AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.8.3.3

Carbonates

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**17**
Available paper years	**2008–2025**

Using this booklet

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

Name: _____ **Date:** _____

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

4.8.3.3 Carbonates

Answer 01 · Mark scheme

January 2008 | CHY1H | Original Q2 | Legacy

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

Answer 02 · Mark scheme

January 2008 | CHY2H | Original Q6 | Legacy

The full source mark scheme begins on page 29. Follow original question 6 in that document.

4.8.3.3 Carbonates

Answer 03 · Mark scheme

Question 6

question	answers	extra information	mark
(a)(i)		each correct test and one result = **1** mark	
		one other result for any test = **1 mark** this mark can only be awarded once	1
	Na_2CO_3: HCl → (odourless) gas (1) CO_2 / carbon dioxide (1)		1
	NaCl: $AgNO_3$ → white ppt (1) silver chloride (1)		1
	$NaNO_3$: Al + NaOH → pungent /sharp smell / choking gas (1) NH_3 / ammonia (1)		1
	Na_2SO_4: $BaCl_2$ → white ppt (1) barium sulfate (1)		1
(a)(ii)	all would give a yellow / yellow-orange (flame) / same coloured (flame) / same results **or** they all contain sodium owtte	allow orange (flame)	1
(b)	any **two** from: • fast / quick or comment about speed • small amounts • sensitive / accurate • ease of automation • sample not used up • reliable / efficient • can be left to run / continuous analysis	ignore cost ignore human error accept any valid answer accept operators do not need chemical skills ignore results can be saved	2
total			8

4.8.3.3 Carbonates

Answer 04 · Mark scheme

June 2008 | CHY3H | Original Q3 | Legacy

question	answers	extra information	mark
3(a)	test: add NaOH	allow any group 1 / 2 hydroxide **or** hydroxide (ions) **or** OH^- incorrect **or** no reagent = **0**, except add NaOH and aluminium **or** heat / warm could get <u>result</u> mark	1
	result: gas turns (red) litmus blue / ammonia is given off	accept alkaline gas / ammonia produced do **not** accept blue litmus turns blue allow any acid-base indicator with correct result	1
3(b)	test: add (dilute) acid	named acid incorrect **or** no reagent = 0	1
	result: gas gives (white) solid / precipitate with limewater **or** goes white with limewater	accept CO_2 produced gas turns limewater milky / cloudy / white (ignore misty) allow calcium hydroxide for limewater	1
Total			**4**

4.8.3.3 Carbonates

Answer 04 · Mark scheme June 2008 | CHY3H | Original Q3 | Legacy

COMPONENT NUMBER: CHY3H

COMPONENT NAME: Chemistry

STATUS: Final

DATE: June 2008

Answer 05 · Mark scheme November 2010 | CHY1AP | Original Q2 | Legacy

Two	**A**	Water	**4**
	B	Calcium oxide	**3**
	C	Calcium carbonate	**1**
	D	Carbon dioxide	**2**

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

Answer 06 · Mark scheme June 2011 | CHY1AP | Original Q7 | Legacy

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

4.8.3.3 Carbonates

Answer 07 · Mark scheme

June 2011 | CHY3H | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)(i)	Mountain View: (65+35 =)100		1
	Valley Croft: (16+14 =) 30 **OR** Mountain View Ca (65) is about 4 times Valley Croft (Ca 16) (1) Mountain View Mg (35) is about twice Valley Croft (Mg 14) (1)	ignore other ions unless used in another calculation or calculations. In this case the list principle applies if no other mark awarded either: Ca 65 compared with Ca 16 **and** Mg 35 compared with Mg 14 gains **1** mark **or** difference in Ca (65 – 16) = 49 **and** Mg (35 – 14) = 21 gains **1** mark	1
1(a)(ii)	shake / stir / swirl (water with soap)	allow mix ignore add / use soap / titrate	1
	(about) 3 × the scum / precipitate / solid (compared with Valley Croft)	accept (about) 3 × volume / drops / amount / quantity of soap solution for (permanent) lather (compared with Valley Croft) ignore scale / time	1
	fair test: eg same volume / amount of water **or** shake for same amount of time **or** use same type / concentration of soap	allow same temperature do **not** accept same volume of soap ignore repeat the experiment	1

Question 1 continues on the next page

Question 1 continued

question	answers	extra information	mark
1(b)	strong(er) teeth / bones **or** good for heart	allow contains calcium (ions / compounds) ignore magnesium **or** charge on the calcium ion do **not** accept any other ions	1
1(c)	any **one** from: • produces scale / limescale / calcium carbonate / magnesium carbonate • produces scum • more soap needed • costs more to soften water • (scale) lowers efficiency of appliances	ignore health effects allow fur for scale allow doesn't lather easily ignore detergent allow costs if qualified ignore just damage to pipes	1
1(d)(i)	water / everything is made of / contains chemicals **or** water contains named ion from the label	accept company (probably) means water contains no added substances ignore water has not been treated	1
1(d)(ii)	Valley Croft scientists may be biased / vested interest	accept Food Standards Agency / independent scientists (more likely to be) unbiased allow Valley Croft scientists may falsify results ignore accuracy / reliability / fairness / validity	1
Total			**9**

4.8.3.3 Carbonates

Answer 07 · Mark scheme

June 2011 | CHY3H | Original Q1 | Legacy

CHY3H

4.8.3.3 Carbonates

Answer 08 · Mark scheme

Question 6

question	answers	extra information	mark
6(a)	limewater **or** calcium hydroxide solution		1
	(reacts with carbon dioxide and) turns cloudy / milky	linked to first point if no other mark awarded 'puts out lighted splint' gains **1** mark	1
6(b)(i)	any **two** from: • same volume / amount of the acids • concentration of the acids • temperature • same surface area / size / mass / amount of calcium carbonate • same measuring equipment		2

Question 6 continues on the next page…….

CH1HP

Question 6 cont'd…

question	answers	extra information	mark
6(b)(ii)	any **three** from: • (after about 4 minutes) the sulfuric acid stops reacting **or** nitric acid continues to react • (initially) the reaction with sulfuric acid is faster • (the reaction stops) because calcium sulfate is a solid • (the reaction continues) because calcium nitrate is soluble / in solution / aqueous • because the calcium sulfate prevents the sulfuric acid reacting with the calcium carbonate • (the rate is faster) because sulfuric acid contains two hydrogens	accept more CO_2 with nitric acid at any time after 4 minutes allow sulfuric acid produces a solid allow nitric acid produces an (aqueous) solution	3
Total			**7**

4.8.3.3 Carbonates

Answer 08 · Mark scheme

January 2012 | CH1HP | Original Q6 | Legacy

CH1HP

Answer 09 · Mark scheme

June 2012 | CH1HP | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)(i)	water	accept hydrogen oxide allow H_2O	1
5(a)(ii)	carbon dioxide	allow CO_2 accept any soluble carbonate **or** carbonic acid	1
5(b)(i)	$CaCO_3$ + **2** HCl → $CaCl_2$ + CO_2 + H_2O		1
5(b)(ii)	because sulfur reacts with oxygen / air to produce sulfur dioxide **or** sulfur burns to produce sulfur dioxide and (sulfur dioxide) causes acid rain that reacts with/erodes limestone/calcium carbonate	accept correct equation ignore wears away	1 1
5(c)(i)	 because carbon dioxide is produced from burning methane because carbon dioxide is produced from decomposing calcium carbonate/limestone	it = carbon dioxide ignore references to carbon dioxide is in the air accept correct equation accept correct equation do **not** accept carbon in calcium carbonate reacting with air	 1 1
5(c)(ii)	nitrogen this is the main gas / 75 – 80% / of air	 allow there is a lot of this gas in air	1 1
Total			**9**

4.8.3.3 Carbonates

Answer 09 · Mark scheme

June 2012 | CH1HP | Original Q5 | Legacy

CH1HP

4.8.3.3 Carbonates

Answer 10 · Mark scheme

January 2013 | CH1HP | Original Q2 | Legacy

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

4.8.3.3 Carbonates

Answer 10 · Mark scheme

January 2013 | CH1HP | Original Q2 | Legacy

CH1HP

4.8.3.3 Carbonates

Answer 11 · Mark scheme

June 2013 | CH1HP | Original Q5 | Legacy

Question 5

question	Answers	extra information	Mark
5(a)(i)	H_2O	must be formula	1
	CaO	must be formula	1
5(a)(ii)		it = carbon (dioxide)	
	carbon dioxide from the air / (Earth's early) atmosphere	accept carbon dioxide from millions of years ago	1
	formed (sedimentary) rocks **or** fossil fuels	ignore trapped / stored	1
5(b)(i)		it = carbon (dioxide)	
	decreases rapidly at first		1
	then slowly **or** levels off		1
		allow both marks if the description is correct using either 'rapidly' **or** 'slowly'	
		allow correct use of figures for either marking point	
		if no other mark awarded, allow CO_2 decreased for **1** mark	
5(b)(ii)	any **two** from: • used by plants • dissolved in oceans • 'locked up' in fossil fuels **or** formed fossil fuels • 'locked up' in rocks **or** formed rocks	it = carbon (dioxide) accept photosynthesis	2

Question 5 continues on the next page

4.8.3.3 Carbonates

Question 5 continued

question	Answers	extra information	Mark
5(c)		it = percentage of carbon (dioxide)	
	(yes)	ignore yes or no	
	because the percentage of carbon dioxide is increasing		1
	which causes global warming (to increase)	allow (carbon dioxide) causes greenhouse effect/climate change	1
	or		
	(no)		
	because the percentage of carbon dioxide is low (1)		
	compared to millions of years ago (1)	allow global warming can be caused by other factors (e.g. Sun / water vapour / methane)	
Total			**10**

4.8.3.3 Carbonates

Answer 12 · Mark scheme

June 2013 | CH3HP | Original Q5 | Legacy

Question 5

question	Answers	extra information	Mark
5(a)(i)	place sample in flame	accept flame test accept any workable method allow burn ignore heat	1
	sodium: yellow (flame)	allow orange	1
	potassium: lilac (flame)	allow purple	1
5(a)(ii)	(lilac) colour (of potassium) obscured by (yellow) colour of sodium	allow difficult to see two colours allow sodium colour is brighter allow colours mix	1
5(b)	acidify (with nitric acid)	do **not** accept if acidified with anything other than nitric acid	1
	add silver nitrate (solution)		1
	white precipitate	depends on second marking point allow white solid ignore silver chloride ignore solution goes cloudy / milky	1
5(c)(i)	add excess (sodium hydroxide)	allow add sodium hydroxide	1
	<u>aluminium</u> (ions / hydroxide) (re)dissolve	depends on first marking point allow if aluminium, (white) precipitate / solid dissolves allow magnesium (ions / hydroxide) do not (re)dissolve	1
5(c)(ii)	place sample in flame	accept flame test accept any workable method allow burn ignore heat	1
	flame does not go red	accept calcium (ions / hydroxide would produce) red flame allow magnesium (ions / hydroxide) (produce) no flame colour	1
Total			**11**

4.8.3.3 Carbonates

Answer 13 · Mark scheme June 2014 | CH3HP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
7(a)	lithium yellow	*allow* Li^+ / *Li* *allow orange*	1 1	2 / 3.4.1a	E
7(b)	silver nitrate (solution) white precipitate	incorrect test = **0** marks ignore (nitric) acid do **not** allow other *named* acids	1 1	1 / 3.4.1e	E
7(c)	blue precipitate (with sodium hydroxide) indicates copper ions and white precipitate (with barium chloride) indicates sulfate ions but iron(II) ions produce a green precipitate (with sodium hydroxide)	*allow* Cu^{2+} *allow* SO_4^{2-} *accept compound X is copper sulfate/*$CuSO_4$ *for* ***1*** *mark*	1 1 1	3 / 3.4.1c/f	E
Total			**7**		

4.8.3.3 Carbonates

Answer 14 · Mark scheme

June 2016 | CH1HP | Original Q3 | Legacy

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)(i)	(thermal) decomposition	allow decomposes or endothermic	1	AO1 1.2.1b/c
3(a)(ii)	copper oxide		1	AO2 1.2.1b/c
3(b)(i)	the (potassium) carbonate did not decompose/change/react (when heated) the mass did not change or the limewater did not go cloudy because no carbon dioxide produced	allow temperature not high enough do **not** allow potassium did not decompose ignore references to reactivity	1 1 1	AO1+AO2 +AO3 1.2.1c/e; 4.5.4a
3(b)(ii)	the less reactive the metal the more (easily) its carbonate will decompose/react or vice versa	needs to be a relative comparison allow max **1** mark where the distinction between a metal and its carbonate is not clear allow **1** mark for carbonates of reactive metals do not decompose or vice versa	2	AO3 1.2.1 c; 1.3
3(c)(i)	make it economical (to extract the metal/iron)	allow make it worth extracting allow so they can make money/profit	1	AO1 1.3.1a
3(c)(ii)	Fe balanced correctly (2,3,4,3)	 not ecf allow correct balanced equation but with $2Fe_2$ on right for one mark	1 1	AO2 1.1.3b; 1.3.2c

4.8.3.3 Carbonates

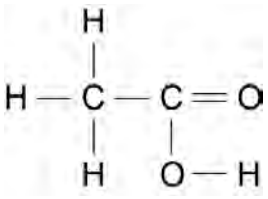
Answer 14 · Mark scheme

3(c)(iii)	**iron** from the blast furnace is brittle **steel** produced is strong / flexible	"it" = iron allow steel has more/specific uses allow steel is rust-resistant	1 1	AO1 1.3.2a/b/c
3(c)(iv)	(recycling) is used to conserve iron (ore) **or** energy **or** resources **or** minimise pollution **or** reduce the need to quarry (not reuse) because of damage, paint removal, rusting/corrosion, metal fatigue/weaker (not landfill) because sites have limited space **or** loss of habitats	allow reverse arguments. allow to reduce the use of landfill	1 1 1	AO1+AO2 1.3.1j
Total			**15**	

4.8.3.3 Carbonates

Answer 15 · Mark scheme

June 2016 | CH3HP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
1(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	
1(a)(ii)		allow –OH do not allow lower case 'h'	1	AO1 3.6.2a
1(a)(iii)	acid	must be in this order ignore any name of an acid	1	AO1 3.6.2b
	ester(s)		1	
1(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
1(c)(i)	lilac red	must be in this order allow purple	1 1	AO1 3.4.1a
1(c)(ii)	colours are masked / changed by each flame colour		1	AO3 3.4.1a
Total			12	

4.8.3.3 Carbonates

Answer 15 · Mark scheme

Question	Answers	Extra information	Mark	AO / SpecRef
2			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:

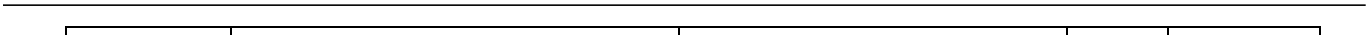
- acid in burette **or** flask
- alkali/sodium hydroxide **or** acid in burette or flask
- volume of acid **or** alkali measured using the pipette
- indicator in flask
- white tile under the flask
- slow addition
- swirling/mixing
- colour change of indicator
- burette volume measured

Total		6

4.8.3.3 Carbonates

Answer 15 · Mark scheme

June 2016 | CH3HP | Original Q1 | Legacy



4.8.3.3 Carbonates

Answer 16 · Mark scheme

June 2019 | 8462/2H | Original Q2

Question 2

Question	Answers	Mark	AO/ Spec. Ref
02.1	**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		
02.2	formulation(s)	1	AO1 4.8.1.2

4.8.3.3 Carbonates

Answer 16 · Mark scheme

June 2019 | 8462/2H | Original Q2

02.3	1.20 g = 1200 mg **or** 700 mg = 0.700 g	an answer of 58.3333333 (%) correctly rounded to at least 2 significant figures scores **3** marks	1	AO2 4.8.1.2
	$\frac{700}{1200} \times 100$ **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**	

Answer 17 · Mark scheme

June 2025 | 8462/2H | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	calcium (ions) **or** magnesium (ions)	allow Ca^{2+} (ion) allow Mg^{2+} (ion) allow zinc / Zn^{2+} (ion)	1	AO1 4.8.3.2 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	(test) add excess sodium hydroxide (solution) (result) with sodium hydroxide the (white) precipitate dissolves	 allow with sodium hydroxide a colourless solution is produced	1 1	AO1 4.8.3.2 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	Ca^{2+}	ignore calcium	1	AO1 4.2.1.2 4.8.3.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	Cl^-	ignore chloride	1	AO1 4.2.1.2 4.8.3.4 RPA7

4.8.3.3 Carbonates

Answer 17 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	(test) (bubble the gas through) limewater	allow (bubble the gas through) calcium hydroxide solution	1	AO1 4.8.2.3 4.8.3.3 RPA7
	(result) (which) turns milky / cloudy		1	
		MP2 is dependent upon MP1 being awarded		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6		allow converse argument		
	(using ethanoic acid) the rate of reaction is lower		1	
	(because) ethanoic acid is a weak(er) acid		1	
	(so) the concentration of hydrogen ions is lower	allow (so) ethanoic acid is (only) partially ionised	1	
	(and) the frequency of collisions is lower		1	

Total Question 6	11

Version 1.0: 0108

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Additional Science 4463 / Chemistry 4421

CHY2H Unit 2 Chemistry

Mark Scheme

2008 examination – January series

4.8.3.3 Carbonates

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

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

Further copies of this Mark Scheme are available to download from the AQA Website: www.aqa.org.uk

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4.8.3.3 Carbonates

MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

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

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

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

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

2. Emboldening

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

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

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

3. Marking points

3.1 Marking of lists

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

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

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

4.8.3.3 Carbonates

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

Candidate	Response	Marks awarded
1	4,8	0
2	green, 5	0
3	red*, 5	1
4	red*, 8	0

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

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

3.2 Use of chemical symbols / formulae

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

3.3 Marking procedure for calculations

Full marks can be given for a correct numerical answer, as shown in the column 'answers', without any working shown.

However if the answer is incorrect, mark(s) can be gained by correct substitution / working and this is shown in the 'extra information' column;

3.4 Interpretation of 'it'

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

3.5 Errors carried forward

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

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

3.6 Phonetic spelling

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

3.7 Brackets

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

3.8 Unexpected Correct Answers not in the Mark Scheme

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

4.8.3.3 Carbonates

CHY2H

Question 1

question	answers	extra information	mark
(a)	sensible line of best fit which goes through or close to all the points **except** the anomalous point	allow wobbly / short double lines ± ½ square	1
(b)	loss of gas / loss of CO_2	idea of gas produced / formed	1
(c)	7		1
(d)(i)	steeper line from around the same starting point and left of the points levelling off at 99	allow crosses if they are fully correct for **1** mark accept short level line at 99 ± ½ square	1 1
(d)(ii)	any **three** from: • particles / molecules / atoms/ ions have more energy • move faster • collide <u>more</u> often **or** <u>more</u> chance of collisions **or** bump into each other <u>more</u> • collide with <u>more</u> force / energy **or** <u>more</u> particles have the activation energy **or** <u>more</u> collisions result in reaction **or** <u>more</u> collisions are successful	 allow given / gain / get energy ignore move about more ignore vibrate more / faster ignore collide quicker / faster	3
total			8

4.8.3.3 Carbonates

CHY2H

Question 2

question	answers	extra information	mark
(a)	any **one** from: • they are made of layers • atoms / ions / particles / layers (of atoms) can slide over each other	 do **not** accept line / rows / lattice	1
(b)	any **one** from: • smaller / tiny **or** very small • correct size range 1 to 100 nanometres • a few hundred atoms in size	 do **not** allow small alone if they state smaller and give a size outside range ignore size if it is less than 20,000	1
(c)	harder plus **one** from: • so does not wear as quickly / erode as quickly • less vulnerable to damage owtte • because they have a high surface area to volume ratio **or** stronger (1) plus **one** from: (1) • less likely to break / do not break • not as vulnerable to damage owtte • do not bend out of shape • because they have a high surface area to volume ratio	 ignore corrode harder to wear down = **1** mark accept withstand pressure harder and stronger alone gains **1** mark	1 1
total			4

4.8.3.3 Carbonates

CHY2H

Question 3

question	answers	extra information	mark
(a)	N_2O		1
(b)	13.8 to 14	gains full marks without working if answer incorrect 13 gains **1** mark **or** 14/101 × 100 gains **1** mark	2
total			3

4.8.3.3 Carbonates

CHY2H

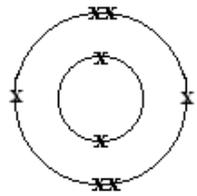
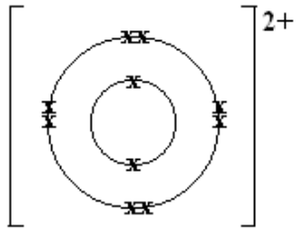
Question 4

question	answers	extra information	mark
(a)	electric current / electricity		1
	plus **one** from:		1
	• is passed through ionic compound / substance / electrolyte	must be linked to electricity allow liquid compound / substance	
	• passed through molten/aqueous compound / substance	do **not** allow solution / liquid alone	
	• causing decomposition	accept split up / breakdown / breaking up owtte ignore separated accept elements are formed ignore new substances form	
(b)	hydrogen	accept H_2 do **not** accept H / H^2	1
(c)	one electron from each atom	accept each carbon is bonded to three other carbon atoms leaving one (unbonded) electron owtte	1
	is delocalised / free (to move)	must be linked to electrons answers of delocalised / free electrons only, gains **1** mark accept each carbon is bonded to three other carbon atoms leaving delocalised / free electrons = **2** marks **maximum 1** mark if graphite described as a metal / giant ionic lattice	1
total			5

4.8.3.3 Carbonates

CHY2H

Question 5

question	answers	extra information	mark
(a)	any **one** from: • gives out heat / energy • transfers energy from a substance to the surroundings • ΔH / energy change / enthalpy change is negative	accept releases / gives off owtte ignore references to light	1
(b)	$2Mg + O_2 \rightarrow 2MgO$	accept correct multiples / fractions	1
(c)		electrons do not need to be paired accept dots / circles / e instead of crosses do **not** allow 2.6 without diagram	1
(d)		electrons do not need to be paired allow without brackets must have the charge accept dots / circles / e instead of crosses ignore extra empty outer shells ignore nucleus do **not** allow $[2.8]^{2+}$ without diagram	1

continued…

4.8.3.3 Carbonates

CHY2H

Question 5 continued…

question	answers	extra information	mark
(e)	oppositely charged (ions / atoms)	allow positive and negative(ions / atoms)	1
	(they) attract	must be in correct context accept held by electrostatic forces ignore ionic bonding **maximum 1** if they refer to intermolecular forces / attractions / covalent bonds	1
(f)	magnesium chloride	accept $MgCl_2$ (if correctly written)	1
total			7

4.8.3.3 Carbonates

CHY2H

Question 6

question	answers	extra information	mark
(a)	**Compound A** any **one** from: • sodium bromide • potassium bromide • ammonium bromide • hydrogen bromide • any metal bromide except silver and lead. **Compound B** silver nitrate	accept correct formulae accept silver sulfate	1 1
(b)	the silver compound will decompose / silver ions be reduced to silver (owtte)	accept film would darken owtte accept any idea of light changing silver bromide / silver ions / silver nitrate / silver sulfate allow 'forms a black solid' / it would turn black	1
(c)	precipitation	accept descriptions of precipitation reactions accept double decomposition accept precipitate do **not** allow displacement	1
(d)	electrons are gained	 the second mark **must** be linked to electrons accept it / silver / silver ions gains electrons for **both** marks ignore references to oxygen	1 1
total			6

4.8.3.3 Carbonates

CHY2H

Question 7

question	answers	extra information	mark
(a)	1213.8 to 1214.3 correct answer not given then check working 1) moles of $N_2 = \frac{1000}{28}$ $= 35.7$ mol 2) moles of $NH_3 = 2 \times$ (answer from (1)) $= 71.4$ mol 3) mass of NH_3 = (answer from 2) × 17 $= 71.4 \times 17 = 1214$ g **or** • 28g of $N_2 \rightarrow 34$g of NH_3 • 1g of $N_2 \rightarrow \frac{34}{28}$ $= 1.214$g NH_3 • 1000 g of $N_2 \rightarrow 1000 \times 1.214$ $= 1214$g **or** • $1000 \times \frac{34}{28}$ **or** **other correct methods**	gains **3** marks without working **1** mark for each correct step do **not** penalise rounding errors in this part **1** mark for each correct step do **not** penalise rounding errors in this part allow error carried forward eg gains **2** marks if correct answer not given $1000 \times \frac{28}{34}$ gains **1** mark, **2** marks if correctly calculated (823.5g) $1000 \times \frac{28}{17}$ gains **1** mark if calculated correctly (1647.05g) look for the key ideas in the methods above	3

continued…

4.8.3.3 Carbonates

CHY2H

Question 7 continued…

question	answers	extra information	mark
(b)	25 / 25.035 **or** ecf from (a)	gains **2** marks even when there is no working incorrect answer then 304/(their answer from (a)) × 100 gains **1** mark	2
	or using figures from part (b)		
	27.6 / 28	gains **2** marks even when there is no working accept 27 for **1** mark if answers incorrect then304/1100 × 100 gains **1** mark	
(c)(i)	increase yield		1
	reaction is exothermic		1
	or		
	allow decreased yield because rate of reaction is slower / fewer collisions for **2** marks	**must** get both points for **2** marks	
(c)(ii)	increase yield		1
	plus **one** from: • more (gaseous) reactant molecules than (gaseous) product molecules (owtte) • increased rate of reaction / more collisions	accept greater volume on the left than the right owtte	1

continued…

4.8.3.3 Carbonates

CHY2H

Question 7 continued…

question	answers	extra information	mark
(d)	any **one** from: **economic** • large town provides workforce • workers do not have to travel far to the factory. (owtte) • transport infrastructure already in place for large town. (owtte) • factory brings prosperity to town (owtte) • factory provides employment • reduced tourism • reduction in local house prices • any other sensible economic factor linked to town		1
	any **one** from: **safety** • escape of dangerous / harmful chemicals / gases (owtte) • danger of increased traffic • risk of explosion.(owtte) /danger of high pressure • consequences of an accident could be severe if the town is close • any other sensible safety idea	do **not** allow polluting gases unqualified	1

continued…

4.8.3.3 Carbonates

CHY2H

Question 7(d) continued…

question	answers	extra information	mark
	any **one** from: **environmental** • factory might be unsightly (owtte) • screening of factory (owtte) • loss of habitats (owtte) • plant trees/ hedges etc on and around plant site • pollution of water / air / soil could harm plants / animals **or** noise pollution • CO_2 is produced by burning fuels / heating • CO_2 causes global warming / any effect of global warming • eye sore • any other sensible environmental factor	must be explained	1
total			12

4.8.3.3 Carbonates

Answer 17 · Examiner comments

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Question 6

06.1 Three quarters of students correctly identified either calcium or magnesium. A few students gained credit for zinc.

06.2 Just over a quarter of students scored both marks on this item. Many students repeated the information given to them in the stem of the question, stating that they would add sodium hydroxide and observe a white precipitate, which did not gain marks. Some described adding more sodium hydroxide, without specifying that this should be until excess and whilst these students were not awarded the first marking point, they still had access to the second marking point.
Descriptions of the result were often vague. Some responses stated that 'the precipitate would dissolve' but failed to identify the reagent. Others simply said, 'it' will redissolve, become clear, or turn colourless, which was insufficient. There was a misconception that the aluminium dissolves, rather than the precipitate.

06.3 Both the correct symbol and the charge on the ion were required to gain the mark for this item. A quarter of students did this. Many others wrote the name, or the symbol without a charge.

06.4 As with 06.3, both the symbol and the charge on the ion were needed to gain the mark. As with 06.3, a quarter of students answered this correctly. Similar mistakes, writing the name or a symbol without a charge were commonly seen.

06.5 Around two thirds of students gained both marks on this item. A small number of students described adding limewater to solution C, rather than bubbling the gas produced through limewater.

06.6 Around half of students identified ethanoic acid as a weak acid and stated that the rate of reaction was lower. Fewer students were able to describe a lower concentration of hydrogen ions, with some describing fewer hydrogen ions without making any reference to volume. Credit was given to those who described ethanoic acid as partially ionised, however, there was the misconception that less hydrogen ions were ionised. Only a minority of students made a correct reference to the frequency of collisions.