### 3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

### 3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

### 3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

### 3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

### 3.8 Ignore / Insufficient / Do <u>not</u> allow

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.


STEMUP.CO.UK

**Quality of Written Communication and levels marking**

In Question 8(b) candidates are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Candidates will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

**Level 1: basic**

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

**Level 2: clear**

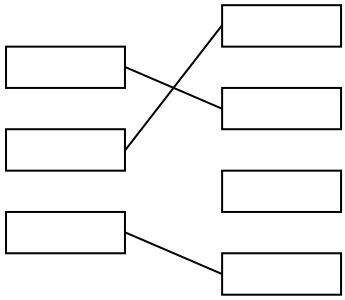
- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

**Level 3: detailed**

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.


STEMUP.CO.UK

**Question 1**

| question | answers | extra information | Mark |
|---|---|---|---|
| **1(a)** |  | one mark for each substance linked correctly to its description<br>do **not** accept more than one line from each substance | 3 |
| **1(b)** | 0 / zero / none / no charge<br>electron | | 1<br>1 |
| **1(c)(i)** | nucleus | | 1 |
| **1(c)(ii)** | atomic number | | 1 |
| **1(c)(iii)** | mass number | | 1 |
| **Total** | | | **8** |


STEMUP.CO.UK

**Question 2**

| question | Answers | extra information | Mark |
|---|---|---|---|
| **2(a)** | oxygen | must be name<br>do **not** accept oxide or dioxide | 1 |
| **2(b)(i)** | 2 x C–C<br>and<br>5 x C–H | all single (line) bonds | 1 |
| **2(b)(ii)** | $C_3H_8$ | must be formula<br>do **not** accept lower case h | 1 |
| **2(b)(iii)** | water | | 1 |
| **2(c)** | ethane and butane boil at temperatures less than 20°C<br>ethene and hexene each have a carbon-carbon double bond | | 1<br>1 |
| **2(c)** | ethane and butane boil at temperatures less than 20°C<br>ethene and hexene each have a carbon-carbon double bond | | 1<br>1 |
| **Total** | | | **6** |


STEMUP.CO.UK

**Question 3**

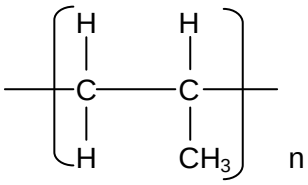
| question | answers | extra information | Mark |
|---|---|---|---|
| **3(a)(i)** | magnesium oxide | | 1 |
| **3(a)(ii)** | decomposition | | 1 |
| **3(b)(i)** | bar chart | | 1 |
| **3(b)(ii)** | more | | 1 |
| **3(b)(iii)** | limewater<br>turns cloudy / milky | <br>accept forms a white precipitate | 1<br>1 |
| **Total** | | | **6** |

**Question 4**

| question | answers | extra information | Mark |
|---|---|---|---|
| **4(a)(i)** | a vegetable oil has a mixture of fats | | 1 |
| **4(a)(ii)** | corn (oil) | allow 229 to 268 (°C) | 1 |
| **4(b)(i)** | colourless | | 1 |
| **4(b)(ii)** | rapeseed (oil)<br>because this oil has most unsaturated fat<br>**or**<br>because this oil has the most carbon-carbon double bonds | <br>accept because this oil has least saturated fat<br>allow this oil has more unsaturated fat<br>ignore figures unless there is an indication that 88.6(%) is the highest percentage of unsaturated fat<br>ignore melting points / smoke points<br>if corn oil or olive oil is chosen then allow **1** mark for has a high amount / percentage of unsaturated fat **or** has a low amount / percentage of saturated fat | 1<br>1 |
| **4(c)(i)** | (olive oil / molecules) decompose / break down | allow burn<br>ignore react | 1 |
| **4(c)(ii)** | **any two** from:<br>for olive oil<br>• different flavour / taste<br>• high(er) energy content<br>• hard(er) / crisp(er) **or** different texture<br>• dark(er) / different colour<br>• have (more) fat<br>• cooks quick(ly) | if answered in terms of water:<br>• different flavour / taste<br>• low(er) energy content<br>• soft(er) **or** different texture<br>• light(er)/ different colour<br>• have less / no fat<br>• cooks slow(ly)<br>ignore healthier | 2 |
| **Total** | | | **8** |


STEMUP.CO.UK

**Question 5**

| question | answers | extra information | Mark |
|---|---|---|---|
| **5(a)(i)** | ethene | allow $C_2H_4$ | 1 |
| **5(a)(ii)** |  | accept line drawn from word 'Monomer' or from the monomer box to the correct 'Polymer'<br>allow the correct 'Polymer' indicated by a tick, circled etc. | 1 |
| **5(b)(i)** | nickel | accept Ni | 1 |
| **5(b)(ii)** | 75(%) | | 1 |
| **5(b)(iii)** | (stainless steel) is hard /strong / durable<br>(stainless steel) resistant to corrosion **or** unreactive | it = stainless steel<br>accept (pure) iron is soft<br>accept (pure) iron rusts / corrodes / reacts<br>do **not** allow corrosive | 1<br>1 |
| **5(c)** | **Advantage**: Conserves resources of crude oil and ores<br>**Disadvantage**: High cost of separating materials | do **not** allow more than one tick in the advantage column<br>do **not** allow more than one tick in the disadvantage column | 1<br>1 |
| **Total** | | | **8** |


STEMUP.CO.UK

**Question 6**

| question | answers | extra information | Mark |
|---|---|---|---|
| **6(a)** | any **two** from:<br>• similar fossils in Africa and South America<br>• similar rocks in Africa and South America<br>• 'jigsaw fit' | ignore same plants / animals<br><br>allow rocks / fossils match in Africa and South America | 2 |
| **6(b)** | crust<br>mantle<br>heat / energy<br>earthquake | | 1<br>1<br>1<br>1 |
| **Total** | | | **6** |


STEMUP.CO.UK

**Question 7**

| question | answers | extra information | Mark |
|---|---|---|---|
| **7(a)** | any **two** from:<br>• copper / ores are running out / harder to find<br>• there are no / very small amounts of high-grade copper ores left<br>• copper metal is in demand<br>• copper is expensive<br>• now economical to extract copper from low-grade ores | it = copper<br><br>allow new methods of extraction e.g. bioleaching and phytomining<br><br>allow high-grade ores are running out for **2** marks | 2 |
| **7(b)(i)** | large amounts / 98% of rock to dispose of as waste<br>**or**<br>waste rock takes up a lot of space | accept contains toxic (metal) compounds / bioleacher | 1 |
| **7(b)(ii)** | (copper sulfide reacts with oxygen to) produce sulfur dioxide / $SO_2$<br>that causes acid rain | allow (sulfur reacts with oxygen to) produce sulfur dioxide / $SO_2$<br>allow description of effects of acid rain **or** sulfur dioxide<br>if no other mark awarded allow $CO_2$ produced which causes global warming **or** $CO_2$ produced by burning fuel or heating the furnace for **1** mark | 1<br>1 |
| **7(b)(iii)** | any **one** from:<br>• large amounts of fuels / energy used (for the furnace and electrolysis)<br>• (the extraction has) many steps / stages / processes<br>• large amounts of ore / material have to be mined | <br>allow large amounts of electricity needed<br>ignore high temperature / electrolysis unqualified<br>allow (extraction) is a long process / takes a lot of time<br>allow ores contain a low percentage of copper | 1 |

**Question 7 continues on the next page**


STEMUP.CO.UK

**Question 7 continued**

| question | answers | extra information | Mark |
|---|---|---|---|
| **7(b)(iv)** | (copper ions move towards) the negative electrode / *cathode* | | 1 |
| | because copper ions / $Cu^{2+}$ are positively charged **or** are oppositely charged **or** copper ions need to gain electrons | allow because metal ions are positive **or** opposites attract | 1 |
| **7(b)(v)** | (growing) plants | | 1 |
| **Total** | | | **9** |


STEMUP.CO.UK

**Question 8**

| question | answers | extra information | Mark |
|---|---|---|---|
| **8(a)(i)** | exothermic | accept combustion<br>allow burning **or** oxidation **or** redox | 1 |
| **8(a)(ii)** | carbon monoxide / *CO* (is produced)<br>because there is incomplete / partial combustion (of the fuel) | allow monoxide (is produced)<br>ignore carbon oxide<br>accept because there is insufficient oxygen / air (to burn the fuel) | 1<br>1 |

**Question 8(b) continues on the next page**

**Question 8 continued**

| question | Answers | extra information | Mark |
|---|---|---|---|
| **8(b)** | Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5. | | 6 |

| **0 marks** | **Level 1 (1-2 marks)** | **Level 2 (3-4 marks)** | **Level 3 (5-6 marks)** |
|---|---|---|---|
| No relevant content. | There is a statement that crude oil is heated **or** that substances are cooled. However there is little detail and any description may be confused or inaccurate. | There is some description of heating / evaporating crude oil **and either** fractions have different boiling points **or** there is an indication of a temperature difference in the column. | There is a reasonable explanation of how petrol is or fractions are separated from crude oil using evaporating **and** condensing. |

If cracking is given as a preliminary or subsequent process to fractional distillation then ignore.

However, if cracking / catalyst is given as part of the process, maximum is **level 2**

**examples of chemistry points made in the response could include:**

- Some / most of the hydrocarbons (or petrol) evaporate / form vapours or gases
- When some of / a fraction of the hydrocarbons (or petrol) cool to their boiling point they condense
- Hydrocarbons (or petrol) that have (relatively) low boiling points and are collected near the top of the fractionating column or hydrocarbons with (relatively) high boiling points are collected near the bottom of the fractionating column
- The process is fractional distillation
- Heat the crude oil / mixture of hydrocarbons or crude oil / mixture is heated to about 350°C
- Some of the hydrocarbons remain as liquids
- Liquids flow to the bottom of the fractionating column
- Vapours / gases rise up the fractionating column
- Vapours / gases cool as they rise up the fractionating column
- The condensed fraction (or petrol) separates from the vapours / gases and flows out through a pipe
- Some of the hydrocarbons remain as vapours / gases
- Some vapours / gases rise out of the top of the fractionating column
- There is a temperature gradient in the fractionating column or the fractionating column is cool at the top and hot at the bottom

| **Total** | | | **9** |
|---|---|---|---|

**UMS Conversion Calculator**: www.aqa.org.uk/umsconversion



STEMUP.CO.UK

| Centre Number | | | | | | Candidate Number | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Surname | | | | | | | | | | |
| Other Names | | | | | | | | | | |
| Candidate Signature | | | | | | | | | | |

| For Examiner's Use | |
|---|---|
| Examiner's Initials | |
| Question | Mark |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| TOTAL | |

General Certificate of Secondary Education
Foundation Tier
January 2013

# Science A
**Unit Chemistry C1**

**CH1FP**

**F**

# Chemistry
**Unit Chemistry C1**

**Monday 14 January 2013 9.00 am to 10.00 am**

**For this paper you must have:**
- a ruler
- the Chemistry Data Sheet (enclosed).

You may use a calculator.

**Time allowed**
- 1 hour

**Instructions**
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

**Information**
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 7(c) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

**Advice**
- In all calculations, show clearly how you work out your answer.

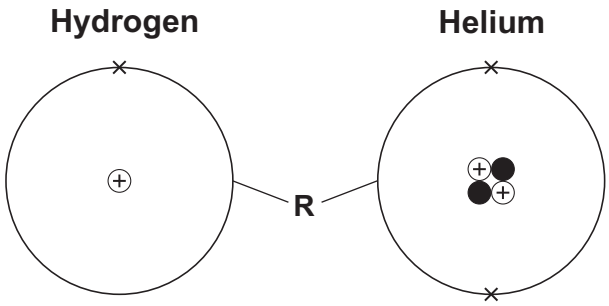


STEMUP.CO.UK

Do not write outside the box

Answer **all** questions in the spaces provided.

**1** The Sun is mainly hydrogen and helium.
The diagrams show an atom of hydrogen and an atom of helium.




**1 (a)** Draw a ring around the correct answer to complete each sentence.

**1 (a) (i)** The centre of each atom is called the

molecule.

nucleus.

shell.

*(1 mark)*

**1 (a) (ii)** The circle (labelled **R**) around the centre of each atom is called

a bond.

an electrical charge.

an energy level (shell).

*(1 mark)*

Do not write outside the box

**1 (b)** Use the diagrams on page 2 to help you to answer these questions.

Draw **one** line from each question to its correct answer.

| Question | Answer |
|---|---|
| How many protons are there in the hydrogen atom? | 1 |
| How many electrons are there in the helium atom? | 2 |
| What is the mass number of the helium atom? | 3 |
| | 4 |

*(3 marks)*

**1 (c)** The Sun is 73% hydrogen and 25% helium. The rest is other elements.

What is the percentage of other elements in the Sun? ..... %

*(1 mark)*

**1 (d)** One of the other elements in the Sun is neon.
Neon is in the same group of the periodic table as helium.

Use the Chemistry Data Sheet to help you to answer these questions.

**1 (d) (i)** How many protons are there in a neon atom?

.....

*(1 mark)*

**1 (d) (ii)** Which group of the periodic table are helium and neon in?

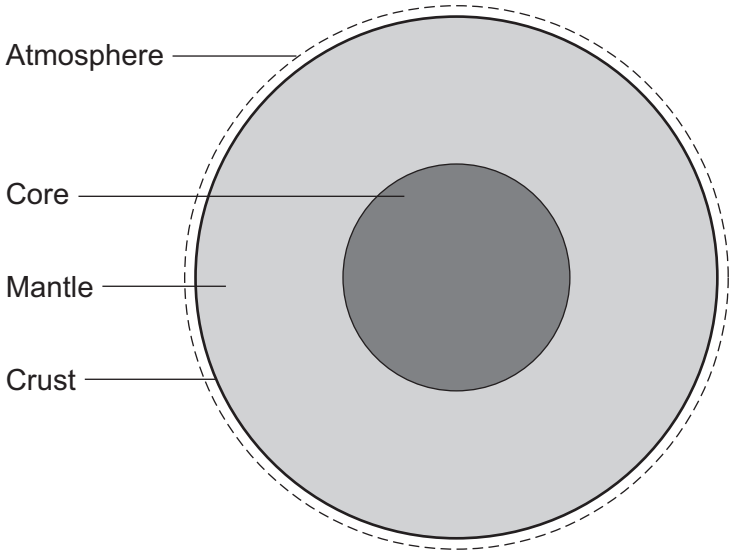
.....

*(1 mark)*

8

Do not write outside the box

**2** The diagram shows the layers in and around the Earth.




**2 (a)** Use the diagram above to help you to answer this question.

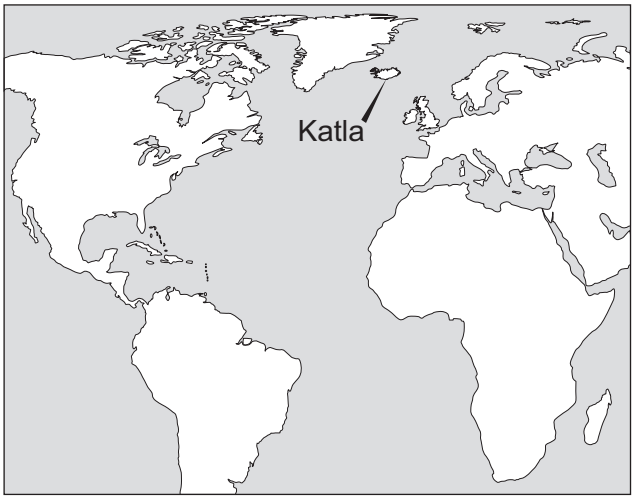
Draw **one** line from each statement to its correct layer.

| Statement | Layer |
|---|---|
| There are mountain ranges. | atmosphere |
| There are convection currents that cause earthquakes. | core |
| There is a mixture of gases. | crust |
| | mantle |

*(3 marks)*

Do not write outside the box

**2 (b)** Iceland has many volcanoes.
Scientists are monitoring a volcano in Iceland, called Katla.




There has been an increase in the number of small earthquakes (tremors) around Katla.

**2 (b) (i)** Draw a ring around the correct answer to complete the sentence.

Iceland has volcanoes because it

- has low temperatures.
- is an island.
- is on a tectonic plate boundary.

*(1 mark)*

**2 (b) (ii)** People do not know when Katla will next erupt.

Tick (✓) the correct reason why.

| Reason | Tick (✓) |
|---|---|
| Small earthquakes (tremors) near the volcano are happening more often. | |
| The last two eruptions happened a long time ago in October 1918 and in May 1860. | |
| Scientists cannot accurately predict when volcanic eruptions will occur. | |

*(1 mark)*

**Question 2 continues on the next page**

**Turn over ▶**

Do not write outside the box

**2 (c)** Previous eruptions of Katla produced large amounts of solid ash particles and sulfur dioxide.

Use the correct answer to complete each sentence.

| | | | |
|---|---|---|---|
| **acid rain** | **earthquakes** | **global dimming** | **global warming** |

An environmental impact caused by solid ash particles is ..... .

An environmental impact caused by sulfur dioxide is ..... .

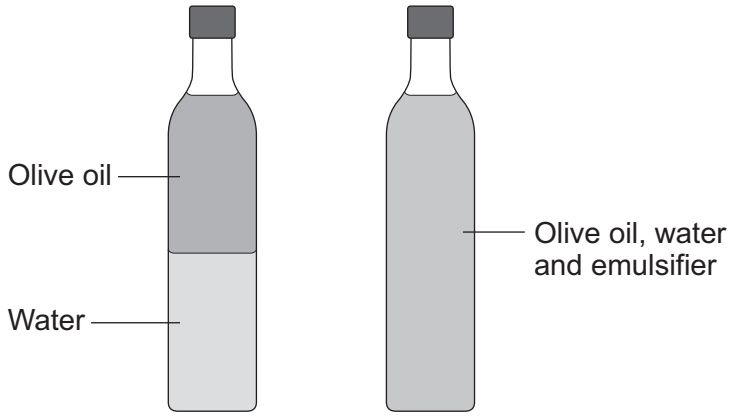
*(2 marks)*

7

Do not write outside the box

**3** Olive oil has a high content of healthy, unsaturated fats.

**3 (a)** Olive oil and water do not mix.
A salad dressing is made by shaking olive oil and water with an emulsifier.




**3 (a) (i)** Complete the sentence.

The salad dressing of olive oil, water and emulsifier is a mixture

called an ..... .

*(1 mark)*

**3 (a) (ii)** Give **one** benefit of using emulsifiers in food.

.....

.....

*(1 mark)*

**3 (b)** Olive oil has a boiling point of 300 °C.

**3 (b) (i)** Complete the sentence.

The boiling point of olive oil compared to the boiling point of water

is ..... .

*(1 mark)*

**3 (b) (ii)** Apart from colour, state **two** ways in which a food cooked in olive oil will be different to a food cooked in water.

.....

.....

.....

.....

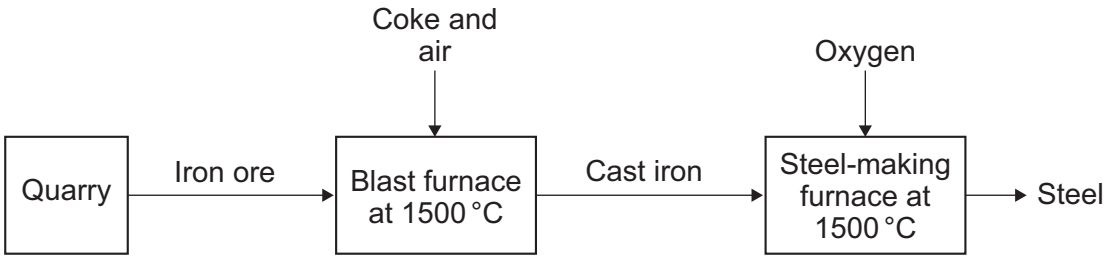
*(2 marks)*

5

Do not write outside the box

**4** The iron produced from iron ore in a blast furnace is called cast iron.

Cast iron is converted into steel in a furnace.




Iron ore contains iron oxide.
Coke contains carbon.

**4 (a)** Quarrying iron ore will have an impact on everything near to the quarry.

**4 (a) (i)** Describe **one** positive impact and **one** negative impact of quarrying iron ore.

positive impact .....

.....

negative impact.....

.....

*(2 marks)*

**4 (a) (ii)** Draw a ring around the correct answer to complete the sentence.

Ores contain enough metal to make extraction of the metal

carbon neutral.

economical.

reversible.

*(1 mark)*

**4 (b)** Many chemical reactions take place in a blast furnace.
Use the flow diagram to help you to answer this question.

Suggest how the blast furnace is heated.

.....

.....

*(1 mark)*

Do not write outside the box

**4 (c)** A chemical reaction for the extraction of iron is:

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$

**4 (c) (i)** Complete the word equation for this chemical reaction.

..... + carbon monoxide → iron + .....

*(2 marks)*

**4 (c) (ii)** Draw a ring around the correct answer to complete the sentence.

Iron is extracted from its ore by

- decomposition.
- oxidation.
- reduction.

*(1 mark)*

**4 (d)** Cast iron contains about 4% carbon.
Cast iron is converted into low-carbon steels.

**4 (d) (i)** Low-carbon steel is produced by blowing oxygen into molten cast iron.

Suggest how oxygen removes most of the carbon.

.....

.....

.....

.....

*(2 marks)*

**4 (d) (ii)** Draw a ring around the correct answer to complete the sentence.

Metals, such as nickel, are added to low-carbon steels to make the steel

- corrode easily.
- easy to shape.
- much harder.

*(1 mark)*

**Question 4 continues on the next page**

Do not write outside the box

**4 (e)** Recycling steel uses less energy than producing steel from iron ore**.**

Tick (✓) **one** advantage and tick (✓) **one** disadvantage of recycling steel.

| Statement | Advantage Tick (✓) | Disadvantage Tick (✓) |
|---|---|---|
| Iron is the second most common metal in the Earth's crust. | | |
| Less carbon dioxide is produced. | | |
| More iron ore needs to be mined. | | |
| There are different types of steel which must be sorted. | | |

*(2 marks)*

12

Do not write outside the box

**5** This question is about compounds produced from crude oil.

The table below shows four of these compounds.

| Compound | Melting point in °C | Boiling point in °C |
|---|---|---|
| methane ($CH_4$) | –183 | –164 |
| ethene ($C_2H_4$) | –169 | –104 |
| decane ($C_{10}H_{22}$) | –30 | +174 |
| icosane ($C_{20}H_{42}$) | +37 | +343 |

**5 (a)** Tick (✓) **two** correct statements about the four compounds.

| Statement | Tick (✓) |
|---|---|
| Methane has the lowest melting point and icosane has the highest boiling point. | |
| Ethene and methane are alkanes. | |
| Methane and decane are gases at room temperature (20 °C). | |
| Decane and icosane are liquid at 100 °C. | |

*(2 marks)*

**5 (b)** Petrol contains a mixture of compounds, including octane ($C_8H_{18}$).

Complete the word equation for the complete combustion of octane.

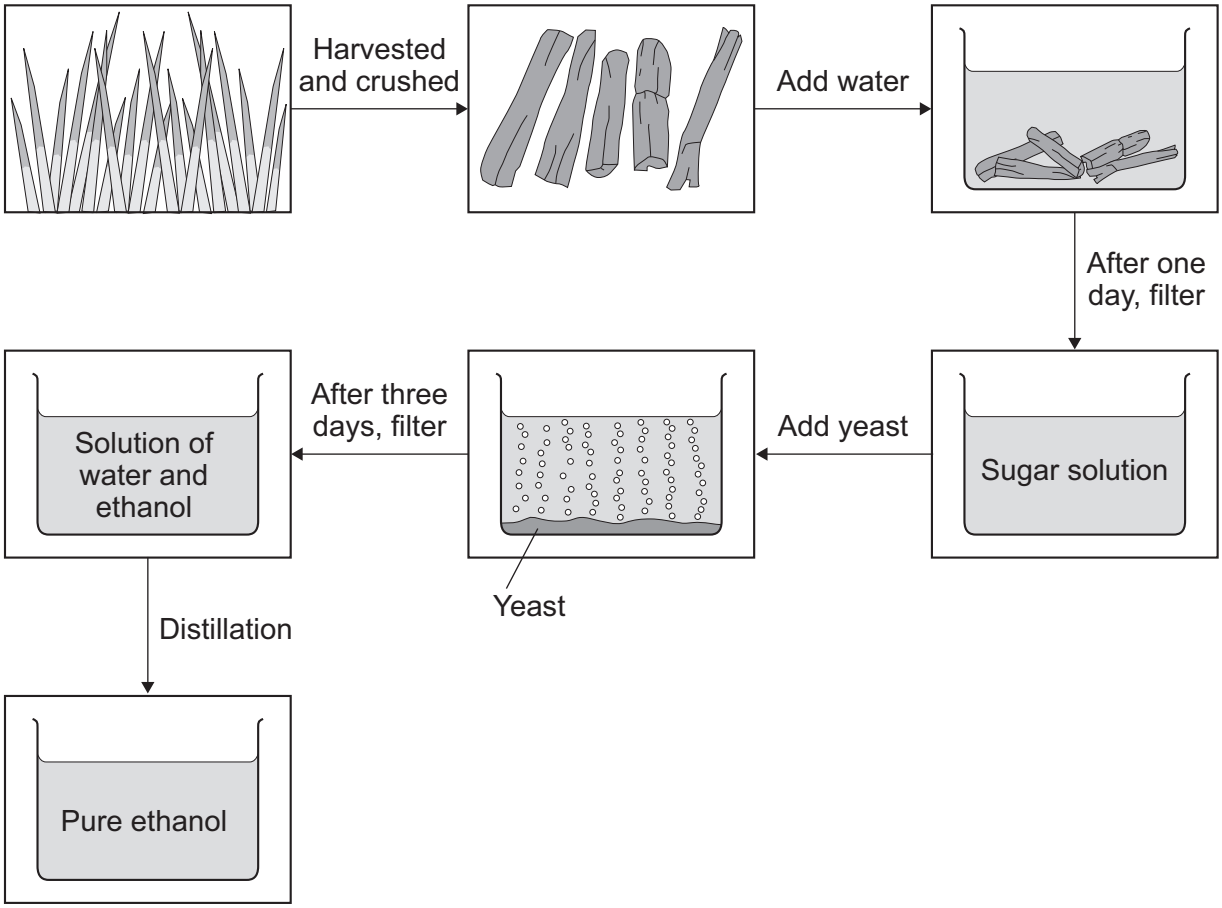
octane + oxygen → ..... + .....

*(2 marks)*

**Question 5 continues on the next page**

Do not write outside the box

**5 (c)** Most petrol used in cars contains about 5% ethanol ($C_2H_5OH$).
Ethanol can be produced from sugar cane.




**5 (c) (i)** Draw a ring around the correct answer to complete the sentence.

The reaction to produce ethanol from sugar solution is

combustion.

displacement.

fermentation.

*(1 mark)*

Do not write outside the box

**5 (c) (ii)** Some people say that increasing the production of ethanol from sugar cane will be **good** for the environment.

Suggest **two** reasons why.

1 .....

.....

.....

2 .....

.....

.....

*(2 marks)*

**5 (c) (iii)** Other people say that increasing the production of ethanol from sugar cane will be **bad** for the environment.

Suggest **two** reasons why.

1 .....

.....

.....

2 .....

.....

.....

*(2 marks)*

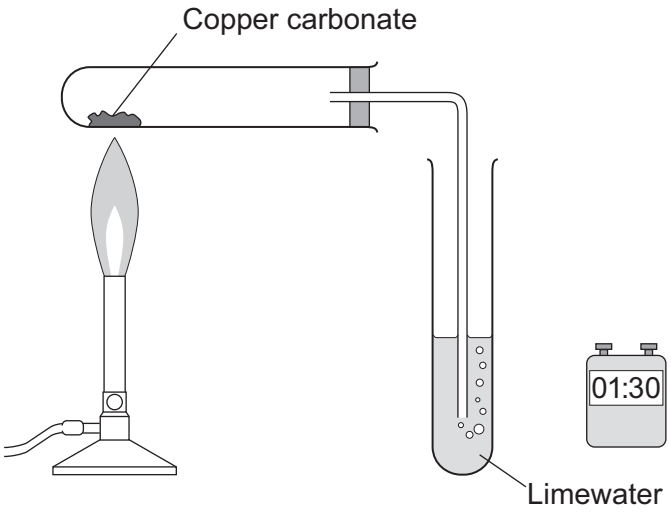
9

**Turn over for the next question**

Do not write outside the box

**6** Carbon dioxide is produced when copper carbonate is heated.

A student investigated heating copper carbonate.
The student used the apparatus to measure how long it took for carbon dioxide to be produced.
The student also noted what happened during each minute for three minutes.




**6 (a)** The student used changes to the limewater to measure how long it took for carbon dioxide to be produced.

Describe how.

.....

.....

.....

.....

*(2 marks)*

Do not write outside the box

**6 (b)** The student wrote down her observations.

| Time interval in minutes | Observations |
|---|---|
| Between 0 and 1 | A slow release of gas bubbles.<br>The limewater did not change.<br>The solid in the test tube was green. |
| Between 1 and 2 | A fast release of gas bubbles.<br>The limewater changed at 1 minute 10 seconds. |
| Between 2 and 3 | No release of gas bubbles.<br>The solid in the test tube was black. |

**6 (b) (i)** Suggest the reason for the student's observations between 0 and 1 minute.

.....

.....

.....

.....

.....

*(2 marks)*

**6 (b) (ii)** Explain the student's observations between 1 and 2 minutes.

.....

.....

.....

.....

*(2 marks)*

**6 (b) (iii)** Explain the student's observations between 2 and 3 minutes.

.....

.....

.....

.....

*(2 marks)*

8

**Turn over ▶**

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

Do not write outside the box

**7** This question is about oil reserves.

**7 (a)** Diesel is separated from crude oil by fractional distillation.

Describe the steps involved in the fractional distillation of crude oil.

.....

.....

.....

.....

.....

.....

.....

.....

*(3 marks)*

**7 (b)** Diesel is a mixture of lots of different *alkanes*.

What are *alkanes*?

.....

.....

.....

.....

.....

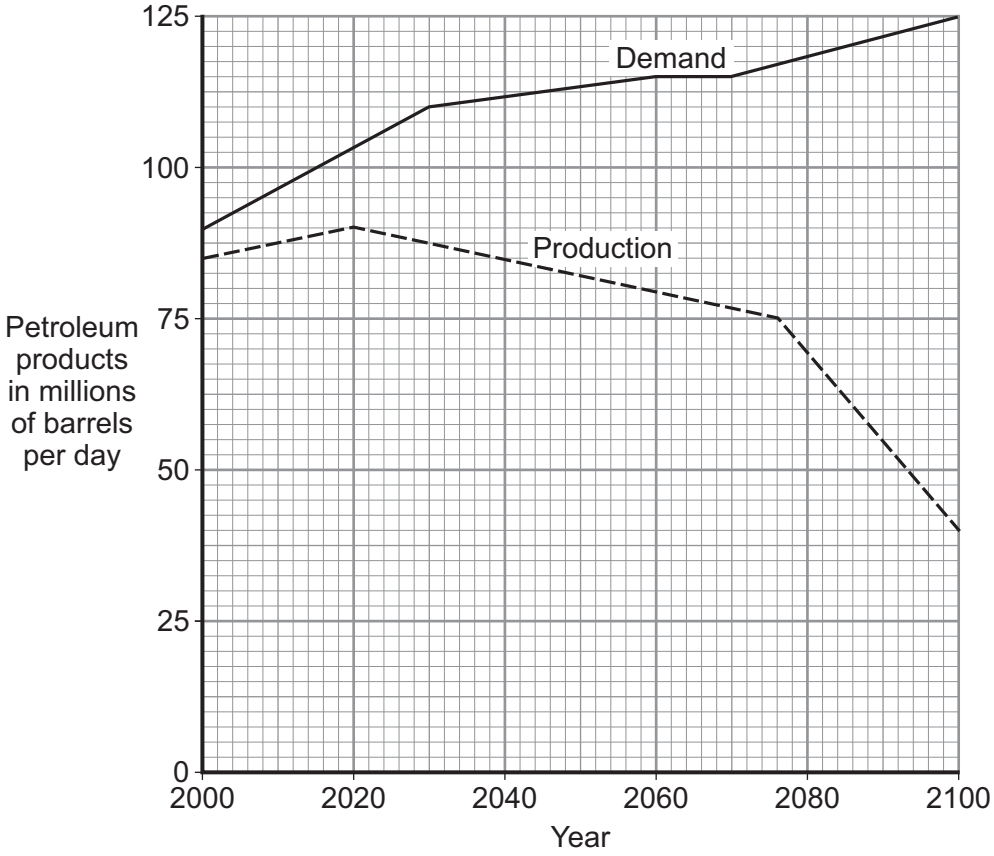
*(2 marks)*

**Question 7 continues on the next page**

Do not write outside the box

**7 (c)** *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Petroleum products, such as petrol, are produced from crude oil.
The graph shows the possible future production of petroleum products from crude oil and the expected demand for petroleum products.




Canada's oil sands hold about 20% of the world's known crude oil reserves.

The oil sands contain between 10 to 15% of crude oil. This crude oil is mainly bitumen.

In Canada the oil sands are found in the ground underneath a very large area of forest. The trees are removed. Then large diggers and trucks remove 30 metres depth of soil and rock to reach the oil sands. The oil sands are quarried. Boiling water is mixed with the quarried oil sands to separate the bitumen from the sand. Methane (natural gas) is burned to heat the water.

The mixture can be separated because bitumen floats on water and the sand sinks to the bottom of the water. The bitumen is cracked and the products are separated by fractional distillation.

Do not write outside the box

Use the information on page 18 and your knowledge and understanding to suggest the advantages and disadvantages of extracting petroleum products from oil sands.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

*(6 marks)*

11

**END OF QUESTIONS**

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

Copyright © 2013 AQA and its licensors. All rights reserved.



**General Certificate of Secondary Education**
**January 2013**

# Science A / Chemistry CH1FP

## (Specification 4405 / 4402)

## Unit 1: Chemistry 1

# Final

# *Mark Scheme*

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all examiners participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for standardisation each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, examiners encounter unusual answers which have not been raised they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available from: aqa.org.uk

Copyright © 2013 AQA and its licensors. All rights reserved.

**Copyright**
AQA retains the copyright on all its publications. However, registered schools/colleges for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to schools/colleges to photocopy any material that is acknowledged to a third party even for internal use within the school/college.

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).
Registered address: AQA, Devas Street, Manchester M15 6EX.

## Information to Examiners

### 1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right-hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

### 2. Emboldening

**2.1** In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following bullet points is a potential mark.

**2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.

**2.3** Alternative answers acceptable for a mark are indicated by the use of **or**.
Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.

### 3. Marking points

### 3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error / contradiction negates each correct response. So, if the number of error / contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.

Example 1: What is the pH of an acidic solution? (1 mark)

| Student | Response | Marks awarded |
|---|---|---|
| 1 | green, 5 | 0 |
| 2 | red*, 5 | 1 |
| 3 | red*, 8 | 0 |



STEMUP.CO.UK

Example 2: Name two planets in the solar system. (2 marks)

| Student | Response | Marks awarded |
|---|---|---|
| 1 | Neptune, Mars, Moon | 1 |
| 2 | Neptune, Sun, Mars, Moon | 0 |

**3.2 Use of chemical symbols / formulae**

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

**3.3 Marking procedure for calculations**

Full marks can be given for a correct numerical answer, without any working shown.

However, if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column or by each stage of a longer calculation.

**3.4 Interpretation of 'it'**

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

**3.5 Errors carried forward**

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

**3.6 Phonetic spelling**

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

**3.7 Brackets**

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

**3.8 Ignore / Insufficient / Do <u>not</u> allow**

Ignore or insufficient is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.
Do **not** allow means that this is a wrong answer which, even if the correct answer is given, will still mean that the mark is not awarded.



STEMUP.CO.UK

# Quality of Written Communication and levels marking

In Question 7(c) students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

## Level 1: basic

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

## Level 2: clear

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

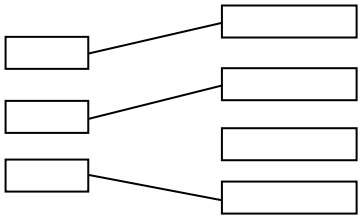
## Level 3: detailed

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.



STEMUP.CO.UK

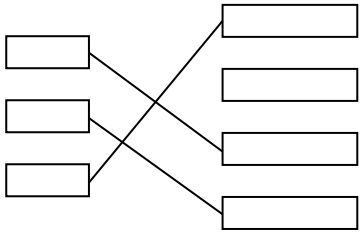
**CH1FP**

| question | answers | extra information | mark |
|---|---|---|---|
| **1(a)(i)** | nucleus | | 1 |
| **1(a)(ii)** | an energy level (shell) | | 1 |
| **1(b)** |  | | 1<br>1<br><br>1 |
| **1(c)** | 2/two(%) | | 1 |
| **1(d)(i)** | 10/ten | | 1 |
| **1(d)(ii)** | (group) 0 | accept noble gases<br>ignore (group) 8 | 1 |
| **Total** | | | **8** |



STEMUP.CO.UK

**CH1FP**

| question | answers | extra information | mark |
|---|---|---|---|
| **2(a)** |  | | 1<br><br>1<br><br>1 |
| **2(b)(i)** | is on a tectonic plate boundary | | 1 |
| **2(b)(ii)** | scientists cannot accurately predict when volcanic eruptions will occur | | 1 |
| **2(c)** | global dimming<br>acid rain | must be in this order | 1<br>1 |
| **Total** | | | **7** |



STEMUP.CO.UK

**CH1FP**

| question | answers | extra information | mark |
|---|---|---|---|
| **3(a)(i)** | emulsion | | 1 |
| **3(a)(ii)** | any **one** from:<br>• provides better texture<br>• improves coating ability<br>• improves appearance | ignore forms an emulsion<br>allow improves the taste<br>allow easier to spread<br>allow prevents ingredients from separating **or** stays mixed | 1 |
| **3(b)(i)** | higher / greater | allow high<br>accept 200(°C) more<br>allow (only) 100°C | 1 |
| **3(b)(ii)** | any **two** from:<br>in olive oil the food<br>• has a higher energy content<br>• has a harder/crisper texture<br>• has a different flavour / taste<br>• absorbs olive oil | allow converse points for water<br>allow not as healthy **or** more fat<br>if no other mark awarded allow cooks quicker for **1** mark | 2 |
| **Total** | | | **5** |



STEMUP.CO.UK

**CH1FP**

| question | answers | extra information | mark |
|---|---|---|---|
| **4(a)(i)** | Positive impact<br>any **one** from:<br>• provides employment **or**<br>• improves local economy<br>• improved transport - new roads are built, new rail links<br>• after use the quarry could provide recreation facilities<br><br>Negative impact<br>any **one** from:<br>• destruction of animal habitats<br>• fewer plants and trees to absorb carbon dioxide<br>• visual pollution **or** noise pollution **or** atmospheric / air pollution<br>• more traffic<br>• uses non-renewable resources | <br><br><br><br><br><br><br><br><br><br><br><br><br>allow dust pollution<br><br><br><br>allow pollutants from burning diesel | 1<br><br><br><br><br><br><br><br>1 |
| **4(a)(ii)** | economical | | 1 |
| **4(b)** | carbon / coke burns (in oxygen / air) | accept carbon / coke reacts with oxygen / air | 1 |
| **4(c)(i)** | iron oxide (reactant)<br>carbon dioxide (product) | must be words | 1<br>1 |
| **4(c)(ii)** | reduction | | 1 |



STEMUP.CO.UK

**CH1FP**

| question | answers | extra information | mark |
|---|---|---|---|
| **4(d)(i)** | oxygen reacts with carbon<br>**or**<br>oxygen and carbon produce carbon dioxide / carbon monoxide<br>carbon dioxide / carbon monoxide is a gas<br>**or**<br>the carbon is removed as a gas | | 1<br><br><br><br>1 |
| **4(d)(ii)** | much harder | | 1 |
| **4(e)** | Advantage:<br>less carbon dioxide is produced<br>Disadvantage:<br>there are different types of steel which must be sorted | | <br>1<br><br>1 |
| **Total** | | | **12** |



STEMUP.CO.UK

**CH1FP**

| question | answers | extra information | mark |
|---|---|---|---|
| **5(a)** | Methane has the lowest melting point and icosane has the highest boiling point<br>Decane and icosane are liquid at 100°C | | 1<br>1 |
| **5(b)** | <br>water / $H_2O$<br>carbon dioxide / $CO_2$ | either order<br>allow hydrogen oxide | <br>1<br>1 |
| **5(c)(i)** | fermentation | | 1 |
| **5(c)(ii)** | any **two** from:<br>• sugar cane/plants absorb carbon dioxide<br>• growing sugar cane/plants reduces global warming<br>• renewable resource/sustainable | <br>ignore oxygen released<br>allow ethanol from plants is carbon neutral<br>accept conserves fossil fuels / petrol | 2 |
| **5(c)(iii)** | any **two** from:<br>• destruction of habitats/forests (to grow sugar cane/crops)<br>• fermentation releases carbon dioxide<br>• production plants cause visual pollution<br>• pollution from the transportation of sugar cane / Ethanol<br>• growing sugar cane / plants uses a lot of land | | 2 |
| **Total** | | | **9** |



STEMUP.CO.UK

**CH1FP**

| question | answers | extra information | mark |
|---|---|---|---|
| **6(a)** | time from when the heating is started until | | 1 |
| | the limewater turns cloudy / milky | | 1 |
| **6(b)(i)** | the temperature was not high enough | accept the copper carbonate had not started to decompose / react<br><br>accept it takes time to heat up the copper carbonate | 1 |
| | the bubbles of gas were air | accept no carbon dioxide produced | 1 |
| **6(b)(ii)** | the copper carbonate was decomposing / reacting | accept the temperature was high enough to cause decomposition / a reaction | 1 |
| | so carbon dioxide was produced | allow correct word / symbol equation | 1 |
| **6(b)(iii)** | copper oxide was produced | allow correct word / symbol equation | 1 |
| | because the copper carbonate had completely decomposed / reacted | ignore all of the carbon dioxide had been given off | 1 |
| **Total** | | | **8** |



STEMUP.CO.UK

**CH1FP**

| question | answers | extra information | mark |
|---|---|---|---|
| **7(a)** | heat to vaporise (the crude oil) | do **not** accept cracking / burning | 1 |
| | vapours condense | | 1 |
| | at different temperatures | allow they have different boiling points | 1 |
| **7(b)** | (alkanes) are hydrocarbons **or** are compounds of hydrogen and carbon only | | 1 |
| | alkanes are saturated **or** have only (carbon-carbon) single bonds | accept have no (carbon-carbon) double bonds<br>accept general formula is $C_nH_{2n+2}$ for **2** marks | 1 |



STEMUP.CO.UK

**CH1FP**

| question | answers | extra information | mark |
|---|---|---|---|

**7(c)**

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. — 6

| 0 marks | Level 1 (1-2 marks) | Level 2 (3-4 marks) | Level 3 (5-6 marks) |
|---|---|---|---|
| No relevant content. | There is a basic description of at least one advantage or one disadvantage of extracting petroleum products from oil sands. | There is a clear description of an advantage and a disadvantage of extracting petroleum products from oil sands. | There is a detailed description of both advantages and disadvantages of extracting petroleum products from oil sands. |

**examples of the chemistry/environmental/economic/social points made in the response**

**Advantages:**

- the oil sands are needed because crude oil is running out
- this crude oil is needed because demand is increasing
- the oil sands contain a large amount of crude oil
- the oil sands could improve Canada's economy
- the oil sands provide employment for a lot of people
- the trees / forest are used for wood products / fuel

**Disadvantages:**

- destruction of environment / habitats
- fewer trees / forests to absorb carbon dioxide
- specified pollution, for example, visual, noise, atmospheric (including dust), water (including river or drinking) with cause, e.g. gases/particulates from burning diesel
- large amounts of methane(natural gas) are used to provide energy
- energy / fuel needed for cracking and fractional distillation
- burning fuel releases carbon dioxide
- crude oil / natural gas contains locked up carbon
- crude oil is non-renewable

| Total | | 11 |
|---|---|---|

**UMS conversion calculator** www.aqa.org.uk/umsconversion



STEMUP.CO.UK

| Centre Number | | | | | | Candidate Number | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Surname | | | | | | | | | | |
| Other Names | | | | | | | | | | |
| Candidate Signature | | | | | | | | | | |

| For Examiner's Use | |
|---|---|
| Examiner's Initials | |
| Question | Mark |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| TOTAL | |

General Certificate of Secondary Education
Foundation Tier
June 2012

# Science A
**Unit Chemistry C1**

**CH1FP**

**F**

# Chemistry
**Unit Chemistry C1**

**Friday 15 June 2012 1.30 pm to 2.30 pm**

**For this paper you must have:**
- a ruler
- the Chemistry Data Sheet (enclosed).

You may use a calculator.

**Time allowed**
- 1 hour

**Instructions**
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

**Information**
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 8(b) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

**Advice**
- In all calculations, show clearly how you work out your answer.

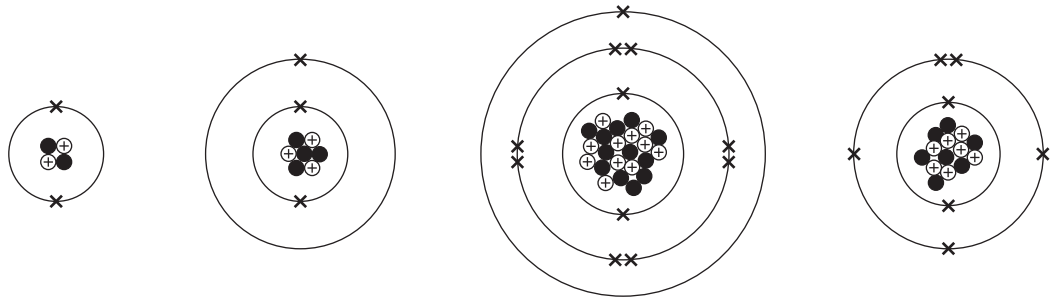


STEMUP.CO.UK

Do not write outside the box

Answer **all** questions in the spaces provided.

**1** The diagrams show the sub-atomic particles in four different atoms.



**Atom A** **Atom B** **Atom C** **Atom D**

Use the Chemistry Data Sheet to help you to answer these questions.

**1 (a)** Draw a ring around the correct answer to complete each sentence.

**1 (a) (i)** The centre of each atom is called the

energy level.
molecule.
nucleus.

*(1 mark)*

**1 (a) (ii)** The centre of each atom contains neutrons and

bonds.
electrons.
protons.

*(1 mark)*

**1 (b)** Complete the sentence.

There is no overall electrical charge on each atom because the

number of ..... is equal to the number of ..... .

*(1 mark)*

Do not write outside the box

**1 (c)** What is the name of the element represented by atom **D**? .....

*(1 mark)*

**1 (d)** Which **two** of the atoms, **A**, **B**, **C** and **D**, are in the same group of the periodic table?

Give a reason for your answer.

Atom [ ] and atom [ ]

Reason .....

.....

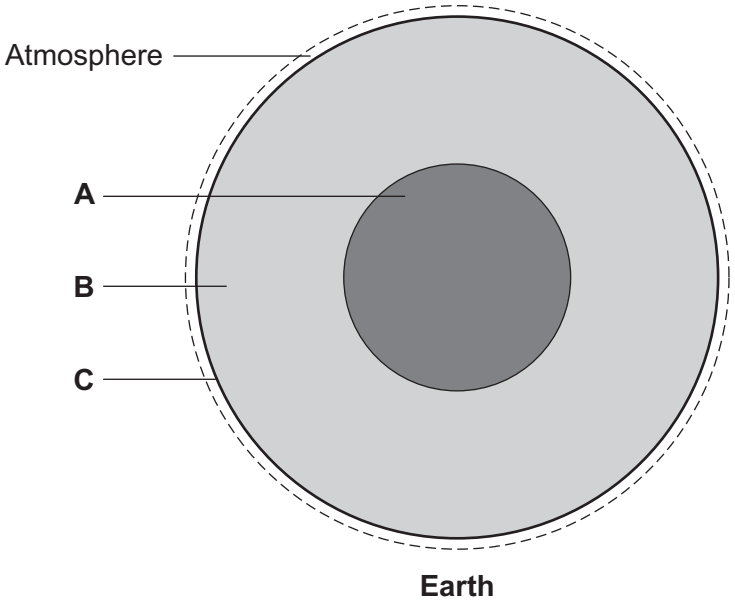
*(2 marks)*

6

**Turn over for the next question**

*Do not write outside the box*

**2** This is a diagram of the layered structure of the Earth.




**Earth**

**2 (a)** Draw a line from each layer to the correct name of the layer.

| Layer | Name |
|---|---|
| Layer **A** | core |
| Layer **B** | crust |
| Layer **C** | mantle |
| | nucleus |

*(3 marks)*

Do not write outside the box

**2 (b)** The Earth's early atmosphere was 96 % carbon dioxide.
The atmosphere of the Earth today is 0.04 % carbon dioxide.

The percentage of carbon dioxide in the Earth's atmosphere has changed.

Give **two** reasons why.

You should consider:

- the formation of surface water (oceans)
- the formation of sedimentary rocks (limestone).

.....

.....

.....

.....

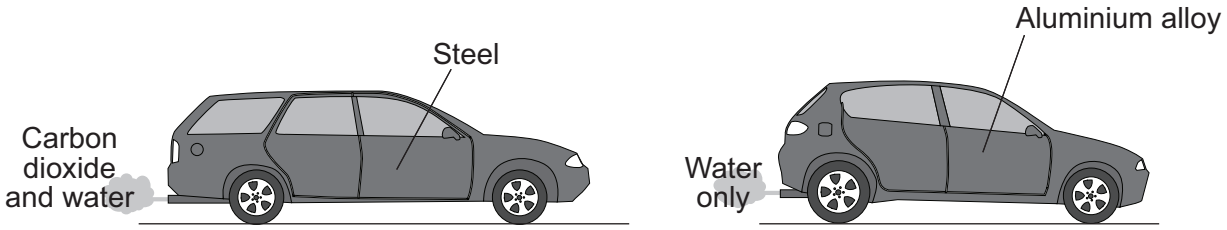
*(2 marks)*

5

**Turn over for the next question**

Do not write outside the box

**3** The picture shows two different cars.




**3 (a)** Some properties of aluminium are given below.

Tick (✓) **two** reasons why aluminium is better than steel for car bodies.

| Reason | Tick (✓) |
|---|---|
| Aluminium is not a transition metal. | |
| Aluminium has a low density. | |
| Aluminium is expensive to extract. | |
| Aluminium is resistant to corrosion. | |

*(2 marks)*

**3 (b)** Each car body is made from an *alloy*.

**3 (b) (i)** What is an *alloy*?

.....

.....

*(1 mark)*

**3 (b) (ii)** An alloy is used to make a car body. A pure metal is **not** used to make a car body.

Suggest why.

.....

.....

*(1 mark)*

Do not write outside the box

**3 (c)** The car with a steel body uses petrol for fuel.

Draw a ring around the correct answer to complete each sentence.

**3 (c) (i)** Petrol is made from

air.

crude oil.

metal ores.

*(1 mark)*

**3 (c) (ii)** Petrol is a mixture of

carbonates

hydrocarbons

polymers

including $C_8H_{18}$

*(1 mark)*

**3 (c) (iii)** In the car engine petrol reacts with

argon

nitrogen

oxygen

to produce carbon dioxide and water.

*(1 mark)*

**3 (d)** Look at the substances coming out of each car's exhaust.

**3 (d) (i)** Suggest the name of the fuel used in the car with the aluminium alloy body.

Name of fuel .....

*(1 mark)*

**3 (d) (ii)** Why is the fuel burned in the car with the aluminium alloy body better for the environment than petrol?

.....

.....

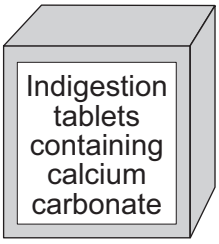
*(1 mark)*

9

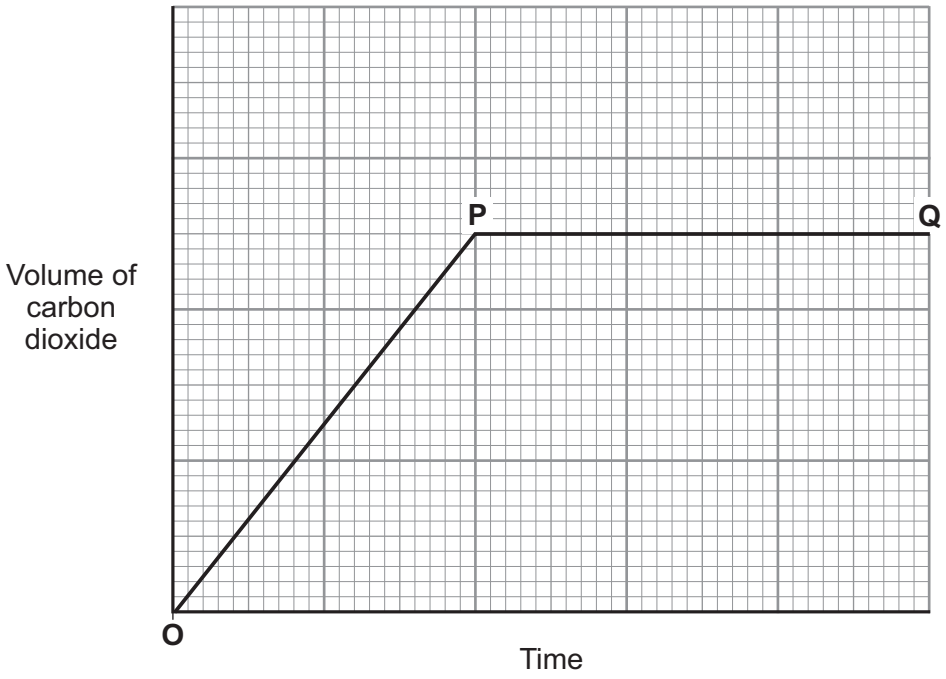
**Turn over for the next question**

Do not write outside the box

**4** Human stomachs contain hydrochloric acid.
Stomach ache can be caused by too much acid in the stomach.
Indigestion tablets can be used to reduce the amount of acid in the stomach.




**4 (a)** The graph shows how the volume of carbon dioxide produced changes with time, after some calcium carbonate is added to hydrochloric acid.




**4 (a) (i)** Complete the sentence to explain what happens between **O** and **P**.

Between **O** and **P** the calcium carbonate and hydrochloric acid ..... .

*(1 mark)*

**4 (a) (ii)** Complete the sentence to explain what happens at **P**.

At **P** the calcium carbonate and hydrochloric acid .....

because .....

*(2 marks)*

Do not write outside the box

**4 (a) (iii)** Describe the test for carbon dioxide gas.

Test .....

Result of the test .....

*(2 marks)*

**4 (b)** Calcium carbonate is found in limestone.
Limestone is removed from the ground by quarrying.



Tick (✓) **one** advantage and tick (✓) **one** disadvantage of quarrying limestone.

| Statement | Advantage Tick (✓) | Disadvantage Tick (✓) |
|---|---|---|
| Quarrying limestone destroys the shells and skeletons of marine organisms that formed the limestone. | | |
| Quarrying limestone releases dust, and lorries release carbon dioxide from burning diesel fuel. | | |
| Quarrying limestone provides building materials, employment and new road links. | | |
| Quarrying limestone removes ores from the ground. | | |

*(2 marks)*

7

Turn over ▶

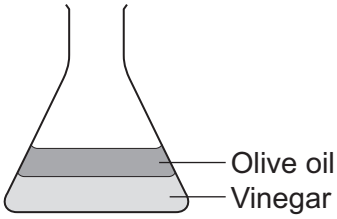
Do not write outside the box

**5** Olive oil is used to make salad dressings and margarine.

**5 (a)** Vinegar is often used in salad dressings.
Vinegar contains 95% water and 5% ethanoic acid.

**5 (a) (i)** To make a simple salad dressing add olive oil to vinegar and shake.
After a few minutes the mixture separates.

**Simple salad dressing**



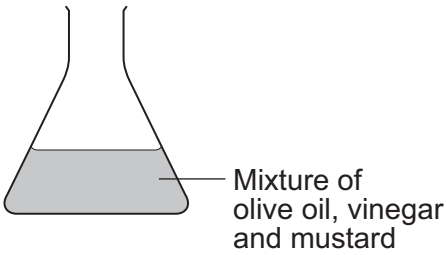

Tick (✓) **one** reason why the olive oil separates above the vinegar.

| Reason | Tick (✓) |
|---|---|
| Olive oil does not dissolve in vinegar. | |
| Olive oil has a higher density than vinegar. | |
| Olive oil has a higher boiling point than vinegar. | |

*(1 mark)*

**5 (a) (ii)** To make a French salad dressing add mustard to the olive oil and vinegar and shake.
After several minutes the mixture does **not** separate.

**French salad dressing**




The olive oil, vinegar and mustard mixture does **not** separate.
Give **one** reason why.

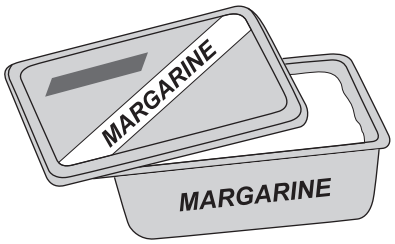
.....

.....

*(1 mark)*

Do not write outside the box

**5 (b)** Olive oil contains *unsaturated* compounds. Olive oil can be hardened to make margarine.




**5 (b) (i)** Draw a ring around the correct answer to complete the sentence.

*Unsaturated* compounds contain | double | ionic | metallic | carbon-carbon bonds.

*(1 mark)*

**5 (b) (ii)** Draw **one** line from the test that would detect unsaturated compounds to the result of the test.

| Test | Result of test |
|---|---|
| Add bromine water | Turns cloudy |
| Add limewater | Turns colourless |
| Add water | Turns orange |

*(1 mark)*

**5 (c)** Olives grow on trees.
When olive oil is burned it produces carbon dioxide.

**5 (c) (i)** Burning olive oil as a fuel is said to be 'carbon neutral'.
Suggest why.

.....

.....

*(1 mark)*

**5 (c) (ii)** Olive oil is too expensive to use as biodiesel fuel.
Suggest another reason why olive oil should **not** be used as a fuel.

.....

.....

*(1 mark)*

6

**Turn over ▶**

Do not write outside the box

**6** Ethanol ($C_2H_5OH$) can be made from ethene or from sugar.

**6 (a)** Complete the table which shows the number of atoms of each element in the formula of ethanol.

Use the Chemistry Data Sheet to help you to complete the table.

| Element | Symbol | Number of atoms in the formula $C_2H_5OH$ |
|---|---|---|
| Carbon | C | 2 |
| Hydrogen | H | ..... |
| ..... | O | 1 |

*(2 marks)*

**6 (b)** Ethene ($C_2H_4$) is produced when hydrocarbons are cracked.

**6 (b) (i)** Tick (✓) **two** conditions needed to crack a hydrocarbon.

| Condition | Tick (✓) |
|---|---|
| The presence of an emulsifier. | |
| Heating the hydrocarbon to a high temperature. | |
| Adding oxygen to the hydrocarbon. | |
| The presence of a catalyst. | |

*(2 marks)*

**6 (b) (ii)** Draw the missing bonds to complete the displayed structure of ethene.

**H H**

**C C**

**H H**

*(1 mark)*

**6 (b) (iii)** Name the substance added to ethene ($C_2H_4$) to produce ethanol ($C_2H_5OH$).

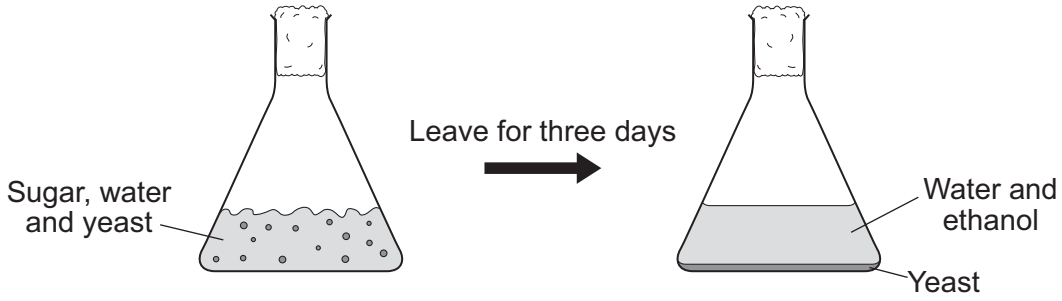
.....

*(1 mark)*

Do not write outside the box

**6 (c)** The diagram shows how a solution of ethanol is made from sugar dissolved in water.

The boiling point of ethanol is 78 °C and the boiling point of water is 100 °C.




**6 (c) (i)** Name the gas produced during this reaction.

.....

*(1 mark)*

**6 (c) (ii)** What are the main steps needed to obtain pure ethanol from the mixture produced after three days?

.....

.....

.....

.....

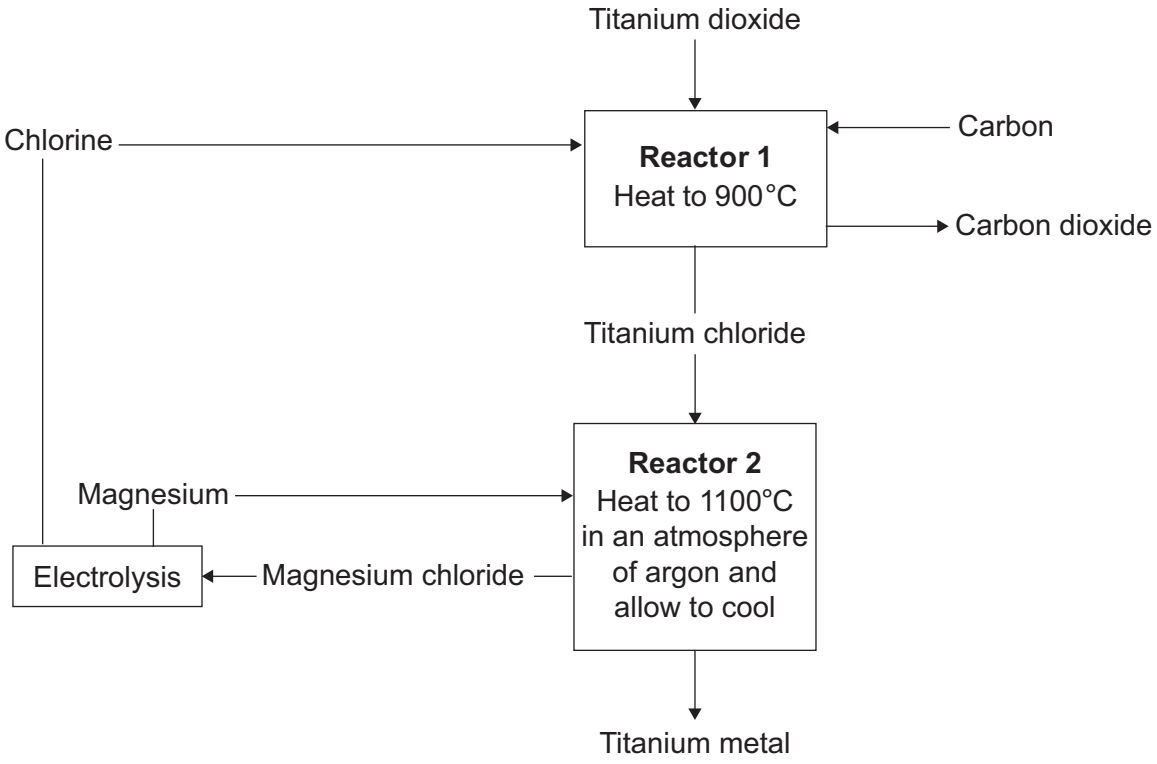
*(2 marks)*

9

**Turn over for the next question**

Do not write outside the box

**7** Rutile is an ore of titanium. Rutile contains titanium dioxide.
The flow chart shows how titanium metal is extracted from titanium dioxide.




**7 (a)** Titanium is much more expensive than iron.

Give **one** reason why.

.....

.....

*(1 mark)*

**7 (b)** Name the only waste product shown on the flow chart.

.....

*(1 mark)*

Do not write outside the box

**7 (c)** Describe the example of recycling shown on the flow chart.

.....

.....

.....

.....

*(2 marks)*

**7 (d)** The air is removed from **Reactor 2**. An atmosphere of argon is used for the reaction between titanium chloride and magnesium metal.

Explain why.

.....

.....

.....

.....

*(2 marks)*

**Question 7 continues on the next page**

Do not write outside the box

**7 (e)** Titanium metal is produced by reacting titanium chloride with magnesium.

950 kg of titanium chloride was mixed with 240 kg of magnesium metal. The mixture was heated and produced 950 kg of magnesium chloride.

Calculate the mass of titanium metal produced.

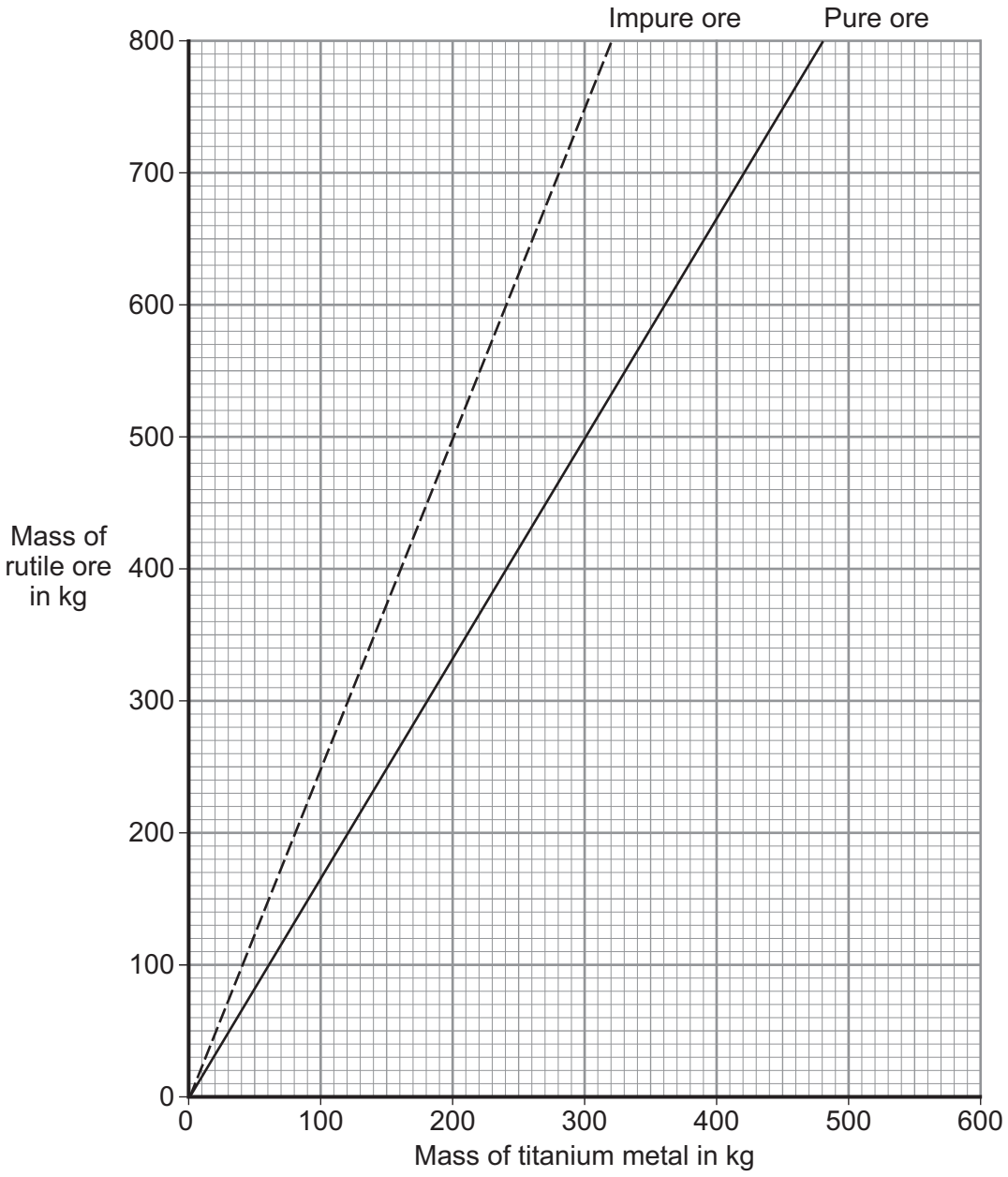
.....

Mass = ..... kg

*(1 mark)*

Do not write outside the box

**7 (f)** The graph shows the mass of titanium metal produced from a pure rutile ore and from an impure rutile ore.




The difference between the two lines represents the amount of waste rock in the impure ore.

300 kg of titanium metal was produced from the impure ore.

Calculate the mass of waste rock in the impure ore.

.....

Mass = ..... kg

*(1 mark)*

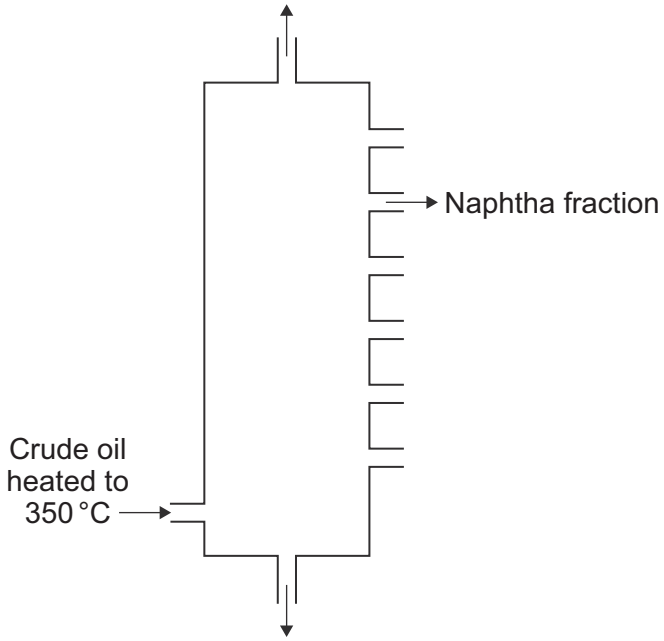
8

**Turn over ▶**

Do not write outside the box

**8** Crude oil is used to produce poly(ethene).

**8 (a)** Fractional distillation is used to separate crude oil into fractions.




**8 (a) (i)** Write a number, **2**, **3**, **4** or **5**, next to each stage so that the description of fractional distillation is in the correct order. Numbers **1** and **6** have been done for you.

| Number | Stage |
|---|---|
| **1** | The crude oil is heated to 350 °C. |
| | When a fraction in the vapours cools to its boiling point, the fraction condenses. |
| | Any liquids flow down to the bottom of the column and the hot vapours rise up the column. |
| **6** | The condensed fraction is separated and flows out through a pipe. |
| | When the hot vapours rise up the column, the vapours cool. |
| | Most of the compounds in the crude oil evaporate. |

*(2 marks)*

**8 (a) (ii)** The naphtha fraction is cracked to produce ethene ($C_2H_4$).
Ethene is used to make the polymer called poly(ethene).

Name **two** substances produced when poly(ethene) burns in air.

1 .....

2 .....

*(2 marks)*

Do not write outside the box

**8 (b)** *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Each year in the UK, billions of plastic bags are given free to shoppers. These bags are made from poly(ethene) and are often used only once.
After being used many of these plastic bags are either thrown away as litter or buried in landfill sites.

In 2006 over 10 billion of these plastic bags were given free to shoppers.
In 2009 the number of plastic bags given to shoppers had decreased to 6.1 billion.
One reason for the decrease was because some supermarkets made people pay for their plastic bags.

From 2011 a new type of plastic shopping bag made mainly from poly(ethene) had a use-by date of only one year printed on the bag.

Use the information above and your knowledge and understanding to describe advantages and disadvantages of using plastic shopping bags made from poly(ethene).

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

*(6 marks)*

10

**END OF QUESTIONS**

Do not write outside the box

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

ACKNOWLEDGEMENT OF COPYRIGHT-HOLDERS AND PUBLISHERS

Question 4 Photograph © Thinkstock

Copyright © 2012 AQA and its licensors. All rights reserved.

Version : 10/08/2012

# General Certificate of Secondary Education

# Science A 4405 / Chemistry 4402

## CH1FP Unit Chemistry 1

# Mark Scheme

*2012 examination – June series*

STEMUP.CO.UK

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

Copyright © 2012 AQA and its licensors. All rights reserved.

COPYRIGHT
AQA retains the copyright on all its publications. However, registered schools / colleges for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to schools / colleges to photocopy any material that is acknowledged to a third party even for internal use within the school / college.

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).
Registered address: AQA, Devas Street, Manchester M15 6EX

# MARK SCHEME

## Information to Examiners

### 1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

### 2. Emboldening

**2.1** In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

**2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.

**2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

### 3. Marking points

#### 3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.



STEMUP.CO.UK

Example 1: What is the pH of an acidic solution? (1 mark)

| Student | Response | Marks awarded |
|---|---|---|
| 1 | 4,8 | 0 |
| 2 | green, 5 | 0 |
| 3 | red*, 5 | 1 |
| 4 | red*, 8 | 0 |

Example 2: Name two planets in the solar system. (2 marks)

| Student | Response | Marks awarded |
|---|---|---|
| 1 | Neptune, Mars, Moon | 1 |
| 2 | Neptune, Sun, Mars, Moon | 0 |

### 3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

### 3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

### 3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

### 3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

### 3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

### 3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.



STEMUP.CO.UK

## Quality of Written Communication and levels marking

In Question 8(b) students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

**Level 1: Basic**

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

**Level 2: Clear**

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

**Level 3: Detailed**

- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.



STEMUP.CO.UK

**CH1FP**

**Question 1**

| question | answers | extra information | mark |
|---|---|---|---|
| **1(a)(i)** | nucleus | | 1 |
| **1(a)(ii)** | protons | | 1 |
| **1(b)** | protons / + / positive<br><br>electrons / – / negative | both words needed in any order for **1** mark | 1 |
| **1(c)** | nitrogen | allow N or $N_2$ | 1 |
| **1(d)** | B **and** C<br><br>(both) have one electron **or** same number of electrons in the outer energy level / shell | both letters needed in any order for **1** mark<br>allow Li **and** Na<br><br>allow both are in Group **1**<br>allow both are alkali metals<br>allow both can lose only one electron **or** become +1 ions<br>allow this mark if no letters given in boxes | 1<br><br>1 |
| **Total** | | | **6** |



STEMUP.CO.UK

**CH1FP**

**Question 2**

| question | answers | extra information | mark |
|---|---|---|---|
| **2(a)** | A – core<br><br>B – mantle<br><br>C – crust | | 1<br><br>1<br><br>1 |
| **2(b)** | any **two** from:<br><br>• carbon dioxide dissolves / absorbs in water / oceans<br><br>• plants / algae photosynthesise / absorb / use carbon dioxide<br><br>• marine organisms use (dissolved) carbon dioxide to form their shells / skeletons<br><br>**or**<br><br>limestone was formed from the shells / skeletons of marine organisms | <br><br>allow reacts with water<br><br>accept remains of plants / algae / marine organisms contain locked up carbon dioxide / carbon in the form of fossil fuels<br>do **not** accept plants use carbon dioxide for respiration<br><br>accept carbon dioxide became locked up in sedimentary rocks / carbonates / limestone<br><br>**or**<br><br>precipitation or formation of insoluble carbonates | 2 |
| **Total** | | | **5** |



STEMUP.CO.UK

**CH1FP**

**Question 3**

| question | answers | extra information | mark |
|---|---|---|---|
| **3(a)** | Aluminium has a low density<br><br>Aluminium is resistant to corrosion | | 1<br><br>1 |
| **3(b)(i)** | (an alloy) is a mixture of metals | accept (an alloy) can be a metal mixed with another metal **or** iron mixed with carbon / a non-metal | 1 |
| **3(b)(ii)** | pure metals are soft<br><br>**or**<br><br>alloys are hard | allow weak<br><br><br><br>allow strong / keep their shape<br>ignore rust / corrosion | 1 |
| **3(c)(i)** | crude oil | | 1 |
| **3(c)(ii)** | hydrocarbons | | 1 |
| **3(c)(iii)** | oxygen | | 1 |
| **3(d)(i)** | hydrogen | allow $H_2$ or H | 1 |
| **3(d)(ii)** | only water is produced (from the fuel)<br><br>**or**<br><br>no carbon dioxide is produced (from the fuel) | <br><br><br><br>allow less carbon dioxide produced **or** less global warming<br>allow carbon dioxide causes global warming | 1 |
| **Total** | | | **9** |



STEMUP.CO.UK

**CH1FP**

**Question 4**

| question | answers | extra information | mark |
|---|---|---|---|
| **4(a)(i)** | react | allow neutralise<br>allow bubbles / fizzes<br>accept produces gas / $CO_2$<br><br>ignore rises | 1 |
| **4(a)(ii)** | stop reacting / producing<br><br>the (hydrochloric) acid / (calcium) carbonate is used up<br><br>**OR**<br><br>have been used up (1)<br><br>the graph line becomes horizontal / levels out (1)<br><br>**OR**<br><br>stays the same / no change (1)<br><br>no further reaction (1) | stops on its own is insufficient<br>allow stop working / bubbling / fizzing<br><br>accept because the (calcium) carbonate has neutralised the (hydrochloric) acid<br><br>ignore reference to graph line | 1<br><br>1 |
| **4(a)(iii)** | bubble the gas through limewater / calcium hydroxide solution<br><br>(the solution) goes cloudy | allow (add) limewater<br>test must be correct to gain result mark<br><br>allow milky | 1<br><br>1 |
| **4(b)** | advantage > Quarrying limestone provides building materials, employment and new road links<br><br>disadvantage > Quarrying limestone releases dust, and lorries release carbon dioxide from burning diesel fuel | | 1<br><br>1 |
| **Total** | | | **7** |



STEMUP.CO.UK

**CH1FP**

**Question 5**

| question | answers | extra information | mark |
|---|---|---|---|
| **5(a)(i)** | Olive oil does not dissolve in vinegar | | 1 |
| **5(a)(ii)** | (the mustard is) an emulsifier | accept an emulsion has formed | 1 |
| **5(b)(i)** | double | | 1 |
| **5(b)(ii)** | add bromine water – turns colourless | | 1 |
| **5(c)(i)** | because the (olive) trees/plants/crops/leaves/fruit absorb/use carbon dioxide | allow carbon for carbon dioxide<br>allow carbon dioxide is used in photosynthesis | 1 |
| **5(c)(ii)** | any **one** from:<br>• olive oil is a food<br>• olives are slow-growing<br>• olives require a lot of land<br>• not enough olive trees / oil<br>• olive oil <u>dense</u> / <u>viscous</u> / <u>high boiling point</u> | ignore habitats<br>ignore gives off carbon dioxide | 1 |
| **Total** | | | **6** |



STEMUP.CO.UK

**CH1FP**

**Question 6**

| question | answers | extra information | mark |
|---|---|---|---|
| **6(a)** | 6<br><br>oxygen | | 1<br><br>1 |
| **6(b)(i)** | heating the hydrocarbon to a high temperature<br><br>the presence of a catalyst | | 1<br><br>1 |
| **6(b)(ii)** | all bonds correct<br><br>four C—H bonds **and**<br><br>one C=C bond | | 1 |
| **6(b)(iii)** | water | accept hydrogen oxide/steam<br><br>allow $H_2O$ | 1 |
| **6(c)(i)** | carbon dioxide | allow $CO_2$ | 1 |
| **6(c)(ii)** | by filtering/decanting/centrifuging (to remove yeast)<br><br>(fractional) distillation (to separate ethanol from water) | ignore sieving<br><br>accept a description of (fractional) distillation | 1<br><br>1 |
| **Total** | | | **9** |



STEMUP.CO.UK

**CH1FP**

**Question 7**

| question | answers | extra information | mark |
|---|---|---|---|
| **7(a)** | any **one** from:<br><br>• there are many stages needed (to extract titanium)<br><br>• more energy / materials are needed (to extract titanium)<br><br>• titanium cannot be extracted by using carbon | ignore references to cost / mining / availability<br><br>allow longer / slower / more complicated process / batch process<br><br>ignore higher temperature<br>ignore reference to electrolysis<br><br>do **not** accept titanium extracted by electrolysis | 1 |
| **7(b)** | carbon dioxide | allow $CO_2$ | 1 |
| **7(c)** | magnesium chloride is electrolysed / used / decomposed<br><br>magnesium and / or chlorine are recycled / reused | <br><br>allow the products of electrolysis are recycled<br>word / symbol equation = **1** mark | 1<br><br>1 |
| **7(d)** | <br><br>because oxygen / nitrogen (in air) would react with the magnesium **or** would produce magnesium oxide / nitride<br><br>whereas argon is inert / unreactive **or** argon does not react with magnesium | accept titanium for magnesium<br><br><br><br>ignore argon is in Group 0 / noble gas | <br><br>1<br><br>1 |
| **7(e)** | 240 | | 1 |
| **7(f)** | 250 | allow range 245 to 250 | 1 |
| **Total** | | | **8** |



STEMUP.CO.UK

**CH1FP**

**Question 8**

| question | answers | extra information | mark |
|---|---|---|---|
| **8(a)(i)** | (1)<br>5<br>3<br>(6)<br>4<br>2 | all numbers in the correct order gains both marks<br><br>any two numbers in the correct position gains **1** mark | 2 |
| **8(a)(ii)** | <br>water<br><br>carbon dioxide | ignore formula if correct name given<br><br>accept hydrogen oxide<br><br>allow $H_2O$<br><br>allow $CO_2$<br><br>accept carbon monoxide / CO **or** carbon / C | <br>1<br><br>1 |

**Question 8 continues on the next page . . .**



STEMUP.CO.UK

**CH1FP**

**Question 8 cont'd**

| question | answers | extra information | mark |
|---|---|---|---|
| **8(b)** | Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. **Examiners should also refer to the information on page 2**, and apply a 'best-fit' approach to the marking. | | 6 |

| 0 marks | Level 1 (1-2 marks) | Level 2 (3-4 marks) | Level 3 (5-6 marks) |
|---|---|---|---|
| No relevant content. | There is a **basic** description of at least one advantage **or** one disadvantage caused by using plastic shopping bags made from poly(ethene). | There is a **clear** description of both an advantage **and** a disadvantage caused by using plastic shopping bags made from poly(ethene). | There is a **detailed** description of both advantages **and** disadvantages caused by using plastic shopping bags made from poly(ethene). |

**examples of the chemistry/social points made in the response:**
ignore cost unqualified

**Advantages:**

- Simple properties eg strong / low density / water resistant
- Bags can be reused (for shopping) **or** another specified use eg bin liners
- Money charged for bags can go to good causes **or** encourage reuse
- Poly(ethene) bags can be recycled eg made into milk bottle crates
- Poly(ethene) bags can be burned to provide heat for buildings/generation of electricity
- New bags are now made that can biodegrade

**Disadvantages:**

- (Older) bags can take many years to biodegrade
- There is a shortage of landfill space
- Bags are made from (crude) oil which is a non-renewable resource/running out
- Large amounts of energy/fuel are used for the production of poly(ethene)
- Production of poly(ethene) releases carbon dioxide/causes global warming
- Specified issue caused by litter eg visual pollution or effect on wildlife
- Burning bags release carbon dioxide / causes global warming

| | | | |
|---|---|---|---|
| **Total** | | | **10** |

**UMS Conversion Calculator** www.aqa.org.uk/umsconversion



STEMUP.CO.UK

| Centre Number | | | | | | Candidate Number | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Surname | | | | | | | | | | |
| Other Names | | | | | | | | | | |
| Candidate Signature | | | | | | | | | | |

| For Examiner's Use | |
|---|---|
| Examiner's Initials | |
| Question | Mark |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| TOTAL | |

General Certificate of Secondary Education
Foundation Tier
January 2012

# Science A
**Unit Chemistry C1**

**CH1FP**

**F**

# Chemistry
**Unit Chemistry C1**

**Wednesday 18 January 2012 9.00 am to 10.00 am**

**For this paper you must have:**
- a ruler
- the Chemistry Data Sheet (enclosed).

You may use a calculator.

**Time allowed**
- 1 hour

**Instructions**
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

**Information**
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- Question 5(b) should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

**Advice**
- In all calculations, show clearly how you work out your answer.



STEMUP.CO.UK

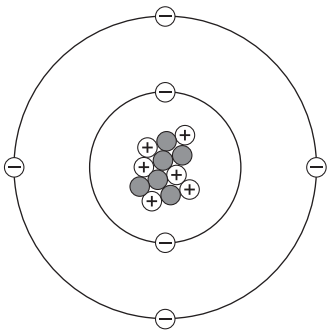
Do not write outside the box

Answer **all** questions in the spaces provided.

**1** The picture shows a diamond ring.




**1 (a)** Diamond is a form of carbon. The diagram represents a carbon atom.



Complete the table to show the name and charge of each type of particle in the carbon atom.

| Name of particle | Charge |
|---|---|
| proton | |
| neutron | 0 |
| | –1 |

*(2 marks)*

Do not write outside the box

**1 (b)** Use the Chemistry Data Sheet to help you to answer these questions.

**1 (b) (i)** Draw a ring around the correct answer to complete the sentence.

Gold and carbon are

compounds.

elements.

mixtures.

*(1 mark)*

**1 (b) (ii)** Complete the sentence.

Gold and carbon have different properties because gold is a metal

and carbon is a ..... .

*(1 mark)*

**1 (c)** Draw a ring around the correct answer to complete each sentence.

Pure gold is not used to make the ring because pure gold is too

hard.

reactive.

soft.

The gold ring is made by mixing pure gold with other metals to form

a compound.

an atom.

an alloy.

*(2 marks)*

**Question 1 continues on the next page**

Do not write outside the box

**1 (d)** The data in the table shows some information about the three metals in the gold ring.

| Name of metal | Atomic number | Percentage (%) of metal |
|---|---|---|
| gold | 79 | |
| silver | 47 | 16 |
| copper | 29 | 9 |

Draw **one** line from each question to its correct answer.

| Question | Answer |
|---|---|
| What is the percentage of gold in this ring? | 29 |
| How many electrons are there in a copper atom? | 61 |
| How many neutrons are in an atom of silver with a mass number of 108? | 75 |
| | 79 |

*(3 marks)*

9

*Do not write outside the box*

**Turn over for the next question**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

Do not write outside the box

**2** Cans for food and drinks are made from steel or aluminium.
The main metal in steel is iron.

**2 (a)** Reacting iron oxide with carbon produces iron.

Draw a ring around the correct answer to complete the sentence.

The reaction to produce iron from iron oxide is

- decomposition.
- oxidation.
- reduction.

*(1 mark)*

**2 (b)** Aluminium cannot be produced by reacting aluminium oxide with carbon.

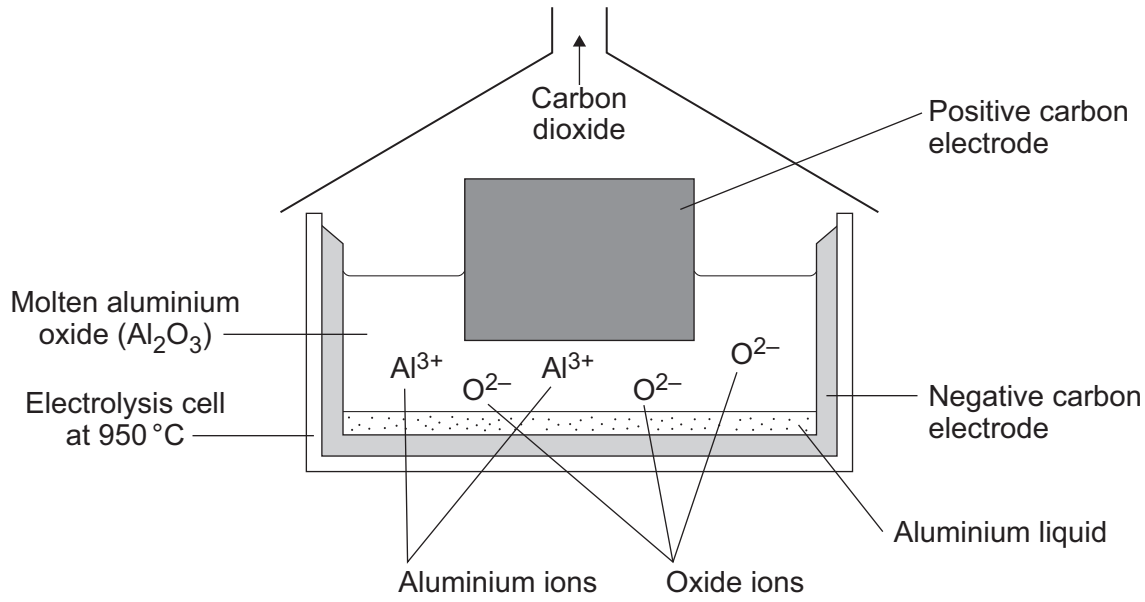
Why does aluminium oxide **not** react with carbon?

Tick (✓) the correct answer.

| Answer | Tick (✓) |
|---|---|
| aluminium is less reactive than carbon | |
| carbon is less reactive than aluminium | |
| oxygen is more reactive than carbon | |

*(1 mark)*

**2 (c)** Aluminium can be produced by electrolysis.



Do not write outside the box

Why do the aluminium ions collect at the negative electrode?

.....

.....

.....

.....

*(2 marks)*

**2 (d)** Some statements about aluminium are given below.

Tick (✓) **two** statements that are correct reasons why aluminium is used to make cans.

| Statement | Tick (✓) |
|---|---|
| aluminium conducts electricity | |
| aluminium is not a transition metal | |
| aluminium has a low density | |
| aluminium is resistant to corrosion | |

*(2 marks)*

**2 (e)** Recycling aluminium cans uses less fossil fuels than producing aluminium from its ore.

Tick (✓) **one** advantage and tick (✓) **one** disadvantage of recycling aluminium to make aluminium cans.

| Statement | Advantage Tick (✓) | Disadvantage Tick (✓) |
|---|---|---|
| aluminium is the most common metal in the Earth's crust | | |
| less carbon dioxide is produced | | |
| more aluminium ore needs to be mined | | |
| used aluminium cans have to be collected and transported | | |

*(2 marks)*

8

**Turn over ▶**

Do not write outside the box

**3 (a)** Crude oil is a mixture of compounds.
These compounds are made up of hydrogen and carbon atoms only.

**3 (a) (i)** Draw a ring around the correct answer to complete the sentence.

Compounds made up of carbon and hydrogen atoms only are called

| |
|---|
| alcohols. |
| hydrocarbons. |
| vegetable oils. |

*(1 mark)*

**3 (a) (ii)** The table shows five of these compounds.

| Compound | State at room temperature (20 °C) | Boiling point in °C |
|---|---|---|
| ethane, $C_2H_6$ | gas | –89 |
| butane, $C_4H_{10}$ | gas | 0 |
| hexane, $C_6H_{14}$ | liquid | +69 |
| pentadecane, $C_{15}H_{32}$ | liquid | +270 |
| heptadecane, $C_{17}H_{36}$ | solid | +302 |

Tick (✓) **two** correct statements about the five compounds.

| Statement | Tick (✓) |
|---|---|
| ethane has the smallest molecules | |
| hexane and pentadecane are liquid at 100 °C | |
| heptadecane has the highest boiling point | |
| butane boils at 100 °C | |

*(2 marks)*

**3 (a) (iii)** Draw a ring around the correct answer to complete each sentence.

Fractional distillation is used to separate the compounds in crude oil.

The first step in fractional distillation is

| |
|---|
| cracking |
| displacing |
| evaporating |

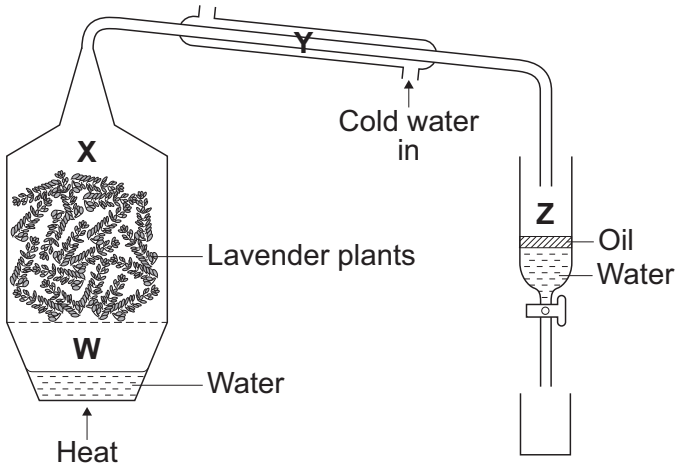
the crude oil.

Do not write outside the box

During fractional distillation the compounds | burn / condense / decompose | at different temperatures.

*(2 marks)*

**3 (b)** Steam distillation is used to separate oils from plants.
The diagram shows some apparatus that can be used to separate oil from lavender plants. Four parts of the apparatus are labelled **W**, **X**, **Y** and **Z**.




**3 (b) (i)** In which part, **W**, **X**, **Y** or **Z**, of the apparatus:

is steam produced ☐

are steam and oil condensed? ☐

*(2 marks)*

**3 (b) (ii)** Use the correct word from the box to complete the sentence.

| **dissolves** | **floats** | **sinks** |
|---|---|---|

When the oil separates from the water, the oil ..... .

*(1 mark)*

**3 (b) (iii)** Describe how part **Z** of the apparatus can be used to remove the water from the oil.

.....

.....

.....

.....

*(2 marks)*

10

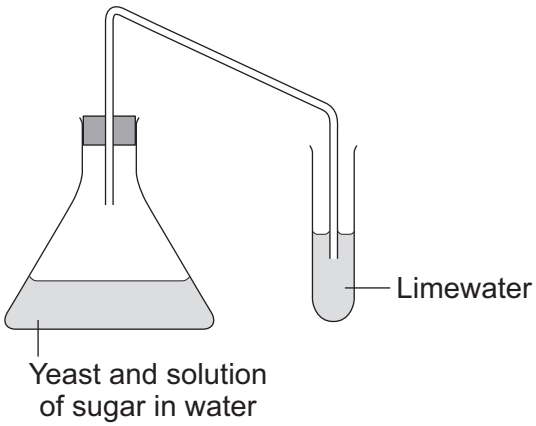
**Turn over ▶**

Do not write outside the box

**4** Two fuels that can be used for cars are:

- petrol from crude oil
- ethanol made from sugar in plants.

**4 (a)** A student used the apparatus shown to investigate the reaction to make ethanol from sugar.




**4 (a) (i)** Draw a ring around the correct answer to complete the sentence.

This reaction to make ethanol from sugar is

| |
|---|
| combustion. |
| decomposition. |
| fermentation. |

*(1 mark)*

**4 (a) (ii)** Complete the sentences.

The limewater turns ..... .

This happens because ..... .

*(2 marks)*

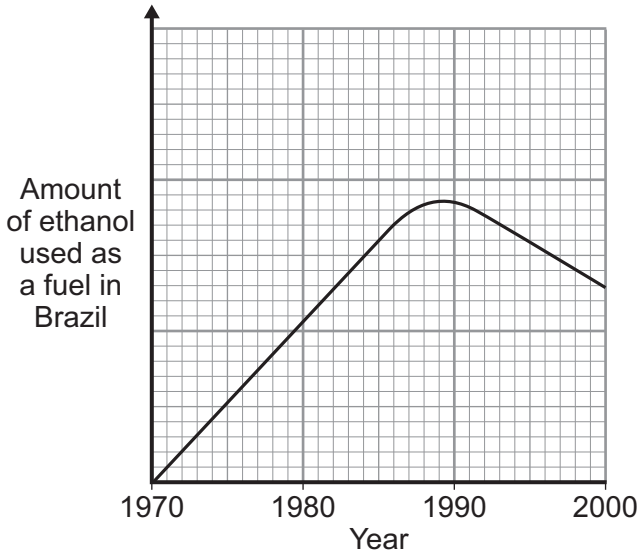
Do not write outside the box

**4 (b)** In 1970, the Brazilian Government stated that all petrol must contain more than 25 % ethanol.

The reasons for this statement in 1970 were:

- Brazil did not have many oilfields
- Brazil has a climate suitable for growing sugar cane.

The graph shows the amount of ethanol used as a fuel in Brazil from 1970 to 2000.




**4 (b) (i)** Use the graph to describe the changes in the amount of ethanol used as a fuel in Brazil from 1970 to 2000.

.....

.....

.....

.....

*(2 marks)*

**4 (b) (ii)** In 2011, the Brazilian Government decided to reduce the amount of ethanol in petrol to 18 %.

Suggest **one** reason for their decision.

.....

.....

*(1 mark)*

6

**Turn over ▶**

Do not write outside the box

**5** Cement is made by heating a mixture of clay and limestone in a kiln.

**5 (a)** Many kilns are heated by burning natural gas (methane) in air.

A chemical equation for the burning of methane is:

$$CH_4 + 2O_2 \rightarrow 2H_2O + CO_2$$

Describe this reaction in words.

Give the names of the molecules **and** the numbers of each molecule in this chemical equation.

.....

.....

.....

.....

*(2 marks)*

**5 (b)** *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Limestone contains calcium carbonate.
There is a large deposit of limestone under an area of natural beauty.
A company wants to quarry this limestone and build a kiln near to the quarry to make cement.

**Area of natural beauty**



**A quarry**



Explosives will be used to extract the limestone out of the ground.

Heavy machinery will be used to lift and crush the limestone.

Lorries will be used to transport the limestone to the kiln to make cement.

The lorries and the heavy machinery will use diesel fuel.

Do not write outside the box

Quarrying limestone and making cement will have an impact on everything near the area.

Describe the positive and the negative impacts of quarrying limestone and making cement.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

*(6 marks)*

8

**Turn over for the next question**

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

Do not write outside the box

**6** A mixture of petrol and air is burned in a car engine.
Petrol is a mixture of alkanes. Air is a mixture of gases.

The tables give information about the composition of petrol and the composition of air.

| Petrol | |
|---|---|
| **Alkane** | **Formula** |
| hexane | $C_6H_{14}$ |
| heptane | |
| octane | $C_8H_{18}$ |
| nonane | $C_9H_{20}$ |
| decane | $C_{10}H_{22}$ |

| Air | |
|---|---|
| **Gas** | **Percentage (%)** |
| nitrogen | 78 |
| oxygen | 21 |
| carbon dioxide | 0.035 |
| Small amounts of other gases and water vapour | |

**6 (a)** Use the information above to answer these questions.

**6 (a) (i)** Give the formula for heptane.

.....

*(1 mark)*

**6 (a) (ii)** Complete the general formula of alkanes.
n = number of carbon atoms

$$C_nH$$

*(1 mark)*

**6 (b)** Alkanes in petrol burn in air.
The equations represent two reactions of hexane burning in air.

**Reaction 1** $2C_6H_{14} + 19O_2 \rightarrow 12CO_2 + 14H_2O$

**Reaction 2** $2C_6H_{14} + 13O_2 \rightarrow 12CO + 14H_2O$

**Reaction 2** produces a different carbon compound to **Reaction 1**.

**6 (b) (i)** Name the carbon compound produced in **Reaction 2**.

.....

*(1 mark)*

**6 (b) (ii)** Give a reason why the carbon compounds produced are different.

.....

.....

*(1 mark)*

**Question 6 continues on the next page**

**Turn over ▶**

Do not write outside the box

**6 (c)** The table shows the percentages of some gases in the exhaust from a petrol engine.

| Name of gas | Percentage (%) |
|---|---|
| nitrogen | 68 |
| carbon dioxide | 15 |
| carbon monoxide | 1.0 |
| oxygen | 0.75 |
| nitrogen oxides | 0.24 |
| hydrocarbons | 0.005 |
| sulfur dioxide | 0.005 |
| other gases | |

**6 (c) (i)** What is the percentage of the other gases in the table?

.....

*(1 mark)*

**6 (c) (ii)** What is the name of the compound that makes up most of the other gases?

.....

*(1 mark)*

**6 (c) (iii)** Give a reason why sulfur dioxide is produced in a petrol engine.

.....

.....

*(1 mark)*

**6 (c) (iv)** State how nitrogen oxides are produced in a petrol engine.

.....

.....

.....

.....

*(2 marks)*

Do not write outside the box

**6 (d)** Many scientists are concerned about the carbon dioxide released from burning fossil fuels such as petrol.

Explain why.

.....

.....

.....

.....

*(2 marks)*

11

**Turn over for the next question**

Do not write outside the box

**7** There are about 500 000 earthquakes every year. On 12 January 2010 there was an earthquake near Port-au-Prince in Haiti. Many buildings were destroyed causing the deaths of thousands of people. The earthquake did not come as a surprise to scientists who predicted the earthquake a week earlier. The Government and people ignored the prediction.



The Richter scale is used to compare the size of earthquakes.

| Richter scale value | Effect of earthquake |
|---|---|
| Less than 2 | People do not feel the earthquake. |
| 2 – 4 | People feel the earthquake but the earthquake rarely causes damage to buildings. |
| 4 – 5 | People feel the earthquake and the earthquake causes minor damage to a few buildings. |
| 5 – 6 | Shaking of the ground and major damage to some buildings. |
| 6 – 8 | Violent shaking of the ground and many buildings destroyed. |
| 8 – 10 | Very violent shaking of the ground and most buildings destroyed. |

**7 (a)** Use the information above to answer these questions.

**7 (a) (i)** Suggest the Richter scale value for the earthquake that happened near Port-au-Prince in Haiti.

.....

*(1 mark)*

**7 (a) (ii)** Governments and people often ignore scientists' predictions of an earthquake.

Suggest **three** reasons why.

1 .....

.....

.....

Do not write outside the box

2 .....

.....

.....

3 .....

.....

.....

*(3 marks)*

**7 (b)** During the twentieth century many scientists proposed ideas about the cause of earthquakes and about the Earth's crust.
In 1912 Alfred Wegener proposed his idea of '*continental drift*'.
In 1930 Arthur Holmes suggested his idea of '*mantle dynamics*'.

**7 (b) (i)** What did Wegener mean by *'continental drift'*?

.....

.....

.....

.....

.....

*(2 marks)*

**7 (b) (ii)** Holmes' idea of '*mantle dynamics*' provided an explanation for Wegener's idea of *'continental drift'.*

Suggest what *'mantle dynamics'* is and state what causes *'mantle dynamics'*.

.....

.....

.....

.....

.....

*(2 marks)*

8

**END OF QUESTIONS**

*Do not write outside the box*

**There are no questions printed on this page**

**DO NOT WRITE ON THIS PAGE**
**ANSWER IN THE SPACES PROVIDED**

ACKNOWLEDGEMENT OF COPYRIGHT-HOLDERS AND PUBLISHERS

Question 1 Photograph © Thinkstock
Question 5 Photographs © Thinkstock
Question 7 Photograph © Thinkstock

Copyright © 2012 AQA and its licensors. All rights reserved.

Version : 07/03/2012

# General Certificate of Secondary Education

# Science A 4405 / Chemistry 4402

## CH1FP Unit Chemistry 1

# Mark Scheme

*2012 examination – January series*

STEMUP.CO.UK

Mark schemes are prepared by the Principal Examiner and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation meeting attended by all examiners and is the scheme which was used by them in this examination. The standardisation meeting ensures that the mark scheme covers the students' responses to questions and that every examiner understands and applies it in the same correct way. As preparation for the standardisation meeting each examiner analyses a number of students' scripts: alternative answers not already covered by the mark scheme are discussed at the meeting and legislated for. If, after this meeting, examiners encounter unusual answers which have not been discussed at the meeting they are required to refer these to the Principal Examiner.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

Copyright © 2012 AQA and its licensors. All rights reserved.

COPYRIGHT
AQA retains the copyright on all its publications. However, registered schools / colleges for AQA are permitted to copy material from this booklet for their own internal use, with the following important exception: AQA cannot give permission to schools / colleges to photocopy any material that is acknowledged to a third party even for internal use within the school / college.

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).
Registered address: AQA, Devas Street, Manchester M15 6EX

# MARK SCHEME

## Information to Examiners

### 1. General

The mark scheme for each question shows:

- the marks available for each part of the question
- the total marks available for the question
- the typical answer or answers which are expected
- extra information to help the Examiner make his or her judgement and help to delineate what is acceptable or not worthy of credit or, in discursive answers, to give an overview of the area in which a mark or marks may be awarded.

The extra information is aligned to the appropriate answer in the left-hand part of the mark scheme and should only be applied to that item in the mark scheme.

At the beginning of a part of a question a reminder may be given, for example: where consequential marking needs to be considered in a calculation; or the answer may be on the diagram or at a different place on the script.

In general the right hand side of the mark scheme is there to provide those extra details which confuse the main part of the mark scheme yet may be helpful in ensuring that marking is straightforward and consistent.

### 2. Emboldening

**2.1** In a list of acceptable answers where more than one mark is available 'any **two** from' is used, with the number of marks emboldened. Each of the following lines is a potential mark.

**2.2** A bold **and** is used to indicate that both parts of the answer are required to award the mark.

**2.3** Alternative answers acceptable for a mark are indicated by the use of **or**. (Different terms in the mark scheme are shown by a / ; eg allow smooth / free movement.)

### 3. Marking points

#### 3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students have provided extra responses. The general principle to be followed in such a situation is that 'right + wrong = wrong'.

Each error/contradiction negates each correct response. So, if the number of error/contradictions equals or exceeds the number of marks available for the question, no marks can be awarded.

However, responses considered to be neutral (indicated as * in example 1) are not penalised.



STEMUP.CO.UK

Example 1: What is the pH of an acidic solution? (1 mark)

| Student | Response | Marks awarded |
|---|---|---|
| 1 | 4,8 | 0 |
| 2 | green, 5 | 0 |
| 3 | red*, 5 | 1 |
| 4 | red*, 8 | 0 |

Example 2: Name two planets in the solar system. (2 marks)

| Student | Response | Marks awarded |
|---|---|---|
| 1 | Pluto, Mars, Moon | 1 |
| 2 | Pluto, Sun, Mars, Moon | 0 |

### 3.2 Use of chemical symbols / formulae

If a student writes a chemical symbol / formula instead of a required chemical name, full credit can be given if the symbol / formula is correct and if, in the context of the question, such action is appropriate.

### 3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

### 3.4 Interpretation of 'it'

Answers using the word 'it' should be given credit only if it is clear that the 'it' refers to the correct subject.

### 3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward are kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation e.c.f. in the marking scheme.

### 3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

### 3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.



STEMUP.CO.UK

## Quality of Written Communication and levels marking

In Question 5(b) students are required to produce extended written material in English, and will be assessed on the quality of their written communication as well as the standard of the scientific response.

Students will be required to:

- use good English
- organise information clearly
- use specialist vocabulary where appropriate.

The following general criteria should be used to assign marks to a level:

**Level 1: Basic**

- Knowledge of basic information
- Simple understanding
- The answer is poorly organised, with almost no specialist terms and their use demonstrating a general lack of understanding of their meaning, little or no detail
- The spelling, punctuation and grammar are very weak.

**Level 2: Clear**

- Knowledge of accurate information
- Clear understanding
- The answer has some structure and organisation, use of specialist terms has been attempted but not always accurately, some detail is given
- There is reasonable accuracy in spelling, punctuation and grammar, although there may still be some errors.

**Level 3: Detailed**

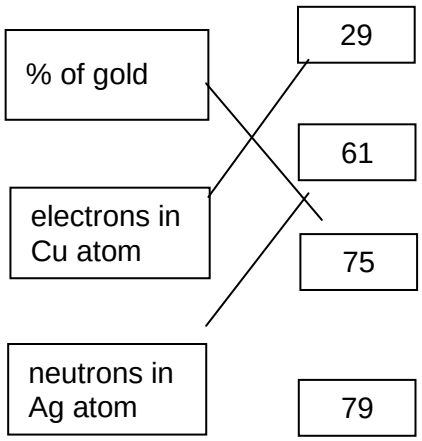
- Knowledge of accurate information appropriately contextualised
- Detailed understanding, supported by relevant evidence and examples
- Answer is coherent and in an organised, logical sequence, containing a wide range of appropriate or relevant specialist terms used accurately.
- The answer shows almost faultless spelling, punctuation and grammar.



STEMUP.CO.UK

**CH1FP**

**Question 1**

| question | answers | extra information | mark |
|---|---|---|---|
| **1(a)** | +1/+<br>electron | do **not** accept 1 without the +<br>allow phonetic spelling | 1<br>1 |
| **1(b)(i)** | elements | | 1 |
| **1(b)(ii)** | non-metal | | 1 |
| **1(c)** | soft<br>an alloy | | 1<br>1 |
| **1(d)** |  | **one** mark for each correct link<br>extra lines lose the mark | 3 |
| **Total** | | | 9 |



STEMUP.CO.UK

**CH1FP**

**Question 2**

| question | answers | extra information | mark |
|---|---|---|---|
| **2(a)** | reduction | | 1 |
| **2(b)** | carbon is less reactive than aluminium | | 1 |
| **2(c)** | | they = aluminium ions<br>ignore particle names | |
| | aluminium (ions) / they are positively charged | accept aluminium (ions) / they are cations<br>allow aluminium (ions) / they have an opposite charge | 1 |
| | so they are attracted **or** they move towards the negative electrode<br><br>**OR**<br><br>aluminium (ions) / they need to gain electrons (1)<br><br>which come from the negative electrode (1) | if no other marks awarded allow 'opposites attract' for **1** mark | 1 |
| **2(d)** | aluminium has a low density | | 1 |
| | aluminium is resistant to corrosion | | 1 |
| **2(e)** | **advantage** less carbon dioxide is produced | | 1 |
| | **disadvantage** used aluminium cans have to be collected and transported | | 1 |
| **Total** | | | **8** |



STEMUP.CO.UK

**CH1FP**

**Question 3**

| question | answers | extra information | mark |
|---|---|---|---|
| **3(a)(i)** | hydrocarbons | | 1 |
| **3(a)(ii)** | ethane has the smallest molecules<br><br>heptadecane has the highest boiling point | | 1<br><br>1 |
| **3(a)(iii)** | evaporating<br><br>condense | | 1<br><br>1 |
| **3(b)(i)** | **W**<br><br>**Y** | | 1<br><br>1 |
| **3(b)(ii)** | floats | if no answer written on line, allow correct answer indicated in the box | 1 |
| **3(b)(iii)** | open the tap<br><br><br>stop the flow of liquid when the water has run out | allow let the water out<br><br>ignore remove water<br><br>allow until oil is left behind<br>ignore filter | 1<br><br><br>1 |
| **Total** | | | **10** |



STEMUP.CO.UK

**CH1FP**

**Question 4**

| question | answers | extra information | mark |
|---|---|---|---|
| **4(a)(i)** | fermentation | | 1 |
| **4(a)(ii)** | cloudy<br><br>there is carbon dioxide / $CO_2$ | accept milky / white<br><br>accept calcium carbonate forms<br><br>allow a (white) solid / precipitate forms | 1<br><br>1 |
| **4(b)(i)** | <br><br><br><br>(the amount of ethanol used) increases (from 1970) to 1989<br><br>then it decreases from 1989 (to 2000) | if no year(s) or incorrect year(s) indicated then max **1**<br><br>correct year(s) only needs to be indicated once to gain full marks<br>accept values in range 1987-1992 | <br><br><br><br>1<br><br>1 |
| **4(b)(ii)** | any **one** from:<br><br>• Brazil had more oilfields<br><br>• cost of crude oil had decreased<br><br>• cost of ethanol / sugar (cane) had increased<br><br>• demand for ethanol / sugar (cane) had increased<br><br>• availability of ethanol / sugar (cane) had decreased<br><br>• climate change affects growing sugar (cane) | <br><br><br><br><br><br><br><br><br><br>accept availability of land to grow sugar (cane) had decreased | 1 |
| **Total** | | | **6** |



STEMUP.CO.UK

**CH1FP**

**Question 5**

| question | answers | extra information | mark |
|---|---|---|---|
| **5(a)** | • one / 1 (molecule of) methane (reacts with) two / 2 (molecules of) oxygen<br><br>• two / 2 (molecules of) water / steam / hydrogen oxide and one / 1 (molecule of) carbon dioxide (are produced) | if no other marks awarded all four names correct<br>**or**<br>correct number **and** name for two molecules<br>**or**<br>4 correct numbers gains **1** mark<br><br>allow all four names correct **and** correct number of atoms in each substance for **2** marks | 1<br><br>1 |

**Question 5(b) continues on the next page**



STEMUP.CO.UK

**CH1FP**

**Question 5(b) cont'd……**

| | | |
|---|---|---|
| **5(b)** | Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 2, and apply a 'best-fit' approach to the marking. | 6 |

| **0 marks** | **Level 1 (1-2 marks)** | **Level 2 (3-4 marks)** | **Level 3 (5-6 marks)** |
|---|---|---|---|
| No relevant content. | There is a simple description of a positive **and / or** a negative impact caused by the plan to quarry limestone and / or make cement. | There is a clear description of both a positive **and** a negative impact caused by the plan to quarry limestone and / or make cement. | There is a detailed description of both positive impacts **and** negative impacts caused by the plan to quarry limestone and / or make cement. |

**examples of the chemistry points made in the response**

**Positive impacts:**

- Limestone / cement is used for building
- Limestone needed for industrial processes
- Company landscapes / provides recreation facilities in the quarry after use
- Provides employment
- Improves local economy
- Improved transport links

**Negative impacts:**

- Destruction of habitats
- Fewer plants / trees to absorb carbon dioxide
- Example of visual pollution
- Example of noise pollution
- Example of atmospheric pollution
- More traffic

| | | | |
|---|---|---|---|
| **Total** | | | **8** |



STEMUP.CO.UK

**CH1FP**

**Question 6**

| question | answers | extra information | mark |
|---|---|---|---|
| **6(a)(i)** | $C_7H_{16}$ | mark answer line first<br><br>answer may be given in the table | 1 |
| **6(a)(ii)** | $C_nH_{2n+2}$ | | 1 |
| **6(b)(i)** | carbon monoxide | do **not** accept carbon oxide<br><br>do **not** accept water<br><br>ignore CO | 1 |
| **6(b)(ii)** | because of partial / incomplete combustion (in reaction 2)<br>**or** complete combustion (in reaction 1) | allow because there is less / insufficient oxygen (in reaction 2)<br>**or** sufficient oxygen (in reaction 1)<br>allow different amounts of oxygen used (in the reactions) **or** $19O_2$ (in reaction 1) **and** $13O_2$ (in reaction 2)<br><br>ignore air | 1 |
| **6(c)(i)** | 15 (%) | ignore units | 1 |
| **6(c)(ii)** | water (vapour)/steam | allow $H_2O$ / $OH_2$ / hydrogen oxide | 1 |

**Question 6 continues on the next page…….**



STEMUP.CO.UK

**CH1FP**

**Question 6 cont'd…..**

| question | answers | extra information | mark |
|---|---|---|---|
| **6(c)(iii)** | sulfur in petrol / crude oil (reacts with oxygen) | it = sulfur dioxide | 1 |
| **6(c)(iv)** | because nitrogen **and** oxygen (are in the air and) react | allow nitrogen **and** oxygen burn<br><br>accept nitrogen + oxygen → nitrogen oxide **or** symbol equation<br><br>ignore air | 1 |
| | at high temperature (inside a petrol engine) | allow heat / hot (engine) | 1 |
| **6(d)** | because carbon dioxide / it causes global warming **or**<br>because carbon dioxide / it has an impact on oceans | allow because carbon dioxide / it causes greenhouse effect / climate change | 1 |
| | because this carbon dioxide / carbon / it was 'locked up' (in fossil fuels) **or**<br><br>because the percentage/amount of carbon dioxide / it in the atmosphere is increasing | | 1 |
| **Total** | | | **11** |



STEMUP.CO.UK

**CH1FP**

**Question 7**

| question | answers | extra information | mark |
|---|---|---|---|
| **7(a)(i)** | 6-8 | accept any value in the range 6-8 | 1 |
| **7(a)(ii)** | any **three** from:<br>• there are many earthquakes predicted by scientists each year<br>• expense / inconvenience / panic caused by government / people taking action<br>• most / some earthquakes do little or no damage<br>• scientists do not know what is happening below the crust<br>• scientists cannot (accurately) predict where the earthquake will occur<br>• scientists cannot (accurately) predict when the earthquake will occur<br>• scientists cannot (accurately) predict the strength of the earthquake | allow scientists / predictions have been wrong<br>ignore lack of evidence<br>allow earthquakes are random<br>If none of the last 3 points have been awarded then 'scientists cannot accurately predict earthquakes' gains **1** mark | 3 |

**Question 7 continues on the next page…….**



STEMUP.CO.UK

**CH1FP**

**Question 7 cont'd….**

| question | answers | extra information | mark |
|---|---|---|---|
| **7(b)(i)** | | allow crust / plate for continent | |
| | continents were once joined together<br>**or** continents breaking up / separating / fitted like a jigsaw | accept there was a supercontinent / Pangaea | 1 |
| | so the continents are moving | accept continents not in fixed positions<br>allow continents move apart for **2** marks<br>if no other mark awarded allow continents drift apart for **1** mark | 1 |
| **7(b)(ii)** | | allow credit for both marking points if given in 3(b)(i) | |
| | convection currents (in the mantle) | accept movement / flow (in the mantle) | 1 |
| | caused by heat **or** | | |
| | caused by radioactive processes | ignore chemical reactions | 1 |
| **Total** | | | **8** |

**UMS Conversion Calculator** www.aqa.org.uk/umsconversion



STEMUP.CO.UK