AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.9.1.2

The Earth's early atmosphere

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**37**
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.

4.9.1.2 The Earth's early atmosphere

Answer 01 · Mark scheme January 2007 | CHY1F | Original Q7 | Legacy

Question 7

	answers	extra information	mark
(a)	oxygen **and** nitrogen		1
	20 – 21% **and** 78 – 80%	accept any two correct responses in the correct space for **one** mark	1
(b)(i)	acid rain	accept toxic gas or consequence of acid rain	1
(ii)	idea of the removal or use of sulfur dioxide gas (from the waste gases)	do **not** accept remove sulfur from coal	1
(iii)	oxygen	accept O_2	1
	water	accept H_2O accept hydrogen oxide / steam	1
(c)	any **two** from: • it's a 'greenhouse gas' or increase greenhouse effect • causes global warming or increase in the Earth's temperature • sea-levels rise or flooding • climate change • (polar) ice-caps melt • extension of deserts	accept action of a 'greenhouse gas' mention of ozone / acid rain / global dimming = max **1** mark	2
(d)	idea trap / store / lock the carbon dioxide		1
	in the oil reservoir **or** under the sea <u>bed</u>	do **not** accept 'into the oil' / 'under the sea'	1
total			10

4.9.1.2 The Earth's early atmosphere

Answer 02 · Mark scheme March 2007 | CHY1B | Original Q2 | Legacy

Two	**A**	carbon dioxide	**1**
	B	nitrogen	**3**
	C	noble gases	**4**
	D	oxygen	**2**

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 | CHY1F | Original Q5 | Legacy

The full source mark scheme begins on page 37. Follow original question 5 in that document.

Answer 05 · Mark scheme November 2007 | CHY1B | Original Q4 | Legacy

Four	**A**	ammonia	**3**
	B	helium	**2**
	C	methane	**1**
	D	oxygen	**4**

Answer 06 · Mark scheme March 2008 | CHY1BP | Original Q9 | Legacy

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

Answer 07 · Mark scheme June 2008 | CHY1BP | Original Q3 | Legacy

Three	**A**	Carbon dioxide	**2**
	B	Nitrogen	**1**
	C	Oxygen	**3**
	D	Water vapour	**4**

4.9.1.2 The Earth's early atmosphere

Answer 08 · Mark scheme June 2008 | CHY1BP | Original Q6 | Legacy

Six	**A**	catalysis	**2**		
	B	polymerisation	**3**		
	C	combustion	**4**		
	D	thermal decomposition	**1**		
	A		**B**	**C**	**D**

Answer 09 · Mark scheme November 2008 | CHY1BP | Original Q5 | Legacy

Five	**A**	carbon dioxide	**3**		
	B	helium	**1**		
	C	nitrogen	**2**		
	D	oxygen	**4**		
	A		**B**	**C**	**D**

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

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

Answer 11 · Mark scheme March 2009 | CHY1BP | Original Q6 | Legacy

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

4.9.1.2 The Earth's early atmosphere

Answer 12 · Mark scheme June 2009 | CHY1F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	nitrogen / N_2		1
4(a)(ii)	carbon dioxide / CO_2		1
4(b)(i)	humans / scientists had not evolved	accept it was billions / millions of years ago allow too long ago	1
4(b)(ii)	temperature is above 100°C **or** any water would evaporate / boil	accept Venus is too hot	1
4(c)	any **three** from: • used by plants • used for photosynthesis • dissolves in oceans / seas • used to form the shells / skeletons of marine organisms • locked up as limestone / carbonates • locked up as fossil fuels / oil / coal	accept plants take in carbon dioxide and give out oxygen for the first two bullet points ie **2** marks allow absorbs into oceans / seas	3
Total			**7**

4.9.1.2 The Earth's early atmosphere

Answer 12 · Mark scheme June 2009 | CHY1F | Original Q4 | Legacy

CHY1F

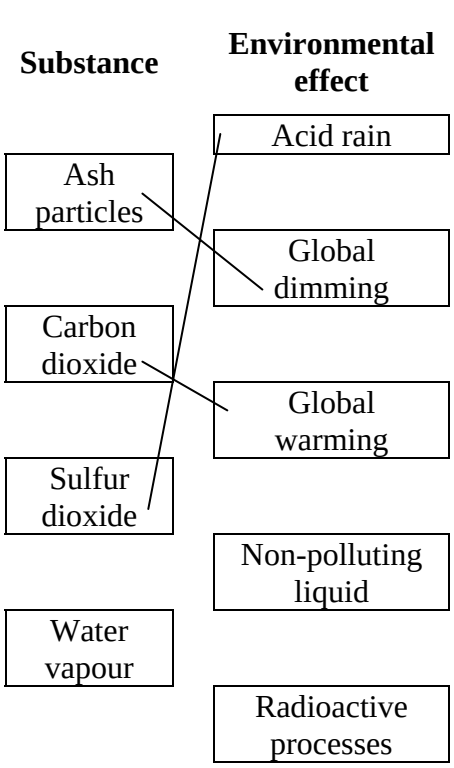
Answer 13 · Mark scheme November 2009 | CHY1BP | Original Q2 | Legacy

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

4.9.1.2 The Earth's early atmosphere

Answer 14 · 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**

4.9.1.2 The Earth's early atmosphere

Answer 14 · Mark scheme January 2010 | CHY1F | Original Q3 | Legacy

CHY1F

Answer 15 · Mark scheme March 2010 | CHY1BP | Original Q1 | Legacy

Question	Key		
One	**A**	oxygen	**1**
	B	nitrogen	**4**
	C	carbon dioxide	**2**
	D	helium	**3**

Answer 16 · Mark scheme March 2010 | CHY1BP | Original Q7 | Legacy

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

Answer 17 · Mark scheme March 2010 | CHY1BP | Original Q9 | Legacy

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

Answer 18 · Mark scheme June 2010 | CHY1BP | Original Q1 | Legacy

Question	Key		
One	**A**	Nitrogen	**2**
	B	Oxygen	**3**
	C	Carbon dioxide	**1**
	D	Argon	**4**

Answer 19 · Mark scheme June 2010 | CHY1BP | Original Q2 | Legacy

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

4.9.1.2 The Earth's early atmosphere

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**

4.9.1.2 The Earth's early atmosphere

Answer 21 · Mark scheme

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

4.9.1.2 The Earth's early atmosphere

Answer 21 · Mark scheme

January 2011 | CHY1F | Original Q3 | Legacy

CHY1F

Answer 22 · Mark scheme

June 2011 | CHY1BP | Original Q8 | Legacy

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

4.9.1.2 The Earth's early atmosphere

Answer 23 · 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**

4.9.1.2 The Earth's early atmosphere

Answer 23 · Mark scheme

June 2011 | CHY1F | Original Q1 | Legacy

CHY1F

Answer 24 · Mark scheme

November 2011 | CHY1BP | Original Q1 | Legacy

Question	Key		
One	**A**	ammonia	**4**
	B	carbon dioxide	**1**
	C	nitrogen	**3**
	D	oxygen	**2**

4.9.1.2 The Earth's early atmosphere

Answer 25 · 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**

4.9.1.2 The Earth's early atmosphere

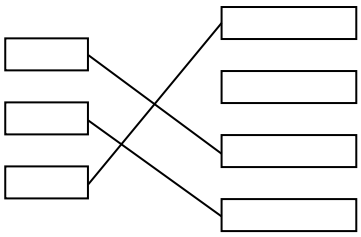
Answer 25 · Mark scheme June 2012 | CH1FP | Original Q2 | Legacy

CH1FP

4.9.1.2 The Earth's early atmosphere

Answer 26 · 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**

4.9.1.2 The Earth's early atmosphere

Answer 26 · Mark scheme

January 2013 | CH1FP | Original Q2 | Legacy

CH1FP

4.9.1.2 The Earth's early atmosphere

Answer 27 · Mark scheme

June 2013 | CH1FP | Original Q3 | Legacy

Question 3

question	answers	extra information	Mark
3(a)(i)	magnesium oxide		1
3(a)(ii)	decomposition		1
3(b)(i)	bar chart		1
3(b)(ii)	more		1
3(b)(iii)	limewater turns cloudy / milky	 accept forms a white precipitate	1 1
Total			6

4.9.1.2 The Earth's early atmosphere

Answer 28 · Mark scheme June 2014 | CH1FP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
2(a)	argon / Ar		1	1 / 1.1.2b	G
2(b)(i)	0		1	1 / 1.1.2b	A
2(b)(ii)	unreactive		1	1 / 1.1.2b	A
2(c)(i)	94.96(%)		1	2 / 1.7.2c	E
2(c)(ii)	any **two** from: • plants or photosynthesis • absorbed in oceans / *seas* • locked up in *(*sedimentary*)* rocks • locked up in fossil fuels	allow oceans store **or** take in **or** dissolve carbon dioxide	2	2 / 1.7.2f/g/h	E
Total			**6**		

4.9.1.2 The Earth's early atmosphere

Answer 28 · Mark scheme

June 2014 | CH1FP | Original Q2 | Legacy



4.9.1.2 The Earth's early atmosphere

Answer 29 · Mark scheme

June 2015 | CH1FP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	
6(a)	any **one** from: • not enough evidence or proof • (life and the Earth were created) billions of years ago	allow no evidence or no proof allow a long time ago ignore different beliefs or no one was there	1	2 / 1.7.2d	

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

1+2+3 / 1.7.1a/b/c / 1.7.2a/b/c/f/g/h

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content	Statements based on diagrams	Description of how one change occurred	Descriptions of how at least two changes occurred

Examples of chemistry points made in the response could include:

Main changes

- oxygen increased because plants / algae developed and used carbon dioxide for photosynthesis / growth producing oxygen; carbon dioxide decreased because of this
- carbon dioxide decreased because oceans formed and dissolved / absorbed carbon dioxide; carbon dioxide became locked up in sedimentary / carbonate rocks and / or fossil fuels
- oceans formed because the Earth / water vapour cooled and water vapour in the atmosphere condensed
- continents formed because the Earth cooled forming a supercontinent / Pangaea which formed the separate continents
- volcanoes reduced because the Earth cooled forming a crust

Other changes

- nitrogen has formed because ammonia in the Earth's early atmosphere reacted with oxygen / denitrifying bacteria

Total			7

4.9.1.2 The Earth's early atmosphere

Answer 30 · Mark scheme

June 2016 | CH1FP | Original Q2 | Legacy

Question 2

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

4.9.1.2 The Earth's early atmosphere

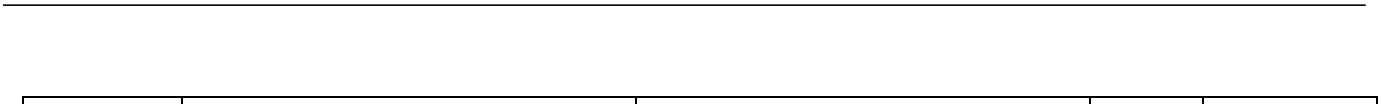
Answer 31 · Mark scheme June 2017 | CH1FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)(i)	dissolved locked up		1 1	**AO1** 1.7.2g;h
1(a)(ii)	photosynthesis		1	**AO1** 1.7.2f
1(b)(i)	argon - 1 nitrogen - 80 oxygen - 20	each mark is awarded for <u>one</u> line from each gas to the correct percentage	1 1 1	**AO1** **AO3** 1.7.2a
1(b)(ii)	(burning) fossil fuels	allow deforestation **or** a description allow (increase in) transport / factories ignore more people **or** population (increase)	1	**AO1** 1.7.2i
Total			**7**	

4.9.1.2 The Earth's early atmosphere

Answer 31 · Mark scheme

June 2017 | CH1FP | Original Q1 | Legacy



4.9.1.2 The Earth's early atmosphere

Answer 32 · Mark scheme June 2018 | 8462/2F | Original Q10

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

4.9.1.2 The Earth's early atmosphere

Answer 32 · Mark scheme

June 2018 | 8462/2F | Original Q10

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

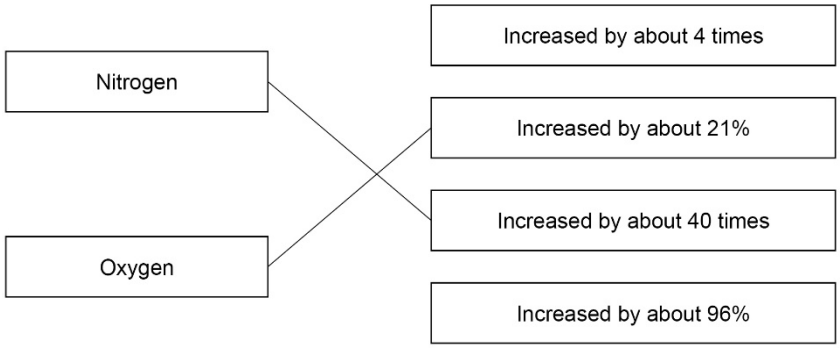
4.9.1.2 The Earth's early atmosphere

Answer 33 · Mark scheme November 2021 | 8462/2F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	4.6 billion years ago		1	AO1 4.9.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	0.92 (%)		1	AO2 4.9.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	 do **not** accept more than one line from a box on the left		1 1	AO1 AO2 4.9.1.1 4.9.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	carbon dioxide dissolving in sea water formation of sedimentary rocks		1 1	AO1 4.9.1.2 4.9.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	carbon dioxide (+ water →) (→ glucose +) oxygen	allow CO_2 allow O_2	1 1	AO1 4.9.1.3

4.9.1.2 The Earth's early atmosphere

Question 1 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	evidence / proof		1	AO1 4.9.1.2

Total			**9**

4.9.1.2 The Earth's early atmosphere

Answer 34 · Mark scheme

June 2022 | 8462/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	78.09 (%)		1	AO2 4.9.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	ammonia methane		1 1	AO1 4.9.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	photosynthesis		1	AO1 4.9.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	dissolving carbon dioxide in oceans formation of sedimentary rocks		1 1	AO1 4.9.1.2 4.9.1.4

4.9.1.2 The Earth's early atmosphere

Answer 34 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	1500 (millions of years ago)		1	AO2 4.9.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	2500 (millions of years ago)	allow a value in the range 2500 to 2700 (millions of years ago)	1	AO3 4.9.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	plankton		1	AO1 4.7.1.1 4.9.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.8	(there is) limited evidence	allow the timescale was millions / billions of years	1	AO2 4.9.1.2

Total Question 3		**10**

4.9.1.2 The Earth's early atmosphere

Answer 35 · Mark scheme

June 2023 | 8462/2F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	Mars		1	AO1 4.9.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	20%		1	AO1 4.9.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	algae and plants evolved photosynthesis took place		1 1	AO1 4.9.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	(*y*-axis labelled) 5, 10, 15, (20) oxygen bar drawn to 16%	allow (*y*-axis labelled) 4, 8, 12, 16, (20) ignore correct intermediate values allow a tolerance of ± ½ a small square	1 1	AO2 4.9.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	test tube **A**		1	AO2 4.6.1.2

4.9.1.2 The Earth's early atmosphere

Answer 35 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	a glowing splint		1	AO1 4.8.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	manganese dioxide is a catalyst in this reaction		1	AO2 4.6.1.4

Total Question 1	9

4.9.1.2 The Earth's early atmosphere

Answer 36 · Mark scheme

June 2024 | 8462/2F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	percentage of nitrogen increases until 2.3 billion years then remains constant	 allow a value in the range 2.1 to 2.4 billion years allow until 80% 	1 1 1	AO2 4.9.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	the percentage of carbon dioxide decreased		1	AO1 4.9.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	light		1	AO1 4.9.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	algae plants		1 1	AO1 4.9.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	cellulose starch		1 1	AO1 4.7.3.4

4.9.1.2 The Earth's early atmosphere

Answer 36 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	1.4×10^{11}		1	AO2 4.3.1.2 4.7.3.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	70 000 000 000		1	AO2 4.7.3.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.8	helix		1	AO1 4.7.3.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.9	4		1	AO1 4.7.3.4

Total Question 4	**13**

Answer 37 · Mark scheme

June 2025 | 8462/2F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	line of best fit		1	AO2 4.9.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2	40 (%)		1	AO2 4.9.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	carbon dioxide was dissolved in oceans		1	AO3 4.9.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	nitrogen was released during volcanic activity		1	AO3 4.9.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	2.5 billion years ago		1	AO3 4.9.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	ammonia methane		1 1	AO1 4.9.1.2

4.9.1.2 The Earth's early atmosphere

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.7	photosynthesis		1	AO1 4.9.1.3

Total Question 6	**8**

4.9.1.2 The Earth's early atmosphere

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

4.9.1.2 The Earth's early atmosphere

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.

4.9.1.2 The Earth's early atmosphere

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.

4.9.1.2 The Earth's early atmosphere

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.

4.9.1.2 The Earth's early atmosphere

CHY1F Question 1

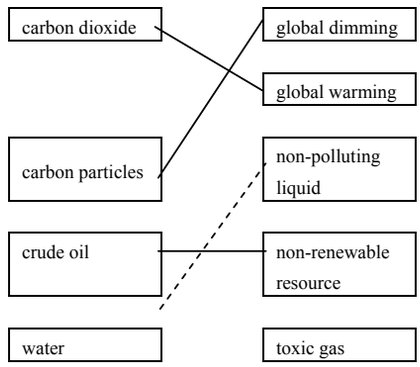
	answers	extra information	mark
(a)	low density unreactive		1 1
(b)	a polymer		1
(c)	any **one** from: • not broken down by (microorganisms) • does not decay (naturally)	ignore cannot recycle / degrade / disintegrate	1
total			4

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

4.9.1.2 The Earth's early atmosphere

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

4.9.1.2 The Earth's early atmosphere

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

4.9.1.2 The Earth's early atmosphere

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

4.9.1.2 The Earth's early atmosphere

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

4.9.1.2 The Earth's early atmosphere

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

4.9.1.2 The Earth's early atmosphere

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

4.9.1.2 The Earth's early atmosphere

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

Answer 32 · Examiner comments

June 2018 | 8462/2F | Original Q10

Question 10 (standard demand)

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

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

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

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

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

Use of statistics

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

Mark Ranges and Award of Grades

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

4.9.1.2 The Earth's early atmosphere

Answer 34 · Examiner comments

June 2022 | 8462/2F | Original Q3

Question 3 (Low and standard demand)

03.1 Just over half of the students correctly worked out the percentage of nitrogen.

03.2 Nearly 60% of the students gained two marks, with methane being well known but ammonia less so.

03.3 Photosynthesis was correctly identified by nearly 90% of the students.

03.4 Nearly 50% of the students gained two marks, with carbon dioxide dissolving in oceans better known than formation of sedimentary rocks.

03.5 Nearly four fifths of the students could correctly read the value from the graph.

03.6 Even though the numerical scale was increasing in the backwards direction, more than 90% of the students scored this mark.

03.7 Plankton was identified by nearly 60% of the students.

03.8 The answer required the idea of limited evidence or that it was billions (or millions) of years ago. Lack of proof or data or that it was a long time ago were insufficient. Just over 20% of the students answered this question correctly.

Answer 35 · Examiner comments

June 2023 | 8462/2F | Original Q1

Question 1 (Low demand)

01.1 Just over three quarters of students identified the correct planet, with the other distractors being roughly equally selected.

01.2 Just over half of the students correctly identified the percentage of oxygen in the atmosphere. 80% was the most common incorrect response.

01.3 Around half of the students gained two marks. ‘Carbonate sediments formed in oceans’ was the most common distractor. Some students did not read the rubric correctly and only ticked one box.

01.4 More than a half of the students gained 2 marks for correctly completing the scale on the *y*- axis and drawing a correct bar. The most common incorrect response was to omit the scale on the *y*-axis. A minority of students achieved no marks for the bar chart as they had included a non-linear scale.

4.9.1.2 The Earth's early atmosphere

Answer 35 · Examiner comments June 2023 | 8462/2F | Original Q1

01.5 This question was answered very well with more than 90% of students correctly identifying which test tube was at the highest temperature. A small minority chose test tube B, which produced the fewest bubbles.

01.6 This was also very well answered, with more than two thirds of students correctly identifying the test for oxygen. 'Bromine water' was the most common distractor.

01.7 Just over 50% of students recognised that a catalyst does not appear in a chemical reaction. 'Manganese dioxide is used up during this reaction' was a powerful distractor.

Answer 36 · Examiner comments June 2024 | 8462/2F | Original Q4

Question 4 (low and standard demand)

04.1 One in four students obtained all three marks in this question with two out of five obtaining two marks. The most frequently seen reason for not obtaining full marks was to incorrectly determine the date in billions of years at which the percentage of nitrogen in the atmosphere became constant. Students need to be exposed to as many examples as possible of explaining trends as some struggled to express the percentage of nitrogen becoming constant, describing the line as becoming, steady, calm, stable, stopping or going at a constant speed or using vague statements about 'it.'

04.2 Almost 80% of students correctly identified that the percentage of carbon dioxide decreased.

04.3 Well over 80% of students correctly identified light as being the energy source for photosynthesis.

04.4 Nearly 80% of students identified the two organisms that produce oxygen. A further 15% correctly identified one organism, usually plants.

04.5 Less than 30% of students could correctly identify the two natural polymers produced from glucose. It is important that students read the question carefully as there was a significant number of students who ticked only one box rather than the two requested.

04.6 Well over 75% of students correctly expressed the relative formula mass of DNA in standard form.

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4.9.1.2 The Earth's early atmosphere

Answer 36 · Examiner comments June 2024 | 8462/2F | Original Q4

04.7 Only one in two students were able to correctly calculate the relative formula mass of each polymer chain in DNA. The most popular incorrect distractor was 140 000 000 000 where the student had failed to realise that the DNA molecule was comprised of two chains.

04.8 Just under 75% of students correctly described the shape of a DNA molecule as a double helix. The most common incorrect response was double bond.

04.9 Less than 35% of students were able to correctly identify the number of different nucleotides present in a molecule of DNA.

Answer 37 · Examiner comments June 2025 | 8462/2F | Original Q6

Question 6

06.1 Nearly 80% of students completed the line of best fit.

06.2 Two thirds of students correctly read 40% from the graph. The most common incorrect response was 24%, which corresponds to 3.25 billion years ago.

06.3 3 in 5 students correctly identified that carbon dioxide dissolving in water caused the concentration to drop initially.

06.4 Over half of students knew that the percentage of nitrogen increasing in the atmosphere was caused by volcanic action.

06.5 Knowledge of the changes of the atmosphere over time was known by fewer than half of the students.

06.6 Fewer than 20% of students identified both gases in the Earth's early atmosphere. Hydrogen and helium were the two distractors that were seen most.

06.7 Over half of students correctly identified the process as photosynthesis. Respiration and combustion were the two most common incorrect answers.