AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.8.1.1

Pure substances

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**18**
Available paper years	**2007–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.8.1.1 Pure substances

Answer 01 · Mark scheme

June 2007 | CHY1F | Original Q7 | Legacy

The full source mark scheme begins on page 30. Follow original question 7 in that document.

4.8.1.1 Pure substances

Answer 02 · Mark scheme

June 2008 | CHY2F | Original Q8 | Legacy

question	answers	extra information	mark
8(a)	(propanone) has a low(er) boiling point **or** (propanone) evaporates fast(er) owtte	**or** water has a high(er) boiling point **or** water evaporates slow(er) allow propane / solution / it allow evaporates at lower temperature **or** boils quicker ignore density / reactivity / melting point	1
8(b)(i)	0.29	ignore + **or** – ignore units	1
8(b)(ii)	any **two** sensible suggestions eg: • weighing error • (copper) lost during washing owtte • (copper) lost during electrolysis / reaction owtte • electrodes not completely dry • impurities in the electrode • copper falling off when removing electrode / copper from cell	 accept human error **or** inaccurate measurements allow different washing of electrodes ignore timing errors ignore 'fair test' ignore sludge ignore gases produced	2

Question 8 continued on next page…

COMPONENT NUMBER: CHY2F

COMPONENT NAME: Additional Science / Chemistry

STATUS: Final

DATE: June 2008

Question 8 continued…

question	answers	extra information	mark
8(c)	any **four** from: • impure copper is anode / positive (electrode) • pure copper is cathode / negative (electrode) • copper sulfate solution **or** any soluble copper salt in solution • copper loses electrons **or** copper is oxidised • copper forms positive ions / particles • copper gains electrons **or** copper reduced at negative electrode • copper attracts to / collects at negative electrode • sludge / impurities collect at the bottom owtte • impurities not attracted to electrode	as alternative to these two points $Cu \rightarrow Cu^{2+} + 2e^{-}$ = **2** marks **or** $Cu^{2+} + 2e^{-} \rightarrow Cu$ at negative electrode allow sludge left behind **or** sludge left in solution **or** impurities separated from copper ignore get rid of impurities	4
Total			**8**

4.8.1.1 Pure substances

Answer 03 · Mark scheme March 2009 | CHY1AP | Original Q2 | Legacy

Two	**A**	carbon	**2**
	B	cast iron	**4**
	C	iron	**3**
	D	iron oxide	**1**

Answer 04 · Mark scheme June 2010 | CHY1AP | Original Q2 | Legacy

Two	**A**	Alloy **A**	**1**
	B	Alloy **B**	**3**
	C	Alloy **C**	**4**
	D	Alloy **D**	**2**

Answer 05 · Mark scheme June 2010 | CHY1AP | Original Q8 | Legacy

Eight	**2**	**1**	**1**	**2**

Answer 06 · Mark scheme March 2011 | CHY1AP | Original Q9 | Legacy

Nine	**4**	**3**	**2**	**2**

4.8.1.1 Pure substances

Answer 07 · Mark scheme

June 2011 | CHY3F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	(copper) stops barnacles / seaweed (sticking)	it = copper accept lead doesn't stop barnacles / seaweed (sticking) ignore all other properties	1
6(a)(ii)	(Muntz Metal) is less expensive / cheaper / cheapest	it = Muntz Metal must be a comparison accept copper is more expensive ignore other properties	1
6(b)(i)	atomic absorption spec(troscopy) / spectrometry **or** mass spec(trometry) / spectroscopy	accept spectroscopy / spectrometry alone allow AAS / MS do **not** allow NMR spectroscopy **or** IR spectrometry **or** chromatography	1
6(b)(ii)	sensitive **or** detect (very) small amounts **or** only small sample needed	it = instrumental method allow (more) precise ignore accurate allow converse for chemical method ignore metal contains small amount / low concentration of iron	1
6(c)	any **two** from: • unreactive / not very reactive • strong / hard • malleable / easy to shape	transition elements (= they) allow does not corrode ignore reference to rust ignore tough / durable / hard wearing ignore ductile / density / melting point	2
Total			**6**

The AQA UMS Conversion Calculator is available on the Results statistics page of the AQA Website

4.8.1.1 Pure substances

Answer 08 · Mark scheme

June 2012 | CH1FP | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)	any **one** from: • there are many stages needed (to extract titanium) • more energy / materials are needed (to extract titanium) • titanium cannot be extracted by using carbon	ignore references to cost / mining / availability allow longer / slower / more complicated process / batch process ignore higher temperature ignore reference to electrolysis do **not** accept titanium extracted by electrolysis	1
7(b)	carbon dioxide	allow CO_2	1
7(c)	magnesium chloride is electrolysed / used / decomposed magnesium and / or chlorine are recycled / reused	 allow the products of electrolysis are recycled word / symbol equation = **1** mark	1 1
7(d)	 because oxygen / nitrogen (in air) would react with the magnesium **or** would produce magnesium oxide / nitride whereas argon is inert / unreactive **or** argon does not react with magnesium	accept titanium for magnesium ignore argon is in Group 0 / noble gas	 1 1
7(e)	240		1
7(f)	250	allow range 245 to 250	1
Total			**8**

4.8.1.1 Pure substances

Answer 08 · Mark scheme

June 2012 | CH1FP | Original Q7 | Legacy

CH1FP

4.8.1.1 Pure substances

Answer 09 · Mark scheme

June 2013 | CH1FP | Original Q7 | Legacy

Question 7

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

Question 7 continues on the next page

Question 7 continued

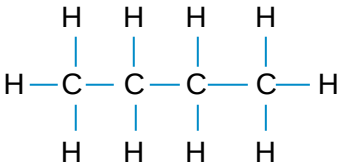
question	answers	extra information	Mark
7(b)(iv)	(copper ions move towards) the negative electrode / *cathode*		1
	because copper ions / Cu^{2+} are positively charged **or** are oppositely charged **or** copper ions need to gain electrons	allow because metal ions are positive **or** opposites attract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

4.8.1.1 Pure substances

Answer 10 · Mark scheme

June 2016 | CH1FP | Original Q5 | Legacy

Question 5

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

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 **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

4.8.1.1 Pure substances

Answer 11 · Mark scheme

November 2020 | 8462/1F | Original Q10

Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	(total) mass before = 156.76 (g) **and** (total) mass after = 156.76 (g) **or** increase in mass of beaker **A** and contents = 29.96 (g) **and** decrease in mass of beaker **B** and contents = 29.96 (g) (so) the mass of products equals the mass of the reactants **or** (so) there is no change in mass during the reaction	allow 78.26 + 78.50 = 156.76 **and** 108.22 + 48.54 = 156.76 allow 108.22 – 78.26 = 29.96 **and** 48.54 – 78.50 = – 29.96 allow (so) no atoms were lost or made during the reaction	1 1	AO2 AO1 4.3.1.1
10.2	filter / filtration	allow a description of filtration	1	AO2 4.1.1.2
10.3	sodium nitrate (solution) **or** silver nitrate (solution) **or** sodium iodide (solution)	allow correct formulae allow sodium / nitrate / silver / iodide ions	1	AO2 4.1.1.2
10.4	to remove / evaporate the water	allow to dry (the solid)	1	AO3 4.1.1.2

Question 10 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.5	(total M_r = 170 + 150) = 320	allow (235 + 85) = 320	1	AO2 4.3.3.2
	(% atom economy =) $\frac{235}{320} \times 100$	allow correct use of incorrectly calculated total M_r	1	
	= 73.4375 (%)		1	
	= 73.4 (%)	allow an answer correctly calculated to 3 significant figures from an incorrect percentage calculation which uses the values in the question	1	
10.6	any **one** from: • for sustainable development • for economic reasons • to produce a high(er) percentage of useful product	allow to reduce waste	1	AO1 4.3.3.2
Total			**10**	

4.8.1.1 Pure substances

Answer 12 · Mark scheme

November 2021 | 8462/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	fuel		1	AO1 4.7.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	propene		1	AO2 4.7.2.1 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	(percentage yield =) $\frac{380}{400} \times 100$ = 95 (%)		1 1	AO2 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	some ethanol changes back into ethene and steam some ethanol escapes from the apparatus		1 1	AO2 4.3.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	C_2H_5OH + **3** O_2 → 3 H_2O + 2 CO_2	allow multiples	1	AO2 4.1.1.1 4.3.1.1 4.7.2.3

Question 7 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	(advantages) (fermentation) low energy usage (fermentation) uses renewable raw materials (disadvantages) (fermentation) produces impure ethanol (fermentation) slow rate of reaction		 1 1 1 1	AO3 4.7.2.2 4.7.2.3 4.10.1.1

Total			**11**

4.8.1.1 Pure substances

Answer 13 · Mark scheme

June 2022 | 8462/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	element		1	AO1 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	**A**		1	AO2 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	**B**		1	AO2 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	filtration	allow filtering allow a description of filtration	1	AO2 4.1.1.2

4.8.1.1 Pure substances

Answer 13 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	**C**	allow 78 (°C)	1	AO3 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	increases	allow becomes warmer / hotter	1	AO3 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	heat (the solution) until crystallisation point is reached leave the solution (to cool / crystallise)	allow heat (the solution) until crystals start to form allow heat (the solution) to reduce the volume allow heat (the solution) to evaporate (some of the water) if no other mark is awarded allow **1** mark for heat the solution to dryness	1 1	AO1 4.1.1.2 4.4.2.3 RPA1

Total Question 2		**8**

4.8.1.1 Pure substances

Answer 14 · Mark scheme

June 2022 | 8462/2F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	100 7	must be in this order	1 1	AO1 4.8.1.1 4.10.1.2 RPA8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	pH probe / meter **or** universal indicator (paper / solution)	allow wide range indicator (paper / solution)	1	AO1 4.10.1.2 RPA8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	balance measuring cylinder		1 1	AO1 4.10.1.2 RPA8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	(mean =) $\frac{1.73 + 1.70 + 1.75 + 1.78}{4}$ = 1.74 (g)		1 1	AO2 4.10.1.2 RPA8

4.8.1.1 Pure substances

Answer 14 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	(mass =) $\frac{1.5 \times 1000}{50}$ = 30 (g)		1 1	AO2 4.10.1.2 RPA8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	yellow		1	AO1 4.8.3.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	white		1	AO1 4.8.3.4 RPA7

Total Question 1		11

4.8.1.1 Pure substances

Answer 15 · Mark scheme

June 2023 | 8462/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	(total atoms =) 30 (percentage =) $\frac{6}{30} \times 100$ = 20 (%)	 allow correct use of an incorrectly determined total number of atoms 	1 1 1	AO2 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	sizes slide (over each other)	allow diameters do **not** accept shapes allow move over each other	1 1	AO1 AO3 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	(as the percentage by mass of tin increases the) melting point (of solder) decreases to 183 °C then increases	 allow a value in the range 182–184 °C allow to 62% (tin) 	1 1 1	AO2 4.2.2.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	232 °C		1	AO3 4.2.2.7

4.8.1.1 Pure substances

Answer 15 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	the atoms gain energy and their arrangement becomes less ordered		1	AO1 4.2.2.1

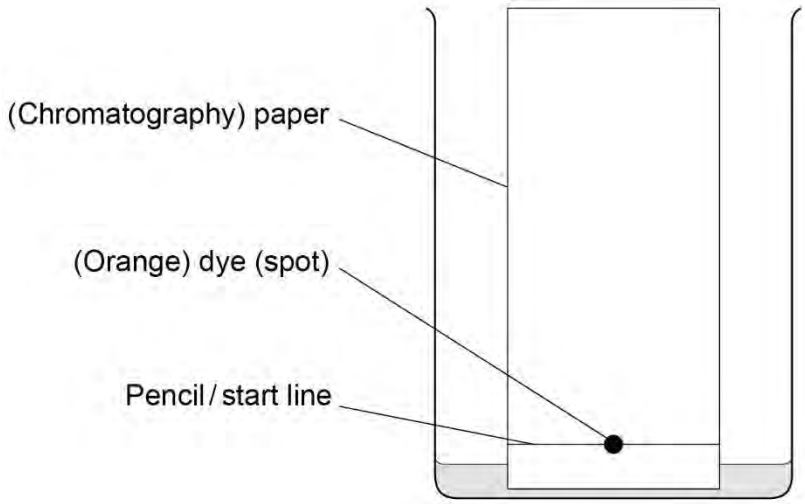
Total Question 4	10

4.8.1.1 Pure substances

Answer 16 · Mark scheme

June 2023 | 8462/2F | Original Q3

Question 3

Question	Answers	Mark	AO / Spec. Ref.
03.1		1 1 1	AO1 4.8.1.3 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	left the investigation for too long		1	AO3 4.8.1.3 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	(there is) more than one spot **or** (there are) three spots		1	AO3 4.8.1.1 4.8.1.3 RPA6

4.8.1.1 Pure substances

Answer 16 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	(distance moved by red spot) = 1.8 (cm) (distance moved by solvent) = 7.2 (cm) (R_f =) $\frac{1.8}{7.2}$ = 0.25	allow a value in the range 1.6 to 2.0 (cm) allow a value in the range 7.1 to 7.3 (cm) allow correct use of incorrectly determined distance(s)	1 1 1 1	AO2 4.8.1.3 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	dark yellow spot		1	AO3 4.8.1.3 RPA6

Total Question 3	10

4.8.1.1 Pure substances

Answer 17 · Mark scheme

June 2024 | 8462/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	D		1	AO2 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	C		1	AO2 4.1.1.1

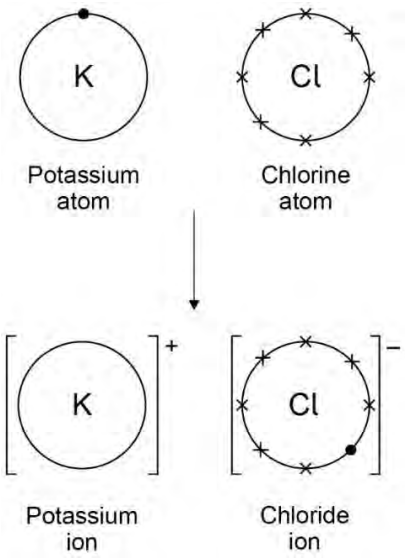
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	sections **A**, **B** and **C**		1	AO1 4.1.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	can be bent and shaped good conductor of electricity		1 1	AO1 4.1.2.3 4.1.3.1 4.2.2.7

4.8.1.1 Pure substances

Answer 17 · Mark scheme

June 2024 | 8462/1F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5		allow any combination of ×, •, ○, $e^{(-)}$ for electrons ignore any inner shells		AO2 4.1.2.5 4.2.1.2
	evidence of the outer electron on the potassium atom moving to leave a potassium ion with no outer electrons	allow potassium ion with eight outer electrons	1	
	chloride ion with eight outer electrons		1	
		an answer of  scores **2** marks		

4.8.1.1 Pure substances

Answer 17 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	B		1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	A		1	AO1 4.1.1.2

Total Question 1	9

Answer 18 · Mark scheme

June 2025 | 8462/2F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	labelled paper in solvent	allow paper touching solvent	1	AO1 4.8.1.3 RPA6
	labelled start line above solvent level	do **not** accept start line touching solvent	1	
	labelled ink spot on start line		1	
		if no other mark awarded allow **1** mark for a complete unlabelled diagram		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	(so the start line) does not smudge / run / dissolve **or** pencil is insoluble	allow (because an ink line) would smudge / run / dissolve	1	AO1 4.8.1.3 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	$0.80 = \frac{5.2}{\text{distance moved by solvent}}$		1	AO2 4.8.1.3 RPA6
	distance moved by solvent $= \frac{5.2}{0.80}$		1	
	= 6.5 (cm)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	from the start line to the centre of the spot		1	AO1 4.8.1.3 RPA6

4.8.1.1 Pure substances

Answer 18 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	use a different solvent use a different type of chromatography paper		1 1	AO1 4.8.1.3 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	1		1	AO2 4.8.1.1 4.8.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.7	more accurate		1	AO2 4.8.3.6

Total Question 5	12

4.8.1.1 Pure substances

Version 1.0: 0707

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science B 4462 / Chemistry 4421

CHY1F Unit Chemistry 1

Mark Scheme

2007 examination - June series

4.8.1.1 Pure substances

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 candidates' 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 candidates' 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 candidates' 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

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Dr Michael Cresswell, Director General.

4.8.1.1 Pure substances

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 candidates 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.

4.8.1.1 Pure substances

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

Candidate	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)

Candidate	Response	Marks awarded
1	Pluto, Mars, Moon	1
2	Pluto, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a candidate 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.

3.8 Unexpected Correct Answers not in the Mark Scheme

The Examiner should use professional judgement to award credit where a candidate has given an unexpected correct answer which is not covered by the mark scheme. The Examiner should consult with the Team Leader to confirm the judgement. The Team Leader should pass this answer on to the Principal Examiner with a view to informing all examiners.

4.8.1.1 Pure substances

CHY1F Question 1

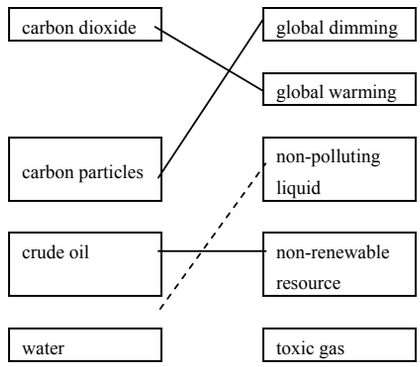
	answers	extra information	mark
(a)	low density unreactive		1 1
(b)	a polymer		1
(c)	any **one** from: • not broken down by (microorganisms) • does not decay (naturally)	ignore cannot recycle / degrade / disintegrate	1
total			4

CHY1F Question 2

	answers	extra information	mark
(a)(i)	additive		1
(b)	any **three** from: • colour 1 is made up of only one colour / dye • colour 2 is made up of only one colour / dye • colour 3 is made up of two colours / dyes **or** more colours (than colours 1 and 2) • colours 1, 2 and 3 are all different • colour 1 is less dark than colour 2	accept colour 3 is a mixture of colours 1 and 2 for **3** marks accept E-number or additive instead of colour ignore comments about height / level	3
total			4

4.8.1.1 Pure substances

CHY1F Question 3

	answers	extra information	mark
(a)	hydrogen	ignore formulae	1
(b)	any **two** from: • different sized molecules / more or less (carbon) atoms (in molecules) • fuels have <u>different</u> boiling points • fuels condense at <u>different</u> temperatures	ignore different densities	2
(c)		all three correct = **3** marks two correct = **2** marks one correct = **1** mark	3
total			6

4.8.1.1 Pure substances

CHY1F Question 4

	answers	extra information	mark
(a)(i)	any **one** from: • iron ore is a limited resource / non-renewable • iron is in high demand • provide jobs • economic advantage		1
(ii)	any **two** from: • would damage (wildlife) habitats / countryside / greenfield sites • extra traffic • visual (pollution) / eyesore • noise (pollution) / sound (pollution) • dust (pollution) • river (pollution) • carbon dioxide (from traffic) / adds to greenhouse effect / global warming • damage roads / buildings by <u>vibrations</u> / <u>shockwaves</u>		2
(b)(i)	carbon monoxide / carbon	accept formulae CO / C	1
(ii)	atoms are all the same (size) / type	accept (particles) are all the same (size) / type for one mark	1 1

Continued on next page

4.8.1.1 Pure substances

Question 4 continued

	answers	extra information	mark
(iii)	any **two** from: • impurities / carbon / different (sized) atoms **or** elements **or** metals • changes the structure / disrupts the pattern or layers • prevents layers sliding over each other • it is an alloy		2
total			8

4.8.1.1 Pure substances

CHY1F Question 5

	answers	extra information	mark
(a)	core	ignore outer or inner	1
	mantle		1
(b)(i)	carbon dioxide	accept formula CO_2	1
	oxygen	accept formulae O_2 / O	1
(ii)	4%		1
(iii)	carbon dioxide has <u>decreased</u> / from 95% to 0%		1
	oxygen has <u>increased</u> / from 0% to 21%		1
	any **one** from: (carbon dioxide decrease) • carbon dioxide used during photosynthesis / by plants • carbon dioxide dissolves in oceans • carbon dioxide is locked up in rocks / carbonates / fossil fuels (oxygen increase) • oxygen released during photosynthesis / by plants		1
total			8

4.8.1.1 Pure substances

CHY1F Question 6

	answers	extra information	mark
(a)	any **two** from: • nitrogen • carbon dioxide • water (vapour) / steam	 accept formulae N / N_2 accept formula CO_2 ignore CO accept formula H_2O	2
(b)	any **three** from: <u>limestone</u> • abundant / local • natural material **or** no 'processing' needed • relatively easy to cut • appearance better <u>concrete</u> • <u>raw materials</u> are abundant • can be reinforced (by steel rods) / strong(er) / supported (by steel rods) • concrete mixture can be poured / moulded / constructed on site • less reactive with acid rain / weathering / erosion	no mark for 'limestone' or 'concrete' on first line – mark advantages only ignore ideas of speed of production or easier to use accept 'can build higher' ignore density / extraction / quarrying / pollution / cost	3
total			5

4.8.1.1 Pure substances

CHY1F Question 7

	answers	extra information	mark
(a)(i)	$Cu_2S + 2O_2 \rightarrow 2CuO + SO_2$	accept fractions and multiples	1
(ii)	any **two** from: • sulfur dioxide • causes acid rain • consequence of acid rain eg kills fish / plants	 accept sulphur dioxide / sulphur oxide / SO_2 ignore other comments eg global warming / ozone / global dimming / greenhouse effect	2
(b)	any **two** from: • heat (copper oxide with carbon) • oxygen is removed by carbon **or** carbon monoxide / carbon dioxide is produced **or** carbon displaces copper • because carbon is more reactive than copper	 accept copper (oxide) loses oxygen **or** carbon gains oxygen accept carbon oxide accept a correct word or balanced symbol equation allow a correct comparison of reactivity	2
(c)(i)	electrolysis	accept electroplating	1
(ii)	(electrical) wiring / appliances / coins / pipes / cladding for buildings / jewellery / making alloys **or** named alloys		1

Continued on next page

Question 7 continued

	answers	extra information	mark
(d)	any **three** explanations from: <u>for recycling</u> • less acid rain (pollution) • copper reserves last longer / conserved **or** do not run out • energy for extraction (saved) **or** less energy required • less mining / quarrying • less waste (copper) / electrical appliances dumped **or** less landfill <u>against recycling</u> • collection problems • transport problems • difficult to separate copper from appliances • energy used to melt the collected copper	ignore electrolysis / pollution ignore ideas about less machinery / plant ignore idea of cost	3
total			10

4.8.1.1 Pure substances

Answer 13 · Examiner comments — June 2022 | 8462/1F | Original Q2

Question 2 (Low and standard demand)

02.1 This was answered correctly by the great majority of students.

02.2 About 60% of students correctly identified diagram **A** as a mixture of compounds. **D**, a pure compound, was the most popular incorrect response .

02.3 Just over half of students correctly identified **B** as a mixture of elements. About a quarter chose **A**, which was a mixture of compounds.

Answer 13 · Examiner comments — June 2022 | 8462/1F | Original Q2

02.4 Most students correctly named filtration as the method to be used. Distillation and evaporation were common incorrect responses.

02.5 Most students gave **C** as the correct liquid. A few wrote water, despite the boiling point of water not being given in the table.

02.6 This question was poorly answered. Many students seemed to think that the question was about vapours passing through the condenser rather than the water used to cool the vapours.

02.7 Very few complete descriptions of the process of crystallisation were seen; over half of students scored one of the marks, but very few scored both. Many students did not realise the starting point was sodium chloride solution and tried to produce sodium chloride from a chemical reaction before crystallising the solution. Few realised that crystallisation is a two step process - heating to concentrate the solution and then leaving the remaining solution to cool and crystallise.

4.8.1.1 Pure substances

Answer 14 · Examiner comments

June 2022 | 8462/2F | Original Q1

Question 1 (Low demand)

01.1 Around 70% of the students gained 2 marks. The boiling point of pure water was slightly better known than its pH.

01.2 Under half of the students gained this mark, with universal indicator being the most common correct answer and pH scale the most common incorrect response.

01.3 Around 70% of the students gained two marks. Use of a thermometer was the most common incorrect response.

01.4 Very well answered, with nearly 90% of the students gaining both of the marks. the majority both obtaining the correct answer and showing their working.

01.5 This was also very well answered, with more than three-quarters of the students scoring both marks.

01.6 Nearly 50% of the students gained a mark for knowing the flame colour of sodium is yellow.

01.7 Knowing that the halide ion test produces a white precipitate gained a mark for over 50% of the students.

4.8.1.1 Pure substances

Answer 15 · Examiner comments June 2023 | 8462/1F | Original Q4

Question 4 (low and standard demand)

04.1 This question discriminated well. Nearly a third succeeded in calculating the percentage of lead atoms as 20%, though it was less common to show the working as a simple mathematical expression. A response of 25% was fairly common, as a result of assuming the total number of atoms was 24 instead of adding all the atoms together. This answer scored two marks.

04.2 Few students scored both marks, although two fifths scored one mark. Many did know that it was the layers' ability to slide over each other that was reduced, but fewer knew that this was due to the different sizes of the two types of atom.

4.3 This question discriminated well, with the majority of students scoring at least one mark and about two fifths scoring all three. Students generally followed the sequence when describing the effect of the mass of tin on melting point and took note of the instruction to 'Use data from Figure 5.' Often, however, the data was contradictory, with many students quoting 60% tin rather than 62%, which meant that even though they quoted 183°C, they could not be awarded the mark for identifying the turning point.

04.4 Most students did not realise that pure tin means 100% tin, so did not read the correct value of temperature from the graph. Many gave 323 °C as a result of two errors: looking at 0% tin (ie pure lead) and misreading the scale on the y-axis.

04.5 This was well answered, with well over half choosing the correct option.

Answer 16 · Examiner comments June 2023 | 8462/2F | Original Q3

Question 3 (Low and standard demand)

03.1 Less than 50% of students achieved all 3 marks on this question. Frequent incorrect responses were for MP1 incorrectly identifying chromatography paper as being litmus paper, wrongly identifying the spot as black ink in MP2, negating the information in the

4.8.1.1 Pure substances

Answer 16 · Examiner comments June 2023 | 8462/2F | Original Q3

question and for MP3 incorrectly identifying the start line as the solvent front. A number of students said that the spot was ‘pen’ rather than ‘ink’.

03.2 Less than one third of students were able to identify the correct reason for the mistake identified in the question. The most common incorrect response was to suggest that the student had used the incorrect solvent, which was more popular than the correct answer.

03.3 More than half of students achieved this mark. Common incorrect responses suggested that the dye had changed colour, or that the orange spot was not seen as either the dye was insoluble or that the dye had gone off the top of the paper.

03.4 About one third of students achieved all four marks for this question. A commonly seen incorrect response was to wrongly measure the distance travelled by the dye and/or to a lesser extent the solvent. Most students correctly substituted and evaluated the equation. A minority of students went on to incorrectly round their answer and so did not achieve MP4.

03.5 More than two thirds of the students correctly identified the dye with the largest Rf value. Around one-fifth thought that the red spot had largest R_f value.

Answer 17 · Examiner comments June 2024 | 8462/1F | Original Q1

Question 1 (low demand)

01.1 More than two thirds of students identified the pure compound, with the three distractors being approximately equally popular.

01.2 Just over one third of students identified the correct mixture. Distractor **A**, which is a mixture of two compounds, proved more popular than the correct answer.

01.3 More than four fifths of students identified the position of metals in the periodic table. Sections **B**, **C** and **D** was the most popular distractor.

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4.8.1.1 Pure substances

Answer 17 · Examiner comments June 2024 | 8462/1F | Original Q1

01.4 Fewer than one third of students scored both marks, with nearly one in ten scoring neither. Low melting point was a popular distractor.

01.5 Over half of students scored both marks. Some students placed the electron from the potassium atom on the chlorine atom, rather than completing the structure of the chloride ion. Some added to the potassium ion diagram unnecessarily. A few showed an electron moving from chlorine to potassium. There were some blank answers, perhaps because the students did not realise there was something to do; students need to read the whole paper, not just the parts above an answer line.

01.6 More than four fifths of students identified the distillation apparatus.

01.7 Nearly all students identified the filtration apparatus. The most popular distractor was diagram **B**.

Answer 18 · Examiner comments June 2025 | 8462/2F | Original Q5

Question 5

05.1 A third of students gained all three marks, completing a clear diagram of the chromatography required practical. The details of what was required were included in the instructions, however many students did not seem to read the instructions, as labels were frequently missed. Another point worth noting was that nearly 20% of students made no attempt to answer this item. This suggests that some students are not reading all the given information. The information given in exam papers is designed to support students in answering the questions.

05.2 Over half of students knew why a pencil, rather than a pen, was used to draw the start line. Many others struggled to express themselves with the clarity that was expected.

05.3 Nearly 60% of students scored all three marks on this familiar calculation. The students who scored nothing were unable to rearrange the equation. Some students gained 1 mark for substituting values into the given equation, but then not rearranging correctly.

05.4 Only one third of students knew that measurements need to be made to the centre of the spot. Both the distractors were commonly seen.

4.8.1.1 Pure substances

Answer 18 · Examiner comments June 2025 | 8462/2F | Original Q5

05.5 Three quarters of students scored at least 1 mark for this question. The most common distractor was leaving for a different length of time.

05.6 Two thirds of students correctly gave 1 as the number of spots produced during the chromatography of a pure substance.

05.7 Over 4 in 5 students gave the correct response of more accurate.