AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.10.3.2

Alloys as useful materials

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**48**
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.

4.10.3.2 Alloys as useful materials

Answer 01 · Mark scheme June 2007 | CHY1A | Original Q6 | Legacy

The full source mark scheme begins on page 59. Follow original question 6 in that document.

Answer 02 · Mark scheme June 2007 | CHY1F | Original Q6 | Legacy

The full source mark scheme begins on page 63. Follow original question 6 in that document.

4.10.3.2 Alloys as useful materials

Answer 03 · Mark scheme January 2008 | CHY1F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
(a)(i)	monomers		1
(a)(ii)	crude oil		1
(b)	any **three** from: • metal may not corrode away / remains • plastic remains / does not break down (decay) / not affected by microorganisms • should recycle / conserve resources / mend the kettle / burn (plastic) as a fuel • landfill sites are limited / filling up • water pollution	accept non-biodegradable accept it is a waste of materials / resources ignore harms wildlife / habitats **or** problems caused by burning the kettle	3
total			5

4.10.3.2 Alloys as useful materials

Answer 03 · Mark scheme

January 2008 | CHY1F | Original Q4 | Legacy

CHY1F

4.10.3.2 Alloys as useful materials

Answer 04 · Mark scheme January 2008 | CHY1F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
(a)	good (electrical) conductor	allow low reactivity / resistance to corrosion do **not** accept heat conductor	1
(b)	a mixture of metals	accept contains more than one type of metal	1
(c)(i)	any **one** from: • eyesore • destruction of habitats • pollution of water • dust pollution • noise • traffic pollution		1
(c)(ii)	acid rain	allow sulfur dioxide is a pollutant	1
(d)(i)	running out of copper (ores)		1
(d)(ii)	any **two** from: • any specific example of using less copper • reuse / recycle • use low-grade copper ores • use other metals / materials in place of copper	allow do **not** throw copper / brass away	2
total			7

4.10.3.2 Alloys as useful materials

Answer 04 · Mark scheme

January 2008 | CHY1F | Original Q6 | Legacy

CHY1F

Answer 05 · Mark scheme

March 2008 | CHY1AP | Original Q7 | Legacy

Seven	**2**	**2**	**3**	**1**

4.10.3.2 Alloys as useful materials

Answer 06 · Mark scheme

June 2008 | CHY1F | Original Q6 | Legacy

question	answers	extra information	mark
6(a)	(an alloy) that can return to its original shape (after being deformed / bent / twisted)	accept (on heating / cooling) it returns to its shape	1
6(b)	any **two** from: • brass / it is a mixture • zinc changes structure / disrupts patterns or layers • copper metal atoms / layers able to slide over each other	 accept brass / it is not pure accept zinc prevents atoms / layers sliding over each other	2
6(c)(i)	oxygen / O_2 / O		1
6(c)(ii)	lead remains (in furnace) because of its high boiling point zinc boils / evaporates (out of furnace) because of its low boiling point	 if neither mark awarded then allow **1** mark for different boiling points ignore references to melting points	1 1
Total			**6**

4.10.3.2 Alloys as useful materials

Answer 06 · Mark scheme June 2008 | CHY1F | Original Q6 | Legacy

COMPONENT NUMBER: CHY1F

COMPONENT NAME: Science B / Chemistry

STATUS: Final

DATE: June 2008

Answer 07 · Mark scheme November 2008 | CHY1AP | Original Q4 | Legacy

Four	**A**	a mixture	**2**
	B	expensive to extract from its ore	**1**
	C	a good conductor	**4**
	D	hard-wearing	**3**

Answer 08 · Mark scheme November 2008 | CHY1AP | Original Q6 | Legacy

Six	**2**	**3**	**2**	**1**

Answer 09 · Mark scheme March 2009 | CHY1AP | Original Q9 | Legacy

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

Answer 10 · Mark scheme November 2009 | CHY1AP | Original Q2 | Legacy

Two	**A**	metal ore	**1**
	B	reactive metal	**4**
	C	transition metal	**3**
	D	metal alloy	**2**

Answer 11 · Mark scheme November 2009 | CHY1AP | Original Q6 | Legacy

Six	**2**	**4**	**2**	**4**

4.10.3.2 Alloys as useful materials

Answer 12 · Mark scheme

November 2009 | CHY1AP | Original Q9 | Legacy

Nine	**4**	**3**	**2**	**1**

4.10.3.2 Alloys as useful materials

Answer 13 · Mark scheme

Question 1

question	answers	extra information	mark
1(a)(i)	copper / Cu		1
1(a)(ii)	50(p)		1
1(a)(iii)	25		1
1(a)(iv)	tin		1
1(b)(i)	any **one** from: • high cost of copper • less copper available ***or*** (copper ores exhausted / **only** low-grade ores available) • high demand for copper • high percentage (%) of copper in the coin • inflation (of cost)	allow metal is expensive allow copper is non-renewable	1
1(b)(ii)	any **one** from: • stronger / harder • cost of copper **or** copper is more expensive to extract **or** steel is cheap • less copper available **or** (copper ores exhausted / **only** low-grade ores available) • high demand for copper • less copper is needed	ignore rust allow cheaper (to make)	1
Total			**6**

4.10.3.2 Alloys as useful materials

Answer 13 · Mark scheme January 2010 | CHY1F | Original Q1 | Legacy

CHY1F

Answer 14 · Mark scheme March 2010 | CHY1AP | Original Q2 | Legacy

Two	**A**	iron	**3**
	B	aluminium	**4**
	C	gold	**1**
	D	stainless steel	**2**

Answer 15 · Mark scheme March 2010 | CHY1AP | Original Q7 | Legacy

Seven	**4**	**4**	**4**	**2**

Answer 16 · Mark scheme March 2010 | CHY1AP | Original Q8 | Legacy

Eight	**2**	**3**	**2**	**2**

Answer 17 · 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 18 · Mark scheme June 2010 | CHY1AP | Original Q8 | Legacy

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

4.10.3.2 Alloys as useful materials

Answer 19 · Mark scheme June 2010 | CHY1F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	alloys		1
2(b)	bar drawn correctly up to 4%	ignore width of bar	1
2(c)	(contains) more carbon	ignore contains 4% carbon accept higher level responses related to structure / arrangement of atoms	1
2(d)(i)	73.8		1
2(d)(ii)	mild (steel)		1
2(d)(iii)	corrosion		1
Total			**6**

4.10.3.2 Alloys as useful materials

Answer 19 · Mark scheme June 2010 | CHY1F | Original Q2 | Legacy

CHY1F

Answer 20 · Mark scheme November 2010 | CHY1AP | Original Q1 | Legacy

Question	Key		
One	**A**	Iron	**1**
	B	Aluminium	**2**
	C	Copper	**4**
	D	Calcium	**3**

4.10.3.2 Alloys as useful materials

Answer 21 · Mark scheme

January 2011 | CHY1F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)(i)	conducts electricity		1
2(a)(ii)	mixture (of metals)	(it = alloy)	1
2(b)	any **two** from: • noise • dust • traffic • eyesore	ignore pollution without qualification allow dirt	2
Total			**4**

4.10.3.2 Alloys as useful materials

Answer 21 · Mark scheme January 2011 | CHY1F | Original Q2 | Legacy

CHY1F

Answer 22 · Mark scheme March 2011 | CHY1AP | Original Q1 | Legacy

Question	Key		
One	**A**	Aluminium	**3**
	B	Calcium	**4**
	C	Copper	**2**
	D	Iron	**1**

Answer 23 · Mark scheme June 2011 | CHY1AP | Original Q8 | Legacy

Eight	**3**	**2**	**4**	**1**

4.10.3.2 Alloys as useful materials

Answer 24 · 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

4.10.3.2 Alloys as useful materials

Answer 25 · Mark scheme

November 2011 | CHY1AP | Original Q1 | Legacy

Question	Key		
One	**A**	hard	**3**
	B	resistant to corrosion	**4**
	C	easily shaped	**2**
	D	brittle	**1**

4.10.3.2 Alloys as useful materials

Answer 26 · Mark scheme

January 2012 | CH1FP | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	reduction		1
2(b)	carbon is less reactive than aluminium		1
2(c)	aluminium (ions) / they are positively charged so they are attracted **or** they move towards the negative electrode **OR** aluminium (ions) / they need to gain electrons (1) which come from the negative electrode (1)	they = aluminium ions ignore particle names accept aluminium (ions) / they are cations allow aluminium (ions) / they have an opposite charge if no other marks awarded allow 'opposites attract' for **1** mark	 1 1
2(d)	aluminium has a low density aluminium is resistant to corrosion		1 1
2(e)	**advantage** less carbon dioxide is produced **disadvantage** used aluminium cans have to be collected and transported		1 1
Total			**8**

4.10.3.2 Alloys as useful materials

Answer 26 · Mark scheme

January 2012 | CH1FP | Original Q2 | Legacy

CH1FP

4.10.3.2 Alloys as useful materials

Answer 27 · Mark scheme

June 2012 | CH1FP | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)	Aluminium has a low density Aluminium is resistant to corrosion		1 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 **or** alloys are hard	allow weak allow strong / keep their shape 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) **or** no carbon dioxide is produced (from the fuel)	 allow less carbon dioxide produced **or** less global warming allow carbon dioxide causes global warming	1
Total			**9**

4.10.3.2 Alloys as useful materials

Answer 27 · Mark scheme

June 2012 | CH1FP | Original Q3 | Legacy

CH1FP

4.10.3.2 Alloys as useful materials

Answer 28 · Mark scheme June 2012 | CH2FP | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	cryolite		1
4(a)(ii)	lower the melting point of the aluminium oxide		1
4(b)(i)	opposite charges **or** oxide ions are negative attract		1 1
4(b)(ii)	carbon		1
4(b)(iii)	reacts with oxygen **or** forms carbon dioxide	accept burns	1
4(c)	**Structure mark**: **either** Al (atoms) in layers / rows **or** alloy (atoms) not in layers / rows **Sliding mark**: **either** so (Al layers) can slide **or** so (alloy) layers cannot slide	 accept Al (atoms) all the same size allow Al (atoms) in lines accept different sizes of atoms in alloy allow alloy (atoms) not in lines	1 1
Total			**8**

4.10.3.2 Alloys as useful materials

Answer 28 · Mark scheme

June 2012 | CH2FP | Original Q4 | Legacy

CH2FP

4.10.3.2 Alloys as useful materials

Answer 29 · Mark scheme

January 2013 | CH1FP | Original Q4 | Legacy

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

4.10.3.2 Alloys as useful materials

Answer 29 · Mark scheme

CH1FP

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

4.10.3.2 Alloys as useful materials

Answer 29 · Mark scheme

January 2013 | CH1FP | Original Q4 | Legacy

CH1FP

4.10.3.2 Alloys as useful materials

Answer 30 · Mark scheme

January 2013 | CH2FP | Original Q6 | Legacy

question	answers	extra information	mark
6(a)(i)	an alloy		1
6(a)(ii)	harder		1
6(b)(i)	162.5	correct answer with or without working gains **2** marks if no answer or incorrect answer then evidence of correct working [56 + (3x35.5)] gains **1** mark	2
6(b)(ii) **(view with 6bi)**	34.46	accept rounding from 34 - 34.5 correct answer with or without working gains **2** marks accept ecf from 6 (b)(i) correctly calculated for **2** marks if no answer or incorrect answer then evidence of 56 / 162.5 **or** 56 / answer to 6(b)(i) gains **1** mark	2
Total			**6**

4.10.3.2 Alloys as useful materials

Answer 30 · Mark scheme

January 2013 | CH2FP | Original Q6 | Legacy

January 2013

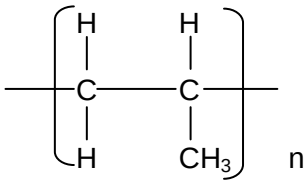
CH2FP

4.10.3.2 Alloys as useful materials

Answer 31 · Mark scheme

June 2013 | CH1FP | Original Q5 | Legacy

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' 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 (stainless steel) resistant to corrosion **or** unreactive	it = stainless steel accept (pure) iron is soft accept (pure) iron rusts / corrodes / reacts do **not** allow corrosive	1 1
5(c)	**Advantage**: Conserves resources of crude oil and ores **Disadvantage**: High cost of separating materials	do **not** allow more than one tick in the advantage column do **not** allow more than one tick in the disadvantage column	1 1
Total			**8**

4.10.3.2 Alloys as useful materials

Answer 32 · Mark scheme June 2013 | CH2FP | Original Q3 | Legacy

Question 3

question	answers	extra information	Mark
3(a)	(alloy) atoms / ions / particles not in layers	accept layers are distorted accept different (size) particles / atoms	1
	so, (alloy) layers / atoms / ions / particles can't slide	if no other mark awarded allow (an alloy) is a mixture of metals for **1** mark	1
3(b)	diamonds have a giant covalent structure		1
	diamonds have strong bonds between carbon atoms		1
3(c)(i)	a compound		1
3(c)(ii)	CH_4		1
3(c)(iii)	covalent		1
3(d)	methane has a low boiling point or boiling point less than 20°C		1
	because it has small molecules	accept it has forces between molecules accept weak forces between molecules for **2** marks	1
Total			**9**

4.10.3.2 Alloys as useful materials

Answer 33 · Mark scheme

June 2013 | CH2FP | Original Q5 | Legacy

Question 5

question	answers	extra information	Mark
5(a)	giant lattices		1
5(b)(i)	heat / warm / increase the temperature	allow reduce pressure do not accept melt	1
5(b)(ii)	(polymer) chains cannot slide because they have cross-links	 if no other mark awarded allow polymers do not melt for **1** mark	1 1
5(c)(i)	separates (substances)		1
5(c)(ii)	any **two** from: • quick / rapid • accurate • can detect small quantities / sensitive	ignore reliable / precise / efficient ignore references to cost	2
Total			**7**

4.10.3.2 Alloys as useful materials

Answer 34 · Mark scheme June 2014 | CH2FP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
2(a)	alloy		1	1 / 2.2.4d	A
2(b)	in mixture: *different sized / bigger atoms* *so there are no layers / rows / lines (to slide)*	accept converse	 1 1	1 / 2.2.4c / 2.1.1h	E
2(c)	any **two** from: • cost • toxicity • strength • *appearance of brace* • *unreactive **or** resistant to corrosion / saliva*	*ignore references to bend and mould* *allow rusting as alternative to corrosion*	2	3 / 2.2.4	E
2(d)	crosslinks	*allow lines / bonds between the rows / chains*	1	1 / 2.2.5b	E
Total			**6**		

4.10.3.2 Alloys as useful materials

Answer 34 · Mark scheme

June 2014 | CH2FP | Original Q2 | Legacy



4.10.3.2 Alloys as useful materials

Answer 35 · Mark scheme June 2016 | CH1FP | Original Q3 | Legacy

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 % correct bar for iron at 5.0 %	allow error of +/- 0.05% allow error of +/- 0.05%	1 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 oxygen = 3	allow one allow three	1 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: • to conserve resources of iron or iron ore • to avoid the need for quarrying/mining • to conserve energy resources or fossil fuels • to limit the amount of carbon dioxide produced or to reduce global warming • to reduce the amount of landfill	"it" = steel ignore cost and reuse and time and waste allow steel instead of iron or iron ore allow limited resource or non-renewable	3	AO1 1.3.1j
Total			**13**	

4.10.3.2 Alloys as useful materials

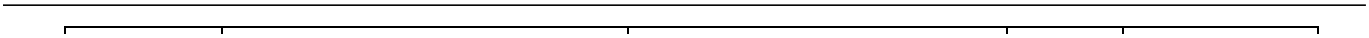
Answer 36 · Mark scheme June 2016 | CH2FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
1(a)(i)	7 / seven		1	AO1 2.1.1e
1(a)(ii)	1 Electron	do **not** accept -1	1 1	AO1 2.3.1b
1(a)(iii)	isotopes		1	AO1 2.3.1d
1(b)(i)	(sodium +) fluorine → sodium fluoride		1	AO2 2.1.1d,e
1(b)(ii)	compounds		1	AO1 2.1.1a
1(b)(iii)	mole		1	AO1 2.3.1g
1(b)(iv)	 sodium (atom) loses fluorine (atom) gains one electron ions formed	**max 3** if reference to incorrect particle / bonding allow sodium forms positive (ion) **or** fluorine forms negative (ion) allow form ionic bond allow to gain a full outer shell of electrons allow forms noble gas structure	 1 1 1 1	AO1 / AO2 2.1.1b,c,d,e,f
1(b)(v)	Dissolve in water High melting point		1 1	AO1 2.2.2a,b
Total			**13**	

4.10.3.2 Alloys as useful materials

Answer 36 · Mark scheme

June 2016 | CH2FP | Original Q1 | Legacy



4.10.3.2 Alloys as useful materials

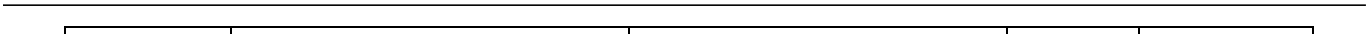
Answer 37 · Mark scheme June 2016 | CH2FP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
3(a)	electricity	allow an electric current	1	AO1 2.7.1a; 2.2.2b
3(b)(i)	chlorine/Cl_2	do **not** accept chloride	1	AO2 2.7.1b
3(b)(ii)	(zinc ions are) positive and (opposite charges) attract	ignore to gain electrons	1 1	AO1/AO2 2.7.1c
3(b)(iii)	reduction		1	AO1 2.7.1e
3(c)(i)	in alloy: different sized atoms/particles **or** no layers/rows so cannot slide	accept converse accept layers distorted	 1 1	AO1/AO2 2.2.4b,c
3(c)(ii)	shape memory (alloys)	accept smart	1	AO1 2.2.4d
Total			**8**	

4.10.3.2 Alloys as useful materials

Answer 37 · Mark scheme

June 2016 | CH2FP | Original Q3 | Legacy



4.10.3.2 Alloys as useful materials

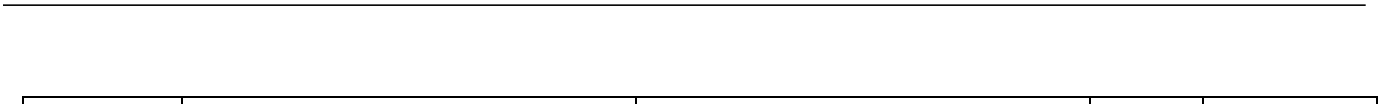
Answer 38 · Mark scheme June 2017 | CH1FP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)	hydrogen	allow H ignore numbers	1	AO2 1.1.2
2(b)	about 100		1	AO1 1.1.1a
2(c)	same number of electrons in the outer shell similar chemical reactions		1 1	AO1 1.1.2a
2(d)	noble transition	ignore inert	1 1	AO1 1.1.2b 1.3.3a
2(e)	ions molecules	in this order	1 1	AO2 1.1.3a
Total			8	

4.10.3.2 Alloys as useful materials

Answer 38 · Mark scheme

June 2017 | CH1FP | Original Q2 | Legacy



4.10.3.2 Alloys as useful materials

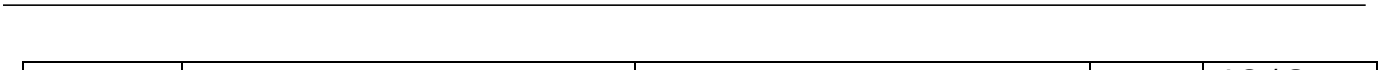
Answer 39 · Mark scheme June 2017 | CH2FP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	s		1	AO2 2.6.1a
2(a)(ii)	to speed up the reaction		1	AO2 2.6.1b
2(a)(iii)	tick (✓) by: 1		1	AO1 2.6.2d
2(a)(iv)	tick (✓) by: To make sure all the sulfuric acid has reacted		1	AO1 2.6.1b
2(b)(i)	funnel	accept filter funnel	1	AO1 2.6.1b
2(b)(ii)	heat / evaporate / boil	accept cool accept leave (to evaporate) do **not** accept heat until all water gone	1	AO1 2.6.1b
2(c)	tick (✓) by: The student left some copper sulfate crystals in the apparatus.		1	AO3 2.3.3d
2(d)(i)	white	accept grey	1	AO1 2.5.1d
2(d)(ii)	it goes blue	accept steam / water vapour ignore unspecified colour change	1	AO1 2.5.1d
2(e)(i)	polymers		1	AO1 2.2.5a
2(e)(ii)	as wealth decreases, ethene production decreases	accept converse	1	AO2 2.6; 3.7.12
2(e)(iii)	no relationship		1	AO2 2.6; 3.7.12
Total			12	

4.10.3.2 Alloys as useful materials

Answer 39 · Mark scheme

June 2017 | CH2FP | Original Q2 | Legacy



4.10.3.2 Alloys as useful materials

Answer 40 · Mark scheme

June 2019 | 8462/1F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	B		1	AO2 4.1.1.1 4.1.1.2
03.2	D		1	AO2 4.1.1.1 4.1.1.2
03.3	E		1	AO2 4.1.1.1 4.1.1.2
03.4	chromatography – blue food colour from a mixture of food colours chromatography – copper from an alloy of copper and zinc crystallisation – copper sulfate from copper sulfate solution crystallisation – ethanol from a mixture of ethanol and water additional line from a box negates the mark for that box		1 1	AO2 4.1.1.2
03.5	(filter) funnel containing filter paper suitable vessel for collecting filtrate sand **and** water labelled in correct place		1 1 1	AO1 AO1 AO2 4.1.1.2
03.6	100 °C		1	AO2 4.1.1.2

4.10.3.2 Alloys as useful materials

Answer 40 · Mark scheme

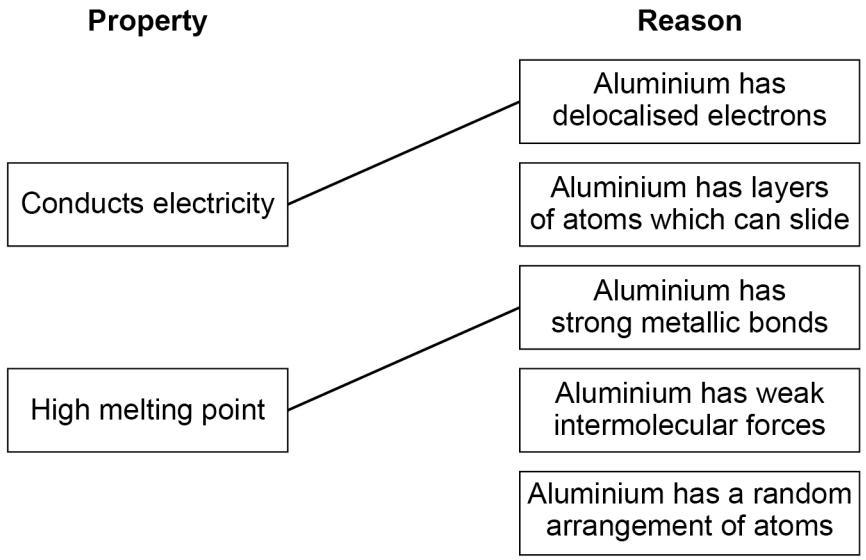
03.7	any **four** from: • solution is heated • water evaporates • the vapour cools in the condenser • the vapour condenses **or** the vapour turns to a liquid • (pure) water collects in the beaker	allow water boils / vaporises	4	AO1 4.1.1.2
Total			**13**	

4.10.3.2 Alloys as useful materials

Answer 41 · Mark scheme

November 2020 | 8462/1F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	 additional line from a box on the left negates the mark from that box		1 1	AO1 4.2.1.5 4.2.2.7 4.2.2.8
05.2	a mixture of metals	allow a mixture of a metal with other elements	1	AO1 4.2.2.7
05.3	bauxite contains a variable percentage of aluminium	allow converse argument allow bauxite does not have a fixed proportion / percentage of aluminium	1	AO3 4.1.1.1
05.4	any **two** from: • danger of dam bursting • leakage of toxic substances from mud to environment • water pollution • damage to habitats • visual pollution • (dam) blocks light • reduces the value of houses	allow the lake (of mud) could overflow allow unpleasant smell	2	AO3 4.4.3.3

4.10.3.2 Alloys as useful materials

Answer 41 · Mark scheme

November 2020 | 8462/1F | Original Q5

Question 5 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	10 / ten		1	AO2 4.1.1.1
05.6	to lower the melting point of the mixture		1	AO1 4.4.3.3
05.7	oxygen carbon	must be in this order	1 1	AO1 4.4.3.3
05.8	$\frac{25}{100}$ × 300 000 =75 000 (kg) = 7.5 ×10^4 (kg)	 allow correct conversion to standard form of an incorrectly calculated mass	1 1 1	AO2 4.4.3.3
Total			**13**	

4.10.3.2 Alloys as useful materials

Answer 42 · Mark scheme

November 2020 | 8462/2F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	tin		1	AO1 4.10.3.2
05.2	any **one** from: • ornaments • musical instruments • hinges / knobs / screws	allow any correct use of brass	1	AO1 4.10.3.2
05.3	(**A**) 12 (carat) (**B**) 3 (grams)		1 1	AO2 4.10.3.2
05.4	any **two** from: • (alloy of gold is) harder • (alloy of gold is) cheaper • aesthetic reasons	allow converse statements about pure gold	2	AO1 AO3 4.2.2.7 4.10.3.2
05.5	any **one** from: • does not corrode • does not react with water • is hard	allow will not rust	1	AO2 4.10.3.1 4.10.3.2
05.6	low carbon steel		1	AO3 4.10.3.2
Total			**8**	

4.10.3.2 Alloys as useful materials

Answer 43 · Mark scheme

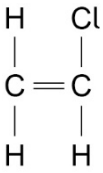
November 2021 | 8462/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	limestone sodium carbonate		1 1	AO1 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	(advantage) stronger (reason) less easily damaged		1 1	AO3 AO2 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	(advantage) lower density (reason) lighter (to install)		1 1	AO3 AO2 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4			1	AO2 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	(add damp) litmus paper (litmus paper) is bleached **or** (litmus paper) turns white	ignore (litmus paper) turns red	1 1	AO1 4.8.2.4

Question 3 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	(polymers) last a long time (wood) renewable	ignore references to cost allow break down slowly allow trees can be replanted allow aesthetic reasons	 1 1	 AO3 AO1 4.10.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	(percentage of aluminium =) $\frac{5.94}{6.00} \times 100$ = 99 (%)		1 1	AO2 4.10.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.8	(alloy is) harder (than pure aluminium)	allow (alloy is) stronger (than pure aluminium) ignore references to cost	1	AO2 4.2.2.7 4.10.3.2

Total			14

4.10.3.2 Alloys as useful materials

Answer 44 · Mark scheme

June 2023 | 8462/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	(total atoms =) 30 (percentage =) $\frac{6}{30}$ × 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

4.10.3.2 Alloys as useful materials

Answer 44 · Mark scheme

June 2023 | 8462/1F | Original Q4

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**

4.10.3.2 Alloys as useful materials

Answer 45 · Mark scheme

June 2023 | 8462/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	carbon		1	AO1 4.10.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	chromium nickel		1 1	AO1 4.10.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	hard resistant to corrosion	in either order	1 1	AO1 4.10.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	(percentage of titanium = 100 – 3.0 – 2.5) = 94.5 (%) (mass =) $\frac{94.5}{100} \times 5.0$ = 4.725 (kg) **alternative approach:** (mass of Al + V = $\frac{5.5}{100} \times 5.0$ =) 0.275 (kg) (1) (mass of titanium =) 5 – 0.275 (1) = 4.725 (kg) (1)	allow correct use of incorrectly determined percentage of titanium allow 4.7 / 4.73 (kg) allow correct use of incorrectly determined mass of Al and V allow 4.7 / 4.73 (kg)	1 1 1	AO2 4.10.3.2

4.10.3.2 Alloys as useful materials

Answer 45 · Mark scheme

June 2023 | 8462/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	(both are) strong	allow (both contain) more aluminium	1	AO3 4.10.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	tin is toxic	allow tin reacts in the body	1	AO3 4.10.3.2

Total Question 7	**10**

4.10.3.2 Alloys as useful materials

Answer 46 · Mark scheme

June 2024 | 8462/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	alloy		1	AO1
	reinforcement		1	AO2 4.10.3.2 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	burning (of methane) releases carbon dioxide	allow burning methane ignore methane is a greenhouse gas	1	AO2 4.9.2.2 4.9.3.1
	decomposition (of limestone) releases carbon dioxide	allow decomposition of limestone	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	hydrochloric acid		1	AO1 4.8.3.3
	limewater		1	RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4		allow converse for plain concrete		AO3 4.10.3.3
	(pre-stressed concrete) can bear the weight of (heavy) traffic	allow (pre-stressed concrete) bridge is less likely to collapse	1	
	(because pre-stressed concrete is) stronger	do **not** accept (because pre-stressed concrete is) more dense	1	

4.10.3.2 Alloys as useful materials

Answer 46 · Mark scheme

June 2024 | 8462/2F | Original Q7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	any **two** from: (plain concrete slabs) • are cheaper • will be lighter (to transport / lay) • do not need to carry vehicles	allow converse for pre-stressed concrete	2	AO3 4.10.3.3

Total Question 7	**10**

4.10.3.2 Alloys as useful materials

Answer 47 · Mark scheme

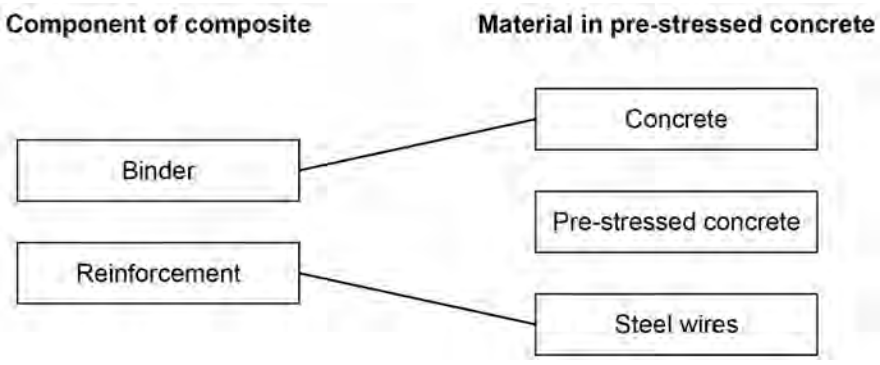
June 2025 | 8462/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	(the sign) ⇌	allow a description of the reversible sign	1	AO1 4.6.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	endothermic	allow (thermal) decomposition	1	AO1 4.6.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	(energy released =) $\frac{4}{20} \times 23$ = 4.6 (kJ)		1 1	AO2 4.6.2.2

Question	Answers	Mark	AO / Spec. Ref.
03.4	 do **not** accept more than one line from a box on the left	1 1	AO2 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	iron	allow Fe	1	AO1 4.10.3.2

4.10.3.2 Alloys as useful materials

Answer 47 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	clay		1	AO1 4.10.3.3

Total Question 3	**8**

4.10.3.2 Alloys as useful materials

Answer 48 · Mark scheme

June 2025 | 8462/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	(mass =) $\frac{75}{100}$ x 4 = 3 (g)		1 1	AO2 4.10.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	3 : 1		1	AO2 4.10.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	copper silver		1 1	AO1 4.10.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	(18 carat gold) contains different sized atoms (so the) layers are distorted (so the) layers (of atoms) slide less easily	 allow (so the) atoms cannot slide over each other	1 1 1	AO2 4.2.2.7 4.10.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	any **one** from: • iron rusts • aesthetic reasons		1	AO2 4.10.3.1 4.10.3.2

Total Question 7	9

4.10.3.2 Alloys as useful materials

Version1.2:15/08/07

ASSESSMENT and QUALIFICATIONS ALLIANCE

GCSE

Science A 4461

Chemistry 4421

CHY1A F & H

Mark Scheme

2007 examination - June series

4.10.3.2 Alloys as useful materials

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4.10.3.2 Alloys as useful materials

CHY1A (Products from Rocks)

Foundation Tier

Question	Key		
One	**A**	atom	**3**
	B	compound	**2**
	C	element	**4**
	D	symbol	**1**
Two	**A**	gold (Au)	**3**
	B	lithium (Li)	**4**
	C	calcium (Ca)	**1**
	D	sulfur (S)	**2**
Three	**A**	a bond	**3**
	B	an electron	**2**
	C	a molecule	**4**
	D	a nucleus	**1**
Four	**A**	Aluminium	**2**
	B	Iron	**3**
	C	Mercury	**1**
	D	Potassium	**4**
Five	**A**	one	**2**
	B	four	**3**
	C	five	**1**
	D	seven	**4**
Six	**A**	hard	**3**
	B	resistant to corrosion	**4**
	C	easily shaped	**2**
	D	brittle	**1**

	A	B	C	D
Seven	**2**	**4**	**3**	**2**
Eight	**1**	**2**	**2**	**3**
Nine	**1**	**2**	**4**	**3**

4.10.3.2 Alloys as useful materials

CHY1A (Products from Rocks)

Higher Tier

Question	Key		
One	**A**	hard	**3**
	B	resistant to corrosion	**4**
	C	easily shaped	**2**
	D	brittle	**1**
Two	**A**	an alloy	**4**
	B	an element	**1**
	C	a hydrocarbon	**2**
	D	a mixture of compounds	**3**

	A	B	C	D
Three	**1**	**2**	**2**	**3**
Four	**1**	**2**	**4**	**3**
Five	**3**	**2**	**1**	**1**
Six	**4**	**4**	**3**	**3**
Seven	**3**	**2**	**3**	**3**
Eight	**1**	**3**	**2**	**3**
Nine	**2**	**3**	**2**	**3**

4.10.3.2 Alloys as useful materials

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

4.10.3.2 Alloys as useful materials

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4.10.3.2 Alloys as useful materials

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.

4.10.3.2 Alloys as useful materials

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.

4.10.3.2 Alloys as useful materials

CHY1F Question 1

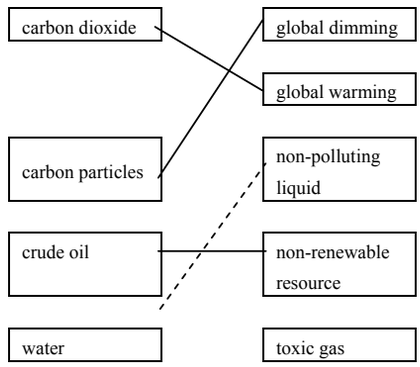
	answers	extra information	mark
(a)	low density unreactive		1 1
(b)	a polymer		1
(c)	any **one** from: • not broken down by (microorganisms) • does not decay (naturally)	ignore cannot recycle / degrade / disintegrate	1
total			4

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

4.10.3.2 Alloys as useful materials

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

4.10.3.2 Alloys as useful materials

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

4.10.3.2 Alloys as useful materials

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

4.10.3.2 Alloys as useful materials

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

4.10.3.2 Alloys as useful materials

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

4.10.3.2 Alloys as useful materials

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

4.10.3.2 Alloys as useful materials

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

4.10.3.2 Alloys as useful materials

Answer 40 · Examiner comments

June 2019 | 8462/1F | Original Q3

Question 3 (low and standard demand)

03.1 This question tested recognition of a diagram representing only one compound.

Almost half of the students identified the correct option.

The diagram representing only one element was a strong distractor.

03.2 This question tested recognition of a diagram representing a mixture of elements.

Approximately 55% of students identified the correct option.

03.3 This question tested recognition of a diagram representing a mixture of an element and a compound.

Approximately 60% of students identified the correct option.

03.4 This question tested students' ability to apply their knowledge and understanding of chromatography and crystallisation.

Approximately two-thirds of students scored both marks.

03.5 The diagram showing how a mixture of sand and water can be separated by filtration was often drawn and labelled clearly enough to score all 3 marks. The most common omissions were a filter funnel or filter paper.

03.6 Approximately two-thirds of students correctly predicted the temperature of 100 °C.

Answer 40 · Examiner comments

June 2019 | 8462/1F | Original Q3

03.7 This question which required a description of distillation was generally answered well. Almost 60% of students scored at least 3 marks.

The marks for the solution being heated and for the water being collected in the beaker were the most often scored.

Marks for the vapour cooling in the condenser and for the vapour condensing were the least often scored. Here, the term vapour / gas / steam needed to be used rather than, for example, evaporated water.

4.10.3.2 Alloys as useful materials

Answer 44 · 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 45 · Examiner comments

June 2023 | 8462/2F | Original Q7

Question 7 (Low and standard demand)

07.1 Almost 70% of the students were able to identify carbon. The two distractors were seen equally as often.

07.2 Around 10% of the students were able to identify the two elements added to iron to make stainless steel and over half of them could identify just one of the metals. 'Zinc' was very often chosen as one metal in the pair.

07.3 Over half of the students gained both marks for correctly identifying both of the properties of stainless steel with a further third gaining 1 mark.

07.4 This calculation discriminated well. Approximately one quarter of students successfully completed the calculation, usually showing full details of their working.

07.5 Almost 90% of the students gained the mark by expressing the idea of strength in a variety of ways, including the positive effect of high strength in the context of aircraft.

07.6 Around one third of students gained this mark. Weaker responses did not include the consequences of the presence of tin in the alloy if used for medical purposes.

4.10.3.2 Alloys as useful materials

Answer 46 · Examiner comments

June 2024 | 8462/2F | Original Q7

Question 7 (low and standard demand)

07.1 Approximately two out of five students gained both marks with a one in two gaining one mark. It is important that students read the question carefully as there was a significant number of students who ticked one box instead of two.

07.2 This question asked for two ways in which a greenhouse gas is released in the process described. Less than 25% of students gained both marks with just over 35% more gaining one mark. Incorrect or insufficient responses included 'heating the limestone' and general references to the equation, or that methane might escape during its combustion.

07.3 The carbonate test is poorly understood with less than 15% of students correctly identifying the substance added to the limestone and the test for carbon dioxide. Two in five students gained one mark. The most frequent incorrect response was to mistakenly identify the test as universal indicator.

07.4 Less than 35% of students gained one mark in this question, with less than 15% gaining two marks. Responses which did not gain credit included those referring to carrying heavy weights in general rather than the weight being from lorries or vehicles, responses in terms of the incorrect property from the table or failing to make a valid comparison.

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Answer 46 · Examiner comments

June 2024 | 8462/2F | Original Q7

07.5 This question proved to be easier than that for the concrete bridge with over 50% of students gaining one mark and over 35% gaining both marks. Responses which did not gain credit again included those that failed to make a valid comparison or those that simply quoted data from the table.

4.10.3.2 Alloys as useful materials

Answer 47 · Examiner comments June 2025 | 8462/2F | Original Q3

03.1 The reversible symbol was identified or correctly described by three quarters of students. Those that did not gain the mark talked about the 'equals sign' or the 'reversible sign' without a description.

03.2 Nearly 9 in 10 students correctly identified the type of reaction as 'endothermic'.

03.3 Well in excess of half of students correctly calculated the energy change. The methods employed were varied, with none being more common.

03.4 Around half of students correctly identified both materials. Many students completely reversed the responses. If 1 mark was awarded it was most likely for correctly identifying the reinforcement.

03.5 Over half of all students

Question 3

03.1 The reversible symbol was identified or correctly described by three quarters of students. Those that did not gain the mark talked about the 'equals sign' or the 'reversible sign' without a description.

03.2 Nearly 9 in 10 students correctly identified the type of reaction as 'endothermic'.

03.3 Well in excess of half of students correctly calculated the energy change. The methods employed were varied, with none being more common.

03.4 Around half of students correctly identified both materials. Many students completely reversed the responses. If 1 mark was awarded it was most likely for correctly identifying the reinforcement.

03.5 Over half of all students were able to identify iron. Aluminium and copper were the most frequently seen incorrect answers.

Answer 47 · Examiner comments June 2025 | 8462/2F | Original Q3

03.6 Three quarters of students correctly identified clay. Poly(ethene) was the most common incorrect response.

4.10.3.2 Alloys as useful materials

Answer 48 · Examiner comments June 2025 | 8462/2F | Original Q7

Question 7

07.1 Half of students correctly calculated the mass of gold in an 18-carat ring.

07.2 Two thirds of students identified the ratio correctly. The most common incorrect response was the wrong way round, 1:3.

07.3 Half of students knew that copper and silver are used in gold jewellery.

07.4 A common question applied to an unfamiliar context saw students struggle, even given the diagrams to help. Many students answered in terms of 24 carat gold, where the question was in terms of 18 carat gold. A common error was the idea that the metal used for alloying was harder than gold, so making the alloy harder. Reference to the given diagrams was absent. Another example of information given being ignored by students.

Answer 48 · Examiner comments June 2025 | 8462/2F | Original Q7

07.5 Half of students gained this mark, usually for the idea that iron rusts.