AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.9.3.1

Atmospheric pollutants from fuels

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**69**
Available paper years	**2007–2024**

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.

4.9.3.1 Atmospheric pollutants from fuels

Answer 01 · Mark scheme

Question 3

	answers	extra information	mark
(a)	tungsten		1
	has the high(est) melting point	accept that metals other than tungsten are likely to melt	1
(b)	argon		1
	is an unreactive gas	accept that gases other than argon are reactive accept that argon is a noble gas or in Group 0	1
total			4

4.9.3.1 Atmospheric pollutants from fuels

Answer 02 · 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

4.9.3.1 Atmospheric pollutants from fuels

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

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

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

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

Answer 05 · Mark scheme June 2007 | CHY1A | Original Q1 | Legacy

Question	***Key***		
One	**A**	atom	**3**
	B	compound	**2**
	C	element	**4**
	D	symbol	**1**

Answer 06 · Mark scheme June 2007 | CHY1A | Original Q2 | Legacy

Two	**A**	gold (Au)	**3**
	B	lithium (Li)	**4**
	C	calcium (Ca)	**1**
	D	sulfur (S)	**2**

Answer 07 · Mark scheme June 2007 | CHY1F | Original Q3 | Legacy

The full source mark scheme begins on page 75. Follow original question 3 in that document.

Answer 08 · Mark scheme November 2007 | CHY1A | Original Q3 | Legacy

Three	**A**	carbon	**4**
	B	carbon monoxide	**3**
	C	carbon dioxide	**1**
	D	oxygen	**2**

Answer 09 · Mark scheme November 2007 | CHY1A | Original Q8 | Legacy

Eight	**1**	**4**	**2**	**3**

4.9.3.1 Atmospheric pollutants from fuels

Answer 10 · Mark scheme

November 2007 | CHY1B | Original Q4 | Legacy

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

4.9.3.1 Atmospheric pollutants from fuels

Answer 11 · Mark scheme January 2008 | CHY1F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
(a)	good (electrical) conductor	allow low reactivity / resistance to corrosion do **not** accept heat conductor	1
(b)	a mixture of metals	accept contains more than one type of metal	1
(c)(i)	any **one** from: • eyesore • destruction of habitats • pollution of water • dust pollution • noise • traffic pollution		1
(c)(ii)	acid rain	allow sulfur dioxide is a pollutant	1
(d)(i)	running out of copper (ores)		1
(d)(ii)	any **two** from: • any specific example of using less copper • reuse / recycle • use low-grade copper ores • use other metals / materials in place of copper	allow do **not** throw copper / brass away	2
total			7

4.9.3.1 Atmospheric pollutants from fuels

Answer 11 · Mark scheme January 2008 | CHY1F | Original Q6 | Legacy

CHY1F

Answer 12 · Mark scheme March 2008 | CHY1AP | Original Q1 | Legacy

One	**A**	sulfur dioxide	**2**
	B	carbon dioxide	**1**
	C	carbon monoxide	**3**
	D	particles	**4**

Answer 13 · Mark scheme March 2008 | CHY1AP | Original Q9 | Legacy

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

Answer 14 · Mark scheme March 2008 | CHY1BP | Original Q1 | Legacy

One	**A**	argon (noble gas)	**2**
	B	carbon dioxide	**3**
	C	nitrogen	**1**
	D	oxygen	**4**

Answer 15 · Mark scheme March 2008 | CHY1BP | Original Q9 | Legacy

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

Answer 16 · Mark scheme June 2008 | CHY1AP | Original Q2 | Legacy

Two	**A**	carbon dioxide	**3**
	B	smoke particles	**2**
	C	sulfur dioxide	**1**
	D	water vapour	**4**

Answer 17 · Mark scheme June 2008 | CHY1AP | Original Q9 | Legacy

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

4.9.3.1 Atmospheric pollutants from fuels

Answer 18 · Mark scheme

June 2008 | CHY1F | Original Q2 | Legacy

question	answers	extra information	mark
2(a)(i)	sulfur dioxide / SO_2		1
2(a)(ii)	global dimming		1
2(a)(iii)	carbon dioxide / CO_2	ignore ozone	1
	increases the levels (of carbon dioxide)	accept it is a greenhouse gas **or** causes global warming / greenhouse effect	1
2(b)	gas / oil bar correct length		1
	coal bar correct length		1
Total			**6**

4.9.3.1 Atmospheric pollutants from fuels

Answer 18 · Mark scheme June 2008 | CHY1F | Original Q2 | Legacy

COMPONENT NUMBER: CHY1F

COMPONENT NAME: Science B / Chemistry

STATUS: Final

DATE: June 2008

Answer 19 · Mark scheme November 2008 | CHY1AP | Original Q3 | Legacy

Three	**A**	hydrogen, H_2	**1**
	B	ammonia, NH_3	**4**
	C	methane, CH_4	**2**
	D	carbon monoxide, CO	**3**

Answer 20 · Mark scheme November 2008 | CHY1AP | Original Q8 | Legacy

Eight	**4**	**2**	**3**	**3**

Answer 21 · 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 22 · Mark scheme March 2009 | CHY1AP | Original Q5 | Legacy

Five	**A**	Molecule **A**	**2**	
	B	Molecule **B**	**1**	
	C	Molecule **C**	**3**	
	D	Molecule **D**	**4**	
	A	**B**	**C**	**D**

Answer 23 · Mark scheme March 2009 | CHY1AP | Original Q6 | Legacy

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

4.9.3.1 Atmospheric pollutants from fuels

Answer 24 · Mark scheme

June 2009 | CHY1AP | Original Q5 | Legacy

Five	**A** Substance **A** **1** **B** Substance **B** **2** **C** Substance **C** **3** **D** Substance **D** **4**			
	A	**B**	**C**	**D**

Answer 25 · Mark scheme

June 2009 | CHY1AP | Original Q6 | Legacy

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

4.9.3.1 Atmospheric pollutants from fuels

Answer 26 · Mark scheme June 2009 | CHY1F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)(i)	wood		1
2(a)(ii)	30 (kJ)		1
2(a)(iii)	carbon / C **or** hydrogen / H **or** sulfur / S **or** oxygen / O		1
2(a)(iv)	3 / three (g)		1
2(b)(i)	releases most energy	accept releases a lot of energy / burns rapidly ignore references to cost	1
	no harmful gases / no or less pollution formed / no global warming / no climate change / no greenhouse gas	accept produces water (only) /steam accept does **not** produce sulfur dioxide / carbon dioxide / carbon monoxide / particles / smoke	1

Question 2 continues on the next page…

4.9.3.1 Atmospheric pollutants from fuels

Answer 26 · Mark scheme

June 2009 | CHY1F | Original Q2 | Legacy

CHY1F

Question 2 Continued

question	answers	extra information	mark
2(b)(ii)	any **one** from: • expensive • difficult to produce • not available in large quantities • explosive / dangerous • not a natural fuel / resource • made from fossil fuels • difficult to store	accept large volume needed allow will run out / non-renewable	1
Total			**8**

4.9.3.1 Atmospheric pollutants from fuels

Answer 26 · Mark scheme

June 2009 | CHY1F | Original Q2 | Legacy

CHY1F

4.9.3.1 Atmospheric pollutants from fuels

Answer 27 · Mark scheme

June 2009 | CHY1F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	3 / three		1
6(a)(ii)	5 / five		1
6(b)	any **one** from: • less / no transport • less / no (fossil) fuel used	 accept less / no distance ignore references to carbon dioxide / carbon emissions	1
6(c)(i)	carbon dioxide / CO_2 (causes) global warming / climate change / greenhouse gas **or** (cement) particles / smoke (1) (causes) asthma / dust / (global) dimming (1) **or** sulfur dioxide / SO_2 / nitrogen oxides / NO_x (1) (causes) acid rain (1)	for a correct emission explanation must be correct for named emission ignore ozone layer accept breathing problems do **not** accept nitrogen or water vapour for emissions do **not** accept no named emission	1 1

Question 6 continues on the next page…

4.9.3.1 Atmospheric pollutants from fuels

Answer 27 · Mark scheme June 2009 | CHY1F | Original Q6 | Legacy

CHY1F

Question 6 Continued

question	answers	extra information	mark
6(c)(ii)	absorb / trap / capture / filter / pass through water / scrub / electrostatic attraction	ignore condense / off setting / different fuel	1
Total			**6**

4.9.3.1 Atmospheric pollutants from fuels

Answer 27 · Mark scheme June 2009 | CHY1F | Original Q6 | Legacy

CHY1F

Answer 28 · Mark scheme November 2009 | CHY1AP | Original Q4 | Legacy

Four	**A**	diesel, steady speed	**2**
	B	diesel, slowing down	**1**
	C	petrol, accelerating	**3**
	D	petrol, slowing down	**4**

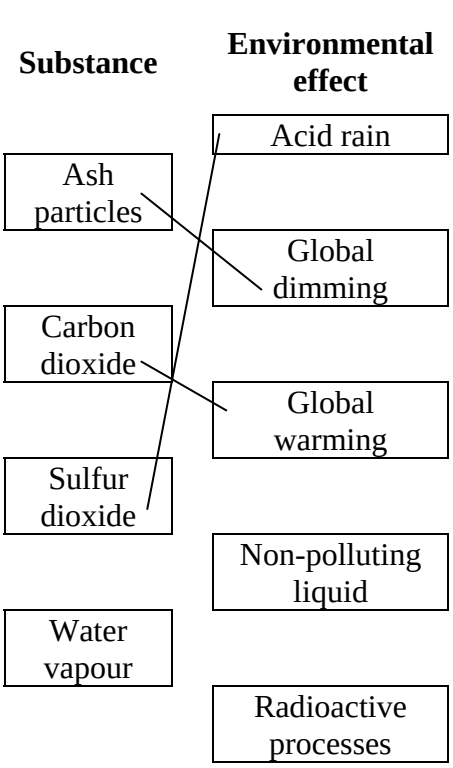
Answer 29 · Mark scheme November 2009 | CHY1BP | Original Q2 | Legacy

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

4.9.3.1 Atmospheric pollutants from fuels

Answer 30 · Mark scheme

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**

4.9.3.1 Atmospheric pollutants from fuels

Answer 30 · Mark scheme

January 2010 | CHY1F | Original Q3 | Legacy

CHY1F

4.9.3.1 Atmospheric pollutants from fuels

Answer 31 · Mark scheme

Question 4

question	answers	extra information	mark
4(a)	elements		1
4(b)(i)	nucleus		1
4(b)(ii)	six		1
4(c)(i)	CH_4		1
4(c)(ii)	bond		1
4(d)(i)	oxygen		1
4(d)(ii)	any **one** from: • (water) does not pollute • (only) water is produced • no carbon dioxide / monoxide (is produced)	 accept no harmful gas(es) allow less pollution accept no greenhouse gas(es) / effect **or** no global warming	1
Total			**7**

4.9.3.1 Atmospheric pollutants from fuels

Answer 31 · Mark scheme January 2010 | CHY1F | Original Q4 | Legacy

CHY1F

Answer 32 · Mark scheme January 2010 | CHY2F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	fertilisers		1
2(b)	air		1
2(c)(i)	water **and** carbon monoxide on correct side of equation	accept H_2O for water and CO for carbon monoxide	1
2(c)(ii)	speeds up the reaction (owtte)	accept lowers the activation energy	1
2(d)	reversible reaction		1
2(e)(i)	10		1
2(e)(ii)	sulfuric water	accept H_2SO_4 accept H_2O / hydrogen oxide	1 1
Total			**8**

Answer 32 · Mark scheme January 2010 | CHY2F | Original Q2 | Legacy

CHY2F

4.9.3.1 Atmospheric pollutants from fuels

Answer 33 · Mark scheme

Question 3

question	answers	extra information	mark
3(a)	electricity / (high) temperatures	allow lightning / heat ignore energy	1
3(b)	nitrogen + oxygen → nitrogen oxide / monoxide	allow any oxide of nitrogen	1
3(c)	more than		1
3(d)(i)	A		1
3(d)(ii)	C		1
Total			**5**

4.9.3.1 Atmospheric pollutants from fuels

Answer 33 · Mark scheme January 2010 | CHY3F | Original Q3 | Legacy

CHY3F

Answer 34 · Mark scheme March 2010 | CHY1AP | Original Q1 | Legacy

Question	*Key*		
One	**A**	carbon dioxide	**3**
	B	particles	**2**
	C	sulfur dioxide	**1**
	D	water vapour	**4**

Answer 35 · Mark scheme June 2010 | CHY1AP | Original Q5 | Legacy

Five	**A**	nitrogen dioxide	**4**
	B	carbon monoxide	**3**
	C	carbon dioxide	**2**
	D	soot (carbon)	**1**

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

4.9.3.1 Atmospheric pollutants from fuels

Answer 36 · Mark scheme

June 2019 | CHY1F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)	acid rain → sulfur dioxide global warming → carbon dioxide global dimming → carbon particles		1 1 1
3(b)(i)	oxygen		1
3(b)(ii)	carbon monoxide		1
3(c)(i)	decreasing	accept running out / none left	1
3(c)(ii)	any **two** from: • world needs (more) energy • plentiful supply • (many) countries have coal • easy to find / extract • oil / gas is running out • cheap **or** cheaper than oil	it = coal accept population is increasing allow (greater) demand for coal / fuels / energy accept readily available allow coal will 'last longer' accept need to use less oil / gas accept need to use it to replace oil / gas	2
Total			**8**

4.9.3.1 Atmospheric pollutants from fuels

Answer 36 · Mark scheme

June 2010 | CHY1F | Original Q3 | Legacy

CHY1F

Answer 37 · Mark scheme

November 2010 | CHY1AP | Original Q6 | Legacy

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

4.9.3.1 Atmospheric pollutants from fuels

Answer 38 · 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**

4.9.3.1 Atmospheric pollutants from fuels

Answer 38 · Mark scheme

January 2011 | CHY1F | Original Q3 | Legacy

CHY1F

4.9.3.1 Atmospheric pollutants from fuels

Answer 39 · Mark scheme

January 2011 | CHY2F | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)(i)	increase		1
5(a)(ii)	energy is given out to the surroundings		1
5(b)(i)	NO	allow 2NO ignore nitrogen oxide do **not** allow equations	1
5(b)(ii)	harmful / poisonous (owtte)	allow dangerous ignore reference to pollution / global warming do **not** accept references to ozone layer	1
5(c)	a catalyst can speed up a chemical reaction different reactions need different catalysts		1 1
5(d)(i)	smaller	accept less / tiny / very small allow 10^{-9} do **not** allow small unless qualified	1
5(d)(ii)	reduce cost (owtte) **or** save resources / raw materials (owtte)	ignore references to energy	1
Total			**8**

4.9.3.1 Atmospheric pollutants from fuels

Answer 39 · Mark scheme January 2011 | CHY2F | Original Q5 | Legacy

CHY2F

Answer 40 · Mark scheme March 2011 | CHY1AP | Original Q5 | Legacy

Five	**A**	Carbon monoxide (CO) / Substance **A**	**4**
	B	Hydrogen (H_2) / Substance **B**	**2**
	C	Methane (CH_4) / Substance **C**	**1**
	D	Hydrogen sulfide (H_2S) / Substance **D**	**3**

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

Answer 41 · Mark scheme March 2011 | CHY1AP | Original Q7 | Legacy

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

Answer 42 · Mark scheme June 2011 | CHY1AP | Original Q1 | Legacy

Question	**Key**		
One	**A**	Carbon dioxide	**3**
	B	Carbon monoxide	**2**
	C	Sulfur dioxide	**1**
	D	Water vapour	**4**

Answer 43 · Mark scheme June 2011 | CHY1AP | Original Q6 | Legacy

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

4.9.3.1 Atmospheric pollutants from fuels

Answer 44 · Mark scheme

June 2011 | CHY1F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	sulfur dioxide / SO_2	allow sulfur oxide	1
2(b)	global dimming		1
2(c)	oxygen / O_2		1
2(d)	(oil is a) limited resource / finite / non-renewable	accept running out of oil **or** wood is sustainable accept (burning oil) increases amount of carbon dioxide in the atmosphere / global warming **or** releases locked up carbon / global dimming / acid rain accept the oil (may become) too expensive	1
2(e)	carbon dioxide produced (from burning wood) carbon dioxide used by plants / trees **or** for photosynthesis	ignore global warming if no other mark awarded allow carbon emissions used by plants / trees **or** for photosynthesis for **1** mark	1 1
Total			**6**

4.9.3.1 Atmospheric pollutants from fuels

Answer 44 · Mark scheme

June 2011 | CHY1F | Original Q2 | Legacy

CHY1F

Answer 45 · Mark scheme

November 2011 | CHY1AP | Original Q7 | Legacy

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

Answer 46 · Mark scheme

November 2011 | CHY1AP | Original Q8 | Legacy

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

4.9.3.1 Atmospheric pollutants from fuels

Answer 47 · Mark scheme

Question 6

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

Question 6 continues on the next page…….

CH1FP

Question 6 cont'd…..

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

4.9.3.1 Atmospheric pollutants from fuels

Answer 47 · Mark scheme

January 2012 | CH1FP | Original Q6 | Legacy

CH1FP

4.9.3.1 Atmospheric pollutants from fuels

Answer 48 · Mark scheme

June 2012 | CH1FP | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)	Aluminium has a low density Aluminium is resistant to corrosion		1 1
3(b)(i)	(an alloy) is a mixture of metals	accept (an alloy) can be a metal mixed with another metal **or** iron mixed with carbon / a non-metal	1
3(b)(ii)	pure metals are soft **or** alloys are hard	allow weak allow strong / keep their shape ignore rust / corrosion	1
3(c)(i)	crude oil		1
3(c)(ii)	hydrocarbons		1
3(c)(iii)	oxygen		1
3(d)(i)	hydrogen	allow H_2 or H	1
3(d)(ii)	only water is produced (from the fuel) **or** no carbon dioxide is produced (from the fuel)	 allow less carbon dioxide produced **or** less global warming allow carbon dioxide causes global warming	1
Total			**9**

4.9.3.1 Atmospheric pollutants from fuels

Answer 48 · Mark scheme

June 2012 | CH1FP | Original Q3 | Legacy

CH1FP

4.9.3.1 Atmospheric pollutants from fuels

Answer 49 · Mark scheme

June 2012 | CH1FP | Original Q5 | Legacy

Question 5

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

4.9.3.1 Atmospheric pollutants from fuels

Answer 49 · Mark scheme

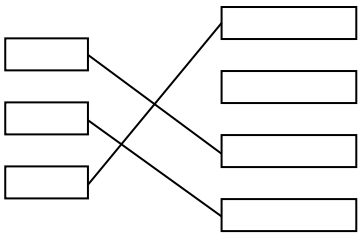
June 2012 | CH1FP | Original Q5 | Legacy

CH1FP

4.9.3.1 Atmospheric pollutants from fuels

Answer 50 · 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**

4.9.3.1 Atmospheric pollutants from fuels

Answer 50 · Mark scheme

January 2013 | CH1FP | Original Q2 | Legacy

CH1FP

4.9.3.1 Atmospheric pollutants from fuels

Answer 51 · 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

4.9.3.1 Atmospheric pollutants from fuels

Answer 51 · Mark scheme January 2013 | CH1FP | Original Q4 | Legacy

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**

4.9.3.1 Atmospheric pollutants from fuels

Answer 51 · Mark scheme

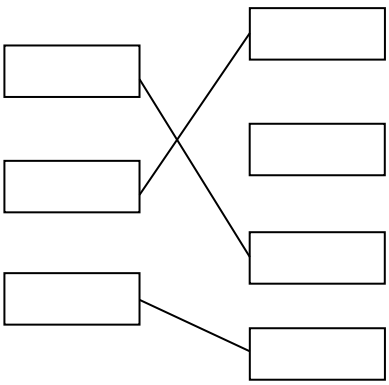
January 2013 | CH1FP | Original Q4 | Legacy

CH1FP

4.9.3.1 Atmospheric pollutants from fuels

Answer 52 · Mark scheme

June 2014 | CH1FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
1(a)(i)	a proton		1	1 / 1.1.1d	A
1(a)(ii)	nucleus		1	1 / 1.1.1c	A
1(a)(iii)	12 4	order must be correct	1 1	2 / 1.1.1g	G
1(b)(i)	5 / five (%)		1	1 / 1.4.3a	G
1(b)(ii)	Carbon dioxide>global warming Sulfur dioxide>acid rain Water>no pollution 		1 1 1	1 / 1.4.3a/c	G
Total			8		

4.9.3.1 Atmospheric pollutants from fuels

Answer 52 · Mark scheme

June 2014 | CH1FP | Original Q1 | Legacy



4.9.3.1 Atmospheric pollutants from fuels

Answer 53 · Mark scheme June 2014 | CH1FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
5(a)(i)	economical		1	1 / 1.3.1a	A
5(a)(ii)	phytomining		1	1 / 1.3.1g	A
5(a)(iii)	carbon dioxide		1	1 / 1.3.1d/f	A
5(b)(i)	copper / Cu iron sulfate / $FeSO_4$		1 1	2 / 1.3.1h	E
5(b)(ii)	copper/ ions have a positive charge	it = copper ions allow copper ions have a different charge accept copper / ions are free to move accept to gain electrons accept copper / ions are attracted to the negative electrode **or** opposite charges attract	1	1 / 1.3.1h	E
5(c)	any **two** from: • copper ores are limited / running out • copper can be recycled • copper can be reused • copper is expensive • landfill sites are filling up • copper compounds are toxic	ignore not biodegradable or does not decay allow copper is running out allow copper is toxic	2	3 / 1.3.1j	E
Total			**8**		

4.9.3.1 Atmospheric pollutants from fuels

Answer 53 · Mark scheme

June 2014 | CH1FP | Original Q5 | Legacy



4.9.3.1 Atmospheric pollutants from fuels

Answer 54 · Mark scheme

June 2014 | CH1FP | Original Q7 | Legacy

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

4.9.3.1 Atmospheric pollutants from fuels

Answer 54 · Mark scheme

June 2014 | CH1FP | Original Q7 | Legacy

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

Total			**9**

4.9.3.1 Atmospheric pollutants from fuels

Answer 55 · Mark scheme

June 2014 | CH2FP | Original Q3 | Legacy

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

4.9.3.1 Atmospheric pollutants from fuels

Answer 55 · Mark scheme

June 2014 | CH2FP | Original Q3 | Legacy



4.9.3.1 Atmospheric pollutants from fuels

Answer 56 · Mark scheme June 2015 | CH1FP | Original Q3 | Legacy

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

4.9.3.1 Atmospheric pollutants from fuels

Answer 56 · Mark scheme

June 2015 | CH1FP | Original Q3 | Legacy



4.9.3.1 Atmospheric pollutants from fuels

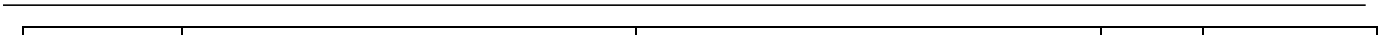
Answer 57 · Mark scheme June 2015 | CH2FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)	1 very small	must be in this order accept negligible, 1/2000 allow zero	1 1	**AO1** 2.3.1b
1(b)	The mass number		1	**AO1** 2.3.1c
1(c)	C		1	**AO2** 2.3.1a
1(d)(i)	2		1	**AO2** 2.1.1a
1(d)(ii)	3		1	**AO2** 2.1.1a
1(e)(i)	28		1	**AO2** 2.3.1f
1(e)(ii)	42.9	accept ecf from (e)(i) accept 42 - 43	1	**AO2** 2.3.3a
1(f)(i)	0.9		1	**AO2** 2.3
1(f)(ii)	any **one** from: • accurate • sensitive • rapid • small sample		1	**AO1** 2.3.2a
Total			**10**	

4.9.3.1 Atmospheric pollutants from fuels

Answer 57 · Mark scheme

June 2015 | CH2FP | Original Q1 | Legacy



4.9.3.1 Atmospheric pollutants from fuels

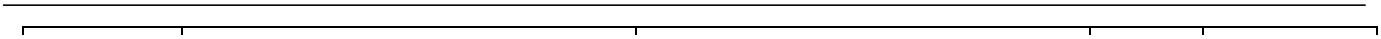
Answer 58 · Mark scheme June 2015 | CH3FP | Original Q7 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7(a)(i)	(19.5 + 18.5 + 19.0)/3	allow (23.0 +19.5 + 18.5 + 19.0)/4 for **1** mark	2	**AO2/ AO3** 3.4.1.g
7(a)(ii)	R P Q	allow Q P R for **1** mark	2	**AO3** 3.4.1.g
7(b)	any **two** from: • repeat more times • calculate a mean • measure to one decimal place		2	**AO3** 3.4.1.g
7(c)	both students get similar results / similar pattern		1	**AO3** 3.4.1.g
Total			**7**	

4.9.3.1 Atmospheric pollutants from fuels

Answer 58 · Mark scheme

June 2015 | CH3FP | Original Q7 | Legacy



4.9.3.1 Atmospheric pollutants from fuels

Answer 59 · Mark scheme

June 2016 | CH1FP | Original Q2 | Legacy

Question 2

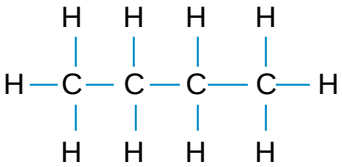
Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	the Earth's (surface) temperature was high **or** at/above 100 °C	allow the Earth's (surface) temperature was too/very hot **or** water evaporated/ boiled **or** turned to steam/gas allow because of heat from volcanoes ignore the Earth's (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**	

4.9.3.1 Atmospheric pollutants from fuels

Answer 60 · Mark scheme

June 2016 | CH1FP | Original Q5 | Legacy

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(a)(i)	high temperature catalyst or steam	allow heating / hot / 250-900 °C allow named catalyst eg zeolite, Al_2O_3, silica, ceramic allow in the absence of air / oxygen ignore any references to pressure	1 1	AO1 1.5.1a
5(a)(ii)	colourless	allow decolourised ignore clear / discoloured	1	AO1 1.5.1d
5(a)(iii)			1	AO2 1.4.2a
5(b)(i)	20.3(0) (kJ)	if answer incorrect allow **1** mark for 24.36/1.2	2	AO2 1.4.3b
5(b)(ii)	use a lid reduce energy / heat loss	allow insulate beaker or use draught shield ignore references to thermometer or repeats or distance of flame or loss of water vapour allow stir (1) to distribute energy / heat (1) allow use a metal can (1) as it's a better conductor (1)	1 1	AO3 4.3.2b/c/d
5(b)(iii)	carbon/soot (produced by) incomplete combustion	ignore tar, smoke allow from a limited supply of oxygen/air	1 1	AO1+AO2 1.4.3a/b
5(b)(iv)	hexane gives out the greatest energy (per 1.0 g) hexane produces the least smoke / carbon / soot	ignore more energy allow has the cleanest flame ignore less smoke / carbon / soot	1 1	AO3 1.4.2c; 1.4.3a/b

4.9.3.1 Atmospheric pollutants from fuels

Answer 60 · Mark scheme

June 2016 | CH1FP | Original Q5 | Legacy

QWC Mark Scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
5(c)			6	AO1+AO2+ AO3 1.1.3b; 1.4.1b/c; 1.4.3a/b/c/d ;1.7.2h/i

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

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
No relevant content	Statements made from the information that indicate whether at least one statement is an advantage **or** a disadvantage **or** a linked advantage or disadvantage	Descriptions of an advantage **and** a disadvantage with some use of their knowledge to add value.	Descriptions of advantages **and** disadvantages that are linked to their own knowledge.

Examples of the added value statements and links made in the response could include:
Note that link words are in bold; links can be either way round.
Accept reverse arguments and ignore cost throughout.

Advantages of using hydrogen:

- Combustion only produces water **so** causes no pollution
- Combustion does not produce carbon dioxide **so** this does not contribute to global warming or climate change
- Combustion does not produce sulfur dioxide **so** this does not contribute to acid rain
- Incomplete combustion of petrol produces carbon monoxide **that is** toxic
- Incomplete combustion of petrol produces particulates **that** contribute to global dimming
- Petrol comes from a non-renewable resource **but** there are renewable/other methods of producing hydrogen
- Hydrogen releases more energy **so** less fuel needed or more efficient

Disadvantages of using hydrogen:

- Hydrogen is a gas **so** is difficult to store or transfer to vehicles
- Hydrogen gas is very flammable **so** leaks cause a greater risk of explosion
- Most hydrogen is produced from fossil fuels **which** are running out
- Cannot be used in existing car engines **so** modification / development or replacement is needed
- Lack of filling stations **so** difficult to refuel your vehicle

Total			18

4.9.3.1 Atmospheric pollutants from fuels

Answer 61 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
7			6	AO2 AO3 1.2.1a;b 1.4.2a 1.4.3a;b;c 1.7.2a;i

Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 4 and apply a 'best-fit' approach to the marking.

0 marks	Level 1 (1–2 marks)	Level 2 (3–4 marks)	Level 3 (5–6 marks)
no relevant information given	discrete relevant points made about types of pollution **or** problematic effects **or** environmental impacts	an explanation of how an environmental impact is caused by the pollution from **or** the problematic effect of a linked process	detailed explanations of how environmental impacts are caused by the pollutions from **or** the problematic effects of linked processes

Examples of chemistry points made in the response could include:

Processes	Types of pollution and problematic effects:
• quarrying • drilling • thermal decomposition • combustion of fossil fuel • use of explosives	• visual pollution • noise pollution • dust pollution • destruction of land • air / atmospheric pollution (methane, carbon dioxide, sulphur dioxide, NO_x, particulates) • water (rivers / lakes / seas) pollution • earth tremors

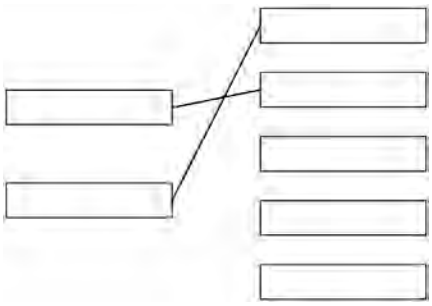
Environmental impacts:

- destruction of areas of natural beauty
- disturbance of people and animals
- breathing problems **or** asthmatic attack
- destruction of habitats **or** biodiversity or kills wildlife and plants
- (CH_4 ; CO_2) greenhouse gases → global warming → consequences
- (particulates) global dimming → consequences including breathing problems
- (SO_2 ; NO_x) acidic gas / rain → consequences including breathing problems
- damage to buildings / infrastructure

Total			6

4.9.3.1 Atmospheric pollutants from fuels

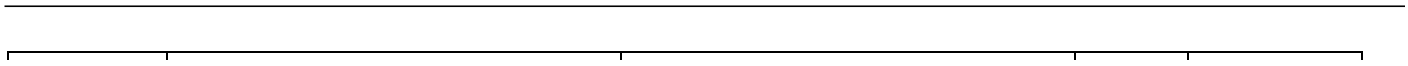
Answer 62 · Mark scheme June 2018 | 8462/2F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	$C_{12}H_{26}$		1	AO2 4.7.1.4
02.2	alkane		1	AO2 4.7.1.1
02.3	air	allow atmosphere	1	AO2 4.9.3.1
02.4		particulates – global dimming sulfur dioxide – acid rain	1 1	AO1 4.9.3.2
02.5	carbon dioxide carbon monoxide		1 1	AO1 4.7.1.3 4.9.3.1
02.6	develop fuel efficient engines use electric cars		1 1	AO3 4.9.3.1
Total			**9**	

4.9.3.1 Atmospheric pollutants from fuels

Answer 62 · Mark scheme

June 2018 | 8462/2F | Original Q2



4.9.3.1 Atmospheric pollutants from fuels

Answer 63 · Mark scheme

June 2019 | 8462/2F | Original Q2

Question 2

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>02.1</td><td>colourless

odourless

toxic

if more than three answers are given, apply the list principle as follows:
<table>
<tr><th>Number of answers</th><th>Number correct</th><th>Number incorrect</th><th>Mark awarded</th></tr>
<tr><td rowspan="3">4</td><td>3</td><td>1</td><td>2</td></tr>
<tr><td>2</td><td>2</td><td>1</td></tr>
<tr><td>1</td><td>3</td><td>0</td></tr>
<tr><td rowspan="3">5</td><td>3</td><td>2</td><td>1</td></tr>
<tr><td>2</td><td>3</td><td>0</td></tr>
<tr><td>1</td><td>4</td><td>0</td></tr>
</table></td><td>any order</td><td>1

1

1</td><td>AO1
4.9.3.2</td></tr>
<tr><td>02.2</td><td>oxygen</td><td>allow air / O_2</td><td>1</td><td>AO2
4.9.3.1</td></tr>
<tr><td>02.3</td><td>$\frac{36}{12} \times 8$

= 24 (g)</td><td>an answer of 24 (g) scores 2 marks</td><td>1

1</td><td>AO2
4.9.2.2</td></tr>
<tr><td>02.4</td><td>animal waste

food in landfill</td><td></td><td>1

1</td><td>AO1
4.9.2.2
4.10.1.1</td></tr>
<tr><td>Total</td><td></td><td></td><td>8</td><td></td></tr>
</table>

4.9.3.1 Atmospheric pollutants from fuels

Answer 64 · Mark scheme

June 2019 | 8462/2F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	(equation contains a) ⇌ (symbol)	allow description of arrow / symbol	1	AO1 4.6.2.1
03.2	exothermic		1	AO1 4.6.2.2
03.3	to reduce costs to use less energy		1 1	AO3 4.6.1.4
03.4	(the world production of ammonia) increased (the increase was) not steady / linear	 do **not** accept decreases ignore levels off	1 1	AO2 4.10.4.1
03.5	the demand for food changed the world population changed		1 1	AO2 AO3 4.10.4.2
03.6	**C** and **D**		1	AO3 4.10.4.2
03.7	**D**		1	AO3 4.10.4.2
Total			**10**	

4.9.3.1 Atmospheric pollutants from fuels

Answer 65 · Mark scheme

November 2020 | 8462/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	acid rain		1	AO1 4.9.3.2
02.2	oxygen carbon	must be in this order	1 1	AO1 4.9.3.1
02.3	dimming		1	AO1 4.9.3.1 4.9.3.2
02.4	$2\ CH_4 + 3\ O_2 \rightarrow$ **2** $CO + 4\ H_2O$	allow multiples	1	AO2 4.3.1.1 4.9.3.1
02.5	air oxygen oxides of nitrogen	must be in this order	1 1 1	AO1 4.9.3.1
Total			**8**	

4.9.3.1 Atmospheric pollutants from fuels

Answer 66 · Mark scheme

November 2021 | 8462/2F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	use of oil has decreased by 0.8% **or** use of oil has decreased from 1.3% to 0.5%		1	AO2 4.10.1.1
	use of solar energy has increased by 3.4% **or** use of solar energy has increased from 0% to 3.4%	allow any value below 0.05% for 2007	1	
	any **one** from: • use of oil increased from 2007 to 2009 • no change in oil use between 2013 and 2015 • no change in solar energy use between 2007 and 2009 • use of solar energy increased most between 2013 and 2015 • between 2007 and 2011 more oil was used **and** between 2013 and 2017 more solar energy was used	allow use of oil was highest in 2009 if no other mark is awarded, allow **1** mark for oil decreased **and** solar energy increased	1	

Question 8 continued

Question	Answers	Mark	AO/ Spec. Ref
08.2	**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 • carbon dioxide produced • (which is) a greenhouse gas • (therefore) surface temperature increases • (therefore) global warming • (so) climate change • (so) polar ice caps melt • (so) increasing sea levels • (so) flooding • (so) extreme weather events • (so) reduction in biodiversity • (so) famine / drought • sulfur dioxide produced • (which causes) acid rain • (so) damage to buildings / statues • (so) damage to trees • (so) damage to aquatic animals • (so) respiratory problems in humans • carbon / soot produced • (which are) particulates • (which cause) global dimming • (so) respiratory problems in humans • carbon monoxide produced • (which is) toxic		4.9.2.2 4.9.2.3 4.9.3.1 4.9.3.2

4.9.3.1 Atmospheric pollutants from fuels

Question 8 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3	solar is (a) renewable (source of energy)	allow oil is (a) finite (source of energy)	1	AO3 4.10.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	any **two** from: • sunshine is unreliable • increased demand for energy • lack of space	ignore references to cost	2	AO3 4.9.2.4 4.10.1.1

Total			**12**

4.9.3.1 Atmospheric pollutants from fuels

Answer 67 · Mark scheme

June 2023 | 8462/2F | Original Q6

Question 6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	coal is a solid	ignore references to cost	1	AO3 4.2.2.1
	(so solid) coal cannot flow through pipelines	allow (so) coal has to be made into a slurry to flow through pipelines	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.2		MP2 is dependent upon MP1 being awarded		AO3 4.9.3.1
	(fuel) coal		1	
	(reason) (coal contains the) highest percentage of sulfur		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.3	any **one** from: • acid rain • respiratory problems (in humans)	allow specified effects of acid rain allow specified respiratory problems	1	AO1 4.9.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4		MP2 is dependent upon MP1 being awarded		AO3 4.9.3.1
	(fuel) (natural) gas		1	
	(reason) (natural gas produces) fewer / fewest solid particles		1	

4.9.3.1 Atmospheric pollutants from fuels

Answer 67 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.5	any **one** from: • global dimming • health problems for humans		1	AO1 4.9.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6	combustion		1	AO1 4.9.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.7	any **three** from: • more oil is used than gas • use of oil has decreased overall • use of oil increased in some years • there was a large drop in use of oil between 2019 and 2020 • use of natural gas decreased overall • use of natural gas increased in some years • use of natural gas remained fairly constant from 2014 to 2020		3	AO2 4.9.2.4 4.9.3.1

Total Question 6	12

4.9.3.1 Atmospheric pollutants from fuels

Answer 68 · Mark scheme

June 2024 | 8462/2F | Original Q1

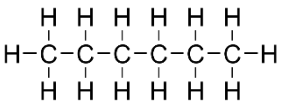
Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	carbon hydrogen	ignore C ignore H	1 1	AO1 4.1.1.1 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	20		1	AO2 4.1.1.1 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	C_nH_{2n+2}		1	AO2 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	alkanes		1	AO2 4.7.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5			1	AO2 4.7.1.1

4.9.3.1 Atmospheric pollutants from fuels

Answer 68 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	fuel	allow fossil fuel	1	AO1 4.7.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	soot carbon monoxide		1 1	AO1 4.9.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.8	C_6H_{12}		1	AO2 4.7.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.9	bar drawn to 84% bars labelled C / carbon **and** H / hydrogen	allow a tolerance of ± ½ a small square	1 1	AO2 4.7.1.1

Total Question 1	12

4.9.3.1 Atmospheric pollutants from fuels

Answer 69 · Mark scheme

June 2024 | 8462/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	increases		1	AO3 4.9.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(mass =) $\frac{7000}{3000}$ = 2.33 (kg)	 allow 2.333333 correctly rounded to at least 2 significant figures	1 1	AO2 4.9.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	rain		1	AO1 4.9.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	five points plotted correctly line of best fit	allow a tolerance of ± ½ a small square allow three or four points plotted correctly for **1** mark	2 1	AO2 4.9.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	increases		1	AO3 4.9.3.2

4.9.3.1 Atmospheric pollutants from fuels

Answer 69 · Mark scheme

June 2024 | 8462/2F | Original Q2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	dimming		1	AO1 4.9.3.2

Total Question 2	**9**

4.9.3.1 Atmospheric pollutants from fuels

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

4.9.3.1 Atmospheric pollutants from fuels

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.

4.9.3.1 Atmospheric pollutants from fuels

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.

4.9.3.1 Atmospheric pollutants from fuels

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.

4.9.3.1 Atmospheric pollutants from fuels

CHY1F Question 1

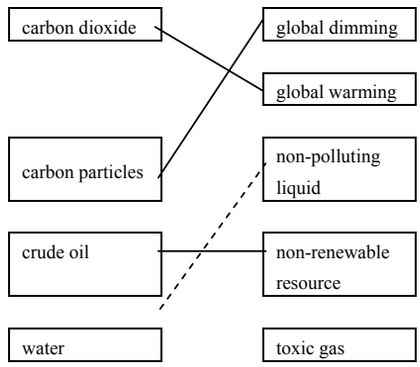
	answers	extra information	mark
(a)	low density unreactive		1 1
(b)	a polymer		1
(c)	any **one** from: • not broken down by (microorganisms) • does not decay (naturally)	ignore cannot recycle / degrade / disintegrate	1
total			4

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

4.9.3.1 Atmospheric pollutants from fuels

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

4.9.3.1 Atmospheric pollutants from fuels

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

4.9.3.1 Atmospheric pollutants from fuels

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

4.9.3.1 Atmospheric pollutants from fuels

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

4.9.3.1 Atmospheric pollutants from fuels

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

4.9.3.1 Atmospheric pollutants from fuels

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

4.9.3.1 Atmospheric pollutants from fuels

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

4.9.3.1 Atmospheric pollutants from fuels

Answer 62 · Examiner comments

June 2018 | 8462/2F | Original Q2

Question 2 (low demand)

02.1 54% of students identified the correct formula with all the other distractors proving equally popular as each other.

02.2 71% of students recognised that octane was an alkane.

02.3 This question was not well answered with 87% of responses failing to score. Of these responses, about half gave ‘plants / trees / photosynthesis’ as the source of oxygen with the remaining suggesting ‘hydrogen / carbon / oxide’ or a named oxide such as ‘carbon dioxide’ was the source.

02.4 Most students knew that sulfur dioxide caused acid rain, although the environmental effect of particulates was less well known.

02.5 Most students realised that carbon dioxide was produced in car engines but far fewer identified carbon monoxide as the other possible product. Nitrogen was often given instead.

02.6 89% of students could identify both ways of reducing atmospheric pollution in cities.

4.9.3.1 Atmospheric pollutants from fuels

Answer 67 · Examiner comments June 2023 | 8462/2F | Original Q6

Question 6 (Low and standard demand)

06.1 Students struggled to express themselves when answering this question with just over 40% of students achieving 1 mark by usually stating that coal was a solid. Less than 30% of students achieved both marks. Most incorrect responses failed to recognise that coal would not flow or pass through the pipeline but suggested it would be in some way difficult to get coal through the pipe. Many other incorrect responses used information from the table and suggested possible dangers to the pipeline, the environment, or operatives due to coals' high sulfur content.

06.2 Over 70% of students gained 1 mark by correctly identifying the fuel as coal. Less than 30% of these students went on to use the information in the table to provide a correct reason that compared coal to the other fuels.

06.3 Fewer than 25% of the students could correctly identify a problem caused by sulfur dioxide emissions.

Frequently seen incorrect responses included that sulfur dioxide:

- is a greenhouse gas
- causes global warming
- is a toxic gas
- causes unspecified pollution.

06.4 Over 85% of students gained 1 mark by correctly identifying the fuel as natural gas. However, less than 25% of these students went on to use the information in the table to provide a reason that compared natural gas to the other fuels.

Answer 67 · Examiner comments June 2023 | 8462/2F | Original Q6

06.5 Students found this question challenging with fewer than 15% of the students correctly identifying a problem caused by particulates. Over 20% of students did not attempt this question. A common incorrect response was to link particulates to global warming or the effects of global warming.

06.6 Over 60% of the students were able to successfully complete the sentence. A common incorrect response was to include burning.

06.7 Almost 30% of students obtained all 3 marks and a further 35% 2 marks. Weaker responses tended to just describe the changes in the lines on the figure without linking the changes in fuel use to the passage of time. Some students struggled to express how natural gas use remained fairly constant from 2014 to 2020.

4.9.3.1 Atmospheric pollutants from fuels

Answer 68 · Examiner comments

June 2024 | 8462/2F | Original Q1

Question 1 (low and standard demand)

01.1 The vast majority of students scored both marks and correctly identified the elements present in a hydrocarbon.

01.2 Over 80% of students correctly identified the number of atoms in the formula provided. The most common distractor was to identify the number of elements present.

01.3 About 70% of students correctly identified the general formula of the alkanes.

01.4 Just over half the students correctly identified the compound as being an alkane.

01.5 Less than 40% of students correctly completed the displayed structural formula of the alkane. The most common incorrect response was to omit the bonds between the carbon atoms. A small percentage of students went on to include additional bonds attached to the ends of the molecule or to include one or more double bonds between carbon atoms. Over a third of students did not attempt this question.

01.6 This question was not well answered with fewer than one third of students correctly identifying petrol as being a fuel. Over 60% of students incorrectly identified alternative general names to describe the reaction of petrol when burned including combustion (complete and incomplete), burning and exothermic.

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Answer 68 · Examiner comments

June 2024 | 8462/2F | Original Q1

01.7 This question was a good discriminator with roughly one third of students correctly identifying both of the atmospheric pollutants. Just over one third of students correctly identified one pollutant most commonly the gaseous pollutant carbon monoxide. The most commonly seen incorrect responses included to identify coal as the solid pollutant and sulfur dioxide as the gaseous pollutant.

01.8 Just over 60% of students correctly completed the equation. Many failed to gain credit because the numbers were not subscripts but the same size as the letters. The most commonly seen incorrect formula was C_3H_7.

01.9 More than 80% of students were able to complete and label the bar chart correctly with a further 10% obtaining one mark. Students should use a ruler when drawing bars to ensure their line stays within the tolerance stated in the mark scheme.

4.9.3.1 Atmospheric pollutants from fuels

Answer 69 · Examiner comments June 2024 | 8462/2F | Original Q2

Question 2 (low demand)

02.1 This was well answered with nearly all students identifying the effect on the rate of global warming.

02.2 Over 70% of students gained both marks for this calculation with less than 3% obtaining just one mark. The most common incorrect response was to invert the expression or to include additional steps in their calculation neither of which allowed access to either marking point.

02.3 Over 75% of students correctly identified acid rain. A frequently seen incorrect response was acid reflux.

02.4 This was well answered with more than 80% of students obtaining two or three marks. The most common reason for gaining two marks was having omitted to plot the point at (0,0). The majority of students drew a correct line of best fit, but a few had doubled or feathered lines, or had clearly not used a ruler.

02.5 Over 90% of students correctly identified that the mass of sulfur dioxide increases.

02.6 This question assessed a little-known part of the specification with fewer than one in ten students correctly identifying that particulates cause global dimming. By far the most common incorrect response was global warming.