AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.10.3.1

Corrosion and its prevention

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**38**
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 | CHY1F | Original Q6 | Legacy

Question 6

	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 Q2 | Legacy

Two	**A**	aluminium ore	**4**
	B	cobalt ore	**2**
	C	copper ore	**3**
	D	nickel ore	**1**

Answer 03 · Mark scheme June 2007 | CHY1A | Original Q6 | Legacy

The full source mark scheme begins on page 37. Follow original question 6 in that document.

Answer 04 · Mark scheme June 2007 | CHY1B | Original Q2 | Legacy

Two	**A**	Crust	**3**
	B	Mantle	**2**
	C	Outer core	**4**
	D	Inner core	**1**

Answer 05 · Mark scheme June 2007 | CHY1F | Original Q5 | Legacy

The full source mark scheme begins on page 41. Follow original question 5 in that document.

Answer 06 · Mark scheme November 2007 | CHY1A | Original Q9 | Legacy

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

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

Four	**A**	a good conductor of electricity	**3**
	B	easy to bend when hot	**1**
	C	resistant to corrosion	**2**
	D	very easily worn away	**4**

4.10.3.1 Corrosion and its prevention

Answer 08 · Mark scheme June 2008 | CHY1BP | Original Q1 | Legacy

One	**A**	Layer **A**	**1**
	B	Layer **B**	**2**
	C	Layer **C**	**3**
	D	Layer **D**	**4**

Answer 09 · Mark scheme March 2009 | CHY1BP | Original Q3 | Legacy

Three	**A**	where the plates drift apart	**2**
	B	where convection currents occur, creating plate movements	**3**
	C	where global warming occurs	**1**
	D	where iron and nickel are found as metals	**4**

Answer 10 · Mark scheme June 2009 | CHY1BP | Original Q1 | Legacy

One	**A**	Atmosphere	**1**
	B	Core	**4**
	C	Crust	**2**
	D	Mantle	**3**

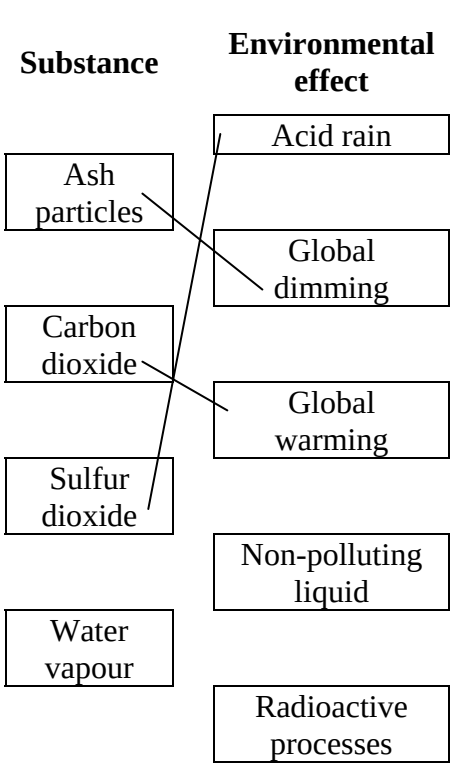
Answer 11 · Mark scheme November 2009 | CHY1BP | Original Q3 | Legacy

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

4.10.3.1 Corrosion and its prevention

Answer 12 · Mark scheme January 2019 | CHY1F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	crust		1
3(a)(ii)	radioactive		1
3(b)		all three correct = **3** marks two correct = **2** marks one correct = **1** mark extra line from a statement cancels the mark	3
3(c)	any **one** from: • (tectonic) plates move • faults / plate boundaries • weaknesses in the (Earth's) crust	idea of movement is required	1
Total			**6**

4.10.3.1 Corrosion and its prevention

Answer 12 · Mark scheme January 2010 | CHY1F | Original Q3 | Legacy

CHY1F

Answer 13 · Mark scheme March 2010 | CHY1AP | Original Q2 | Legacy

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

Answer 14 · Mark scheme March 2010 | CHY1AP | Original Q7 | Legacy

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

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

Seven	**2**	**1**	**3**	**4**

Answer 16 · Mark scheme June 2010 | CHY1BP | Original Q2 | Legacy

Two	**A**	mantle	**3**
	B	core	**2**
	C	atmosphere	**1**
	D	crust	**4**

Answer 17 · Mark scheme June 2010 | CHY1BP | Original Q6 | Legacy

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

Answer 18 · Mark scheme June 2010 | CHY1BP | Original Q7 | Legacy

Seven	**1**	**2**	**3**	**4**

4.10.3.1 Corrosion and its prevention

Answer 19 · Mark scheme

June 2010 | CHY1F | Original Q2 | Legacy

Question 2

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

4.10.3.1 Corrosion and its prevention

Answer 19 · Mark scheme

June 2010 | CHY1F | Original Q2 | Legacy

CHY1F

4.10.3.1 Corrosion and its prevention

Answer 20 · Mark scheme

June 2019 | CHY1F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(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
6(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
6(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
6(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 21 · Mark scheme

January 2011 | CHY1F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)	crust	ignore Earth's	1
	core	ignore inner and/or outer	1
3(b)	bar chart		1
	all heights are correct	accept correctly plotted points	1
	all labels are correct for nitrogen, oxygen and other / argon		1
3(c)(i)	decomposed		1
3(c)(ii)	global warming		1
Total			7

4.10.3.1 Corrosion and its prevention

Answer 21 · Mark scheme

January 2011 | CHY1F | Original Q3 | Legacy

CHY1F

4.10.3.1 Corrosion and its prevention

Answer 22 · Mark scheme

January 2011 | CHY1F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	low percentage / very little 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
6(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
6(b)(i)	has melting point lower than 950°C	(it = aluminium) allow has a low melting point ignore boiling point	1
6(b)(ii)	electrode(s) made of carbon oxygen reacts with electrode(s) / carbon	 accept $C + O_2$ ($\rightarrow$ CO_2) NB oxygen reacts with the carbon electrode(s) = **2** marks	1 1

Question 6 continues on the next page

4.10.3.1 Corrosion and its prevention

Answer 22 · Mark scheme

CHY1F

Question 6 contd

question	answers	extra information	mark
6(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 22 · Mark scheme January 2011 | CHY1F | Original Q6 | Legacy

CHY1F

Answer 23 · Mark scheme March 2011 | CHY1AP | Original Q1 | Legacy

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

Answer 24 · Mark scheme June 2011 | CHY1AP | Original Q4 | Legacy

Four	**A**	Aluminium	**4**
	B	Copper	**3**
	C	Tin	**2**
	D	Iron	**1**

4.10.3.1 Corrosion and its prevention

Answer 25 · Mark scheme

June 2011 | CHY1F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)	layer 1 – crust layer 2 – mantle layer 3 – core	extra line from a layer cancels the mark	1 1 1
1(b)(i)	0.97	extra ring drawn cancels the mark	1
1(b)(ii)	carbon dioxide / CO_2		1
Total			**5**

4.10.3.1 Corrosion and its prevention

Answer 25 · Mark scheme

June 2011 | CHY1F | Original Q1 | Legacy

CHY1F

Answer 26 · Mark scheme

November 2011 | CHY1AP | Original Q1 | Legacy

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

Answer 27 · Mark scheme

November 2011 | CHY1AP | Original Q9 | Legacy

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

4.10.3.1 Corrosion and its prevention

Answer 28 · Mark scheme

January 2012 | CH1FP | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)(i)	6-8	accept any value in the range 6-8	1
7(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

Question 7 continues on the next page…….

4.10.3.1 Corrosion and its prevention

Answer 28 · Mark scheme

January 2012 | CH1FP | Original Q7 | Legacy

CH1FP

Question 7 cont'd….

question	answers	extra information	mark
7(b)(i)		allow crust / plate for continent	
	continents were once joined together **or** continents breaking up / separating / fitted like a jigsaw	accept there was a supercontinent / Pangaea	1
	so the continents are moving	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
7(b)(ii)		allow credit for both marking points if given in 3(b)(i)	
	convection currents (in the mantle)	accept movement / flow (in the mantle)	1
	caused by heat **or**		
	caused by radioactive processes	ignore chemical reactions	1
Total			**8**

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

4.10.3.1 Corrosion and its prevention

Answer 29 · Mark scheme

June 2012 | CH1FP | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	A – core B – mantle C – crust		1 1 1
2(b)	any **two** from: • carbon dioxide dissolves / absorbs in water / oceans • plants / algae photosynthesise / absorb / use carbon dioxide • marine organisms use (dissolved) carbon dioxide to form their shells / skeletons **or** limestone was formed from the shells / skeletons of marine organisms	 allow reacts with water accept remains of plants / algae / marine organisms contain locked up carbon dioxide / carbon in the form of fossil fuels do **not** accept plants use carbon dioxide for respiration accept carbon dioxide became locked up in sedimentary rocks / carbonates / limestone **or** precipitation or formation of insoluble carbonates	2
Total			**5**

4.10.3.1 Corrosion and its prevention

Answer 29 · Mark scheme

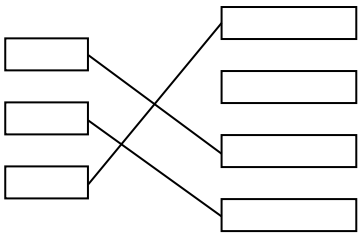
June 2012 | CH1FP | Original Q2 | Legacy

CH1FP

4.10.3.1 Corrosion and its prevention

Answer 30 · 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

4.10.3.1 Corrosion and its prevention

Answer 30 · Mark scheme

January 2013 | CH1FP | Original Q2 | Legacy

CH1FP

4.10.3.1 Corrosion and its prevention

Answer 31 · Mark scheme January 2013 | CH1FP | Original Q4 | Legacy

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

4.10.3.1 Corrosion and its prevention

Answer 31 · Mark scheme

CH1FP

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

4.10.3.1 Corrosion and its prevention

Answer 31 · Mark scheme

January 2013 | CH1FP | Original Q4 | Legacy

CH1FP

4.10.3.1 Corrosion and its prevention

Answer 32 · Mark scheme

June 2013 | CH1FP | Original Q6 | Legacy

Question 6

question	answers	extra information	Mark
6(a)	any **two** from: • similar fossils in Africa and South America • similar rocks in Africa and South America • 'jigsaw fit'	ignore same plants / animals allow rocks / fossils match in Africa and South America	2
6(b)	crust mantle heat / energy earthquake		1 1 1 1
Total			**6**

4.10.3.1 Corrosion and its prevention

Answer 33 · Mark scheme June 2015 | CH1FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)	gold		1	1 / 1.3.1c
1(b)	atom (s)		1	1 / 1.1.1a
1(c)(i)	protons neutrons	any order allow proton allow neutron	1 1	1 / 1.1.1c/h
1(c)(ii)	3 / three		1	2 / 1.1.1e/g / 1.1.2a
1(d)(i)	Al	ignore any numbers / charges	1	2 / 1.1.1b
1(d)(ii)	any **two** from: • limited resource • expensive in terms of energy / mining • effects on the environment, such as, landfill, atmospheric pollution, quarrying	allow uses a lot of energy to extract	2	1 / 1.3.1e/i/j
1(e)	resistant to corrosion does not react (with water or food)	allow **one** mark for low density with a suitable reason given	1 1	2+3 / 1.3.3c
Total			**10**	

4.10.3.1 Corrosion and its prevention

Answer 33 · Mark scheme

June 2015 | CH1FP | Original Q1 | Legacy



4.10.3.1 Corrosion and its prevention

Answer 34 · Mark scheme June 2016 | CH1FP | Original Q3 | Legacy

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)	because it is a good conductor of electricity.		1	AO1 1.3.3b
3(b)(i)	2.1 (%)		1	AO2 1.3.1c
3(b)(ii)	correct bar for calcium at 3.6 % correct bar for iron at 5.0 %	allow error of +/- 0.05% allow error of +/- 0.05%	1 1	AO2 1.3.1c
3(c)(i)	decomposition		1	AO1 1.1.3b; 1.2.1b/c
3(c)(ii)	carbon dioxide		1	AO1 1.2.1c
3(c)(iii)	carbon = 1 oxygen = 3	allow one allow three	1 1	AO2 1.1.3 a
3(c)(iv)	44 (g)	allow forty four	1	AO2 1.1.3 c
3(d)(i)	to make alloys for specific uses.		1	AO1 1.3.2a/b/c
3(d)(ii)	any **three** from: • to conserve resources of iron or iron ore • to avoid the need for quarrying/mining • to conserve energy resources or fossil fuels • to limit the amount of carbon dioxide produced or to reduce global warming • to reduce the amount of landfill	"it" = steel ignore cost and reuse and time and waste allow steel instead of iron or iron ore allow limited resource or non-renewable	3	AO1 1.3.1j
Total			**13**	

4.10.3.1 Corrosion and its prevention

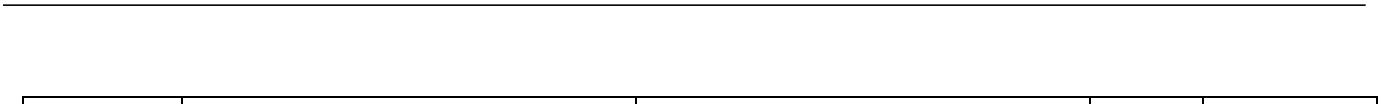
Answer 35 · Mark scheme June 2017 | CH1FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)(i)	2900	allow with **or** without working If answer is not correct allow one mark for 7000/2 **or** for 3500 (km)	2	**AO2** 1.7.1a
5(a)(ii)	plates speeds currents processes	Must be in this order	1 1 1 1	**AO1** 1.7.1c
5(b)(i)	bar correct (47%)	allow ± ½ a square	1	**AO2** 1.7.1b
5(b)(ii)	9 %		1	**AO2** 1.7.1b
5(b)(iii)	limited / finite resource	allow running out **or** non-renewable ignore cost **or** short supply **or** there is not a lot of it left	1	**AO3** 1.3.1j 1.3.3b
5(b)(iv)	electrolysis		1	**AO1** 1.3.1h
5(b)(v)	copper ions are <u>attracted</u> because they are positive	allow opposite (charges) <u>attract</u> allow because they need to gain electrons (to form copper)	1 1	**AO1** 1.3.1g;h
Total			**12**	

4.10.3.1 Corrosion and its prevention

Answer 35 · Mark scheme

June 2017 | CH1FP | Original Q5 | Legacy



4.10.3.1 Corrosion and its prevention

Answer 36 · Mark scheme

June 2019 | 8462/2F | Original Q6

Question 6

Question	Answers		Mark	AO/ Spec. Ref
06.1	**Level 3**: The design/plan would lead to the production of a valid outcome. All key steps are identified and logically sequenced.		5–6	AO2
	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	AO1
	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	AO1 4.10.3.1
	No relevant content		0	
	Indicative content **Plan – allow diagrams to indicate content** • three test tubes containing nails • test tube 1 – open test tube with water • test tube 2 – stoppered test tube with drying agent • test tube 3 – test tube with boiled water • test tube 3 – sealed with oil • leave for several days • observe results **Results** • test tube 1 – nail rusts • test tube 2 – nail does not rust • test tube 3 – nail does not rust			
06.2	0.11 (g)		1	AO2 4.10.3.1
06.3	$\left(\frac{0.08 + \mathbf{X} + 0.09}{3}\right)$ = 0.09 (g)	allow 0.09(3333….) allow ecf **from 06.2**	1	AO2 4.10.3.1
Total			**9**	

4.10.3.1 Corrosion and its prevention

Answer 37 · Mark scheme

June 2023 | 8462/2F | Original Q7

Question 7

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

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

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

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

4.10.3.1 Corrosion and its prevention

Answer 37 · Mark scheme

June 2023 | 8462/2F | Original Q7

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

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

Total Question 7	**10**

4.10.3.1 Corrosion and its prevention

Answer 38 · Mark scheme

June 2025 | 8462/2F | Original Q10

Question 10

Question	Answers	Mark	AO / Spec. Ref.
10.1	**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 38 · Mark scheme

June 2025 | 8462/2F | Original Q10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.2	(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.
10.3	a fixed mass of pigment and a fixed mass of liquid		1	AO1 4.8.1.2

Total Question 10	9

4.10.3.1 Corrosion and its prevention

Version1.2:15/08/07

ASSESSMENT and QUALIFICATIONS ALLIANCE

GCSE

Science A 4461

Chemistry 4421

CHY1A F & H

Mark Scheme

2007 examination - June series

4.10.3.1 Corrosion and its prevention

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Dr Michael Cresswell Director General

4.10.3.1 Corrosion and its prevention

CHY1A (Products from Rocks)

Foundation Tier

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

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

4.10.3.1 Corrosion and its prevention

CHY1A (Products from Rocks)

Higher Tier

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

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

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Version 1.0: 0707

ASSESSMENT and QUALIFICATIONS ALLIANCE

General Certificate of Secondary Education

Science B 4462 / Chemistry 4421

CHY1F Unit Chemistry 1

Mark Scheme

2007 examination - June series

4.10.3.1 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.

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

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Dr Michael Cresswell, Director General.

4.10.3.1 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.

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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

CHY1F Question 1

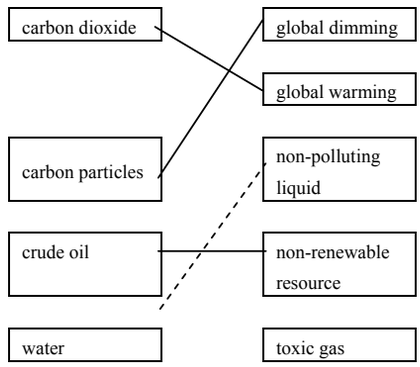
	answers	extra information	mark
(a)	low density unreactive		1 1
(b)	a polymer		1
(c)	any **one** from: • not broken down by (microorganisms) • does not decay (naturally)	ignore cannot recycle / degrade / disintegrate	1
total			4

CHY1F Question 2

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

4.10.3.1 Corrosion and its prevention

CHY1F Question 3

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

4.10.3.1 Corrosion and its prevention

CHY1F Question 4

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

Continued on next page

4.10.3.1 Corrosion and its prevention

Question 4 continued

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

4.10.3.1 Corrosion and its prevention

CHY1F Question 5

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

4.10.3.1 Corrosion and its prevention

CHY1F Question 6

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

4.10.3.1 Corrosion and its prevention

CHY1F Question 7

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

Continued on next page

4.10.3.1 Corrosion and its prevention

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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Answer 37 · Examiner comments

June 2023 | 8462/2F | Original Q7

Question 7 (Low and standard demand)

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

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

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

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

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

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

4.10.3.1 Corrosion and its prevention

Answer 38 · Examiner comments June 2025 | 8462/2F | Original Q10

Question 10

10.1 Over half of students achieved a Level 1 response for comparing the values given in the table. To achieve a higher level, links were required, why comparisons made a difference, and a judgement was required for Level 3. Too many students quoted values from the table with no 'added value' and no credit was given for this.

10.2 Around a third of students scored at least one mark on this item, usually for the idea that water, air or oxygen could not react with the aluminium. Far fewer students were able to explain the specification point that the oxide provides a barrier. Students who described sacrificial protection gained no marks for this question, whereas those that described the reaction as rusting limited their response to one mark.

10.3 A quarter of students correctly identified that a formulation would have fixed quantities of all components.

4.10.3.1 Corrosion and its prevention

Answer 38 · Examiner comments

June 2025 | 8462/2F | Original Q10

Mark Ranges and Award of Grades

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