AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.1.1.2

Mixtures

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**150**
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.

4.1.1.2 Mixtures

Answer 01 · Mark scheme

Question 2

	answers	extra information	mark
(a)	pressing		1
(b)(i)	water	accept hydrogen oxide / H_2O	1
(ii)	filtration or description of this process	accept decanting or similar description of a means of separating the seeds and skins from the liquids accept sieving do **not** accept distillation / evaporation	1
total			3

4.1.1.2 Mixtures

Answer 02 · Mark scheme

Question 4

	answers	extra information	mark
(a)	**1** / one **3** / three		1 1
(b)(i)	(wear safety) glasses / masks / gloves	accept do not handle hot objects / use tongs **or** accept other safety points such as, 'tie hair back'	1
(ii)	calcium oxide	accept quicklime	1
(iii)	carbon dioxide / CO_2 is given off	accept a gas is given off	1
(c)	any **two** from: • conserves (saves) resources • avoids dumping / landfill • lowers energy requirements / save energy • stops quarries opening • less carbon dioxide / carbon emissions / greenhouse gases • lowers the price of glass • glass is non-biodegradable	 accept reduces waste do **not** accept speeds up the process do **not** accept cheaper process	2
(d)(i)	any **two** from: • dust / atmospheric pollution • noise • eyesore • destroys habitats • (extra) traffic • any other named pollution or description of pollution		2

Continued on next page

4.1.1.2 Mixtures

Answer 02 · Mark scheme

	answers	extra information	mark
(ii)	any **one** from: • employment • increases local trade / makes money • future development of quarry – recreation / park / lake / reservoir	do **not** accept cheaper houses / land / new roads	1
total			10

4.1.1.2 Mixtures

Answer 03 · Mark scheme March 2007 | CHY1A | Original Q1 | Legacy

One	**A**	an alkane	**3**
	B	carbon	**2**
	C	crude oil	**1**
	D	sulfur dioxide	**4**

Answer 04 · Mark scheme March 2007 | CHY1A | Original Q8 | Legacy

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

Answer 05 · Mark scheme March 2007 | CHY1B | Original Q8 | Legacy

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

Answer 06 · Mark scheme June 2007 | CHY1B | Original Q1 | Legacy

Question	Key		
One	**A**	an additive	**3**
	B	a catalyst	**4**
	C	an emulsion	**2**
	D	a mixture	**1**

Answer 07 · Mark scheme June 2007 | CHY1B | Original Q5 | Legacy

Five	**A**	These vapours are cooled and condense.	**3**
	B	The mixture is heated in a distillation flask.	**2**
	C	The lavender oil floats on top of the water.	**4**
	D	The lavender plants are crushed.	**1**

Answer 08 · Mark scheme June 2007 | CHY1B | Original Q7 | Legacy

Seven	**2**	**3**	**4**	**4**

Answer 09 · Mark scheme June 2007 | CHY1F | Original Q2 | Legacy

The full source mark scheme begins on page 228. Follow original question 2 in that document.

4.1.1.2 Mixtures

Answer 10 · Mark scheme

June 2007 | CHY1F | Original Q3 | Legacy

The full source mark scheme begins on page 228. Follow original question 3 in that document.

Answer 11 · Mark scheme

June 2007 | CHY1F | Original Q6 | Legacy

The full source mark scheme begins on page 228. Follow original question 6 in that document.

Answer 12 · Mark scheme

November 2007 | CHY1A | Original Q6 | Legacy

Six	**A**	condense	**2**
	B	vaporise	**1**
	C	viscous	**4**
	D	volatile	**3**

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

Answer 13 · Mark scheme

November 2007 | CHY1B | Original Q6 | Legacy

Six	**A**	oil hardens and additives are mixed in	**4**
	B	sunflower oil separates from the water	**2**
	C	water is added and the mixture is stirred	**1**
	D	sunflower oil is reacted with hydrogen	**3**

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

4.1.1.2 Mixtures

Answer 14 · Mark scheme

Question 1

question	answers	extra information	mark
(a)(i)	made up of one sort of atom	accept it is in the periodic table **or** has its own symbol	1
(a)(ii)	nitrogen / N / N_2 **or** oxygen / O / O_2	do **not** accept argon **or** helium do **not** accept oxide	1
(b)(i)	compound carbon		1 1
(b)(ii)	bond		1
total			5

4.1.1.2 Mixtures

Answer 14 · Mark scheme

January 2008 | CHY1F | Original Q1 | Legacy

CHY1F

4.1.1.2 Mixtures

Answer 15 · Mark scheme

Question 2

question	answers	extra information	mark
(a)(i)	colours		1
(a)(ii)	emulsifiers		1
(a)(iii)	preservatives	allow antioxidants	1
(b)	drinks / colours B **and** C are safe drinks / colours A **and** D are not safe	accept a pair of one safe colour **and** one not safe colour identified for **1** mark accept A, B, C and D all contain one safe colour for **1** mark ignore references to shading	1 1
total			5

4.1.1.2 Mixtures

Answer 15 · Mark scheme

January 2008 | CHY1F | Original Q2 | Legacy

CHY1F

4.1.1.2 Mixtures

Answer 16 · Mark scheme

Question 8

question	answers	extra information	mark
(a)(i)	oxygen / O / O_2	do **not** accept oxide	1
(a)(ii)	sodium **and** carbon **and** oxygen	do **not** allow symbols alone do **not** allow oxide	1
	all correct numbers linked to correct elements ie 2 (sodium), a / 1 (carbon), 3 (oxygen)	accept statement 'the number **and** type of atoms' for **1** mark only ignore types of particles	1
(b)(i)	calcium carbonate →	allow $CaCO_3$	1
	calcium oxide + carbon dioxide	either way round allow CaO + CO_2 do **not** allow quick lime maximum **1** mark for unbalanced symbol equation	1
(b)(ii)	thermal decomposition	accept endothermic do **not** accept reversible / equilibrium	1
(c)	any **one** from: • lowers energy / temperature needed **or** conserves energy • decreases the amount of fuel needed • no / less glass going to landfill	do **not** accept no energy ignore cheaper / easier ignore conserves raw materials **or** more quarries needed	1
total			7

4.1.1.2 Mixtures

Answer 17 · Mark scheme

Question 5

question	answers	extra information	mark
(a)(i)	nitrogen + hydrogen → ammonia	accept full correct balanced equation	1
(a)(ii)	reversible (reaction) (owtte)	do **not** allow just 'backwards' (unqualified)	1
(a)(iii)	catalyst / speed up reaction	accept to lower activation energy	1
(a)(iv)	boiling point		1
(a)(v)	recycled (owtte)		1
(b)(i)	used to make explosives (owtte) used to make medicines (owtte)		1
(b)(ii)	used to make fertilisers (owtte)		1
(c)(i)	sensible answers such as provides workers (owtte) good transport links	ignore reference to raw materials	1

continued…

4.1.1.2 Mixtures

Answer 17 · Mark scheme

CHY2F

Question 5 continued…

question	answers	extra information	mark
(c)(ii)	sensible idea		1
	linked reason		1
	idea	linked reason	
	eg escape of chemicals /fumes /waste gases / pollution	harmful to health / environmental damage owtte do **not** allow harmful / damage / smell (unqualified)	
	risk of explosion	because of high pressures / may endanger local people / dangerous	
	risk of fire	because of high temperatures / may endanger local people	
	noise	any detrimental effect on quality of life **or** night and day	
	lorries / traffic	danger / noise / pollution etc	
	unsightly	detrimental effect on quality of life / house prices / reduced tourism	
	uses a lot of land	loss of habitats	
total			10

4.1.1.2 Mixtures

Answer 17 · Mark scheme

January 2008 | CHY2F | Original Q5 | Legacy

CHY2F

4.1.1.2 Mixtures

Answer 18 · Mark scheme

Question 3

question	answers	extra information	mark
(a)(i)	burette		1
(a)(ii)	conical flask	accept conical / flask	1
(b)(i)	an indicator		1
(b)(ii)	changed colour		1
(b)(iii)	titration		1
(c)	3	correct answer = **2** marks (1 × 3) or (1 × 750/250) = **1** mark	2
(d)(i)	hydrogen		1
(d)(ii)	is partially ionised		1
total			9

4.1.1.2 Mixtures

Answer 18 · Mark scheme

January 2008 | CHY3F | Original Q3 | Legacy

CHY3F

Answer 19 · Mark scheme

June 2008 | CHY1AP | Original Q3 | Legacy

Three	**A**	alkane	**3**
	B	engine	**1**
	C	oxygen	**2**
	D	petrol vapour	**4**

4.1.1.2 Mixtures

Answer 20 · Mark scheme June 2008 | CHY1F | Original Q4 | Legacy

question	answers	extra information	mark
4(a)(i)	crushed	if line blank allow crushed circled in the box	1
4(a)(ii)	any **one** from: • 'costs' less / cheaper • easier / faster • less complicated equipment • does not need heating / energy • distilling could decompose the oil		1
4(b)(i)	any **one** from: • do not mix / dissolve • (stay) separate • form layers • are immiscible		1
4(b)(ii)	mix emulsion	words must be in correct places	1 1
Total			**5**

4.1.1.2 Mixtures

Answer 20 · Mark scheme June 2008 | CHY1F | Original Q4 | Legacy

COMPONENT NUMBER: CHY1F

COMPONENT NAME: Science B / Chemistry

STATUS: Final

DATE: June 2008

Answer 21 · 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 22 · Mark scheme November 2008 | CHY1AP | Original Q9 | Legacy

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

* This question was removed from the mark scheme and this test was marked out of 35.

Answer 23 · Mark scheme November 2008 | CHY1BP | Original Q4 | Legacy

Four	**A**	crushed	**1**
	B	pressed	**3**
	C	separated	**4**
	D	stirred	**2**

Answer 24 · Mark scheme November 2008 | CHY1BP | Original Q6 | Legacy

Six	**4**	**3**	**1**	**2**

Answer 25 · Mark scheme March 2009 | CHY1BP | Original Q1 | Legacy

One	**A**	oxygen	**3**
	B	noble gas	**4**
	C	air	**2**
	D	water vapour	**1**

4.1.1.2 Mixtures

Answer 26 · Mark scheme

June 2009 | CHY1BP | Original Q7 | Legacy

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

4.1.1.2 Mixtures

Answer 27 · Mark scheme

June 2009 | CHY1F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	any **one** from: • does not contain much saturated fat **or** low in saturated fat • contains a lot of unsaturated fat **or** high in unsaturated fat	accept correct use of figures to compare the amount of fat to the total amount of fat	1
3(a)(ii)	bromine		1
3(b)(i)	an emulsifier		1
3(b)(ii)	texture		1
3(c)(i)	any **two** from: • **A** has four colours • **B** has three colours • **A / B** have two colours the same • **B** has one different colour	if first two bullets not stated accept **A** has more colours (than **B**) **or B** has less colours (than **A**) for **1** mark only	2
3(c)(ii)	chromatography		1
Total			**7**

4.1.1.2 Mixtures

Answer 27 · Mark scheme

June 2009 | CHY1F | Original Q3 | Legacy

CHY1F

4.1.1.2 Mixtures

Answer 28 · Mark scheme

June 2009 | CHY1F | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)(i)	calcium oxide / quicklime	allow calcium monoxide do **not** accept calcium dioxide ignore chemical formulae	1
7(a)(ii)	any **three** from: • carbon dioxide / CO_2 • (carbon dioxide) reacts (with the calcium hydroxide / slaked lime / plaster) • limestone / calcium carbonate / $CaCO_3$ forms • water is lost / evaporates	it = plaster allow reaction 3 identified do **not** allow incorrect reaction ignore mixes, unless they state the correct product allow marble / chalk allow moisture ignore dries	3
7(b)(i)	as the amount / volume of sand decreases the strength of the mortar increases	accept as sand decreases the mortar is stronger / harder to crack allow as sand decreases the mortar increases allow converse ignore references to height of metal ball	1

Question 7 continues on the next page…

4.1.1.2 Mixtures

Answer 28 · Mark scheme

June 2009 | CHY1F | Original Q7 | Legacy

CHY1F

Question 7 Continued

question	answers	extra information	mark
7(b)(ii)	any **two** from: • 400 / 5th result is anomalous • the interval between the others is similar or the interval is about 6/7 • he has only one set of results	accept two results (36 and 37 / 400 and 500 / 4th and 5th) are almost the same accept result at 400 should be 42 allow the other results fit a pattern / are on a straight line allow he has only done it once ignore reliable	2
Total			**7**

4.1.1.2 Mixtures

Answer 29 · Mark scheme

Question 3

question	answers	extra information	mark
3(a)	pressure		1
3(b)	nitrogen hydrogen		1 1
3(c)	cooled		1
3(d)	nitric		1
Total			**5**

4.1.1.2 Mixtures

Answer 29 · Mark scheme

June 2009 | CHY2F | Original Q3 | Legacy

CHY2F

4.1.1.2 Mixtures

Answer 30 · Mark scheme

June 2009 | CHY2F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	covalent		1
4(b)(i)	liquid		1
4(b)(ii)	fluorine	accept F / F_2 do **not** accept fluoride	1
4(c)(i)	should fluoride ions be added to drinking water?		1
4(c)(ii)	any **one** from: • not enough reliable/valid evidence • may be other factors involved • it is an opinion / choice / belief / ethics issue • it can't be scientifically investigated	mark independently of (c)(i) allow can't do an experiment ignore test	1
Total			**5**

4.1.1.2 Mixtures

Answer 30 · Mark scheme June 2009 | CHY2F | Original Q4 | Legacy

CHY2F

Answer 31 · 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 32 · Mark scheme November 2009 | CHY1AP | Original Q9 | Legacy

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

Answer 33 · Mark scheme November 2009 | CHY1BP | Original Q5 | Legacy

No matching mark scheme was available in the supplied archive for this question.

4.1.1.2 Mixtures

Answer 34 · Mark scheme

Question 2

question	answers	extra information	mark
2(a)(i)	any **one** from: • ice-cream (has additives) • milk (has additives) • strawberries (could contain additives) • additives, such as a sweetener or colour may have been added	accept ingredients (may contain additives)	1
2(a)(ii)	any **one** from: • cheaper • keeps longer • additives used for the strawberry flavour • saves time	accept strawberries are expensive accept strawberries do not keep accept strawberries can cause an allergic reaction	1
2(b)(i)	4 / four		1
2(b)(ii)	dot / colour / E129 / allura red match	ignore chromatography (test)	1
2(b)(iii)	any **one** from: • none of the colours / dots in the milkshake may be caused by E129 / allura red • dot is not the same size • only did one test	accept the matching dot may be caused by another / similar colour accept this could be an anomalous result	1
Total			**5**

4.1.1.2 Mixtures

Answer 34 · Mark scheme January 2010 | CHY1F | Original Q2 | Legacy

CHY1F

4.1.1.2 Mixtures

Answer 35 · Mark scheme

Question 5

question	answers	extra information	mark
5(a)(i)	any **one** from: • bond / join (together) • double bond opens	ignore polymerisation / heat	1
5(a)(ii)	any **one** from: • heat / energy • cost of fuels / the crude oil • construction of the factory / plant • wages / salaries	ignore many processes / distillation / cracking / polymerisation	1
5(a)(iii)	any **two** from: • non-biodegradable • landfill sites are filling up / limited • waste of a resource / could be recycled / reused	ignore gases released / burning / habitats accept remains a long time accept land / space used up accept crude oil is running out	2
5(b)	any **two** from: • renewable / sustainable • less fuel <u>burned</u> • biodegradable • <u>natural</u> resource • plants absorb carbon dioxide	ignore recycling ignore crude oil is running out accept less energy / heat needed	2
Total			**6**

4.1.1.2 Mixtures

Answer 35 · Mark scheme

January 2010 | CHY1F | Original Q5 | Legacy

CHY1F

4.1.1.2 Mixtures

Answer 36 · Mark scheme

Question 7

question	answers	extra information	mark
7(a)(i)	any **one** from: • contain metals / filaments / wires • contain other / toxic chemicals / materials • different type of glass	ignore contamination without explanation accept named metal(s) accept named chemical(s) / material(s) accept glass would not melt ignore thicker / thinner glass	1
7(a)(ii)	any **one** from: • (glass bottles are) recycled • need to be more expensive glass **or** strong / thicker / different glass (to be reused) • damaged / weaker (with reuse) • need to be cleaned / transported • different sizes / shapes / colours • no refunds paid	 accept made to be used only once accept glass bottles are made of readily available materials **or** thin / cheap glass accept need to be sorted	1
7(a)(iii)	any **two** from: • low / less energy / heat or lower temperature needed • low / less fuel burned • no (carbon dioxide) from carbonate(s)	allow converse arguments ignore no energy without explanation ignore no fuel without explanation accept less fuel for extraction / transportation of raw materials accept name(s) of this carbonate(s)	2
7(b)(i)	46		1

Question 7 continues on the next page…

CHY1F

Question 7 continued

question	answers	extra information	mark
7(b)(ii)	any **one** from: • (more) imported (as wine bottles) • not much green glass made in the UK • not a high demand (for green glass)	accept come from / made in other countries **or** made elsewhere	1
7(b)(iii)	any **two** from: • more (clear) glass is produced (64%) than recycled (40%) • (clear) glass going to landfill • (more) raw materials needed / extracted / quarried • (more) heat / energy / fuel would be needed • (more) carbon dioxide produced	accept not enough (clear) glass is recycled allow 'thrown away' ignore they will run out accept high carbon footprint / carbon emissions **or** global warming	2
Total			**8**

4.1.1.2 Mixtures

Answer 37 · Mark scheme

Question 8

question	answers	extra information	mark
8(a)	gas / g	accept low density / low boiling point **or** weak intermolecular forces **or** small molecules **or** simple molecules **or** simple molecular (structure) accept volatile **or** easy to evaporate ignore very light ignore incorrect name of gas	1
8(b)	filter / filtration	accept filter paper accept decant / centrifuge ignore filter funnel / sieving / drained off / funnelling ignore names of compounds ignore evaporation / heating if after filtration do **not** accept crystallisation	1
8(c)	evaporation / crystallisation	accept heating / boiling accept 'leave for a few days' owtte allow cool do **not** allow freeze ignore filtration	1

Question 8 continues on next page

CHY2F

Question 8 continued

question	answers	extra information	mark
8(d)	candidates can gain marks from any two of the three linked pairs		
	hydrogen chloride escaped / released (into atmosphere) **or** (hydrogen chloride) damaged vegetation / harmful	to get both of these **2** marks hydrogen chloride must be mentioned ignore HCl formed / produced / made	1
	used to make chlorine / bleach	ignore sale of hydrogen chloride	1
	unpleasant smell (of calcium sulfide) **or** waste of calcium (sulfide)	ignore calcium sulphide alone allow calcium / calcium sulfate for calcium sulphide to get both of these 2 marks calcium (sulphide) must be mentioned	1
	converted to sulfur **or** used to make sulfuric acid	ignore sale of calcium sulfide	1
	unreacted coal (1) recycled / burnt / used / sold (1)	must be linked to first coal point	
Total			**7**

4.1.1.2 Mixtures

Answer 38 · Mark scheme

March 2010 | CHY1BP | Original Q2 | Legacy

Two	**A**	E150	**1**
	B	E210	**4**
	C	E300	**3**
	D	E450	**2**

Answer 39 · Mark scheme

March 2010 | CHY1BP | Original Q5 | Legacy

Five	**A**	The modified oil solidifies and additives are mixed in	**4**
	B	Soybean oil is used as biofuel in vehicles	**3**
	C	Soybean oil separates from the water	**2**
	D	Mixture of soybean seeds and water is pressed	**1**

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

Answer 40 · Mark scheme

June 2010 | CHY1BP | Original Q5 | Legacy

Five	**A**	Burn in oxygen	**4**
	B	Test for unsaturation	**2**
	C	Add water and shake vigorously	**3**
	D	React with hydrogen	**1**

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

4.1.1.2 Mixtures

Answer 41 · 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**

4.1.1.2 Mixtures

Answer 41 · Mark scheme

June 2010 | CHY1F | Original Q2 | Legacy

CHY1F

4.1.1.2 Mixtures

Answer 42 · Mark scheme

June 2019 | CHY1F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	2 / two		1
4(a)(ii)	E104 spots are at the same level / match	 independent mark	1 1
4(b)(i)	to improve / enhance the colour / change the colour	ignore sell more drinks allow to improve appearance do **not** accept preservative / emulsifier / improve taste / make it fizzy	1
4(b)(ii)	any **one** from: • (artificial) flavourings • carbon dioxide • preservatives • plastic (bottle / cap)	 accept sugar / saccharine / glucose / sweetener / caffeine ignore other additives / tartrazine / quinoline yellow / sunset yellow	1
4(c)(i)	monomers polymers	 	1 1

Question 4 Continues on the next page

4.1.1.2 Mixtures

CHY1F

Question 4 continued

question	answers	extra information	mark
4(c)(ii)	any **two** from: • not enough space • not biodegradable • waste of resource / crude oil • could be recycled • can burn as a fuel to provide energy	ignore litter / global warming / animals / habitats accept not enough landfills **or** landfills are full / filling up allow crude oil is running out ignore reuse	2
Total			**9**

4.1.1.2 Mixtures

Answer 42 · Mark scheme June 2010 | CHY1F | Original Q4 | Legacy

CHY1F

4.1.1.2 Mixtures

Answer 43 · Mark scheme

June 2010 | CHY2F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)(i)	nucleus		1
2(a)(ii)	neutron		1
2(a)(iii)	electron		1
2(b)(i)	6		1
2(b)(ii)	12		1
2(c)	14 C 6		1
2(d)(i)	CH_4		1
2(d)(ii)	compound		1
2(d)(iii)	covalent		1
Total			**9**

4.1.1.2 Mixtures

Answer 43 · Mark scheme

June 2010 | CHY2F | Original Q2 | Legacy

CHY2F

4.1.1.2 Mixtures

Answer 44 · Mark scheme

June 2010 | CHY3F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)(i)	H^+		1
1(a)(ii)	OH^-		1
1(a)(iii)	lower than		1
1(b)	with HCl: UI goes red / pink has a pH 0 ,1 ,2 **or** 3 **or** with ethanoic acid: UI goes orange / yellow (1) has a pH 4 / or above (but less than 7) (1)	 allow a comparison eg redder than ethanoic acid allow a comparison eg has pH less than ethanoic acid. do **not** accept an incorrect pH. allow a comparison with HCl allow a comparison with HCl	 1 1
1(c)	completely		1
1(d)(i)	conical flask		1
1(d)(ii)	titration		1
1(d)(iii)	repeat **or** take average	allow compare with another students results	1
Total			**9**

4.1.1.2 Mixtures

Answer 44 · Mark scheme June 2010 | CHY3F | Original Q1 | Legacy

CHY3F

Answer 45 · Mark scheme November 2010 | CHY1AP | Original Q4 | Legacy

Four	**A**	kerosene	**2**
	B	petroleum gas	**1**
	C	petrol	**3**
	D	bitumen	**4**

Answer 46 · Mark scheme November 2010 | CHY1AP | Original Q5 | Legacy

Five	**A**	uses another metal	**3**
	B	does **not** use a chemical reaction	**2**
	C	could be done in a blast furnace	**4**
	D	is called electrolysis	**1**

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

Answer 47 · Mark scheme November 2010 | CHY1BP | Original Q3 | Legacy

Three	**A**	the oil and solvent mixture	**1**
	B	the plant oil	**3**
	C	the water	**2**
	D	the solvent	**4**

Answer 48 · Mark scheme November 2010 | CHY1BP | Original Q5 | Legacy

Five	**A**	chromatography	**1**
	B	combustion	**4**
	C	hydrogenation	**3**
	D	unsaturation	**2**

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

Answer 49 · Mark scheme November 2010 | CHY1BP | Original Q6 | Legacy

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

Answer 50 · Mark scheme November 2010 | CHY1BP | Original Q7 | Legacy

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

4.1.1.2 Mixtures

Answer 51 · Mark scheme

Question 5

question	answers	extra information	mark
5(a)(i)	crushed / pressed filtered	 allow sieve	1 1
5(a)(ii)	tap opened **or** allow water through tap closed before oil runs through	 accept to leave oil (in the funnel) accept collect oil in a different beaker	1 1
5(b)(i)	3 / three		1
5(b)(ii)	one colour is unsafe / two colours are safe	ignore no or do not know or yes need to check the one colour that is different	1
5(b)(iii)	make (more) profit / money	accept sell (more) crisps **or** (more) people will want to buy their crisps	1
Total			**7**

4.1.1.2 Mixtures

Answer 51 · Mark scheme

CHY1F

4.1.1.2 Mixtures

Answer 52 · Mark scheme

Question 7

question	answers	extra information	mark
7(a)	crude oil / it is evaporated / vaporised vapours / gases / fractions cool and condense (different) vapours / gases / fractions (condense) at different temperatures	ignore heated accept named fraction(s) accept (different) vapours / gases / fractions have different boiling points max **2** marks for description of laboratory method **or** mention of cracking	1 1 1
7(b)(i)	any **one** from: • range of boiling points • range of carbon atoms		1
7(b)(ii)	greater the number (of carbon atoms) the higher the boiling point	do **not** accept molecules / particles	1
7(c)(i)	burning / combustion	allow oxidation / redox	1
7(c)(ii)	any **two** from: • cracking / (thermal) decomposition • heat / vaporise • catalyst / aluminium oxide	reaction with hydrogen gains max of **1** mark only allow porous pot ignore names of other catalysts	2
Total			**8**

4.1.1.2 Mixtures

Answer 53 · Mark scheme

Question 1

question	answers	extra information	mark
1(a)	increases		1
1(b)	the reaction is reversible		1
1(c)	A liquid		1
1(d)	recycled / reused (owtte)	accept returned to pump / start	1
Total			4

4.1.1.2 Mixtures

Answer 53 · Mark scheme

January 2011 | CHY2F | Original Q1 | Legacy

CHY2F

4.1.1.2 Mixtures

Answer 54 · Mark scheme

Question 2

question	answers	extra information	mark
2(a)	stop them reacting	owtte	1
2(b)(i)	fizzing / bubbles / effervescence	owtte	1
2(b)(ii)	(g)		1
2(b)(iii)	limewater		1
2(c)	yellow		1
2(d)(i)	barium chloride		1
2(d)(ii)	white		1
2(d)(iii)	eg don't see what is being bought **or** a comment about quality / purity eg may be impure / contaminated	ignore references to cost	1
Total			**8**

4.1.1.2 Mixtures

Answer 54 · Mark scheme

January 2011 | CHY3F | Original Q2 | Legacy

CHY3F

4.1.1.2 Mixtures

Answer 55 · Mark scheme

Question 3

question	answers	extra information	mark
3(a)(i)	hydrogen		1
3(a)(ii)	partially		1
3(b)(i)	same size / mass / amount / length of magnesium (ribbon) **or** same concentration of acids	allow react for same time ignore repeats ignore volume / amount of acid	1
3(b)(ii)	bubbles / gas given off **or** magnesium disappears / dissolves / reacts slower with ethanoic acid **or** faster with hydrochloric acid		1 1
3(c)(i)	titration	allow titration identified in box if answer line blank	1
3(c)(ii)	burette		1
3(c)(iii)	(indicator) changed colour	allow solution changes colour but not vinegar ignore specific colours	1
Total			8

4.1.1.2 Mixtures

Answer 55 · Mark scheme January 2011 | CHY3F | Original Q3 | Legacy

CHY3F

Answer 56 · Mark scheme March 2011 | CHY1AP | Original Q3 | Legacy

Three	**A**	Carbon	**1**
	B	Gold	**2**
	C	Magnesium	**4**
	D	Zinc	**3**

Answer 57 · Mark scheme March 2011 | CHY1AP | Original Q6 | Legacy

Six	**2**	**4**	**1**	**3**

Answer 58 · Mark scheme March 2011 | CHY1AP | Original Q7 | Legacy

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

Answer 59 · Mark scheme June 2011 | CHY1AP | Original Q5 | Legacy

Five	**A**	electrons		**2**
	B	bonds		**3**
	C	products		**1**
	D	elements		**4**
	A	**B**	**C**	**D**

Answer 60 · Mark scheme June 2011 | CHY1AP | Original Q9 | Legacy

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

Answer 61 · Mark scheme June 2011 | CHY1BP | Original Q5 | Legacy

Five	**A**	Sunflower oil separates as a layer above the water		**2**
	B	Sunflower oil is reacted with hydrogen at 60 °C		**3**
	C	Sunflower oil is mixed with petroleum diesel		**4**
	D	Mixture of sunflower seeds and water is pressed		**1**
	A	**B**	**C**	**D**

4.1.1.2 Mixtures

Answer 62 · Mark scheme June 2011 | CHY1BP | Original Q6 | Legacy

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

Answer 63 · Mark scheme June 2011 | CHY1BP | Original Q9 | Legacy

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

4.1.1.2 Mixtures

Answer 64 · Mark scheme

June 2011 | CHY1F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	(carbon =) 1 (oxygen =) 3		1 1
4(b)(i)	heated		1
4(b)(ii)	carbon dioxide		1
4(c)(i)	combustion		1
4(c)(ii)	carbon is more reactive than zinc		1
4(c)(iii)	zinc boils (in the furnace / below 1300°C) lead does not boil / (only) melts in the furnace / boils above 1300°C	ignore melting point / changes of state if no other mark awarded allow zinc has a lower boiling point **or** lead has a higher boiling point **or** they / zinc **and** lead have different boiling points for **1** mark	1 1
Total			**8**

4.1.1.2 Mixtures

Answer 64 · Mark scheme

June 2011 | CHY1F | Original Q4 | Legacy

CHY1F

4.1.1.2 Mixtures

Answer 65 · Mark scheme

June 2011 | CHY1F | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)(i)	distillation		1
5(a)(ii)	condense (at different temperatures)	accept they / fractions / hydrocarbons have different boiling points ignore melting point / size of molecule	1
5(b)	contains hydrocarbons has a high boiling point		1 1
5(c)	C_5H_{12}		1
Total			**5**

4.1.1.2 Mixtures

Answer 65 · Mark scheme

June 2011 | CHY1F | Original Q5 | Legacy

CHY1F

4.1.1.2 Mixtures

Answer 66 · Mark scheme

June 2011 | CHY3F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)(i)	Sb		1
1(a)(ii)	Se		1
1(a)(iii)	Sn		1
1(a)(iv)	Si		1
1(b)(i)	elements		1
1(b)(ii)	potassium (K)		1
1(b)(iii)	0		1
Total			7

4.1.1.2 Mixtures

Answer 66 · Mark scheme

June 2011 | CHY3F | Original Q1 | Legacy

CHY3F

4.1.1.2 Mixtures

Answer 67 · Mark scheme

June 2011 | CHY3F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	goes up		1
2(b)(i)	B		1
2(b)(ii)	A		1
2(b)(iii)	a catalyst activation energy		1 1
2(c)(i)	eg (ensures) complete reaction **or** even heating	allow spread heat / energy allow mixes properly or mix them together or to get correct temperature ignore dissolves	1
2(c)(ii)	lid (on beaker) **or** insulate (beaker) / use a plastic cup	accept cover beaker	1
Total			**7**

4.1.1.2 Mixtures

Answer 67 · Mark scheme

June 2011 | CHY3F | Original Q2 | Legacy

CHY3F

4.1.1.2 Mixtures

Answer 68 · Mark scheme

January 2012 | CH1FP | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	hydrocarbons		1
3(a)(ii)	ethane has the smallest molecules heptadecane has the highest boiling point		1 1
3(a)(iii)	evaporating condense		1 1
3(b)(i)	**W** **Y**		1 1
3(b)(ii)	floats	if no answer written on line, allow correct answer indicated in the box	1
3(b)(iii)	open the tap stop the flow of liquid when the water has run out	allow let the water out ignore remove water allow until oil is left behind ignore filter	1 1
Total			**10**

4.1.1.2 Mixtures

Answer 68 · Mark scheme

January 2012 | CH1FP | Original Q3 | Legacy

CH1FP

4.1.1.2 Mixtures

Answer 69 · Mark scheme

January 2012 | CH1FP | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)	• one / 1 (molecule of) methane (reacts with) two / 2 (molecules of) oxygen • two / 2 (molecules of) water / steam / hydrogen oxide and one / 1 (molecule of) carbon dioxide (are produced)	if no other marks awarded all four names correct **or** correct number **and** name for two molecules **or** 4 correct numbers gains **1** mark allow all four names correct **and** correct number of atoms in each substance for **2** marks	1 1

Question 5(b) continues on the next page

CH1FP

Question 5(b) cont'd……

5(b)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 2, and apply a 'best-fit' approach to the marking.	6

0 marks	**Level 1 (1-2 marks)**	**Level 2 (3-4 marks)**	**Level 3 (5-6 marks)**
No relevant content.	There is a simple description of a positive **and / or** a negative impact caused by the plan to quarry limestone and / or make cement.	There is a clear description of both a positive **and** a negative impact caused by the plan to quarry limestone and / or make cement.	There is a detailed description of both positive impacts **and** negative impacts caused by the plan to quarry limestone and / or make cement.

examples of the chemistry points made in the response

Positive impacts:

- Limestone / cement is used for building
- Limestone needed for industrial processes
- Company landscapes / provides recreation facilities in the quarry after use
- Provides employment
- Improves local economy
- Improved transport links

Negative impacts:

- Destruction of habitats
- Fewer plants / trees to absorb carbon dioxide
- Example of visual pollution
- Example of noise pollution
- Example of atmospheric pollution
- More traffic

Total			**8**

4.1.1.2 Mixtures

Answer 69 · Mark scheme January 2012 | CH1FP | Original Q5 | Legacy

CH1FP

4.1.1.2 Mixtures

Answer 70 · Mark scheme

Question 6

question	answers	extra information	mark
6(a)(i)	C_7H_{16}	mark answer line first answer may be given in the table	1
6(a)(ii)	C_nH_{2n+2}		1
6(b)(i)	carbon monoxide	do **not** accept carbon oxide do **not** accept water ignore CO	1
6(b)(ii)	because of partial / incomplete combustion (in reaction 2) **or** complete combustion (in reaction 1)	allow because there is less / insufficient oxygen (in reaction 2) **or** sufficient oxygen (in reaction 1) allow different amounts of oxygen used (in the reactions) **or** $19O_2$ (in reaction 1) **and** $13O_2$ (in reaction 2) ignore air	1
6(c)(i)	15 (%)	ignore units	1
6(c)(ii)	water (vapour)/steam	allow H_2O / OH_2 / hydrogen oxide	1

Question 6 continues on the next page…….

CH1FP

Question 6 cont'd…..

question	answers	extra information	mark
6(c)(iii)	sulfur in petrol / crude oil (reacts with oxygen)	it = sulfur dioxide	1
6(c)(iv)	because nitrogen **and** oxygen (are in the air and) react	allow nitrogen **and** oxygen burn accept nitrogen + oxygen → nitrogen oxide **or** symbol equation ignore air	1
	at high temperature (inside a petrol engine)	allow heat / hot (engine)	1
6(d)	because carbon dioxide / it causes global warming **or** because carbon dioxide / it has an impact on oceans	allow because carbon dioxide / it causes greenhouse effect / climate change	1
	because this carbon dioxide / carbon / it was 'locked up' (in fossil fuels) **or** because the percentage/amount of carbon dioxide / it in the atmosphere is increasing		1
Total			**11**

4.1.1.2 Mixtures

Answer 70 · Mark scheme January 2012 | CH1FP | Original Q6 | Legacy

CH1FP

4.1.1.2 Mixtures

Answer 71 · 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**

4.1.1.2 Mixtures

Answer 71 · Mark scheme

June 2012 | CH1FP | Original Q3 | Legacy

CH1FP

4.1.1.2 Mixtures

Answer 72 · Mark scheme

June 2012 | CH1FP | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)(i)	Olive oil does not dissolve in vinegar		1
5(a)(ii)	(the mustard is) an emulsifier	accept an emulsion has formed	1
5(b)(i)	double		1
5(b)(ii)	add bromine water – turns colourless		1
5(c)(i)	because the (olive) trees/plants/crops/leaves/fruit absorb/use carbon dioxide	allow carbon for carbon dioxide allow carbon dioxide is used in photosynthesis	1
5(c)(ii)	any **one** from: • olive oil is a food • olives are slow-growing • olives require a lot of land • not enough olive trees / oil • olive oil dense / viscous / high boiling point	ignore habitats ignore gives off carbon dioxide	1
Total			**6**

4.1.1.2 Mixtures

Answer 72 · Mark scheme

June 2012 | CH1FP | Original Q5 | Legacy

CH1FP

4.1.1.2 Mixtures

Answer 73 · Mark scheme

June 2012 | CH1FP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	6 oxygen		1 1
6(b)(i)	heating the hydrocarbon to a high temperature the presence of a catalyst		1 1
6(b)(ii)	all bonds correct four C—H bonds **and** one C=C bond		1
6(b)(iii)	water	accept hydrogen oxide/steam allow H_2O	1
6(c)(i)	carbon dioxide	allow CO_2	1
6(c)(ii)	by filtering/decanting/centrifuging (to remove yeast) (fractional) distillation (to separate ethanol from water)	ignore sieving accept a description of (fractional) distillation	1 1
Total			**9**

4.1.1.2 Mixtures

Answer 73 · Mark scheme

June 2012 | CH1FP | Original Q6 | Legacy

CH1FP

4.1.1.2 Mixtures

Answer 74 · 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

4.1.1.2 Mixtures

Answer 74 · Mark scheme

June 2012 | CH1FP | Original Q7 | Legacy

CH1FP

4.1.1.2 Mixtures

Answer 75 · Mark scheme

June 2012 | CH1FP | Original Q8 | Legacy

Question 8

question	answers	extra information	mark
8(a)(i)	(1) 5 3 (6) 4 2	all numbers in the correct order gains both marks any two numbers in the correct position gains **1** mark	2
8(a)(ii)	water	ignore formula if correct name given accept hydrogen oxide allow H_2O	1
	carbon dioxide	allow CO_2 accept carbon monoxide / CO **or** carbon / C	1

Question 8 continues on the next page . . .

CH1FP

Question 8 cont'd

question	answers	extra information	mark
8(b)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. **Examiners should also refer to the information on page 2**, and apply a 'best-fit' approach to the marking.		6

0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant content.	There is a **basic** description of at least one advantage **or** one disadvantage caused by using plastic shopping bags made from poly(ethene).	There is a **clear** description of both an advantage **and** a disadvantage caused by using plastic shopping bags made from poly(ethene).	There is a **detailed** description of both advantages **and** disadvantages caused by using plastic shopping bags made from poly(ethene).

examples of the chemistry/social points made in the response:
ignore cost unqualified

Advantages:

- Simple properties eg strong / low density / water resistant
- Bags can be reused (for shopping) **or** another specified use eg bin liners
- Money charged for bags can go to good causes **or** encourage reuse
- Poly(ethene) bags can be recycled eg made into milk bottle crates
- Poly(ethene) bags can be burned to provide heat for buildings/generation of electricity
- New bags are now made that can biodegrade

Disadvantages:

- (Older) bags can take many years to biodegrade
- There is a shortage of landfill space
- Bags are made from (crude) oil which is a non-renewable resource/running out
- Large amounts of energy/fuel are used for the production of poly(ethene)
- Production of poly(ethene) releases carbon dioxide/causes global warming
- Specified issue caused by litter eg visual pollution or effect on wildlife
- Burning bags release carbon dioxide / causes global warming

Total			10

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

4.1.1.2 Mixtures

Answer 76 · Mark scheme

June 2012 | CH2FP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	prevent evaporation of solvent	allow prevent loss of solvent allow to support the (chromatography) paper	1
6(a)(ii)	ink dissolves in the solvent **or** carbon / graphite does not dissolve in the solvent	allow ink 'runs' / spreads **or** pencil does not 'run' / spread allow ink would affect the result / mixes with colours accept pencil for carbon / graphite	1
6(b)(i)	4		1
6(b)(ii)	any **one** from: • because not all colours match • not all colours are safe • some colours could be unsafe • some colours travelled higher (than safe colours)	no mark for 'no / don't know' ignore numbers	1
6(c)(i)	any **two** from: • rapid / quick • accurate • sensitive **or** detects very small quantities	ignore reliable / precise accept small sample	2

Question 6 continues on the next page…

4.1.1.2 Mixtures

Answer 76 · Mark scheme

June 2012 | CH2FP | Original Q6 | Legacy

CH2FP

Question 6 cont'd…

question	answers	extra information	mark
6(c)(ii)	separates		1
6(c)(iii)	identifies solvents / compounds / substances	accept (relative) molecular mass accept formula mass accept M_r accept relative mass accept molecular ion peak	1
Total			**8**

4.1.1.2 Mixtures

Answer 76 · Mark scheme

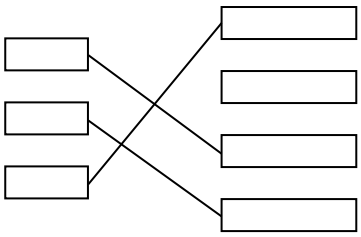
June 2012 | CH2FP | Original Q6 | Legacy

CH2FP

4.1.1.2 Mixtures

Answer 77 · Mark scheme

January 2013 | CH1FP | Original Q2 | Legacy

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

4.1.1.2 Mixtures

Answer 77 · Mark scheme

January 2013 | CH1FP | Original Q2 | Legacy

CH1FP

4.1.1.2 Mixtures

Answer 78 · Mark scheme January 2013 | CH1FP | Original Q3 | Legacy

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

4.1.1.2 Mixtures

Answer 78 · Mark scheme

January 2013 | CH1FP | Original Q3 | Legacy

CH1FP

4.1.1.2 Mixtures

Answer 79 · Mark scheme January 2013 | CH1FP | Original Q5 | Legacy

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

4.1.1.2 Mixtures

Answer 79 · Mark scheme

January 2013 | CH1FP | Original Q5 | Legacy

CH1FP

4.1.1.2 Mixtures

Answer 80 · Mark scheme

January 2013 | CH1FP | Original Q7 | Legacy

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

CH1FP

question	answers	extra information	mark
7(c) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response.			6

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

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

Advantages:

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

Disadvantages:

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

Total		11

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

4.1.1.2 Mixtures

Answer 81 · Mark scheme

January 2013 | CH2FP | Original Q1 | Legacy

question	answers	extra information	mark
1(a)	proton 1 electron very small owtte	ignore ± allow zero allow values from 1/1800 to 1/2000 **or** 0.0005 – 0.00055	1 1
1(b)	8 16		1 1
1(c)(i)	Isotopes		1
1(c)(ii)	$^{18}_{8}\mathbf{O}$		1
1(d)(i)	compound		1
1(d)(ii)	H-O-H		1
1(d)(iii)	covalent		1
1(d)(iv)	sharing		1
Total			**10**

4.1.1.2 Mixtures

Answer 81 · Mark scheme

January 2013

CH2FP

4.1.1.2 Mixtures

Answer 82 · Mark scheme

question	answers	extra information	mark
3(a)	exothermic		1
3(b)	‘Should people use kelp instead of oil as an energy source?’ ‘Will kelp be more popular than coal in the next 10 years?’		1 1
3(c)(i)	any **four** from: • potassium (atom) loses (an electron) and iodine (atom) gains (an electron) • 1 electron • iodide (ion) has negative charge • potassium (ion) has positive charge • electrostatic attraction **or** ionic bonding	If atom or ion omitted = max **3** sharing / covalent / metallic = max **3** ignore reference to full outer shells allow iodine ion accept stable (structure) **or** noble gas (structure)	4
3(c)(ii)	because a solid is formed (from two aqueous solutions)		1
3(c)(iii)	filtering **or** centrifuging **or** decanting		1
Total			**9**

4.1.1.2 Mixtures

Answer 82 · Mark scheme

January 2013

CH2FP

4.1.1.2 Mixtures

Answer 83 · Mark scheme

question	answers	extra information	mark
4(a)	would melt	accept they have a low melting point allow lose their shape ignore would soften when hot ignore boiling point	1
4(b)	to speed up the reaction	accept can use a lower temperature accept less energy needed	1
4(c)(i)	mass spectrometer	allow mass spectroscopy	1
4(c)(ii)	any **one** from: • accurate • sensitive • rapid / quicker • small amount of sample	ignore reliable ignore more precise	1
4(d)	any **two** from: • pressure • temperature • catalyst **or** initiator • solvent	allow concentration	2
Total			**6**

4.1.1.2 Mixtures

Answer 83 · Mark scheme

January 2013 | CH2FP | Original Q4 | Legacy

January 2013

CH2FP

4.1.1.2 Mixtures

Answer 84 · Mark scheme

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**

4.1.1.2 Mixtures

Answer 84 · Mark scheme

January 2013

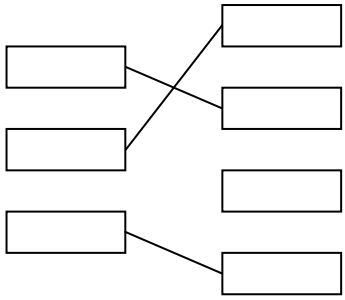
CH2FP

4.1.1.2 Mixtures

Answer 85 · Mark scheme

June 2013 | CH1FP | Original Q1 | Legacy

Question 1

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

4.1.1.2 Mixtures

Answer 86 · Mark scheme

Question 8

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

Question 8(b) continues on the next page

Question 8 continued

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

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

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

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

examples of chemistry points made in the response could include:

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

Total			**9**

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

4.1.1.2 Mixtures

Answer 87 · 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**

4.1.1.2 Mixtures

Answer 88 · Mark scheme

June 2013 | CH2FP | Original Q7 | Legacy

Question 7

question	Answers	extra information	Mark
7(a)(i)	the more sodium hydrogencarbonate the greater the temperature change up to 8 spatula measures then the temperature change is constant	accept examples from the table accept any correct indication of when change occurs if no marks awarded allow **1** mark for: the more sodium hydrogencarbonate the lower the final temperature	1 1 1
7(a)(ii)	energy is taken in from the surroundings **or** endothermic		1
7(b)(i)	gas / carbon dioxide / steam / water is produced	accept carbon dioxide is a gas **or** steam / water is a gas allow gas / air expands when heated	1
7(b)(ii)	no, because (reaction) is exothermic **or** yes, to start the reaction	allow no, because (reactants) were formed by heating ignore references to cooling	1
7(c)(i)	84	correct answer with or without working gains **2** marks if no answer or incorrect answer then evidence of 23 +1 + 12 + (3 × 16) gains **1** mark	2
7(c)(ii)	14.29	accept rounding to 14.3 or 14 allow ecf from (c)(i)	1
Total			**9**

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

4.1.1.2 Mixtures

Answer 89 · Mark scheme

June 2013 | CH3FP | Original Q1 | Legacy

Question 1

question	Answers	extra information	Mark
1(a)	reversible		1
1(b)	catalyst		1
1(c)	recycled	allow re-used	1
1(d)	(Q) S R P	allow **1** mark if one letter in correct place.	2
Total			**5**

4.1.1.2 Mixtures

Answer 90 · Mark scheme

June 2014 | CH1FP | Original Q4 | Legacy

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

4.1.1.2 Mixtures

Answer 90 · Mark scheme

June 2014 | CH1FP | Original Q4 | Legacy



4.1.1.2 Mixtures

Answer 91 · Mark scheme

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

<table>
<tr><td colspan="4">7(b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a ‘best-fit’ approach to the marking.</td><td>1+2+3 / 1.4.3e</td><td>E</td></tr>
<tr><td>0 marks</td><td>Level 1 (1–2 marks)</td><td>Level 2 (3–4 marks)</td><td>Level 3 (5–6 marks)</td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td>No relevant content</td><td>There is a stated advantage or disadvantage of using biodiesel or petroleum diesel.</td><td>There is a stated advantage or disadvantage of using biodiesel or petroleum diesel with a linked consequence.</td><td>There is at least one stated advantage and at least one stated disadvantage of using biodiesel or petroleum diesel with a linked consequence for each.</td></tr>
<tr><td colspan="4">Examples of points made in the response could include:
Advantages of biodiesel:
• Produces less carbon dioxide
• Produces no sulfur dioxide
• Produces less particulates
• Sustainable / renewable
• Growing crops absorb carbon dioxide
• Carbon neutral
• Produces less acid rain
• Conserves the limited amount of petroleum diesel
Disadvantages of biodiesel:
• Produces more nitrogen oxides
• Deforestation for land
• Destruction of habitats for land
• Uses land that could be used for food crops
• Creates food shortages
• Crops are not reliable</td><td></td><td></td></tr>
</table>

Total			**9**

4.1.1.2 Mixtures

Answer 92 · 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**		

4.1.1.2 Mixtures

Answer 92 · Mark scheme

June 2014 | CH2FP | Original Q2 | Legacy



4.1.1.2 Mixtures

Answer 93 · Mark scheme

June 2014 | CH2FP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
3(a)(i)	oxygen, sulfur trioxide	both needed for mark	1	2 / 2.4	E
3(a)(ii)	compound		1	2 / 2.1.1a	A
3(b)	increases	*accept (goes) higher / (goes) up / (is) faster) / (are) more frequent*	1	1 / 2.4.1d	G
3(c)	activation		1	1 / 2.4.1b	G
3(d)	catalyst **or** increase temperature		1	3 / 2.4.1h	E
Total			**5**		

4.1.1.2 Mixtures

Answer 93 · Mark scheme

June 2014 | CH2FP | Original Q3 | Legacy



4.1.1.2 Mixtures

Answer 94 · Mark scheme June 2014 | CH2FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
4(a)(i)	14		1	2 / 2.3.1c	G
4(a)(ii)	isotope		1	1 / 2.3.1d	G
4(a)(iii)	(very) small	*accept smaller / tiny / (very) little*	1	1 / 2.3.1b	G
4(b)(i)	C		1	1 / 2.1	A
4(b)(ii)	NH_3		1	1 / 2.1.1g	A
4(c)(i)	nitric (acid)		1	1 / 2.6.2b	G
4(c)(ii)	indicator		1	1 / 2.6.1b	E
4(c)(iii)	crystallisation **or** evaporation	allow by heating **or** cooling **or** leave (on windowsill) *do not accept freezing*	1	1 / 2.6.1c	E
4(c)(iv)	any **one** from: • grass grows faster • grass grows taller **or** thicker	*allow grass grows better / greener*	1	3 / 2.6.2c	E
4(d)	potassium (atom) loses (an electron) chlorine (atom) gains (an electron) 1 (electron) electron	reference to incorrect bonding or particle = max **3** ignore references to full outer shells	1 1 1 1	1 + 2 / 2.1.1c/d/e	E
Total			**13**		

4.1.1.2 Mixtures

Answer 94 · Mark scheme

June 2014 | CH2FP | Original Q4 | Legacy



4.1.1.2 Mixtures

Answer 95 · Mark scheme

June 2014 | CH2FP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
6(a)(i)	(phosphoric) acid	*allow phosphoric*	1	2 / 2.6.2d	G
6(a)(ii)	H^+ / hydrogen (ion)	*if ion symbol given, charge must be correct*	1	2 / 2.6.2d	E
6(b)(i)	pencil so it will not run / smudge / *dissolve* **or** because ink would run / smudge / *dissolve*	 *ignore pencil will not interfere with / affect the results* *ignore ink will interfere with / affect the results*	1 1	2 / 2.3.2b	E
6(b)(ii)	any **three** from: • *3* colours in Cola • *2* colours in Fruit drink • one of the colours is the same • two of the colours in Cola are different • one of the colours in Fruit drink is different • *one of the colours in Cola is the most soluble*	*reference to spots / dots = max **2*** *allow colouring for colour* *allow more colours in cola **or** fewer colours in fruit drink* *allow some of the colours in the drinks are different* *accept one of the colours in Cola has the highest R_f value*	3	3 / 2.3.2b	E
6(c)	different substances travel at different speeds **or** have different retention times	*accept different attraction to solid* *ignore properties of compounds*	1	1 / 2.3.2c	E

4.1.1.2 Mixtures

Answer 95 · Mark scheme

June 2014 | CH2FP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
6(d)(i)	Is there caffeine in a certain brand of drink?		1	3 / 2.3.2	A
6(d)(ii)	any **two** from: • cannot be done by experiment • based on opinion / *lifestyle choice* • ethical, *social* or economic issue	*accept caffeine has different effects on different people*	2	3 / 2.3.2	E
Total			**11**		

4.1.1.2 Mixtures

Answer 95 · Mark scheme

June 2014 | CH2FP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
7 Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5, and apply a 'best-fit' approach to the marking.				1 + 2 / 2.1.1f/g 2.2.1a 2.2.2a	E

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content	*There is a statement about the bonding and/or structure **or** melting / boiling point of chlorine **or** sodium chloride.*	*There are statements about the bonding and/or structure of chlorine **or** sodium chloride.*	*There are statements about the bonding and/or structure of chlorine **and** sodium chloride.* *There is an explanation of why chlorine is a gas **or** sodium chloride is a solid.*

Examples of chemistry points made in response:

Chlorine:

covalent bonds between atoms

forming (simple) molecules

no / weak attraction / bonds between molecules

low boiling point

Sodium chloride:

*ionic bonds **or** electrostatic attraction*

strong bonds

in all directions

between oppositely charged ions

forming giant lattice

large amounts of energy needed to break bonds

high melting point

Total			6

4.1.1.2 Mixtures

Answer 96 · Mark scheme

June 2014 | CH3FP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
7(a)	filter to remove *solids* **or** *insoluble particles* **OR** *add coagulant (1)* flocculation / settling / remove solids (1) (add) chlorine to reduce the number of microbes	 *accept ozone / UV* accept to kill microbes / bacteria / germs accept sterilise *allow disinfect* *ignore remove microbes*	1 1 1 1	1 / 3.2.2a/c	E
7(b)(i)	ion exchange resin	allow ion exchange column *allow sodium ions / Na^+* *allow hydrogen ions / H^+*	1	1 / 3.2.2b	E
7(b)(ii)	prevent growth of microbes	*accept sterilise* *accept to kill microbes / bacteria / germs* *accept to reduce the number of microbes* *ignore remove microbes*	1	1 / 3.2.2b	E
7(c)	high cost of energy / *heating*	*allow uses a lot of energy*	1	2 / 3.2.2d	E
7(d)	any **one** from: • helps to develop / maintain bones • helps to develop / maintain teeth • reduces heart disease	 allow any suitable positive effect on bones allow any suitable positive effect on teeth	1	1 / 3.2.1f	E
Total			**8**		

4.1.1.2 Mixtures

Answer 96 · Mark scheme

June 2014 | CH3FP | Original Q7 | Legacy



4.1.1.2 Mixtures

Answer 97 · Mark scheme

June 2015 | CH1FP | Original Q3 | Legacy

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

4.1.1.2 Mixtures

Answer 97 · Mark scheme

June 2015 | CH1FP | Original Q3 | Legacy



4.1.1.2 Mixtures

Answer 98 · Mark scheme

June 2015 | CH1FP | Original Q5 | Legacy

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

4.1.1.2 Mixtures

Answer 98 · Mark scheme

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

4.1.1.2 Mixtures

Answer 98 · Mark scheme

June 2015 | CH1FP | Original Q5 | Legacy



4.1.1.2 Mixtures

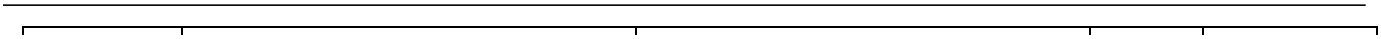
Answer 99 · Mark scheme June 2015 | CH2FP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	A compound		1	**AO1** 2.1.1a
3(b)	lead nitrate potassium iodide	in either order	1 1	**AO2** 2.6.1d
3(c)	filter paper is missing so solid will go through funnel		1 1	**AO3** 2.6.1b
3(d)(i)	percentage yield		1	**AO2** 2.3.3e
3(d)(ii)	any **one** from: • some product lost • reaction may not go to completion • unexpected reaction • impure reactants	allow insufficient reactant	1	**AO1** 2.3.3d
Total			**7**	

4.1.1.2 Mixtures

Answer 99 · Mark scheme

June 2015 | CH2FP | Original Q3 | Legacy



4.1.1.2 Mixtures

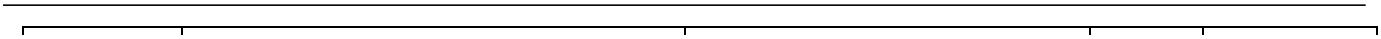
Answer 100 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	any **one** from: • protection/improve lifespan • improve appearance		1	**AO2** 2.7.1d
4(b)(i)	Bleach		1	**AO1** 2.7.1i
4(b)(ii)	Hydrogen is less reactive than sodium.		1	**AO2** 2.7.1f
4(b)(iii)	1 bonding pair of electrons 6 unbonded electrons on Cl	accept dot, cross or e or – or any combination	1	**AO1** 2.7.1e
4(b)(iv)	Covalent		1	**AO1** 2.7.1f
4(b)(v)	Hydrogen chloride has a low boiling point. Hydrogen chloride is made of simple molecules.		1 1	**AO1** 2.2.1a 2.1.1g
4(c)(i)	oxygen	accept carbon dioxide	1	**AO1** 2.7.1h
4(c)(ii)	aluminium ions are positive so are attracted (to the negative electrode)	allow opposites attract	1 1	**AO1/AO2** 2.7.1h 2.2.2b
4(c)(iii)	Reduction		1	**AO1** 2.7.1e
4(c)(iv)	slide	allow move	1	**AO1** 2.2.4b
4(d)(i)	C		1	**AO1** 2.2.3a,c
4(d)(ii)	strong covalent bonds		1	**AO1** 2.2.3a
Total			**14**	

4.1.1.2 Mixtures

Answer 100 · Mark scheme

June 2015 | CH2FP | Original Q4 | Legacy



4.1.1.2 Mixtures

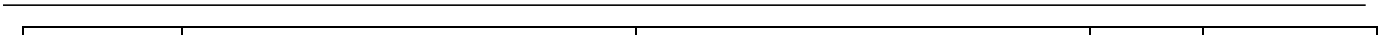
Answer 101 · Mark scheme June 2015 | CH3FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)(i)	Solids		1	**AO1** 3.2.2.a
1(a)(ii)	Chlorine		1	**AO1** 3.2.2.c
1(a)(iii)	kill microbes/bacteria	allow to make the water safe to drink ignore disinfect ignore remove / get rid of microbes	1	**AO1** 3.2.2.a,c
1(b)	energy	allow heat	1	**AO1** 3.2.2.d
1(c)	improve dental health	allow reduce tooth decay allow (local) government requirement allow help teeth	1	**AO1** 3.2.2.c
Total			**5**	

4.1.1.2 Mixtures

Answer 101 · Mark scheme

June 2015 | CH3FP | Original Q1 | Legacy



4.1.1.2 Mixtures

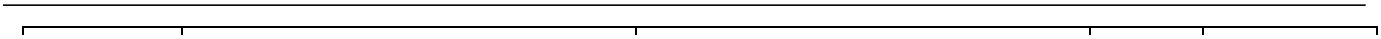
Answer 102 · Mark scheme June 2015 | CH3FP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)(i)	11		1	**AO2** 3.3.1.c
3(a)(ii)	4620 (J)	correct answer gains **2** marks with or without working allow 4.62kJ for **2** marks if answer is incorrect: 100 x 4.2 x 11 gains 1 mark **or** 100 x 4.2 x (their temp. rise) gains **1** mark **or** 100 x 4.2 x (their temp. rise) correctly calculated gains **2** marks	2	**AO2** 3.3.1.c
3(b)	the temperature increases	allow gets hotter allow heat / energy is given off	1	**AO2** 3.3.1.c
3(c)(i)	(energy of) products lower than (energy of) reactants	allow converse allow arrow C points downwards	1	**AO2** 3.3.1.d
3(c)(ii)	A		1	**AO2** 3.3.1.d
Total			**6**	

4.1.1.2 Mixtures

Answer 102 · Mark scheme

June 2015 | CH3FP | Original Q3 | Legacy



4.1.1.2 Mixtures

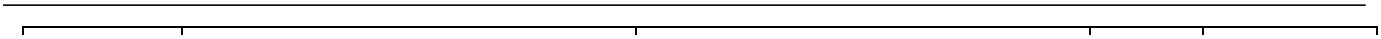
Answer 103 · Mark scheme June 2015 | CH3FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	natural gas	allow correct answer shown in box if answer line blank	1	**AO1** 3.5.1.a
4(b)(i)	450	allow correct answer shown in box if answer line blank	1	**AO1** 3.5.1.b
4(b)(ii)	iron	allow correct answer shown in box if answer line blank	1	**AO1** 3.5.1.b
4(b)(iii)	The catalyst lowers the activation energy.		1	**AO1** 3.3.1.h
4(c)	(the gases are) cooled		1	**AO1/ AO2** 3.5.1.b
	ammonia condenses	allow ammonia liquefies	1	
	nitrogen and hydrogen are recycled	if no other mark awarded allow ammonia is separated for **1** mark	1	
Total			**7**	

4.1.1.2 Mixtures

Answer 103 · Mark scheme

June 2015 | CH3FP | Original Q4 | Legacy



4.1.1.2 Mixtures

Answer 104 · Mark scheme

June 2016 | CH1FP | Original Q2 | Legacy

Question 2

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

4.1.1.2 Mixtures

Answer 105 · Mark scheme

June 2016 | CH1FP | Original Q4 | Legacy

Question 4

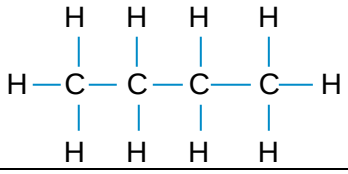
Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)(i)	fermentation		1	AO1 1.5.3b
4(a)(ii)	hydration		1	AO1 1.5.3a
4(a)(iii)	resources of crude oil are non-renewable producing ethanol from plants uses less energy		1 1	AO3 1.4.3e; 1.5.3b
4(b)(i)	turns cloudy / milky / white because carbon dioxide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

4.1.1.2 Mixtures

Answer 106 · 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

Answer 106 · Mark scheme

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

4.1.1.2 Mixtures

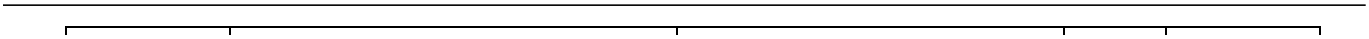
Answer 107 · Mark scheme June 2016 | CH3FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
4(a)(i)	nitrogen: air hydrogen: natural gas		1 1	AO1 3.5.1a
4(a)(ii)	as a catalyst so the reaction speeds up	 allow lowers activation energy or so a lower temperature can be used	1 1	AO1/AO2 3.5.1b
4(a)(iii)	cooled ammonia condenses / liquefies	 allow nitrogen **and** hydrogen remain in the gaseous state	1 1	AO1/AO2 3.5.1b
4(a)(iv)	recycled	allow reused or returned to the reactor	1	AO1 3.5.1b
4(b)	reversible arrows hydrogen **and** ammonia		1 1	AO1 3.5.1b
Total			**9**	

4.1.1.2 Mixtures

Answer 107 · Mark scheme

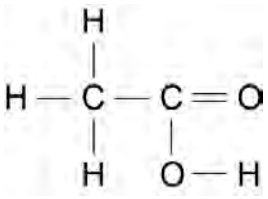
June 2016 | CH3FP | Original Q4 | Legacy



4.1.1.2 Mixtures

Answer 108 · Mark scheme

June 2016 | CH3FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
5(a)(i)	fizz / effervescence / bubbles	allow calcium carbonate decreases in size or dissolves	1	AO2/AO3 3.4.1d, 3.6.2b
	because carbon dioxide produced / released	allow because gas produced / released	1	
	limewater turns cloudy / milky / white		1	
	because (a precipitate of or solid) calcium carbonate forms	allow because of carbon dioxide if not already credited	1	
5(a)(ii)		allow –OH do not allow lower case 'h'	1	AO1 3.6.2a
5(a)(iii)	acid	must be in this order ignore any name of an acid	1	AO1 3.6.2b
	ester(s)		1	
5(b)	white (precipitate) no change no change no change	all four correct 2 marks any two correct 1 mark	2	AO2 3.4.1e,f
5(c)(i)	lilac red	must be in this order allow purple	1 1	AO1 3.4.1a
5(c)(ii)	colours are masked / changed by each flame colour		1	AO3 3.4.1a
Total			12	

4.1.1.2 Mixtures

Answer 108 · Mark scheme

June 2016 | CH3FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
6			6	2AO1 / 3AO2 / 1AO3 3.4.1g

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

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content.	There is a simple description of using some of the apparatus.	There is a description of an experimental method including addition of acid to alkali which may include an indicator or colour change and may include a measurement of volume.	There is a description of titrations that would allow a comparison to be made between the two solutions of hydrochloric acid.

examples of chemistry points made in the response could include:

- acid in burette **or** flask
- alkali/sodium hydroxide **or** acid in burette or flask
- volume of acid **or** alkali measured using the pipette
- indicator in flask
- white tile under the flask
- slow addition
- swirling/mixing
- colour change of indicator
- burette volume measured

Total		6

4.1.1.2 Mixtures

Answer 109 · Mark scheme

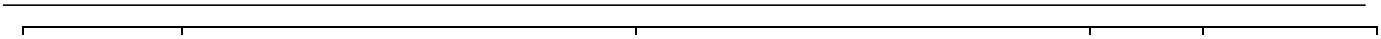
June 2017 | CH1FP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	magnesium oxide	allow MgO but must be correct formula do **not** allow extra products	1	AO2 1.1.3b
3(b)(i)	carbon	ignore C ignore any numbers eg 3 carbon	1	AO1 1.1.1b
3(b)(ii)	loss of oxygen	allow iron gains electrons do **not** allow loss of oxide do **not** allow iron oxide gains electrons	1	AO2 1.3.1d
3(b)(iii)	brittle soft alloys **or** steels		1 1 1	AO1 1.3.2a;b;c
Total			6	

4.1.1.2 Mixtures

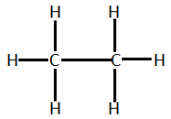
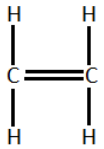
Answer 109 · Mark scheme

June 2017 | CH1FP | Original Q3 | Legacy



4.1.1.2 Mixtures

Answer 110 · Mark scheme June 2017 | CH1FP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)(i)	electronic structure drawn	allow any representation of an electron allow 2,4	1	**AO2** 1.1.1h
6(a)(ii)	six / 6 protons (protons) are positively charged	 do **not** allow electrons in nucleus otherwise ignore electrons do **not** allow nucleus is neutral allow (protons are) + / +1 / 1+ ignore statements about mass if no other mark awarded allow one mark for nucleus	1 1 1	**AO1** **AO2** 1.1.1c;d;e
6(b)	(a hydrocarbon is) made up of hydrogen and carbon (atoms) only	do **not** allow mixture	1	**AO1** 1.4.1a;c
6(c)(i)	 	ethane correctly drawn with another hydrogen on each carbon and another three single bonds ethene correctly drawn with a double bond between the carbon atoms	1 1	**AO1** 1.4.2a 1.5.1c
6(c)(ii)	as the number of carbon atoms increases the boiling point increases	allow converse ignore alkene	1	**AO3** 1.4.2c

4.1.1.2 Mixtures

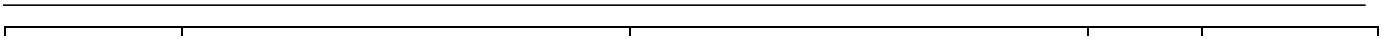
Answer 110 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(c)(iii)	the boiling points of alkanes are higher than the boiling points of alkenes	allow the boiling points of alkenes are lower than the boiling points of alkanes	1	AO2 1.4.2b;c
	that has the same number of carbon atoms	consequential on first marking point	1	
	or state a correct example	e.g. hexane has a higher boiling point than hexene **or** hexane boils at 69°C hexene boils at 64°C		
		if no other mark awarded allow both alkanes and alkenes have the same pattern of the more carbon atoms the higher the boiling point for one mark		
6(d)	(alkane molecules are) cracked	allow break down / up **or** decompose **or** split up	1	AO1 AO2 AO3
	to produce small(er) molecules / alkanes / hydrocarbons	allow short chain for small	1	1.5.1a;b;d
	and alkenes **or** a named alkene	allow molecules that have a double bond **or** are unsaturated	1	
		if no other mark awarded allow evaporate **or** boil for one mark		
		ignore turns to gas		
Total			13	

4.1.1.2 Mixtures

Answer 110 · Mark scheme

June 2017 | CH1FP | Original Q6 | Legacy



4.1.1.2 Mixtures

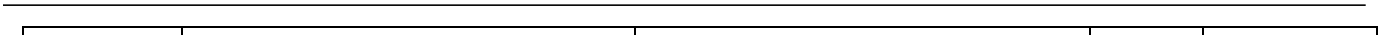
Answer 111 · Mark scheme June 2017 | CH2FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1 (a)(i)	the ink would run / smudge / smear	accept converse	1	**AO1** 2.3.2b
1 (a)(ii)	below		1	**AO1** 2.3.2b
1 (a)(iii)	any **two** from: • contains red • does not contain blue • contains two other colours • contains three colours in total	do **not** accept contains red and blue	2	**AO3** 2.3.2b
1(b)(i)	separated		1	**AO1** 2.3.2c
1(b)(ii)	6/six		1	**AO2** 2.3.2c
1(b)(iii)	any **one** from: • accurate • sensitive • rapid / fast • small sample.	do **not** accept more precise do **not** accept more reliable	1	**AO1** 2.3.2a
Total			**7**	

4.1.1.2 Mixtures

Answer 111 · Mark scheme

June 2017 | CH2FP | Original Q1 | Legacy



4.1.1.2 Mixtures

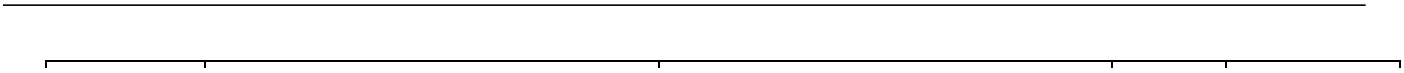
Answer 112 · Mark scheme June 2017 | CH3FP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	filter → to remove solids sterilise → to kill microbes	more than one line from any treatment negates the mark	1 1	**AO1** 3.2.2a,c
2(a)(ii)	tick (✓) by: chlorine		1	**AO1** 3.2.2c
2(b)	large amount of energy / fuel needed	allow electricity / heat for energy ignore time / temperature / lots of stages	1	**AO1** 3.2.2d
2(c)(i)	improve dental health	do **not** allow bones	1	**AO1** 3.2.2c
2(c)(ii)	personal choice **or** may not benefit everyone		1	**AO3** 3.2.2c
Total			**6**	

4.1.1.2 Mixtures

Answer 112 · Mark scheme

June 2017 | CH3FP | Original Q2 | Legacy



Answer 113 · Mark scheme

June 2018 | 8462/1F | Original Q1

The full source mark scheme begins on page 240. Follow original question 1 in that document.

Answer 114 · Mark scheme

June 2018 | 8462/1F | Original Q6

The full source mark scheme begins on page 240. Follow original question 6 in that document.

4.1.1.2 Mixtures

Answer 115 · Mark scheme

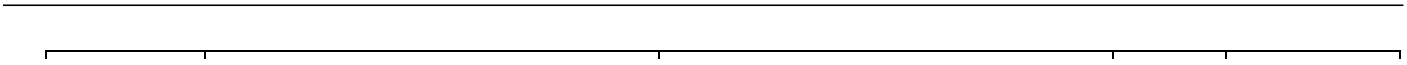
June 2018 | 8462/2F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	crush the flower use more flowers		1 1	AO3 4.8.1.3
05.2	the start line is drawn in ink uses water as the solvent		1 1	AO3 4.8.1.3
05.3	flower A contains a single pure colour the colour in flower C is a mixture		1 1	AO3 4.8.1.3
05.4	$\frac{7.2}{9.0}$ = 0.8	an answer of 0.8 scores **2** marks ignore units	 1 1	AO2 4.8.1.3
Total			**8**	

4.1.1.2 Mixtures

Answer 115 · Mark scheme

June 2018 | 8462/2F | Original Q5



4.1.1.2 Mixtures

Answer 116 · Mark scheme

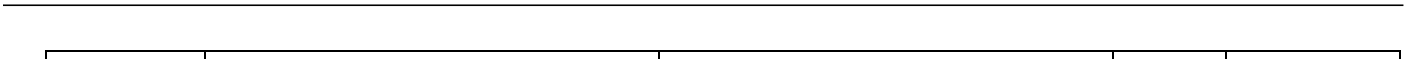
June 2018 | 8462/2F | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	yellow	allow orange allow orange-yellow	1	AO1 4.8.3.1
08.2	copper (ion)	allow Cu^{2+} allow copper (II) allow barium (ion) allow Ba^{2+}	1	AO1 4.8.3.1
08.3	(flame) colours are masked	allow (flame) colours mix / blend allow only see one colour allow cannot see two colours at once ignore hard to distinguish	1	AO1 4.8.3.1
08.4	Li^+ Na^+		1 1	AO2 4.8.3.7
08.5	bromide (ion)	allow Br^- ignore bromine	1	AO1 4.8.3.4
08.6	add barium chloride (solution) add hydrochloric acid white precipitate produced	allow barium nitrate (solution) allow nitric acid allow acidified do **not** accept sulfuric acid dependent on use of a barium compound	1 1 1	AO1 4.8.3.5
Total			**9**	

4.1.1.2 Mixtures

Answer 116 · Mark scheme

June 2018 | 8462/2F | Original Q8



4.1.1.2 Mixtures

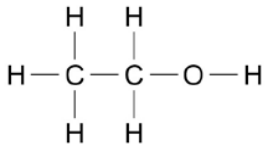
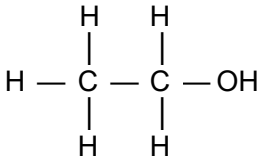
Answer 117 · Mark scheme

June 2018 | 8462/2F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	formulation		1	AO1 4.8.1.2
09.2	$\frac{23.3}{265.5 + 23.3 + 3.0 + 1.5}$ (× 100) = 7.9 (%)	an answer of 7.9 (%) scores **2** marks allow $\frac{23.3}{293.3}$ (× 100) allow 7.944084555 (%) rounded correctly	 1 1	AO2 4.8.1.2
09.3	to deter consumption / drinking (by people)		1	AO3 4.7.2.3
09.4	any **one** from: • fuel • solvent • antiseptic	do **not** accept as an alcoholic drink allow specific uses eg • fuel additive • cleaning products • hand-sanitisers	 1	AO2 4.7.2.3
09.5	ferment(ation) add yeast anaerobic (conditions) **or** warm	ignore distillation allow in the absence of oxygen allow a temperature value in range 5 – 45 °C inclusive allow room temperature ignore hot / heat ignore high temperature	1 1 1	AO1 4.7.2.3

4.1.1.2 Mixtures

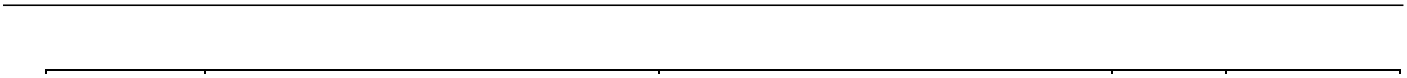
Answer 117 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.6		allow 	1	AO1 4.7.2.3
09.7	hydrogen	allow H_2	1	AO1 4.7.2.3
09.8	oxidising (agent)	allow permanganate / dichromate ions allow [O] ignore oxygen	1	AO1 4.7.2.3
Total			**11**	

4.1.1.2 Mixtures

Answer 117 · Mark scheme

June 2018 | 8462/2F | Original Q9



4.1.1.2 Mixtures

Answer 118 · Mark scheme June 2018 | 8462/2F | Original Q10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	hydrogen	allow H_2	1	AO1 4.10.4.1
10.2	450 °C 200 atm / atmospheres	allow values in the range 400– 500 °C allow values in the range 150– 250 atm / atmospheres allow **1** mark if both values within range but no units given	1 1	AO1 4.10.4.1
10.3	ammonia has a higher boiling point	allow the other gases have lower boiling points ignore references to melting point	1	AO3 4.10.4.1

4.1.1.2 Mixtures

Answer 118 · Mark scheme

June 2018 | 8462/2F | Original Q10

Question	Answers		Mark	AO / Spec. Ref.
10.4	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.		5–6	AO2
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.		3–4	AO1
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.		1–2	AO1
	No relevant content		0	
	Indicative content **changes** • carbon dioxide has decreased • oxygen has increased **processes** • volcanic activity released water vapour • the water vapour condensed to form oceans • carbon dioxide dissolved in oceans • carbonates produce sediments • carbon locked up in sedimentary rocks • algae and plants evolved / appeared • algae / plants absorbed carbon dioxide • by photosynthesis • which also released oxygen • carbon locked up in fossil fuels			4.9.1.2 4.9.1.3 4.9.1.4
10.5	any **one** from: • occurred 4.6 billion years ago • limited or no evidence	allow any indication of billions of years allow limited or no proof ignore there was nobody there	1	AO1 4.9.1.2
Total			**11**	

4.1.1.2 Mixtures

Answer 119 · 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

4.1.1.2 Mixtures

Answer 119 · Mark scheme

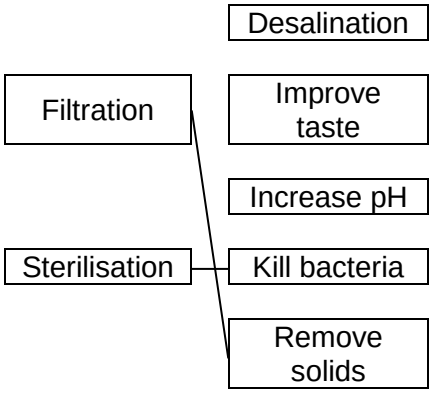
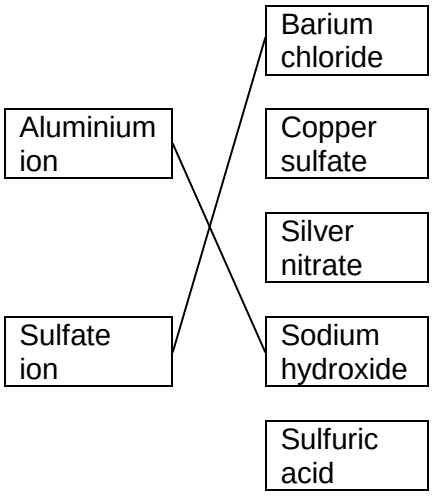
03.7	any **four** from: • solution is heated • water evaporates • the vapour cools in the condenser • the vapour condenses **or** the vapour turns to a liquid • (pure) water collects in the beaker	allow water boils / vaporises	4	AO1 4.1.1.2
Total			**13**	

4.1.1.2 Mixtures

Answer 120 · Mark scheme

June 2019 | 8462/2F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1		an extra line from a step to a reason for that step negates that mark	1 1	AO1 4.10.1.2
01.2	chlorine ozone		1 1	AO1 4.10.1.2
01.3	evaporate all water from the sample measure the sample's boiling point		1 1	AO2 4.8.1.1 4.10.1.2
01.4		an extra line from an ion to a compound needed negates that mark	1 1	AO1 4.8.3.2 4.8.3.5
01.5	distillation		1	AO1 4.10.1.2
Total			9	

4.1.1.2 Mixtures

Answer 121 · Mark scheme

June 2019 | 8462/2F | Original Q9

Question 9

Question	Answers	Mark	AO/ Spec. Ref
09.1	**Level 3**: The design/plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO1 4.8.2.3 4.8.3.1 4.8.3.3
	Level 2: The design/plan would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	
	Level 1: The design/plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content lithium: • crush tablets or dissolve tablet (in water or acid) • clean wire • place on wire • place in (roaring / blue / non-luminous) flame • observe flame colour • crimson flame carbonate: • add hydrochloric acid • effervescence / fizzing • bubble gas through limewater • limewater becomes cloudy		
09.2	formulation(s)	1	AO1 4.8.1.2

4.1.1.2 Mixtures

Answer 121 · Mark scheme

June 2019 | 8462/2F | Original Q9

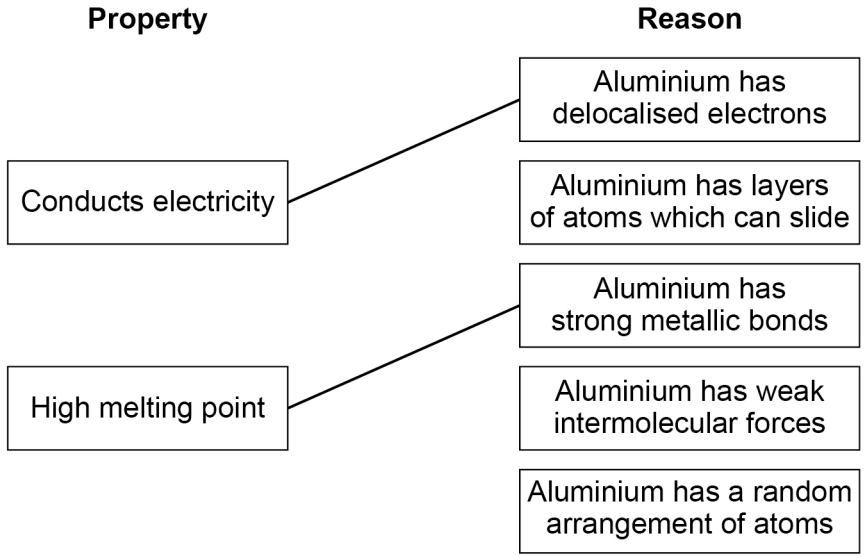
09.3		an answer of 58.3333333 (%) correctly rounded to at least 2 significant figures scores **3** marks		AO2 4.8.1.2
	1.20 g = 1200 mg **or** 700 mg = 0.700 g		1	
	$\frac{700}{1200} \times 100$ **or** $\frac{0.700}{1.20} \times 100$	allow correct use of incorrectly or not converted values from step 1	1	
	= 58.3 (%)	allow 58.3333333 (%) correctly rounded to at least 2 significant figures	1	
Total			**10**	

4.1.1.2 Mixtures

Answer 122 · 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

Answer 122 · Mark scheme

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**	

4.1.1.2 Mixtures

Answer 123 · Mark scheme

November 2020 | 8462/1F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	nitric acid		1	AO2 4.4.2.2 RPA 1
07.2	zinc oxide		1	AO2 4.4.2.2 RPA 1
07.3	magnesium bromide		1	AO2 4.1.1.1
07.4		allow a tolerance of 1 cm^3 on volumes allow a tolerance of 0.2 on pH values		AO2 4.4.2.4
	(from 0) to 20 cm^3 the pH increases (gradually)	allow increase from pH 1 to pH 3	1	
	at 20 cm^3 the pH changes from pH 3 to pH 11	allow sudden / steep increase at 20 cm^3 allow sudden / steep increase from pH 3 to pH 11	1	
	from 20 cm^3 the pH increases (gradually)	allow (gradual) increase from pH 11 if no other marks awarded allow **1** mark for a description of the three stages with no values used.	1	

Answer 123 · Mark scheme

Question 7 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	20 (cm^3)	allow 20.0 (cm^3)	1	AO3 4.4.2.4
07.6	red		1	AO3 4.4.2.4
07.7	$\frac{0.06}{25(.0)} \times 100$ = 0.24 (%)		1 1	AO2 4.4.2.5
07.8	(pipette) measures volume more accurately **or** (pipette has a) smaller (percentage) uncertainty	allow (pipette is) more accurate	1	AO3 4.4.2.5 RPA 2
Total			**11**	

4.1.1.2 Mixtures

Answer 124 · 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

Answer 124 · Mark scheme

Question 10 continued

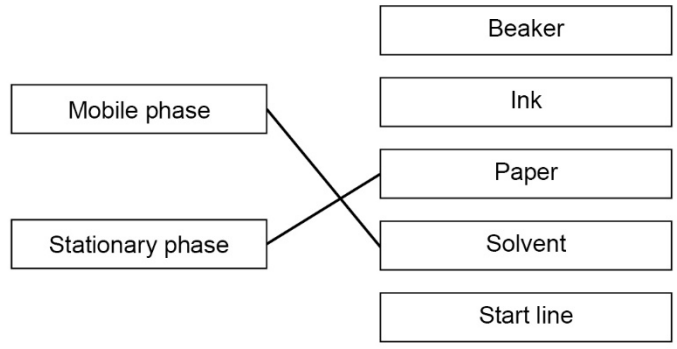
Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.5	(total M_r = 170 + 150) = 320	allow (235 + 85) = 320	1	AO2 4.3.3.2
	(% atom economy =) $\frac{235}{320} \times 100$	allow correct use of incorrectly calculated total M_r	1	
	= 73.4375 (%)		1	
	= 73.4 (%)	allow an answer correctly calculated 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**	

4.1.1.2 Mixtures

Answer 125 · Mark scheme

November 2020 | 8462/2F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	2.7 / 9.0 = 0.3	 ignore units	1 1	AO2 4.8.1.3 RPA6
04.2	**C** and **D**		1	AO1 4.8.1.3 RPA6
04.3	 additional line from a box on the left negates the mark for that box		1 1	AO1 4.8.1.3 RPA6
04.4	17 : 3		1	AO2 4.8.1.2
04.5	formulation		1	AO2 4.8.1.2
04.6	the R_f value would stay the same		1	AO3 4.8.1.2
Total			**8**	

4.1.1.2 Mixtures

Answer 126 · Mark scheme

November 2020 | 8462/2F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	green	allow blue-green	1	AO1 4.8.3.1 RPA 7
08.2	did not clean the metal wire (between tests) **or** copper sulfate (solution) is still present (so) colours are mixed / blended / masked		1 1	AO3 4.8.3.1 RPA 7
08.3	(copper sulfate solution) blue precipitate (calcium iodide solution) white precipitate	allow blue solid allow white solid	1 1	AO1 4.8.3.2 RPA 7
08.4	barium chloride (solution)	allow barium nitrate (solution)	1	AO1 4.8.3.5 RPA 7
08.5	silver nitrate (solution) yellow precipitate	 allow yellow solid allow pale yellow precipitate / solid	1 1	AO1 4.8.3.4 RPA 7
Total			**8**	

4.1.1.2 Mixtures

Answer 127 · Mark scheme

November 2021 | 8462/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	non-metallic element		1	AO3 4.1.1.1 4.1.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	compound		1	AO1 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	noble gases		1	AO1 4.1.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	the boiling points increase down the group		1	AO1 4.1.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	atoms		1	AO1 4.1.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	XO_2		1	AO2 4.2.1.3

4.1.1.2 Mixtures

Answer 127 · Mark scheme

Question 1 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	$(2.8)^2 \times 6$ $= 47.04$ $= 47$ (nm^2)	 allow an answer correct to 2 significant figures resulting from an incorrect attempt at the calculation	1 1 1	AO2 4.2.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.8	the surface area to volume ratio of the fine particle is 10 times greater		1	AO1 4.2.4.1

Total			10

4.1.1.2 Mixtures

Answer 128 · Mark scheme

November 2021 | 8462/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	$\frac{54 + 50 + 55}{3}$ = 53 (°C)	if no other mark awarded allow **1** mark for $\frac{54 + 50 + 37 + 55}{4}$ = 49 (°C)	1 1	AO3 AO2 4.4.1.2 4.5.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	(most reactive) magnesium zinc (least reactive) cobalt	allow ecf from question **04.1**	1	AO3 4.4.1.2 4.5.1.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	(18 ±) 2 (°C)		1	AO2 4.3.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	control		1	AO1 4.4.1.2 4.5.1.1 RPA4

4.1.1.2 Mixtures

Answer 128 · Mark scheme

November 2021 | 8462/1F | Original Q4

Question 4 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	use the same mass of metal / powder		1	AO3 4.4.1.2 4.5.1.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	(A) progress of reaction (B) activation energy (C) products		1 1 1	AO1 4.5.1.2

Total			9

4.1.1.2 Mixtures

Answer 129 · Mark scheme

November 2021 | 8462/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	(mass) balance (volume) measuring cylinder	allow scales allow burette / pipette	1 1	AO1 4.10.1.2 RPA 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(mass of salt = 30.49 – 30.44 =) 0.05 (g salt) (mass of salt in 1000 cm^3 =) $\frac{1000}{50}$ × 0.05 = 1.0 (g) **alternative approach**: (volume ratio = $\frac{1000}{50}$) = 20 (1) (mass of salt in 1000 cm^3) = (30.49 – 30.44) × 20 (1) = 1.0 (g) (1)	allow correct use of incorrectly determined mass of salt allow correct use of incorrectly determined volume ratio	1 1 1	AO2 4.10.1.2 RPA8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	heat the evaporating dish and salt again measure the mass of the evaporating dish and salt again		1 1	AO3 4.10.1.2 RPA 8

Answer 129 · Mark scheme

Question 2 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	(no condenser) (more) steam escapes **or** less steam condenses	allow converse for condenser allow water vapour for steam	1	AO1
	(because) cooling / condensing is less efficient **or** (because) a (liebig) condenser is not used	allow (because) cooling / condensing is slower allow (because) cold water is not used for cooling / condensing	1	AO3 4.1.1.2 4.10.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	(distilled) water is pure	allow microbes are destroyed (by distillation)	1	AO3 4.8.1.1 4.10.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	using chlorine using ozone		1 1	AO1 4.10.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	pH 7		1	AO2 4.4.2.4 4.10.1.2 RPA8

Total			13

4.1.1.2 Mixtures

Answer 130 · Mark scheme

November 2021 | 8462/2F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	(equation contains the symbol) ⇌	allow description of arrow / symbol	1	AO1 4.6.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	the mass of each substance does not change the rates of the forward reaction and reverse reaction are equal		1 1	AO3 AO1 4.6.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	the mixture will have become a paler purple		1	AO3 4.6.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	increases decreases increases	must be in this order	1 1 1	AO1 4.6.1.2 4.6.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	change the temperature **or** add a catalyst	ignore references to pressure	1	AO1 4.6.1.2 4.6.1.3

Total			8

4.1.1.2 Mixtures

Answer 131 · Mark scheme

November 2021 | 8462/2F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	all five points plotted correctly	allow a tolerance of ± ½ a small square allow **1** mark for three or four points plotted correctly	2	AO2 4.7.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	98 (°C)	allow a value in the range 92 to 104 (°C)	1	AO3 4.7.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	the boiling point is lower than 0 (°C)	allow the graph cannot show negative temperatures	1	AO3 4.7.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	gas	allow (g)	1	AO2 4.2.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	C_9H_{20}		1	AO2 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.6	(nonane) has a higher boiling point (so nonane) condenses where the column has a higher temperature	allow converse for the other alkanes allow (so nonane) collects where the column has a higher temperature	1 1	AO2 4.7.1.2

Total			8

4.1.1.2 Mixtures

Answer 132 · Mark scheme

November 2021 | 8462/2F | Original Q10

Question 10

Question	Answers	Mark	AO/ Spec. Ref
10.1	**Level 3**: The design/plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO1 4.8.1.3 RPA6
	Level 2: The design/plan would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	
	Level 1: The design/plan would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content **Method** • draw (pencil) start line on (chromatography) paper • place spot of food colouring on start line • use of suitable solvent • place solvent in beaker / container • place (chromatography) paper in beaker / container • so (chromatography) paper is in solvent • but solvent is below start line • use a lid • wait for solvent to travel up the (chromatography) paper (until near top) • mark solvent front • dry the (chromatography) paper **Measurements** • measure distance between start line and centre of spot • measure distance between start line and solvent front • use of measurements to determine R_f value		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.2	different solvent used		1	AO3 4.8.1.3 RPA6

4.1.1.2 Mixtures

Answer 132 · Mark scheme

Question 10 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.3	paper		1	AO1 4.8.1.3 RPA6

Total			**8**

4.1.1.2 Mixtures

Answer 133 · 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

4.1.1.2 Mixtures

Answer 133 · 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**

4.1.1.2 Mixtures

Answer 134 · Mark scheme

June 2022 | 8462/1F | Original Q10

Question 10

Question	Answers	Mark	AO/ Spec. Ref
10.1	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5–6	AO1 4.5.1.1 RPA 4
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the plan is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content.	0	
	Indicative content • **measure volume of (hydrochloric) acid** • with a measuring cylinder • pour (hydrochloric) **acid into a suitable container** eg polystyrene cup • measure the initial temperature (of hydrochloric acid) • with a thermometer • **add a known mass of sodium carbonate** • measured with a balance • stir • **measure the highest temperature reached** • **repeat with different masses of sodium carbonate or add successive masses of sodium carbonate to the same mixture** • repeat the whole investigation • use the same starting temperature • use the same volume of (hydrochloric) acid each time • use the same concentration of (hydrochloric) acid each time		

4.1.1.2 Mixtures

Answer 134 · Mark scheme

June 2022 | 8462/1F | Original Q10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.2 View with Figure 17	change in highest temperature	allow a tolerance of ± ½ a small square	1	AO2 4.5.1.1 RPA4
	corresponding change in mass	allow a tolerance of ± ½ a small square	1	
	(gradient =) $\frac{\text{change in highest temperature}}{\text{change in mass}}$	allow correct use of an incorrectly determined change in highest temperature and / or change in mass	1	
	(gradient =) 1.6		1	
	°C/g	allow °C/gram(s)	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.3 View with Figure 17	extrapolates line to the *y*-axis		1	AO2 4.5.1.1 RPA4
	20.6 (°C)	allow a tolerance of ± ½ a small square allow a correctly determined value from an incorrectly extrapolated line	1	
	alternative approach:			
	(highest temperature at 1.0 g – change in highest temperature per gram =) 22.2 – 1.6 (1)	allow correct use of value determined for gradient in question**10.2**		
	= 20.6 (°C) (1)			

4.1.1.2 Mixtures

Answer 134 · Mark scheme

June 2022 | 8462/1F | Original Q10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.4	C		1	AO3 4.5.1.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.5	(**X**) energy (**Y**) (overall) energy change		1 1	AO1 4.5.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.6	(level of) products is below (level of) reactants	allow the energy decreases (overall) allow energy is transferred to the surroundings ignore references to bond making / breaking	1	AO1 4.5.1.2

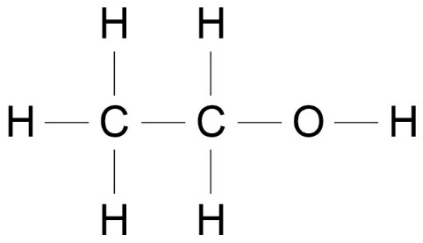
Total Question 10		17

4.1.1.2 Mixtures

Answer 135 · Mark scheme

June 2022 | 8462/2F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1			1	AO1 4.7.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	in hand gel to kill microbes		1	AO1 4.7.2.3

4.1.1.2 Mixtures

Answer 135 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
04.3	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	3–4	AO1 4.8.1.3 RPA6
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content • **draw** pencil **start line** • **place spot of ink on start line** • name suitable solvent • place solvent in beaker • **place paper in solvent so solvent is below start line** • use a lid • **allow solvent / dyes to travel up paper** (until near top) • dry • count spots		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	yeast		1	AO1 4.7.2.3

4.1.1.2 Mixtures

Answer 135 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	(mass =) $\frac{4.4 \times 5}{100}$		1	AO2 4.7.1.3 4.7.2.3
	= 0.22 (kg)		1	
	(conversion 0.22 kg =) 220 (g)	allow a correct conversion of an incorrectly calculated mass	1	
	alternative approach: (conversion 4.4 kg =) 4400 g (1)			
	(mass =) $\frac{4400 \times 5}{100}$ (1)	allow correct use of an incorrectly converted mass		
	= 220 (g) (1)			

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6		allow converse argument for E5		AO3 4.9.1.3 4.9.2.2 4.9.2.4
	E10 contains more ethanol (produced from sugar than E5)		1	
	(so) more sugar is used	allow (so) more plants are grown	1	
	(so more) carbon dioxide is absorbed by plants (when growing)	allow (so more) carbon dioxide is used in photosynthesis (by plants)	1	

4.1.1.2 Mixtures

Answer 135 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	(E10 has) less energy (in a fixed mass)	allow cannot travel as far (on a full tank of E10)	1	AO3 4.7.1.3 4.7.2.3

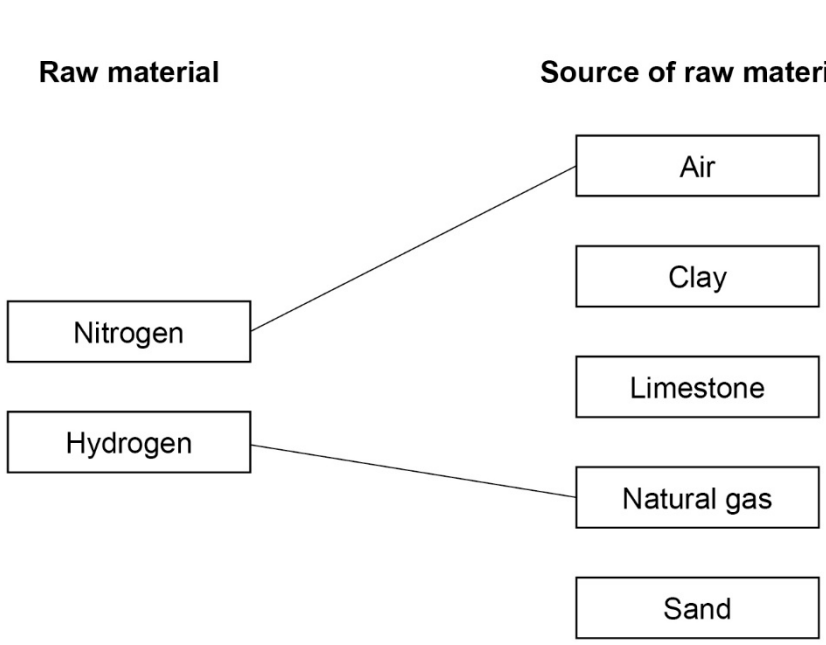
Total Question 4		**14**

4.1.1.2 Mixtures

Answer 136 · Mark scheme

June 2022 | 8462/2F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	 do not accept more than one line from a box on the left		1 1	AO1 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	gas gas		1	AO1 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	there is one product		1	AO2 4.3.3.2 4.10.4.1

4.1.1.2 Mixtures

Answer 136 · Mark scheme

June 2022 | 8462/2F | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	liquefied recycled	must be in this order	1 1	AO1 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	all six points plotted correctly line of best fit	allow a tolerance of ± ½ a small square allow **1** mark for four / five points plotted correctly	2 1	AO2 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	(percentage yield) increases		1	AO2 4.10.4.1

Total Question 5		10

Answer 137 · Mark scheme

June 2022 | 8462/2F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	$Na_2S_2O_3 + 2\,HCl \rightarrow$ **2** $NaCl + H_2O + SO_2 + S$	allow multiples	1	AO2 4.1.1.1 4.3.1.1 4.6.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	(s)		1	AO1 4.2.2.2 4.6.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	a cross on a piece of paper		1	AO1 4.6.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	the rate of reaction decreased		1	AO3 4.6.1.1 4.6.1.2 RPA5

4.1.1.2 Mixtures

Answer 137 · Mark scheme

June 2022 | 8462/2F | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	one of the reactants was used up		1	AO3 4.6.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	initially the line of best fit would be steeper		1	AO2 4.6.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.7	fewer reactant particles have the activation energy the reactant particles move more slowly		1 1	AO2 4.6.1.2 4.6.1.3

Total Question 6		8

4.1.1.2 Mixtures

Answer 138 · Mark scheme

June 2022 | 8462/2F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	nitric acid		1	AO2 4.10.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	(mass =) $\frac{40 \times 600}{800\ 000}$ = 0.03 (kg/m^2)		1 1	AO2 4.10.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	(the scientist might be) biased **or** (there was) no peer review	allow the investigation was not repeated (by others)	1	AO3 4.10.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	one / 1		1	AO2 4.10.4.2

4.1.1.2 Mixtures

Answer 138 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	phosphorus		1	AO2 4.10.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	formulation		1	AO1 4.8.1.2 4.10.4.2

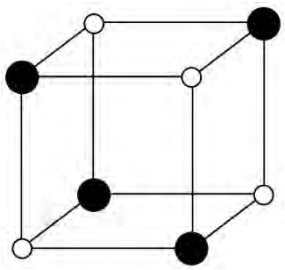
Total Question 7		**7**

4.1.1.2 Mixtures

Answer 139 · Mark scheme

June 2023 | 8462/1F | Original Q7

Question 7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1		allow **1** mark for 2 Na^+ and 2 Cl^-	2	AO1 4.2.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.2	the ions can move (in the liquid)	do **not** accept reference to moving / delocalised electrons	1	AO1 4.4.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3				AO2 4.4.3.2

Molten compound	Product at the negative electrode	Product at the positive electrode	
Magnesium bromide	Magnesium	**Bromine**	1
Potassium chloride	**Potassium**	Chlorine	1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.4	the mixture has a lower melting point than pure aluminium oxide		1	AO1 4.4.3.3

4.1.1.2 Mixtures

Answer 139 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.5	water		1	AO1 4.4.3.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.6	hydrogen is less reactive than sodium		1	AO2 4.4.3.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7	the volume of hydrogen is twice the volume of oxygen	allow the volume of hydrogen is greater than the volume of oxygen allow the volume of hydrogen is (directly) proportional to the volume of oxygen	1	AO3 4.4.3.4

Total Question 7	9

4.1.1.2 Mixtures

Answer 140 · Mark scheme

June 2023 | 8462/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	(the poly(propene) beaker will begin to) melt	allow poly(propene) has a low melting point	1	AO3 4.7.3.1
	(the poly(propene) beaker will) burn / ignite	allow poly(propene) is flammable	1	

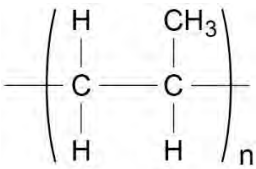
Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(poly(propene) beakers are) less easily broken	allow (poly(propene) beakers are) less likely to shatter allow (poly(propene) beakers are) tougher allow (poly(propene) beakers have a) higher resistance to impact	1	AO3 4.7.3.1 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	boron trioxide		1	AO1 4.10.3.3

Question	Answers	Mark	AO / Spec. Ref.
02.4	<table><tr><th>Symbol for element</th><th>Name of element</th><th>Number of atoms of element in one molecule of propene</th></tr><tr><td>C</td><td>carbon</td><td>3</td></tr><tr><td>H</td><td>hydrogen</td><td>6</td></tr></table> if no other mark awarded allow **1** mark for a correct column	1 1	AO1 AO2 4.1.1.1 4.7.2.1

4.1.1.2 Mixtures

Answer 140 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5			1	AO2 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	(**Stage 1** is) fractional distillation (**Stage 2** is) cracking (**Stage 3** is) polymerisation		1 1 1	AO1 AO2 AO2 4.7.1.2 4.7.1.4 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	alkene monomer		1 1	AO2 4.7.2.1 4.7.3.1

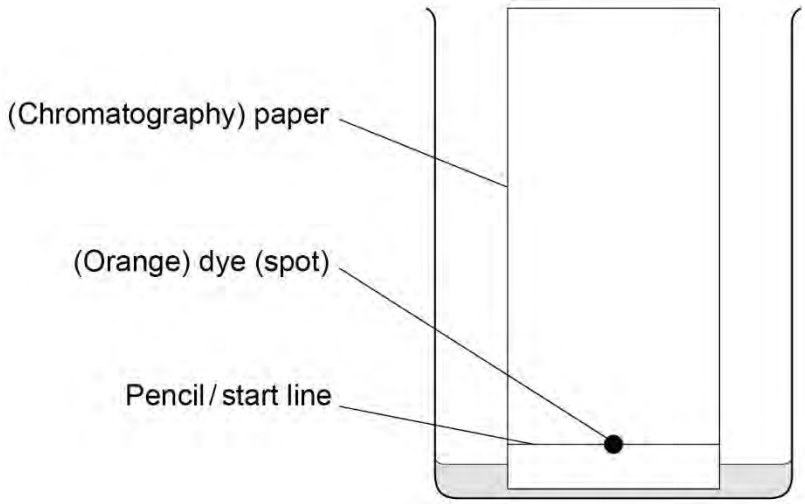
Total Question 2	12

4.1.1.2 Mixtures

Answer 141 · 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

4.1.1.2 Mixtures

Answer 141 · 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

4.1.1.2 Mixtures

Answer 142 · 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

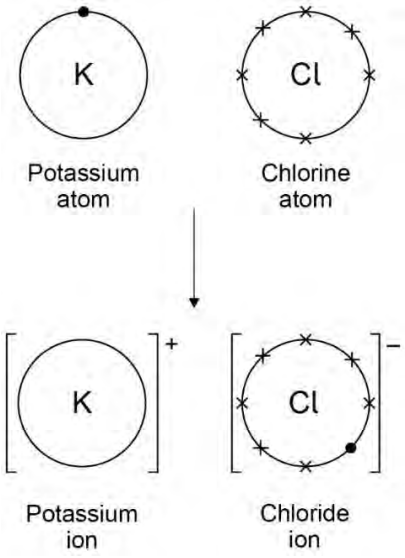
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	sections **A**, **B** and **C**		1	AO1 4.1.2.3

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

4.1.1.2 Mixtures

Answer 142 · Mark scheme

June 2024 | 8462/1F | Original Q1

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

4.1.1.2 Mixtures

Answer 142 · 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**

4.1.1.2 Mixtures

Answer 143 · Mark scheme

June 2024 | 8462/1F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	displacement		1	AO1 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	(percentage =) $\frac{63.5}{159.5} \times 100$		1	AO2 4.3.1.2
	= 39.81191 (%)		1	
	= 39.8 %	allow an answer correctly rounded to 3 significant figures from an incorrect calculation which uses both the values in the question	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	volume of copper sulfate solution		1	AO1 4.5.1.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	0.8(0) g		1	AO3 4.5.1.1 RPA4

4.1.1.2 Mixtures

Answer 143 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	(maximum temperature change) = 47 – 22 (ºC) = 25 (ºC)	 allow correct use of incorrectly determined value(s) from the graph	1 1	AO2 4.5.1.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	(conversion 25 cm^3 =) 0.025 dm^3 (concentration =) $\frac{6.75}{0.025}$ (g/dm^3) = 270 (g/dm^3)	 allow correct use of an incorrectly determined or unconverted volume	1 1 1	AO2 4.3.2.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	line of best fit using the first five points line of best fit using the last four points	max **1** mark if the lines do not intersect	1 1	AO2 4.5.1.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.8	energy is **taken in from** the surroundings so the reaction is **endothermic**		1	AO3 4.5.1.1 RPA4

Total Question 3	**14**

4.1.1.2 Mixtures

Answer 144 · Mark scheme

June 2024 | 8462/1F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	copper sulfate water	allow $CuSO_4$ allow H_2O	1 1	AO2 AO1 4.4.2.2 4.4.2.3 RPA1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	solid remains (in the mixture) **or** no more effervescence / bubbles / fizzing	ignore references to colours allow copper carbonate remains (in the mixture)	1	AO1 4.4.2.3 RPA1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	to remove copper carbonate	allow to remove excess (copper carbonate)	1	AO1 4.1.1.2 4.4.2.3 RPA1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	electric heater **or** water bath	ignore Bunsen burner	1	AO1 4.4.2.3 RPA1

4.1.1.2 Mixtures

Answer 144 · Mark scheme

June 2024 | 8462/1F | Original Q8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	$92.8 = \frac{\text{mass produced}}{12.5} \times 100$	allow mass produced = % yield × $\frac{\text{max theoretical mass}}{100}$	1	AO2 4.3.3.1
	(mass produced) = $\frac{92.8}{100} \times 12.5$		1	
	= 11.6 (g)		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.6	(copper) does not react with (sulfuric) acid	allow is unreactive allow will not displace hydrogen allow is below hydrogen in the reactivity series ignore is not reactive enough	1	AO1 AO3 4.4.1.2 4.4.2.3
	(sodium) could explode **or** could get too hot	allow (the reaction is) dangerous	1	

Total Question 8	10

4.1.1.2 Mixtures

Answer 145 · Mark scheme

June 2024 | 8462/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	(drew start line in) ink ink runs / smudges / dissolves **OR** a pencil should be used (to draw the start line) (1) so that the ink does not run / smudge / dissolve (1)		1 1	AO3 4.8.1.3 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	2		1	AO3 4.8.1.3 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	(dye) **A** (reason) (dye) **A** travelled the same distance as a spot from (substance) **Y** **or** (dye) **A** has the same R_f value as a spot from (substance) **Y**	 allow (dyes) **B, C,** and **D** did not travel the same distance as either spot from (substance) **Y** allow (dyes) **B, C,** and **D** do not have the same R_f value as either spot from (substance) **Y** MP2 is dependent upon the award of MP1	 1 1	AO2 4.8.1.3 RPA6

4.1.1.2 Mixtures

Answer 145 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	(dye) **D** is insoluble (in water)	allow there is no attraction between (dye) **D** and water	1	AO3 4.8.1.3 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	$(R_f =) \frac{2.4}{6.0}$ = 0.4	 ignore units	1 1	AO2 4.8.1.3 RPA6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	solvent		1	AO2 4.8.1.3 RPA6

Total Question 3	**9**

4.1.1.2 Mixtures

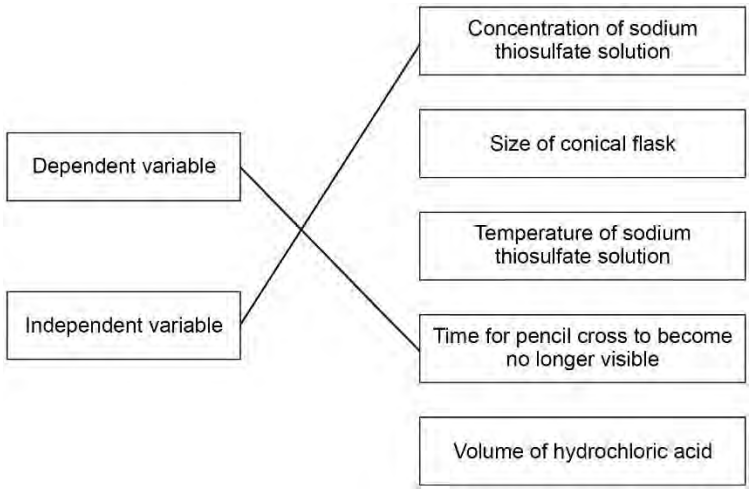
Answer 146 · Mark scheme

June 2024 | 8462/2F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	volume (of reactants) is 90 cm^3	allow volume (of reactants) is greater than 50 cm^3	1	AO3 4.6.1.2 RPA5
	(so conical) flask will overflow	allow (so) solutions will not fit (in conical flask)	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	measuring cylinder	allow (volumetric / graduated) pipette allow burette	1	AO1 4.6.1.2 RPA5

Question	Answers	Mark	AO / Spec. Ref.
05.3	 allow **1** mark if dependent variable and independent variable are identified the wrong way round do **not** accept more than **one** line drawn from a box on the left	1 1	AO1 4.6.1.2 RPA5

4.1.1.2 Mixtures

Answer 146 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	the time taken will increase		1	AO3 4.6.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	32 g/dm^3		1	AO3 4.6.1.1 4.6.1.2 RPA5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	the particles are closer together the particles collide more frequently		1 1	AO1 4.6.1.3 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.7	decreases increases		1 1	AO2 4.6.1.2 4.6.1.3 RPA5

Total Question 5	**11**

4.1.1.2 Mixtures

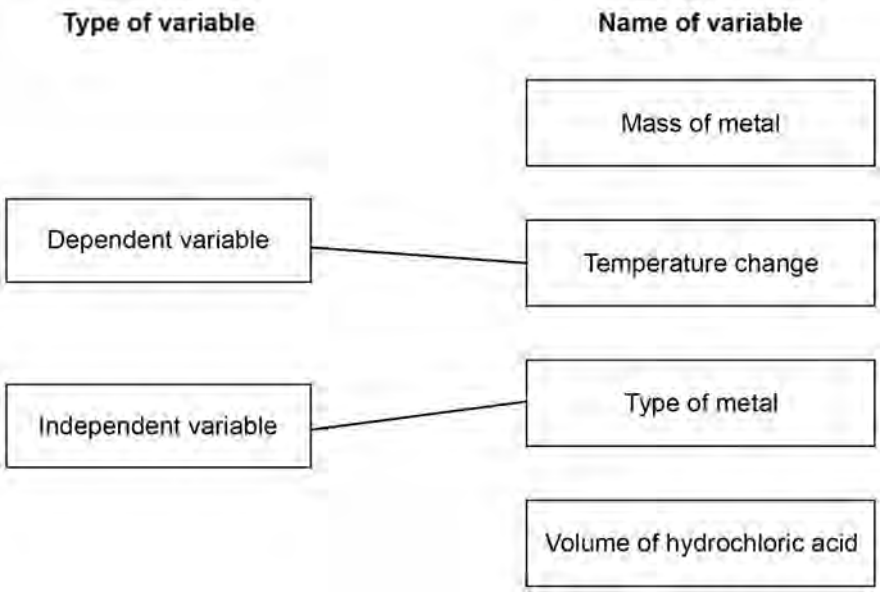
Answer 147 · Mark scheme

June 2025 | 8462/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	magnesium chloride		1	AO2 4.4.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	hydrogen		1	AO1 4.4.2.1

Question	Answers	Mark	AO / Spec. Ref.
02.3	 do **not** accept more than one line from a box on the left	1 1	AO1 4.5.1.1 RPA4

Answer 147 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	a polystyrene cup		1	AO3 4.5.1.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	2 °C		1	AO3 4.5.1.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	increases		1	AO1 4.5.1.1 RPA4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	**A**		1	AO1 4.5.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.8	**C**		1	AO1 4.5.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.9	**B**		1	AO1 4.5.1.2

Total Question 2	10

4.1.1.2 Mixtures

Answer 148 · Mark scheme

June 2025 | 8462/1F | Original Q5

Question 5

Question	Answers	Mark	AO / Spec. Ref.
05.1	<table><tr><td>molten compound</td><td>product at the negative electrode</td><td>product at the positive electrode</td></tr><tr><td>copper chloride</td><td>**copper**</td><td>chlorine</td></tr><tr><td>potassium bromide</td><td>potassium</td><td>**bromine**</td></tr></table>	1 1	AO2 4.4.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	O_2		1	AO1 4.1.1.1 4.2.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	aluminium ions are positive(ly charged) (so) are attracted to the negative electrode	 allow (and) opposite charges attract	1 1	AO1 4.4.3.1 4.4.3.2 4.4.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	(the mixture) has a lower melting point (than aluminium oxide) (so) less energy is required		1 1	AO3 AO1 4.4.3.3

4.1.1.2 Mixtures

Answer 148 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	carbon reacts with the oxygen produced		1	AO1 4.4.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	3.4 cm^3		1	AO2 4.4.3.4 RPA3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.7	hydrogen is less reactive than magnesium		1	AO1 4.4.3.4 RPA3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.8	the volume of hydrogen collected depends on **both** the current and the time		1	AO3 4.4.3.4 RPA3

4.1.1.2 Mixtures

Answer 148 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.9	(change in volume = 3.8 – 1.9 =) 1.9 (cm^3)	allow any correct matching pairs of values of volume and time for **2** marks	1	AO2 4.4.3.4 RPA3
	(change in time = 5 – 2.5 =) 2.5 (min)		1	
	(gradient =) $\frac{1.9}{2.5}$	allow correct use of incorrectly determined values of volume and / or time	1	
	= 0.76 (cm^3/min)	allow correct use of incorrectly determined values of volume and / or time	1	

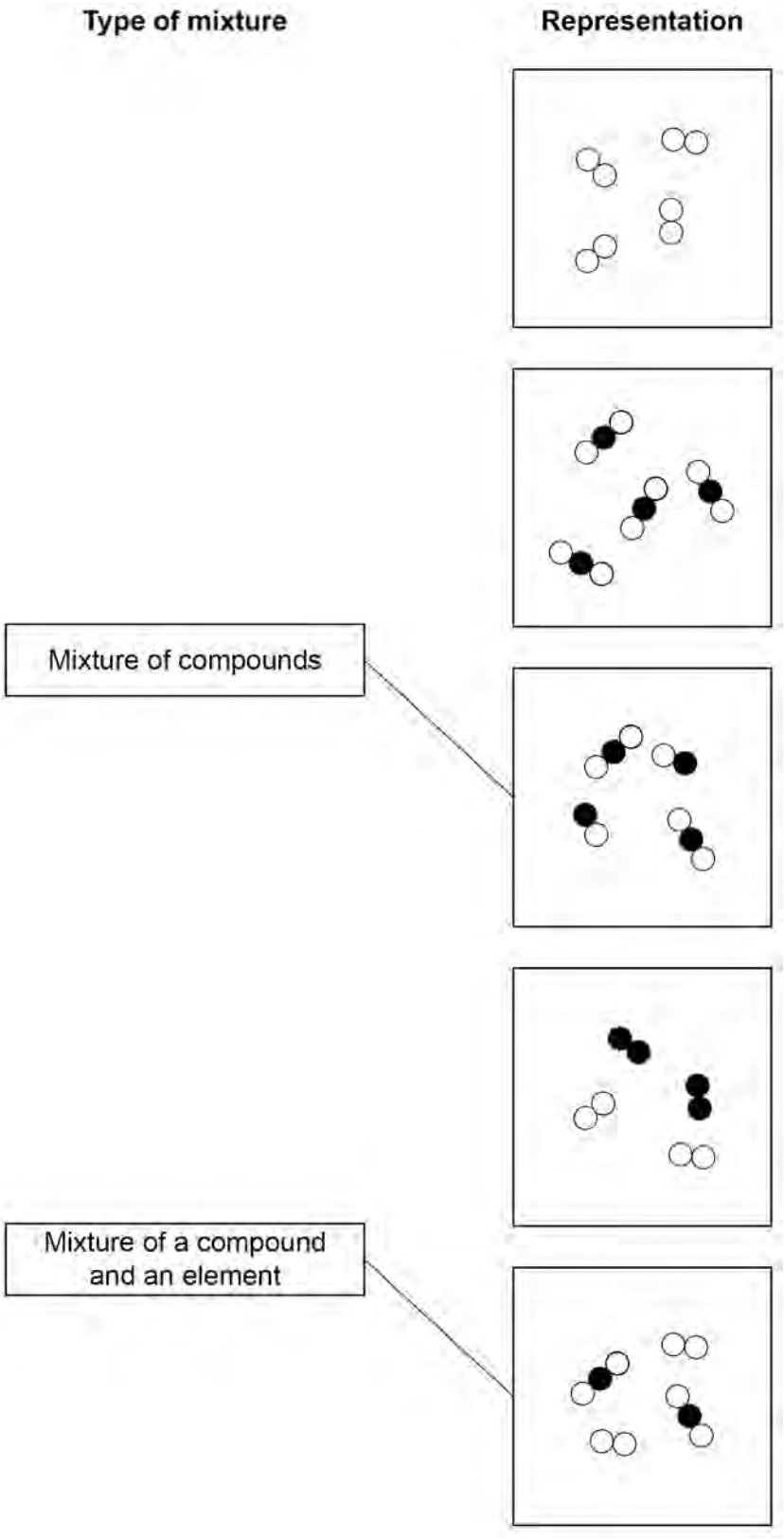
Total Question 5	**15**

4.1.1.2 Mixtures

Answer 149 · Mark scheme

June 2025 | 8462/1F | Original Q7

Question 7

Question	Answers	Mark	AO / Spec. Ref.
07.1	 do **not** accept more than one line from a box on the left	1 1	AO2 4.1.1.1 4.1.1.2

4.1.1.2 Mixtures

Answer 149 · Mark scheme

June 2025 | 8462/1F | Original Q7

Question	Answers	Mark	AO / Spec. Ref.
07.2	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5–6	AO3 4.1.1.2 4.4.2.3 RPA1
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content **add mixture to water** • in a beaker • place beaker on a tripod and gauze • heat • using a Bunsen burner • stir • using a glass rod • to dissolve the salt **filter using filter paper and funnel** • to remove the sand • the sand collects in the filter paper • rinse the sand • leave to dry **heat the salt solution** • in an evaporating dish • heat the solution to half volume **or** heat to crystallisation point • leave the remaining solution to form salt crystals • heat to dryness to obtain salt		

4.1.1.2 Mixtures

Answer 149 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	(% yield =) $\frac{13.6}{16.0} \times 100$		1	AO2 4.3.3.1
	= 85 (%)		1	

Total Question 7	**10**

4.1.1.2 Mixtures

Answer 150 · 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

4.1.1.2 Mixtures

Answer 150 · 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

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

4.1.1.2 Mixtures

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.

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4.1.1.2 Mixtures

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.

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.

4.1.1.2 Mixtures

CHY1F Question 1

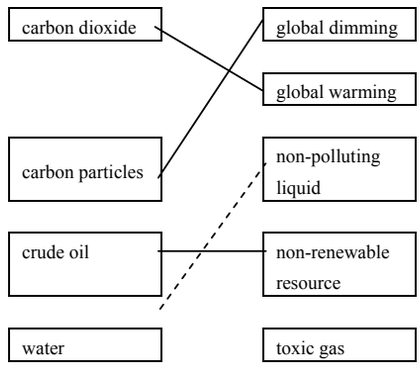
	answers	extra information	mark
(a)	low density unreactive		1 1
(b)	a polymer		1
(c)	any **one** from: • not broken down by (microorganisms) • does not decay (naturally)	ignore cannot recycle / degrade / disintegrate	1
total			4

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

4.1.1.2 Mixtures

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

4.1.1.2 Mixtures

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

4.1.1.2 Mixtures

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

4.1.1.2 Mixtures

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

4.1.1.2 Mixtures

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

4.1.1.2 Mixtures

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

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8462/1F - PAPER 1 FOUNDATION TIER

Mark scheme

8462

June 2018

Version/Stage: 1.0 Final

4.1.1.2 Mixtures

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

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

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MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

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
- the Assessment Objectives and specification content that each question is intended to cover.

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

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

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

2. Emboldening and underlining

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

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

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

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

3. Marking points

3.1 Marking of lists

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

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

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

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

[1 mark]

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

Example 2: Name two planets in the solar system.

[2 marks]

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

3.2 Use of chemical symbols / formulae

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

3.3 Marking procedure for calculations

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. Full marks can, however, be given for a correct numerical answer, without any working shown.

3.4 Interpretation of 'it'

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

3.5 Errors carried forward

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

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

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

3.9 Ignore

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

3.10 Do not accept

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

4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1: Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

Step 2: Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this.

The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

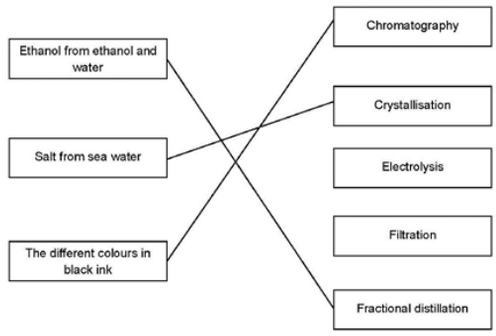
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1			1 1 1	AO1 4.1.1.2
01.2	include a (filter) funnel	allow funnel drawn on the diagram ignore clamp stand	1	AO3 4.1.1.2
01.3	evaporate condense	must be this order	1 1	AO1 4.1.1.2
01.4	$\frac{2}{20} \times 100$ = 10 (%)	an answer of 10 (%) scores **2** marks an answer of 11.1(%) **or** 90 (%) scores **1** mark	1 1	AO2 4.2.2.7
01.5	an alloy		1	AO1 4.2.2.7
01.6	the layers in the mixture are distorted		1	AO1 4.2.2.7

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	8000 nm^3		1	AO2 4.2.4.1
Total			**11**	

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	7		1	AO1 4.1.2.6
02.2	small molecule		1	AO2 4.1.2.6 4.2.2.4
02.3	F_2		1	AO1 4.1.1.1 4.1.2.6
02.4	the reactivity decreases (going down Group 7)	allow the reactivity decreases from chlorine to iodine	1	AO1 4.1.2.6
	(because) chlorine displaces bromine and iodine	allow (because) chlorine has two reactions allow (because) neither bromine nor iodine can displace chlorine	1	AO3 4.1.2.6
	(and) bromine displaces iodine **or** iodine does not react	allow (and) bromine has one reaction **or** iodine has no reactions allow (and) iodine cannot displace bromine	1	AO3 4.1.2.6
02.5	80		1	AO2 4.3.1.2

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	(1.2 kg =) 1200 (g) **or** (900 g =) 0.9 (kg)	an answer of 75 (%) scores **2** marks	1	AO2 4.3.3.1
	$(\frac{900}{1200} \times 100) = 75(\%)$ **or** $(\frac{0.9}{1.2} \times 100) = 75(\%)$	allow an answer correctly calculated from: $(\frac{900}{\text{incorrect attempt at conversion of 1.2}} \times 100)$ **or** $(\frac{\text{incorrect attempt at conversion of 900}}{1.2} \times 100)$	1	
Total			**9**	

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	nucleus neutron neutron electron proton	must be in this order	1 1 1 1 1	AO1 4.1.1.3 4.1.1.4 4.1.1.5
03.2	$(A_r)\ \frac{(63 \times 70) + (65 \times 30)}{100}$ = 63.6	an answer of 63.6 scores **2** marks	1 1	AO2 4.1.1.6
03.3	copper / Cu	allow ecf from answer to question **03.2**	1	AO2 4.1.1.1
03.4	$\frac{1.2 \times 10^{-10}}{10\,000}$ **or** $1.2 \times 10^{-10} \times 1 \times 10^{-4}$ $= 1.2 \times 10^{-14}$ (m)	an answer of 1.2×10^{-14} (m) scores **2** marks a correct answer not in standard form scores **1** mark	1 1	AO2 4.1.1.5
Total			**10**	

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	3.6 (cm^3)		1	AO2 4.4.3.4
04.2	hydrogen line only		1	AO3 4.4.3.4
04.3	both lines		1	AO3 4.4.3.4
04.4	graphite has delocalised electrons		1	AO1 4.2.3.2
04.5	**cathode** zinc (1) **anode** chlorine (1) hydrogen (1) bromine (1)	do **not** accept chloride allow **1** mark if chlorine and zinc the wrong way around do **not** accept bromide allow **1** mark if bromine and hydrogen the wrong way around	1+1 1+1	AO2 4.4.3.2 4.4.3.4
Total			**8**	

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	gas		1	AO1 4.2.2.2
05.2	the gas escapes	allow carbon dioxide escapes do **not** accept references to evaporation	1	AO1 4.3.1.3
05.3	5.12 (g)		1	AO2 4.3.1.3
05.4	4.00 (g) trial 1	allow 2.89 written in either space, or ringed in the table, unless contradicted by mass of copper carbonate or trial number	1	AO3 4.3.1.3
05.5	reheat (and reweigh) until constant mass	 an answer of heat to constant mass scores **2** marks if no other mark scored allow for **1** mark heat for longer **or** (heat at a) higher temperature **alternative approach**: (1) continue heating and pass gas through limewater (1) until the (lime)water stops bubbling **or** until the limewater no longer turns cloudy	1 1	AO3 4.3.1.3

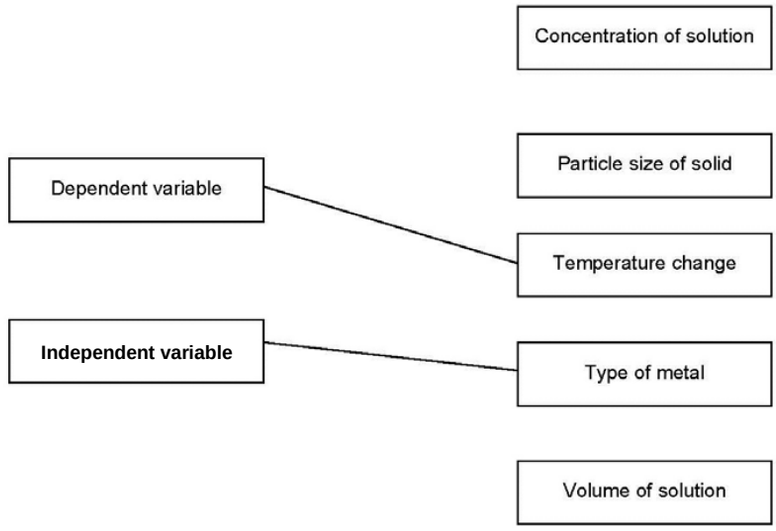
4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	straight line of best fit	must touch at least 5 of the 6 plots	1	AO2 4.3.1.3
05.7	correct value read from line of best fit in Figure 8	allow tolerance of ± ½ small square	1	AO2 4.3.1.3
05.8		a correctly calculated value from their answer to question **05.7** scores **2** marks		AO2 4.3.1.3
	(mass =) $168 \times \frac{\text{answer from question } \mathbf{05.7}}{8.4}$	allow (mass =) answer from question **05.7** × 20	1	
	correctly calculated value (g)		1	
Total			**10**	

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	 allow **one** mark if answers are reversed		1 1	AO1 4.5.1.1
06.2	polystyrene is a better insulator		1	AO3 4.5.1.1
06.3	both bars labelled both bars correctly plotted	 allow tolerance of ± ½ small square ignore width and spacing of bars if no other mark scored, allow **1** mark for any one bar correctly plotted and labelled	1 1	AO2 4.5.1.1

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	temperature increases **or** temperature does not decrease	ignore because it is exothermic allow (because) energy / 'heat' is transferred to the surroundings energy / 'heat' is not taken in from the surroundings allow the energy of the products is less than the energy of the reactants	1	AO3 4.5.1.1
06.5	(most reactive) magnesium (zinc) nickel	this order only	1	AO3 4.5.1.1 4.4.1.2
06.6	suitable method described the observations / measurements required to place in order an indication of how results would be used to place the unknown metal in the reactivity series **approaches that could be used:** **approach 1:** add the unknown metal to copper sulfate solution (1) measure temperature change (1) place the metals in order of temperature change (1)		1 1 1	AO3 4.4.1.2 4.5.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6 cont.	**approach 2:** add the metal to salt solutions of the other metals **or** heat the metal with oxides of the other metals (1) measure temperature change (only if salt solutions used) **or** observe whether a chemical change occurs (1) compare temperature change or whether there is a reaction to place in correct order (1) **approach 3:** add all of the metals to an acid (1) measure temperature change or means of comparing rate of reaction (1) place the metals in order of temperature change or rate of reaction (1) **approach 4:** set up electrochemical cells with the unknown metal as one electrode and each of the other metals as the other electrode (1) measure the voltage of the cell (1) place the metals in order of voltage (1)			
06.7	D		1	AO1 4.5.1.2
06.8	C		1	AO1 4.5.1.2
Total			**12**	

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	sodium oxide	allow Na_2O	1	AO2 4.1.1.1 4.1.2.5 4.4.1.1
07.2	oxidation		1	AO1 4.4.1.1
07.3	13		1	AO1 4.4.2.4
07.4	sodium hydroxide		1	AO2 4.1.1.1
07.5	OH^-		1	AO1 4.4.2.4
07.6	(volume =) $\frac{250}{1000}$ or ¼ or 0.25 (dm^3) **or** (mass per cm^3 =) $\frac{40}{1000}$ (g) or 0.04 (g) ($\frac{250}{1000}$ × 40 =) 10 (g)	an answer of 10 (g) scores **2** marks	1 1	AO2 4.3.2.5

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7	all points correct	allow a tolerance of ± ½ a small square allow **1** mark for 3 points correct ignore any attempt at a line of best fit	2	AO2 4.1.2.5
07.8	39 (°C)	allow any value from 34 to 46 (°C)	1	AO2 4.1.2.5
Total			**10**	

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	any **one** from: • metal • (metal) hydroxide • (metal) carbonate • alkali	allow named example allow correct formula ignore base allow ammonium hydroxide allow ammonium carbonate allow soluble base allow ammonia	1	AO1 4.4.2.1 4.4.2.2 4.4.2.3
08.2	$Ca(NO_3)_2$	allow $Ca^{2+}(NO_3^-)_2$	1	AO2 4.4.2.2

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Mark	AO / Spec. Ref.
01.3	**Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO1 4.4.2.3
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content • use magnesium oxide and sulfuric acid • add sulfuric acid to a beaker • warm sulfuric acid • add magnesium oxide • stir • continue adding until magnesium oxide is in excess • filter • using a filter paper and funnel • to remove excess magnesium oxide • heat solution in an evaporating basin • to crystallisation point • leave to crystallise • pat dry with filter paper credit may be given for diagrams		
Total			**8**

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	FeS_2	do **not** accept equations	1	AO2 4.2.1.3
09.2	26 30 26	must be this order	1 1 1	AO2 4.1.1.4 4.1.1.5
09.3	any **two** from: • iron has a high(er) melting / boiling point • iron is dense(r) • iron is hard(er) • iron is strong(er) • iron is less reactive • iron has ions with different charges • iron forms coloured compounds • iron can be a catalyst	allow the converse statements for sodium allow transition metal for iron allow Group 1 metal for sodium ignore references to atomic structure ignore iron rusts allow iron is less malleable / ductile allow specific reactions showing difference in reactivity allow iron is magnetic	2	AO1 4.1.2.5 4.1.3.1 4.1.3.2

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	carbon is more reactive (than nickel)	allow converse	1	AO1 4.4.1.2 4.4.1.3
	(so) carbon will displace / replace nickel (from nickel oxide) **or** (so) carbon will remove oxygen (from nickel oxide)	allow (so) nickel ions gain electrons allow (so) carbon transfers electrons to nickel (ions)	1	
09.5		an answer of 67.8 (%) scores **3** marks an answer of 67.8160919 (%) or correctly rounded answer to 2, 4 or more sig figs scores **2** marks an incorrect answer for one step does **not** prevent allocation of marks for subsequent steps		AO2 4.3.3.2
	(total M_r of reactants =) 87		1	
	(percentage atom economy) $= \frac{59}{87} \times 100$	allow (percentage atom economy) $= \frac{59}{\text{incorrectly calculated } M_r} \times 100$	1	
	= 67.8 (%)	allow an answer from an incorrect calculation to 3 sig figs	1	
Total			**11**	

4.1.1.2 Mixtures

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	copper, zinc, sodium chloride solution		1	AO2 4.5.2.1
10.2	a reactant is used up	allow the reaction stops allow electrolyte / electrode / ions / metal / metal hydroxide / alkali for reactant	1	AO1 4.5.2.1
10.3	the reaction is not reversible		1	AO1 4.5.2.1
10.4	$2H_2 + O_2 \rightarrow 2H_2O$	allow fractions / multiples allow **1** mark for O_2	2	AO1 AO2 4.1.1.1 4.5.2.2

<table>
<tr><th>Question</th><th>Answers</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td rowspan="5">10.5</td><td>Level 3: A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.</td><td>5–6</td><td>AO3</td></tr>
<tr><td>Level 2: Some logically linked reasons are given. There may also be a simple judgement.</td><td>3–4</td><td>AO3</td></tr>
<tr><td>Level 1: Relevant points are made. This is not logically linked.</td><td>1–2</td><td>AO2</td></tr>
<tr><td>No relevant content</td><td>0</td><td></td></tr>
<tr><td>Indicative content

reasons why fuel cells could be judged as better
<table>
<tr><th>from the table</th><th>from other knowledge</th></tr>
<tr><td>• time for refuelling a fuel cell is faster than recharging
or
a fuel cell does not need to be recharged
• a fuel cell has a greater range</td><td>• hydrogen can be renewable if made by electrolysis using renewable energy
• lithium-ion batteries can catch fire
• produces only water
or
no pollutants produced
• lithium-ion batteries may release toxic chemicals on disposal
• lithium-ion batteries (eventually cannot be recharged so) have a finite life</td></tr>
</table>
reasons why the lithium-ion battery could be judged as better
<table>
<tr><th>from the table</th><th>from other knowledge</th></tr>
<tr><td>• lithium-ion uses energy more efficiently
• cost of lithium-ion car much less
• cost of recharging much less than refuelling with hydrogen</td><td>• hydrogen is often made from fossil fuels so is not renewable
• charging points are more widely available than hydrogen filling stations
• hydrogen takes up a lot of space
or
is difficult to store
• hydrogen can be highly flammable / explosive
• no emissions produced
• (catalyst in the hydrogen fuel-cell eventually becomes poisoned so) have a finite life</td></tr>
</table></td><td></td><td>4.4.3.4
4.5.2.1
4.5.2.2</td></tr>
<tr><td>Total</td><td></td><td></td><td>11</td></tr>
</table>

4.1.1.2 Mixtures

Answer 113 · Examiner comments

June 2018 | 8462/1F | Original Q1

Question 1 (low demand)

01.1 74% of students achieved two or more marks, with 34% of students achieving all three. The vast majority of students knew that black ink would be separated by chromatography, but filtration was a popular incorrect answer for obtaining salt from seawater.

01.2 This question was not well answered. Many students did not know what to call a funnel, referring to it as a plastic cone. Other errors were to use more pieces of paper, or to suggest substituting a beaker for the conical flask. Answers which gave diagrams gained credit.

01.3 69% of students gained both marks, with about one in eight scoring neither.

01.4 51% of students scored both marks on this, the first calculation on the paper. Partial credit was given to those who calculated 2 ÷ 18 as a percentage rather than 2 ÷ 20, or who correctly calculated the percentage of metal A instead of metal B.

01.5 68% of students knew that a mixture of metals is an alloy. The most popular incorrect answer was ‘a compound’.

Answer 113 · Examiner comments

June 2018 | 8462/1F | Original Q1

01.6 48% of students realised that the correct answer is that the layers in the mixture are distorted. 25% of students thought that the correct answer is that ‘the mixture has a giant structure’. Whilst true, this statement does not give the correct explanation for the extra hardness of the mixture.

01.7 74% of students could calculate the volume of the cube correctly. The most popular distractor was 400 nm^3, with 400 nm^2 being the surface area of one face.

4.1.1.2 Mixtures

Answer 114 · Examiner comments

June 2018 | 8462/1F | Original Q6

Question 6 (low and standard demand)

06.1 25% of students could identify both variables, with 41% identifying one. This was usually the independent variable.

Many thought that the concentration of the solution was the dependent variable. A compensatory mark was awarded to those who identified the two correct variables but had them the wrong way round.

06.2 86% of students understood the reason for using a polystyrene cup in this required practical activity.

06.3 This question was very well done, with 83% of students able to draw a bar chart correctly. Of those who achieved a single mark, forgetting to label the bars was more common than mis-use of the scale.

06.4 50% of students answered correctly. Of the unsuccessful attempts, many failed to express their ideas coherently. Some confused endothermic with exothermic, eg saying the temperature decreased, ignoring the evidence in front of them.

There was confusion between heat and temperature: heat is not increasing, and temperature is not given out. Some students thought ‘taking in heat’ means the temperature would rise. This shows a common misunderstanding of endothermic reactions: students think that heat energy is moving, rather than being converted from heat energy to chemical energy.

06.5 81% of students were able to give the correct order of reactivity.

4.1.1.2 Mixtures

Answer 114 · Examiner comments

June 2018 | 8462/1F | Original Q6

06.6 Students found this question difficult to answer. 19% of students achieved all three marks, although47% achieved at least one mark. 14% of students did not attempt the question.

Students answer in terms of repeating the experiment using the unknown metal, and reorder the four elements according to the temperature change. However, many decided to use a different method, with varying degrees of success.

Alternative approaches that were accepted were:

- reacting all four metals with an acid and assessing the rate of reaction or temperature change
- carrying out a series of displacement reactions, either by adding the unknown metal to salt solutions of the other three metals, or by heating the unknown metal with oxides of the others
- using the unknown as the test electrode in a series of electrochemical cells and measuring the voltage.

Approaches that were not accepted included:

- trying to react the metal with the other metals
- measuring melting or boiling point
- looking at the periodic table.

06.7 53% of students could identify line D as the correct answer. A decent number of students confused products with reactants.

06.8 This was well done, with 75% of students able to identify the activation energy on the reaction profile.

4.1.1.2 Mixtures

Answer 115 · Examiner comments

June 2018 | 8462/2F | Original Q5

Question 5 (low demand)

05.1 39% of the answers correctly identified both methods of making the solution more concentrated. A significant number ignored the instruction to tick two boxes, by ticking one.

05.2 A large majority knew that the start line should not be in ink. But far fewer picked up the clue in the stem, that the colours were insoluble in water.

05.3 This was well answered, with 70% of students achieving both marks.

05.4 Full marks were achieved by 93% of students. The only common errors were caused by either inverting the values in the given formula or multiplying instead of dividing.

4.1.1.2 Mixtures

Answer 116 · Examiner comments

June 2018 | 8462/2F | Original Q8

Question 8 (standard demand)

08.1 38% of students gave yellow or orange. There was a lot of variety in the wrong answers with all the colours of the spectrum represented.

08.2 Copper was the most common answer given although a few gave barium

08.3 A lot of students lost this mark as it was unclear if they were talking about the mixture of flame colours or the mixture of metal ions. 29% of students answered correctly.

08.4 57% of students correctly identified both of the ions in the flame emission spectrum.

08.5 3% of students identified the correct answer as bromide. A few put bromine but most seemed to guess.

08.6 The test for sulfate ions was not well known: 10% achieved the mark while 42% of students left it blank.

4.1.1.2 Mixtures

Answer 117 · Examiner comments

June 2018 | 8462/2F | Original Q9

Question 9 (standard demand)

09.1 2% of students recognised a formulation from this part of the specification.

09.2 This was a more difficult calculation as there were lots of numbers given in the question. It appeared to presented little difficulty for some students, however.

09.3 Reading the stem would have avoided answers such as ‘to make it more attractive to drink’. 14% of students realised that it was to warn people not to drink it.

09.4 Uses of ethanol, and therefore methylated spirits, as a solvent, steriliser and fuel were well known with 42% of students achieving the mark.

09.5 Very few students knew about the production of ethanol from sugar solution by fermentation. Some knew the name of the process but could give no correct detail. 8% of students achieved two or three marks.

09.6 3% of students could complete the displayed formula for ethanol. Ethane was the most common answer, but more students did not attempt this question.

09.7 12% of students knew that hydrogen would be the gas produced.

09.8 Even fewer knew that an oxidising agent was required.

Answer 118 · Examiner comments

June 2018 | 8462/2F | Original Q10

Question 10 (standard demand)

10.1 27% of students realised that the other gas used in the Haber process is hydrogen.

10.2 Few knew the temperature and pressure used in the process. This was made even more challenging as they had to give the correct units as well. 12% of students achieved any marks for this question.

10.3 7% of students could explain why only the ammonia, and not the other gases, turn into a liquid because its boiling point is higher.

10.4 This was another 'extended response', 'level marked' question. This time there were three levels and the command word was 'explain'. Again, the question was marked holistically. Students were given information about the current atmosphere of Venus, believed to be similar to that on the early Earth, and the Earth's atmosphere today. Generally, a level 1 response used the percentages given to say in which direction the amounts of these gases had moved. Level 2 moved beyond this, giving an explanation in terms of one process, such as photosynthesis or dissolving in oceans. Level 3 responses usually gave more than one process, for example both of the processes mentioned above. Many students talked only about the changes in the last few centuries, which was not what the question was asking. 47% of students were able to reach level 2 or 3.

10.5 Few students seemed aware of the timescale under consideration here, namely the atmosphere of billions of years ago. A lack of evidence or proof was also accepted.

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account on how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

4.1.1.2 Mixtures

Answer 119 · 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 119 · 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.

4.1.1.2 Mixtures

Answer 133 · 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 133 · 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.

4.1.1.2 Mixtures

Answer 134 · Examiner comments

June 2022 | 8462/1F | Original Q10

Question 10 (Standard demand)

10.1 Many students found planning this practical challenging; less than 5% of answers reached Level 3. Of those who did realise they simply had to add measured masses of sodium carbonate to a measured volume of hydrochloric acid and measure the highest temperature, many compromised their response by heating the mixture with a Bunsen burner. Incorrect approaches included heating the sodium carbonate powder alone to melt it or measuring the loss in mass during the reaction. A significant minority answered in terms of one of the Required Practical Activities, usually the preparation of a salt.

10.2 The calculation was done well, with over 60% of students scoring 3 or more marks. Many students determined the gradient correctly, with most using the coordinates of the points at the limits of the printed line. However, many appeared to misread the scale on the *y*-axis, reading 28.6 as 28.3 and 22.2 as 22.1. Many did not annotate their graph, making it very difficult for examiners to judge whether the *x*-coordinates corresponded to the given *y*-coordinates. Students should always show their working in full, including annotating the graph to enable working marks to be awarded. A sizeable minority of students took a single point on the line and divided the temperature by the mass. Very few correct units were seen; many students did not obtain the unit by dividing the units on the *y*-axis by those on the *x*-axis.

10.3 Most students extrapolated the line to the *y*-axis correctly to read off the value of initial temperature. Some misread the intercept as 20.3 °C. Some students appeared to ignore the information in the question and gave the value of temperature at one end or the other of the printed line. Others attempted to give a value without extrapolating the line.

10.4 Two-thirds of students chose the correct graph, **C**.

10.5 This was poorly answered, with many students appearing to think the vertical axis involved temperature and/or time. Of those who did mention energy, many gave activation energy as one, or even both, of the answers. Only a quarter of students scored one mark and less than 10% scored both.

10.6 Only one third of students scored the mark. Most students did not refer to the relative energies of the reactants and products. Some students appear to believe that an exothermic reaction is one where substances are lost to the surroundings, rather than energy.

4.1.1.2 Mixtures

Use of statistics

Statistics used in this report may be taken from incomplete processing data. However, this data still gives a true account of how students have performed for each question.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the Results Statistics page of the AQA Website.

4.1.1.2 Mixtures

Answer 135 · Examiner comments — June 2022 | 8462/2F | Original Q4

Question 4 (Low and standard demand)

04.1 Around 40% of students were able to complete the displayed structural formula. Others added double bonds or even extra atoms.

04.2 Over 70% of the students gained a mark for their knowledge of hand gels as a use of ethanol. A sizeable minority chose testing for hydrogen.

04.3 This was an extended response question on chromatography and was quite well answered, with most students gaining at least two marks. However access to level 2 was often restricted by missing out one or more of the key steps, without which the investigation would not work. Around a quarter of the students gained all four marks, and around one-third gained two.

04.4 Students found this question challenging, with fewer than 15% of students recognising that yeast must be added.

04.5 This was a more challenging calculation which also needed a unit conversion. About 25% students gained full marks, with just under half gaining at least 1 mark.

04.6 Many students answered in terms of petrol, which cannot possibly remove carbon dioxide from the atmosphere. Many answered in terms of E10 containing more ethanol, without going on to give a further explanation. The ideas of more sugar or plants being needed to carry out more photosynthesis to remove more carbon dioxide were needed. Only around 10% of the students gained all three marks.

04.7 Around 30% of the students realised that E10 produced less energy than E5.

Answer 136 · Examiner comments — June 2022 | 8462/2F | Original Q5

Question 5 (Low and standard demand)

05.1 Nearly 40% of the students gained two marks, with many of the remainder reversing the correct responses.

05.2 Over 40% of the students knew that nitrogen and hydrogen are both gases. Roughly the same number incorrectly selected an option that stated one of these elements is a gas and the other a liquid.

05.3 Fewer than 20% of the students gained a mark. A large majority thought that the reversibility of the reaction was linked to 100% atom economy.

05.4 Both evaporated and filtered were often seen. There was no obvious pattern in the responses and over 30% of the students gained both of the marks.

05.5 Around one-third of students obtained all three marks.
Over 50% of students plotted the points correctly but did not obtain the line of best fit mark. Common mistakes when drawing the line of best fit were to draw a straight line, a series of dot-to-dot straight lines, a very thick line or multiple lines.

05.6 About two-thirds of students realised that the percentage yield of ammonia would also increase.

4.1.1.2 Mixtures

Answer 137 · Examiner comments — June 2022 | 8462/2F | Original Q6

Question 6 (Low and standard demand)

06.1 The equation was correctly balanced by about three-quarters of the students.

06.2 Over 80% of the students knew that (s) represents a solid reactant.

06.3 The use of a cross on paper to monitor the turbidity of the sulfur produced was known by over 70% of the students, although use of a gas syringe was a common incorrect response.

06.4 Over 80% of the students gained the mark, by associating a drop in gradient on the graph with a fall in the rate of reaction.

06.5 Many deduced that one of the reactants was used up, with over 60% of the students gaining a mark. A sizeable number asserted that no light was reaching the sensor, even though the graph did not reach $y = 0$.

06.6 Over 60% of the students gained a mark, but most of the remainder thought that the line would be less steep at the start.

06.7 Over 50% of the students gained two marks. However, there was a wide range of incorrect response combinations, the most common of which used the two responses which were linked to a higher temperature rather than a lower one.

Answer 138 · Examiner comments — June 2022 | 8462/2F | Original Q7

Question 7 (Low and standard demand)

07.1 Over 80% of the students were able to identify nitric acid.

07.2 Around 25% of the students gained both marks, but a significant number inverted the equation when carrying out the calculation. .

07.3 The idea of bias was well known to some students, but many responses blamed inadequate testing in one form or another. Around 25% of the students gained the mark.

07.4 Over half of the students were able to deduce that there was one nitrogen atom in the formula. Two and four were sometimes seen.

07.5 Over 40% of the students gained the mark, but almost as many incorrectly identified oxygen.

07.6 The term “formulation” was not well known with fewer than 5% of the students giving a correct response.

4.1.1.2 Mixtures

Answer 139 · Examiner comments

June 2023 | 8462/1F | Original Q7

Question 7 (low and standard demand)

07.1 This question was answered by fewer than half of the students showing that many students do not read the entire question, but focus only on the sentence above an answer line. As there was no answer line, the instruction to complete Figure 8 was missed. Of those who did respond, most scored at least one mark.

Most of those who did answer realised that two of each ion should be drawn, but many placed the ions directly under the same type of ion, instead of in the alternate positions.

07.2 This standard demand question proved to be difficult even with the prompt to refer to ions. There were few references to electrons, showing that students had taken note of this prompt; however, the idea that ions can move in the liquid state was not given by many students.

07.3 This question was well answered, with more than three quarters of students scoring both marks. Potassium was nearly always correct, but bromine was often incorrectly described as bromide.

07.4 Only a half of the students knew that the mixture has a lower melting point than pure aluminium oxide, with the majority of the rest opting for a higher melting point.

Answer 139 · Examiner comments

June 2023 | 8462/1F | Original Q7

07.5 Only a half of students knew that the source of the hydrogen and oxygen is water. Most of the other chose sulfate ions.

07.6 Again, roughly a half of students knew the reason for the production of hydrogen rather than sodium, with nearly as many choosing the incorrect statement that hydrogen is more reactive than sodium.

07.7 Some students were not specific enough about the relationship of the volumes, merely stating that as one increased, so did the other. However, many gave excellent descriptions of the volume of hydrogen being twice that of oxygen. Just over a half of students scored the mark.

4.1.1.2 Mixtures

Answer 140 · Examiner comments — June 2023 | 8462/2F | Original Q2

Question 2 (Low demand)

02.1 More than two thirds of students were able to use the information provided in the table to provide two correct reasons as to why poly(propene) beakers should not be used to heat liquids. More students suggested that poly(propene) would burn rather than melt. Common incorrect responses did not refer to the effect of heat on poly(propene) instead referring to the effect of the liquid being heated on the polymer.

02.2 More than half of students used the information in the table to suggest a reason why using poly(propene) beakers could save money. The most common incorrect responses did not include a comparison to the glass beakers so that the unqualified 'because they are tough' added no value to the data in the table. Some students used the wrong column and said the poly(propene) does shatter (on impact) even though this then made no sense in the context of saving money.

02.3 More than half of students successfully identified boron trioxide as a raw material for making borosilicate glass.

02.4 More that 90% of students obtained at least one mark on this question (usually for completing the 'name' column correctly) with just over 50% achieving both marks. The most common incorrect response was to incorrectly identify the number of carbon atoms. A minority of students failed to identify the number of atoms but instead calculated the mass of each element.

02.5 This question was very well answered with over 80% of students correctly identifying the repeating unit of poly(propene). The distractors attracted roughly equal support.

02.6 Students struggled to recognise and correctly identify the stages needed to produce poly(propene) from the descriptions provided in the question. Quite often, correct processes were identified but sequenced incorrectly. Less than one-third of students obtained all three marks and less than half achieved 2 marks.

02.7 Just over one third of students achieved 2 marks to identify both of the words that described a hexene molecule during a polymerisation reaction. About half of students achieved 1 mark by identifying hexene as an alkene or by identifying it as a monomer.

Answer 141 · 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

4.1.1.2 Mixtures

Answer 141 · 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 142 · 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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4.1.1.2 Mixtures

Answer 142 · 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**.

4.1.1.2 Mixtures

Answer 143 · Examiner comments

June 2024 | 8462/1F | Original Q3

Question 3 (low and standard demand)

03.1 Two thirds of students recognised this as a displacement reaction. Combustion proved surprisingly popular.

03.2 Nearly a half of students scored 2 or 3 marks on this calculation. A common error was to give the answer to three decimal places instead of three significant figures. A few students thought that 39.81 should be rounded up to 39.9, and some left a recurring dot on the $\dot{8}$ of 39.$\dot{8}$ (so an infinite number of significant figures). Many students operated on the data provided seemingly at random, with addition, subtraction and multiplication seen as well as the division the wrong way round. It was common to leave the ' × 100' out of the expression, so that marking point 1 could not be awarded if the answer was incorrect.

03.3 Two thirds of students identified the volume of copper sulfate solution as the control variable.

03.4 Two thirds of students gave the correct answer. Some students gave the minimum or maximum temperature as their answer, rather than reading the mass at the turning point of the graph.

03.5 Most students realised that they needed to subtract the minimum temperature from the maximum, and three fifths of students scored at least one mark. Some, however, misread those values from the graph, with 45.4 – 20.4 being frequently seen. Although this gave the correct answer, it was as the result of incorrect working so did not score both marks. A minority of students were unable to start the calculation, and various multiplications of random values were seen.

03.6 Over a half of students gave a fully correct answer. Many students could not convert their volume to dm^3 even given the conversion factor, with many trying to do a calculation involving the mass of copper sulfate. However, partial credit was then awarded for those who substituted their value of volume into the given equation and calculated the results correctly. Many students do not seem to understand the terms volume and concentration, and that they mean different things.

03.7 Just over a half of students were able to draw two sharp straight lines, with a ruler, which passed through all the points. Some did not use a ruler, and a few drew an extra line joining the first and last points, meaning that full marks could not be awarded.

03.8 Students struggled with this standard demand question, with only a quarter gaining a mark. More than a half of students selected the second distractor, in which both parts of the statement are the opposite of the correct version. When temperature decreases, heat energy is being taken in from the surroundings and converted to chemical energy, so the reaction is endothermic. It is this reduction in heat energy that causes the temperature decrease. A misconception for many students is thinking that when heat energy is taken in from the surroundings it remains as heat energy in the system, causing the confusion with the direction of temperature change.

4.1.1.2 Mixtures

Answer 144 · Examiner comments — June 2024 | 8462/1F | Original Q8

Question 8 (standard demand)

08.1 Nearly a half of students gave one correct product, although only about one in seven could give both. Copper sulfate was the most common correct answer but the two words were sometimes split either side of the + sign as if they were two substances. Copper and sulfur was another popular combination.

08.2 About a half of students gave a correct observation that would show that the reaction was no longer proceeding. Many did not realise that they were looking for signs of the reaction having stopped, and gave observations they would make while it was still ongoing.

08.3 Nearly two fifths of students were able to state that filtering is used to remove the excess copper carbonate. However, there were many answers that were expressed vaguely in terms of removing impurities, separating solids from liquids, or even removing the wrong substance such as the acid.

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Answer 144 · Examiner comments — June 2024 | 8462/1F | Original Q8

08.4 Only one in six students could give one of the two methods in the specification, i.e. a water bath or an electric heater. The use of a water bath was by far the more popular correct response. Many, however, simply stated that a Bunsen burner would be used. This was an insufficient response unless a beaker of water was also present.

08.5 Nearly a half of students scored two or three marks. Many could not substitute the correct values into the expression. There were often attempts to bring 50 cm^3 into the calculation. Rearrangement of the equation also proved difficult for some students.

08.6 Students struggled with this question, with fewer than one in five scoring one mark and very few scoring two. Many focused on physical properties of the metals, such as boiling point or conductivity, rather than their reactivity. Of those who did consider reactivity, many had the relative reactivities the wrong way round. Responses were often vague; for example ‘high reactivity’ for sodium was insufficient for the mark, as high reactivity on its own does not explain what the problem is.

Answer 145 · Examiner comments — June 2024 | 8462/2F | Original Q3

Question 3 (low and standard demand)

03.1 Over 55% of students obtained two marks by correctly identifying the mistake and providing a correct reason. Almost 30% of students obtained one mark usually by correctly identifying the mistake as using ink but providing an insufficient reason for the mistake such as mix, ruin, or affect the result. In this question there was evidence of students not understanding the meaning of the terms solute and solvent and using them incorrectly.

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4.1.1.2 Mixtures

Answer 145 · Examiner comments June 2024 | 8462/2F | Original Q3

03.2 Nearly 80% of students correctly identified the number of different dyes in substance **Y**. The most common incorrect response was five, where students had mistakenly counted the spots on the chromatogram.

03.3 Over 70% of students correctly identified dye **A** as being present in substance **Y** but only 17% of students provided a correct reason. The most frequently seen incorrect reason was to state that both travelled the same distance failing to take account of the second dye in **Y**. Other vague insufficient reasons that were frequently seen included that the dyes were in line or in the same place.

03.4 Less than 15% of students identified that dye **D** must be insoluble. The most frequently seen incorrect responses included that the dye did not react with the water, was permanent, waterproof, or suggested that the dye was not soluble enough. Other incorrect responses included the idea that substance **D** was pure or contained no other dyes and so could not separate.

03.5 Nearly 90% of students were able to correctly substitute into the equation provided and calculate the R_f from the values given. The most common incorrect response was the values being substituted incorrectly.

03.6 Just over 50% of students correctly identified water as being a solvent. The most common incorrect distractor was solute.

4.1.1.2 Mixtures

Answer 146 · Examiner comments June 2024 | 8462/2F | Original Q5

Question 5 (low and standard demand)

05.1 One in two students were able to correctly explain why a 50 cm^3 flask is unsuitable for use in the method provided and obtain both marks. A further one in four achieved one mark for recognising that the flask was too small but did not provide a reason as to why this would be a problem.

05.2 More than 65% of students were able to correctly name a suitable piece of apparatus for measuring volume. The vast majority of students answered measuring cylinder with burette being a popular second choice. Care should be taken over the spelling of burette to avoid the incorrect response biuret.

05.3 Just over one third of students achieved both marks in this question and a further third achieved one mark. Students appeared to struggle to recognise and correctly identify both the independent and dependent variables. A sizeable number of students identified the independent and dependent variables the wrong way around achieving the compensation mark. It is important that students read the question carefully as there was a significant number of students who drew multiple lines from each box.

05.4 Over 4 in 5 students correctly identified that the time taken for the cross to disappear would increase.

05.5 Over 75% of students correctly identified the concentration of sodium thiosulfate that had the highest rate of reaction.

05.6 This question was well answered with over 90% of students being able to identify at least one correct statement to explain the effect of increasing the concentration. Almost 50% of students correctly identified both statements.

05.7 Just over 60% of students correctly identified what would happen to the time taken for the cross to disappear for both of the changes made to the investigation with a further 10% of students correctly identifying the effect of just one change. The most common incorrect response was to reverse the order.

Answer 147 · Examiner comments

June 2025 | 8462/1F | Original Q2

Question 2 (low and standard demand)

02.1 More than four fifths chose the correct name. Magnesium nitrate was a more popular distractor than magnesium sulfate.

02.2 Fewer than three fifths chose hydrogen as the correct gas. Chlorine was by far the most popular distractor, and oxygen the least.

02.3 Fewer than two fifths of students could identify both variables, but another third could identify one. More students could identify the independent variable correctly than the dependent variable, with the volume of hydrochloric acid being a popular wrong choice for the dependent variable. Some students identified the correct two variables but had them the wrong way round, and a few drew multiple lines from the same box, which automatically negated any marks.

02.4 More than three fifths gave the correct answer, with the two distractors being approximately equal in popularity.

02.5 Just over a third of students gave 2 °C as the resolution of the thermometer, with the majority incorrectly opting for 20 °C. Many appear to think that the resolution of an instrument is the gap between numbered values on the scale rather than the size of the smallest scale division.

02.6 Fewer than half of responses gave the correct answer, with more than half believing that temperature decreases in an exothermic reaction.

02.7 Nearly three quarters of students were able to identify **A** as the reactants. **C** was the most popular distractor, followed by **B** and **D**.

02.8 More than four fifths could identify **C** as the activation energy, with **A** being the most popular distractor.

02.9 Only a quarter of students were able to identify **B** as the overall energy change, with **E** being by far the most popular response.

Answer 148 · Examiner comments — June 2025 | 8462/1F | Original Q5

Question 5 (low and standard demand)

05.1 This was very well answered, although a few said bromide rather than bromine. Four fifths of students scored both marks.

05.2 Three quarters of students chose the correct formula. The most popular distractor was O^2.

05.3 Students found this question difficult and one in ten did not attempt it. Many stated that aluminium, rather than aluminium ions, is positive. The attraction between the positive ions and the negative electrode was better expressed.

05.4 Again, students found this difficult despite the data provided as a prompt, and again one in ten made no attempt. Few students stated clearly that the mixture has a lower melting point, and even fewer that less energy is therefore required. Some stated that the melting point is lowered by cryolite, which was not accepted; the melting point of aluminium oxide is a fixed value. Some did not make a clear reference to energy, referring to fuel or heat instead. Many referred to boiling points instead of melting points, despite also quoting the given values of melting point. Just over a quarter of students scored 1 mark but only one in 20 scored both.

05.5 About half of students gave the correct answer, with the two distractors both being very popular.

05.6 Three quarters of students gave the correct value, with 2.7 cm^3 being the more popular distractor.

05.7 Three fifths of students gave the correct reason, though a surprising number thought that hydrogen is more reactive than magnesium.

05.8 Only a half of students gave the correct answer, with nearly as many thinking that the volume did not depend on the time.

05.9 There were very many fully correct answers, with a half of students scoring full marks. A few measured the change in volume as 1.8 cm^3 instead of 1.9 cm^3, and some inverted

Answer 148 · Examiner comments — June 2025 | 8462/1F | Original Q5

the expression for gradient even though it was provided. Any matching pairs of change in volume and change in time were accepted. Even those who read incorrectly from the graph were able to gain partial credit for showing how to manipulate their values correctly.

4.1.1.2 Mixtures

Answer 149 · Examiner comments — June 2025 | 8462/1F | Original Q7

Question 7 (low and standard demand)

07.1 Many could identify one mixture but not the other; two thirds of students scored one mark but fewer than a third scored both. Many chose the second box (a pure compound) for one of their answers.

07.2 Unlike some 6-mark questions in previous years, most students attempted this question with about 1 in 10 making no attempt. Three fifths of students were able to reach at least level 2 and a third scored full marks. The question provided lots of useful information to prompt and assist with creating a suitable method. Most students could state that the mixture needed to be dissolved in water. Where this happened varied, with many stating a beaker, but a number suggested doing this in a filter funnel. When this happened, some lost credit as they did not mention using a filter paper. Most could suggest evaporating the solution in an evaporating dish. Other common alternatives included leaving the solution to evaporate slowly or with a water bath.

Some students mixed up the correct order in which steps should be undertaken. Those who scored zero marks often described the set up of a water bath without providing any further indicative content. Some thought the glass rod was to measure temperature. Others used it to push the mixture through the filter paper. Those who did not add water to the mixture as their first step had difficulty in producing a method that would work. Many only used the water for a water bath, not as a solvent for the salt.

Answer 149 · Examiner comments — June 2025 | 8462/1F | Original Q7

07.3 Four fifths of students scored both marks. A few inverted the expression provided.

4.1.1.2 Mixtures

Answer 150 · 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.

Answer 150 · 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.