AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.10.3.1

Corrosion and its prevention

Mark schemes and examiner comments

Tier	**Higher**
Question groups	**28**
Available paper years	**2007–2025**

Using this booklet

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

Name: _____ **Date:** _____

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

4.10.3.1 Corrosion and its prevention

Answer 01 · Mark scheme January 2007 | CHY1H | Original Q1 | Legacy

Question 1

	answers	extra information	mark
(a)	radioactivity (keeps the core hot)	accept half-life of radioactive elements has proved the Earth is older than 400 million years accept the Earth is not cooling do **not** accept fossil / rock evidence	1
(b)	any **two** from: • the shapes of the two continents fit together (like a jigsaw) OWTTE • the same type of rocks have been found • the same fossils have been found • rising magma rising through a gap under the Atlantic	 do **not** accept the continents / they are the same shape accept 'rocks match' accept 'fossils match'	2
(c)	any **two** from: • earthquakes • volcanoes • idea of distance between America and Europe / Africa is increasing e.g. continental drift • oceanic ridges • formation of (new) mountain ranges • formation of (new) islands • magnetic stripes • tsunamis	 accept seismic waves accept ocean floor spreading accept fold mountains or mountains increasing in height	2
total			5

4.10.3.1 Corrosion and its prevention

Answer 02 · Mark scheme March 2007 | CHY1A | Original Q5 | Legacy

Five	**A**	aluminium	**4**
	B	calcium	**2**
	C	sodium	**1**
	D	zinc	**3**

Answer 03 · Mark scheme March 2007 | CHY1B | Original Q5 | Legacy

Five	**A**	analysis	**2**
	B	combustion	**4**
	C	condensation	**3**
	D	convection	**1**

Answer 04 · Mark scheme June 2007 | CHY1A | Original Q1 | Legacy

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

Answer 05 · Mark scheme June 2007 | CHY1A | Original Q8 | Legacy

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

Answer 06 · Mark scheme June 2007 | CHY1H | Original Q3 | Legacy

The full source mark scheme begins on page 33. Follow original question 3 in that document.

Answer 07 · Mark scheme November 2007 | CHY1A | Original Q4 | Legacy

Four	**3**	**3**	**2**	**1**

Answer 08 · Mark scheme November 2007 | CHY1A | Original Q7 | Legacy

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

4.10.3.1 Corrosion and its prevention

Answer 09 · Mark scheme

January 2008 | CHY1H | Original Q4 | Legacy

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

Answer 10 · Mark scheme

June 2008 | CHY1AP | Original Q7 | Legacy

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

Answer 11 · Mark scheme

March 2009 | CHY1BP | Original Q8 | Legacy

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

Answer 12 · Mark scheme

June 2009 | CHY1AP | Original Q7 | Legacy

Seven	**4**	**1**	**4**	**1**

4.10.3.1 Corrosion and its prevention

Answer 13 · Mark scheme

June 2009 | CHY1H | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	(gases from) volcanoes		1
3(a)(ii)	100	allow 99	1
3(a)(iii)	any **two** from: • photosynthesis • carbon dioxide used • oxygen produced	they = plants allow carbon dioxide decreased allow oxygen increased ignore nitrogen / respiration	2
3(b)(i)	any **one** from: • sea floor spreading • periodic measurements between continents • evidence from rocks / fossils on different continents • new mountain ranges	 accept oceanic ridges / magnetic stripes accept continents move a few centimetres each year accept continents fit together accept new islands	1
3(b)(ii)	in the mantle any **two** from: • convection (currents) / movement • radioactivity / radioactive decay / nuclear reactions • releases heat / thermal energy	 do **not** accept movement of the plates accept heat from core	1 2
Total			**8**

4.10.3.1 Corrosion and its prevention

Answer 13 · Mark scheme June 2009 | CHY1H | Original Q3 | Legacy

CHY1H

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

Two	**A**	reduction	**4**
	B	combustion	**2**
	C	thermal decomposition	**1**
	D	corrosion	**3**

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

Answer 15 · Mark scheme March 2010 | CHY1BP | Original Q7 | Legacy

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

4.10.3.1 Corrosion and its prevention

Answer 16 · Mark scheme

June 2010 | CHY1H | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)(i)	condensed	it = water vapour accept temperature went below 100°C / boiling point of water allow cooled to form liquid / water / rain do **not** accept evaporated	1
	formed the oceans / seas	ignore rain accept (water vapour) cooled and formed the ocean / sea for **2** marks	1
2(a)(ii)	any **two** from: • used by (green) plants / algae • changed into oxygen • dissolved in oceans / seas • (locked up) in carbonates / sedimentary rocks • (locked up) in fossil fuels / named fossil fuel	ignore oxygen / nitrogen increased ignore reference to volcanoes / respiration accept photosynthesis / plants give out oxygen accept (locked up) in shells / skeletons (of animals)	2
2(b)(i)	cannot get to / reach / drill to / see the core	accept the core is (too) far down (into the Earth) / do not know what happens under the crust / Earth's surface accept it is (too) hot / radioactive ignore lack of evidence unqualified	1

Question 2 continues on the next page

4.10.3.1 Corrosion and its prevention

CHY1H

Question 2 continued

question	answers	extra information	mark
2(b)(ii)	any **three** from: • heat / energy released • from radioactive decay / processes • (causing) convection currents • in the mantle	accept radioactivity / nuclear reactions	3
Total			**8**

4.10.3.1 Corrosion and its prevention

Answer 16 · Mark scheme June 2010 | CHY1H | Original Q2 | Legacy

CHY1H

4.10.3.1 Corrosion and its prevention

Answer 17 · Mark scheme

January 2011 | CHY1H | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)(i)	very little / low percentage of metal (in the ore)	accept only 0.5% metal in the ore **or** over 99% waste in the ore **or** nearly 100% waste in the ore ignore reference to percentage of metal in the Earth's crust **or** energy used or pollution	1
1(a)(ii)	any **one** from • iron uses less energy / fuel for extraction • iron has more uses • more demand for iron • iron is stronger • cheaper / costs less • easier to extract	(it = iron) ignore electrolysis / uses electricity / reactivity ignore high abundance in the Earth's crust / high percentage of metal in ore ignore harder	1
1(b)(i)	has melting point lower than 950°C	(it = aluminium) allow has a low melting point ignore boiling point	1
1(b)(ii)	electrode(s) made of carbon oxygen reacts with electrode(s) / carbon	 accept C + O_2 (→ CO_2) NB oxygen reacts with the carbon electrode(s) = **2** marks	1 1

Question 1 continues on the next page

4.10.3.1 Corrosion and its prevention

CHY1H

Question 1 contd

question	answers	extra information	mark
1(b)(iii)	any **two** from: • saves resources / non renewable • landfill problem • saves energy / fuel / electricity • less carbon dioxide / carbon emissions or reduces carbon footprint • less quarrying / mining	accept aluminium / ore will run out or conserves aluminium accept aluminium does not corrode ignore global warming ignore consequences of quarrying / mining ignore pollution / harms environment / costs / easy to recycle	2
Total			**7**

4.10.3.1 Corrosion and its prevention

Answer 17 · Mark scheme

January 2011 | CHY1H | Original Q1 | Legacy

CHY1H

4.10.3.1 Corrosion and its prevention

Answer 18 · Mark scheme

January 2011 | CHY1H | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	any **two** from: • used by plants • used for photosynthesis • absorbed / dissolved in oceans • locked up in fossil fuels / limestone / sedimentary rocks	 allow specific plants and algae ignore oxygen released / respiration ignore oceans formed	2
3(a)(ii)	calcium carbonate / $CaCO_3$ decomposed / thermal decomposition	 do **not** allow reaction with oxygen accept quicklime / calcium oxide produced $CaCO_3 \rightarrow CaO + CO_2$ gains **2** marks	1 1
3(b)	increasing (CO_2 or global warming) more rapid increase recently carbon dioxide causes global warming	 accept greenhouse gas **or** climate change / sea level rising **or** ice caps melting do **not** accept ozone layer or acid rain or global dimming	1 1 1

Question 3 continues on the next page

4.10.3.1 Corrosion and its prevention

CHY1H

Question 3 contd

question	answers	extra information	mark
3(c)(i)	any **one** from: • Wegener had no evidence / proof • other scientists had different ideas / views • did not respect Wegener as a scientist / geologist	accept movement too slow to measure accept continents / plates fixed or land bridge	1
3(c)(ii)	any **three** from: • plates (move) • heat energy / radioactivity (causes) • convection currents • in mantle	ignore continents	3
Total			**11**

4.10.3.1 Corrosion and its prevention

Answer 18 · Mark scheme

January 2011 | CHY1H | Original Q3 | Legacy

CHY1H

4.10.3.1 Corrosion and its prevention

Answer 19 · Mark scheme

January 2011 | CHY1H | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	removal of oxygen	accept definition in terms of electrons **or** oxidation numbers ignore oxides	1
4(a)(ii)	2 (Cl_2)	allow correct multiples	1
4(a)(iii)	no atoms are lost / made (during a chemical reaction) **or** the atoms are rearranged (during a chemical reaction)	accept because of (the law of) conservation of mass / matter	1
4(b)(i)	sodium is more reactive (than titanium)	accept sodium is very reactive **or** titanium is less reactive do **not** accept sodium is more reactive than argon	1
4(b)(ii)	any **one** from: • sodium / titanium would react with oxygen / air • sodium / titanium does not react with argon	 accept air / oxygen is reactive accept argon is unreactive / inert / a noble gas / in group O	1
4(c)(i)	all atoms are the same / it only contains one type of atom	accept all ions are the same do **not** accept only got one atom do **not** accept all atoms are the same size ignore particles	1
4(c)(ii)	two different / types atoms / elements / ions bonded / joined together	accept more than one type of atom / ion / element do **not** accept different size accept definite proportions do **not** accept mixture	1 1
Total			**8**

4.10.3.1 Corrosion and its prevention

Answer 19 · Mark scheme January 2011 | CHY1H | Original Q4 | Legacy

CHY1H

Answer 20 · Mark scheme June 2011 | CHY1AP | Original Q5 | Legacy

Five	**2**	**2**	**1**	**3**

Answer 21 · Mark scheme November 2011 | CHY1AP | Original Q4 | Legacy

Four	**3**	**2**	**1**	**2**

4.10.3.1 Corrosion and its prevention

Answer 22 · Mark scheme

January 2012 | CH1HP | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	6-8	accept any value in the range 6-8	1
3(a)(ii)	any **three** from: • there are many earthquakes predicted by scientists each year • expense / inconvenience / panic caused by government / people taking action • most / some earthquakes do little or no damage • scientists do not know what is happening below the crust • scientists cannot (accurately) predict where the earthquake will occur • scientists cannot (accurately) predict when the earthquake will occur • scientists cannot (accurately) predict the strength of the earthquake	allow scientists / predictions have been wrong ignore lack of evidence allow earthquakes are random If none of the last 3 points have been awarded then 'scientists cannot accurately predict earthquakes' gains **1** mark	3
3(b)(i)	continents were once joined together **or** continents breaking up / separating / fitted like a jigsaw so the continents are moving	allow crust/plate for continent accept there was a supercontinent / Pangaea accept continents not in fixed positions allow continents move apart for **2** marks if no other mark awarded allow continents drift apart for **1** mark	1 1

Question 3 continues on the next page……..

4.10.3.1 Corrosion and its prevention

CH1HP

Question 3 cont'd….

question	answers	extra information	mark
3(b)(ii)	convection currents (in the mantle) caused by heat **or** caused by radioactive processes	allow credit for both marking points if given in 3(b)(i) accept movement / flow (in the mantle) ignore chemical reactions	1 1
Total			**8**

4.10.3.1 Corrosion and its prevention

Answer 22 · Mark scheme

January 2012 | CH1HP | Original Q3 | Legacy

CH1HP

4.10.3.1 Corrosion and its prevention

Answer 23 · Mark scheme

January 2013 | CH1HP | Original Q7 | Legacy

question	answers	extra information	mark
7(a)	(because to produce low-carbon steel) oxygen is needed to react with / oxidise carbon	accept (to produce low-carbon steel) oxygen removes carbon as carbon dioxide	1
	(to produce titanium) an atmosphere of argon is used because it is unreactive		1
	any oxygen / air would react with / oxidise magnesium or titanium	ignore magnesium chloride / titanium chloride reacts with oxygen	1
7(b)		it = titanium ignore references to abundance / usefulness / temperature / amounts / relative reactivity / equipment	
	for titanium:	allow converse arguments for iron	
	• there are more stages in its manufacture	accept slower rate of production **or** is more labour intensive **or** a batch process is used or the process used is not continuous	1
	• larger amounts of energy are needed	accept the titanium chloride is cooled and reheated which is not energy efficient	1
	• magnesium / chlorine / argon have to be produced **or** are expensive **or** are used		1

4.10.3.1 Corrosion and its prevention

CH1HP

question	answers	extra information	mark
7(c)	titanium is below magnesium and above iron (in the reactivity series of metals)	allow similar position to aluminium **or** carbon **or** zinc	1
	because magnesium removes chlorine from titanium chloride **and** titanium removes oxygen from iron oxide **OR** magnesium more reactive than titanium because it removes chlorine from titanium chloride (1) titanium more reactive than iron because it removes oxygen from iron oxide (1)	allow magnesium displaces titanium **and** titanium displaces iron accept magnesium more reactive than titanium because it displaces titanium accept titanium more reactive than iron because it displaces iron	1
Total			**8**

4.10.3.1 Corrosion and its prevention

Answer 23 · Mark scheme

January 2013 | CH1HP | Original Q7 | Legacy

CH1HP

4.10.3.1 Corrosion and its prevention

Answer 24 · Mark scheme

June 2013 | CH1HP | Original Q6 | Legacy

Question 6

question	Answers	extra information	Mark
6(a)	Earth consists of crust, mantle and core		1
	relative positions (of crust, mantle and core) correctly given		1
	crust is thinner than the mantle and core	accept correct information from a labelled diagram	1
6(b)	continents were joined together	accept there was a supercontinent / Pangaea	1
	the continents then drifted apart **or** moved apart	ignore attempts at explanations for movement	1
Total			**5**

4.10.3.1 Corrosion and its prevention

Answer 25 · 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

4.10.3.1 Corrosion and its prevention

Answer 25 · Mark scheme

June 2016 | CH1HP | Original Q3 | Legacy

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**	

4.10.3.1 Corrosion and its prevention

Answer 26 · Mark scheme

June 2019 | 8462/2H | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	Tube 1: (nail) rusts because air / oxygen **and** water present		1	AO1
	Tube 2: (nail) does not rust because no water	allow Tube 2: (nail) does not rust because only air / oxygen	1	AO1
	Tube 3: (nail) does not rust because no air / oxygen	allow Tube 3: (nail) does not rust because only water	1	AO1
	Tube 4: (nail) does not rust because paint is a barrier (to water / air / oxygen)	allow Tube 4: (nail) does not rust because paint is a protective layer / coating (against water / air / oxygen) **or** allow Tube 4: (nail) does not rust because paint protects it from water / air / oxygen	1	AO1 AO2 4.10.3.1 4.10.3.2
	Tube 5: (nail) does not rust because stainless steel resistant to corrosion	allow Tube 5: (nail) does not rust because stainless steel does not corrode allow Tube 5: (nail) does not rust because stainless steel contains nickel / chromium If no other mark awarded allow **1** mark for correct rusting pattern in all 5 tubes	1	

4.10.3.1 Corrosion and its prevention

Answer 26 · Mark scheme

June 2019 | 8462/2H | Original Q4

04.2	magnesium is more reactive (than iron) (so magnesium) provides sacrificial protection	allow converse allow magnesium is more reactive (than steel) allow (so magnesium) corrodes / reacts instead of iron / steel allow (so magnesium) corrodes / reacts before iron / steel ignore references to protective layers ignore references to magnesium rusting	1 1	AO2 4.10.3.1
04.3	(aluminium has a coating of) aluminium oxide (so the aluminium oxide) protects the metal (from further corrosion)	 allow (so aluminium oxide) prevents water / air / oxygen from reaching the metal	1 1	AO1 4.10.3.1
Total			**9**	

4.10.3.1 Corrosion and its prevention

Answer 27 · Mark scheme

June 2024 | 8462/2H | Original Q6

Question 6

Question	Answers	Mark	AO / Spec. Ref.
06.1	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3 4.10.2.1 4.10.3.2
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content	0	
	Indicative content • bamboo is renewable • aluminium is a finite resource • growing bamboo uses up agricultural land • mining aluminium ore is a polluting activity • cost of aluminium alloy is lower • (so) can be replaced more frequently • aluminium alloy is stronger • (so) can withstand larger forces • aluminium alloy has lower mass • (so) bicycle is faster • (so) is easier to carry / transport • the aluminium alloy frame lasts less long • (so) bicycle must be replaced more frequently • aluminium alloy is recyclable (so) aluminium ores are conserved • bamboo can provide renewable heat energy • (so) less overall contribution to global warming • (and) is carbon neutral • neither material may reach landfill • both materials have a sustainable disposal method **Reasoned judgment**		

4.10.3.1 Corrosion and its prevention

Answer 27 · Mark scheme

June 2024 | 8462/2H | Original Q6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	aluminium (alloy) has an oxide coating (so) contact between aluminium (alloy) and water / air / oxygen is prevented	 do **not** accept sacrificial protection	1 1	AO1 4.10.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	(coating with) grease	allow (coating with) oil allow galvanise allow use stainless steel as the alloy	1	AO2 4.10.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	(carbon fibre) reinforcement (polymer resin) matrix / binder	allow reinforces the polymer / resin ignore (carbon) fibres allow binds the fibres / fragments ignore (polymer) resin	1 1	AO2 4.10.3.3

Total Question 6	11

4.10.3.1 Corrosion and its prevention

Answer 28 · Mark scheme

June 2025 | 8462/2H | Original Q3

Question 3

Question	Answers	Mark	AO / Spec. Ref.
03.1	**Level 3:** A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.	5–6	AO3 4.10.1.1 4.10.1.2 4.10.2.2 4.10.3.1
	Level 2: Some logically linked reasons are given. There may also be a simple judgement.	3–4	
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content	0	
	Indicative content • aluminium ore is a finite resource • wood is a renewable resource • aluminium ore has to be mined / quarried o which causes dust / noise pollution • trees require land for growing o which reduces land for farming o which can lead to deforestation • cost of wood is lower o so more doors can be obtained for the same cost • aluminium is stronger o so less easily damaged • aluminium doors do not need painting o so less maintenance required • both are recyclable o so resources are conserved o so less goes into landfill o so less fossil fuels used o so less climate change • judgement		

4.10.3.1 Corrosion and its prevention

Answer 28 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	(the oxide coating) acts as a barrier (that) prevents air / oxygen / water reaching the aluminium / metal	do **not** accept sacrificial protection do **not** accept references to rusting do **not** accept sacrificial protection	1 1	AO1 4.10.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	a fixed mass of pigment and a fixed mass of liquid		1	AO1 4.8.1.2

Total Question 3	9

4.10.3.1 Corrosion and its prevention

Version 1.0: 0707

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science B 4462 / Chemistry 4421

CHY1H Unit Chemistry 1

Mark Scheme

2007 examination - June series

4.10.3.1 Corrosion and its prevention

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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4.10.3.1 Corrosion and its prevention

MARK SCHEME

Information to Examiners

1. General

The mark scheme for each question shows:

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

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

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

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

2. Emboldening

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

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

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

3. Marking points

3.1 Marking of lists

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

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

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

4.10.3.1 Corrosion and its prevention

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

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

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

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

3.2 Use of chemical symbols / formulae

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

3.3 Marking procedure for calculations

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

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

3.4 Interpretation of 'it'

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

3.5 Errors carried forward

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

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

3.6 Phonetic spelling

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

3.7 Brackets

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

3.8 Unexpected Correct Answers not in the Mark Scheme

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

4.10.3.1 Corrosion and its prevention

CHY1H Question 1

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

4.10.3.1 Corrosion and its prevention

CHY1H Question 2

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

Continued on next page

4.10.3.1 Corrosion and its prevention

Question 2 continued

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

4.10.3.1 Corrosion and its prevention

CHY1H Question 3

	answers	extra information	mark
(a)(i)	core		1
(ii)	plate (boundaries)	accept parts of the crust ignore crust alone	1
	sudden movement / colliding **or** normally move a few centimetres per year	accept movement but ignore movement apart accept continental drift	1
	convection currents / driven by heat from radioactive processes / decay	idea of source of energy for the movement	1
	the idea of uncertainty with an explanation eg scientists do not know (with any certainty) • what happens under the crust • where the forces / pressure are building up • we cannot measure the forces • when the forces reach their limit	 ignore references to volcanoes	1
(b)(i)	78		1

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4.10.3.1 Corrosion and its prevention

Question 3 continued

	answers	extra information	mark
(ii)	marks awarded for any 2 gases from the following 3 gases	max **3** marks from CO_2	
	any **four** from: carbon dioxide has decreased: • used by plants / bacteria (stromatolites) • during photosynthesis (must be linked to CO_2 decrease) • 'locked up' in (sedimentary) rocks / carbonates / fossil fuels • dissolved in oceans **and / or** oxygen has increased because: • released by plants / bacteria (stromatolites) • during photosynthesis (must be linked to O_2 increase) **and / or** nitrogen has increased because • ammonia reacted with oxygen (to release nitrogen) • nitrogen is released by bacteria	ignore references to respiration	4
total			10

4.10.3.1 Corrosion and its prevention

CHY1H Question 4

	answers	extra information	mark
(a)	permitted additive / (added) chemicals **or** names / types of additives	accept the chemical name ignore food additive alone	1
(b)(i)	water and oil do not mix / are immiscible **or** don't dissolve each other	ignore density ignore emulsifier alone	1
(ii)	any **two** from: • emulsifier • forms an emulsion • holds the two components together • by lowering the surface tension	 accept description of an emulsion accept stops them separating / they mix allow bonds / binds for holds accept a description of how an emulsifier works for **two** marks eg 'tadpole' diagram or dispersal of oil drops	2
(c)(i)	(because they contain) a double (carbon carbon) bond	accept unsaturated ignore poly or mono	1
(ii)	results suggest sunflower oil is best **or** 'the one that took the least time' because (sunflower oil) has the highest amount of unsaturation / most double bonds / least saturated	 ignore uses up I_2 most quickly second mark is dependent on first	1 1

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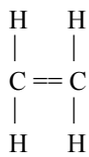
4.10.3.1 Corrosion and its prevention

Question 4 continued

	answers	extra information	mark
(d)(i)	any **one** from: • have a higher melting point than (vegetable) oil • are solid at (room temperature) / hardened / harder	 accept useful as spreads **or** doesn't soak into bread ignore hard / soft(er)	1
(ii)	any **two** from: • hydrogen added • to carbon carbon double bond / to saturate • (nickel) catalyst / temperature 60 - 150°C	 do **not** accept 'water' wrong catalyst doesn't get this mark ignore high / warm temperature	2
total			10

4.10.3.1 Corrosion and its prevention

CHY1H Question 5

	answers	extra information	mark
(a)(i)	by (fractional) distillation **or** fractionation	accept a description of the distillation process (heat and how separation works) eg heat **and** condense accept boil / vapourise etc for heat	1
(ii)	CO_2 H_2O	note the order of these products must be correct wrong way round = **1** mark	1 1
(b)(i)	(hexane) has been broken down (into smaller hydrocarbons / molecules)	accept (thermal) decomposition / cracked / split / broken up owtte	1
(ii)		accept $CH_2=CH_2$	1
(iii)	water / hydrogen oxide / steam	accept H_2O	1

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4.10.3.1 Corrosion and its prevention

Question 5 continued

	answers	extra information	mark
(c)	candidates must include both sugar cane and crude oil in their evaluation **and** both an advantage and a disadvantage to gain full marks. if they do not then the maximum mark is three any **four** from: <u>advantages of using sugar</u> • country has no wealth to buy (large quantities of) crude oil • country has limited technological development **or** underdeveloped / third world country • able / suitable climate to grow sugar cane • enough land to grow sugar cane / land cannot be used to grow food / deforestation • sugar is a renewable source **or** crude oil is a non-renewable resource / finite resource / limited resources • CO_2 / carbon neutral <u>advantages of using alkanes:</u> • economic costs are low • continuous process • country has large oil resources • country has oil refineries / cracking plants • very pure product • faster process	not 'expensive' alone	4
total			10

4.10.3.1 Corrosion and its prevention

Answer 27 · Examiner comments

June 2024 | 8462/2H | Original Q6

Question 6 (standard and standard / high demand)

06.1 Most students were able to compare the given data with mathematical processing commonly seen and where the majority of the credit for linked reasons was awarded. Most of the explicitly linked reasons in the indicative content were rarely seen.

Many students thought that burning bamboo to produce heat energy as a method of disposal was a negative point, commonly referring to the release of carbon dioxide as problematic. This was invalid given that bamboo can be seen as a carbon neutral material.

A significant number of students gave comprehensive responses in terms of logically linked reasons but were unable to reach Level 3 because they did not give a reasoned judgement as to which material is better. It is essential that students understand what is required when a particular command word is used, in this case 'evaluate'.

Around one-fifth of students gained a Level 3 mark, with roughly a further 55% achieving Level 2.

06.2 The idea of a protective oxide coating was scored much more often than the idea of contact between aluminium and water or air or oxygen being prevented.

Common misconceptions were that aluminium has too low a reactivity to react with water or oxygen, that the presence of other metals means that aluminium cannot react with water or oxygen - quite often the idea of sacrificial protection was included – or that iron is the only metal that can corrode. Less than 5% of students gained both marks.

06.3 Greasing, oiling and the use of a sacrificial metal, eg galvanising, were commonly seen. Around three-quarters of students gained this mark.

06.4 A significant number of students gave properties of the components, eg strong, flexible, light. The term 'matrix' was seen much more often than 'binder'. The components of a composite were often reversed. Around 15% of students were awarded both marks.

4.10.3.1 Corrosion and its prevention

Answer 28 · Examiner comments

June 2025 | 8462/2H | Original Q3

Question 3

03.1 Fewer than 1% of students gained no marks on this evaluation extended response question. Around two fifths of students achieved a Level 3 response. There were many excellent answers, with a large number of reasons linked to the table and to other knowledge, accompanied by a judgement. The space allowed was sufficient to score full marks, but many students unnecessarily used additional pages.
The most common linked reasons, which added information not in the table, were that aluminium ore is finite and that trees are renewable. Links to mining and deforestation were also common, as were various consequences of the disposal methods. The lack of a need for maintenance of aluminium doors was less commonly noted, as was the idea that wooden doors could be damaged more easily.
Weaker responses, which merely gave comparisons from information in the table and added no consequences, were limited to level 1. Answers which merely requoted information from the table were not creditworthy.

03.2 Fewer than 1 in 5 students achieved both marks on this item. There was much confusion, with many referring to aluminium oxide as a form of sacrificial protection rather than a physical unreactive barrier. Many also referred to corrosion of aluminium as rusting. Some referred to protecting aluminium from contact with unspecified particles. Some referred to galvanizing, which is incorrect on two levels; it is a coating with zinc not aluminium oxide, and it is a method of sacrificial protection rather than just a barrier.

03.3 Half of students identified that a formulation must contain fixed quantities of all components.