AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.1.1.1

Atoms, elements and compounds

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**65**
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.

4.1.1.1 Atoms, elements and compounds

Answer 01 · Mark scheme January 2007 | CHY1F | Original Q1 | Legacy

Question 1

	answers	extra information	mark
(a)	made of one sort of atom	accept it is in the periodic table accept it only has lithium atoms	1
(b)	nucleus labelled correctly electron labelled correctly		1 1
total			3

Answer 02 · Mark scheme March 2007 | CHY1A | Original Q4 | Legacy

Four	**A**	compounds	**1**
	B	elements	**2**
	C	groups	**4**
	D	properties	**3**

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

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

Answer 04 · 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**

4.1.1.1 Atoms, elements and compounds

Answer 05 · Mark scheme

November 2007 | CHY1A | Original Q1 | Legacy

One	**A**	atoms	**1**
	B	compounds	**3**
	C	elements	**4**
	D	molecules	**2**

4.1.1.1 Atoms, elements and compounds

Answer 06 · Mark scheme

January 2008 | CHY1F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
(a)(i)	made up of one sort of atom	accept it is in the periodic table **or** has its own symbol	1
(a)(ii)	nitrogen / N / N_2 **or** oxygen / O / O_2	do **not** accept argon **or** helium do **not** accept oxide	1
(b)(i)	compound carbon		1 1
(b)(ii)	bond		1
total			5

4.1.1.1 Atoms, elements and compounds

Answer 06 · Mark scheme

January 2008 | CHY1F | Original Q1 | Legacy

CHY1F

4.1.1.1 Atoms, elements and compounds

Answer 07 · Mark scheme

Question 8

question	answers	extra information	mark
(a)(i)	oxygen / O / O_2	do **not** accept oxide	1
(a)(ii)	sodium **and** carbon **and** oxygen	do **not** allow symbols alone do **not** allow oxide	1
	all correct numbers linked to correct elements ie 2 (sodium), a / 1 (carbon), 3 (oxygen)	accept statement 'the number **and** type of atoms' for **1** mark only ignore types of particles	1
(b)(i)	calcium carbonate →	allow $CaCO_3$	1
	calcium oxide + carbon dioxide	either way round allow CaO + CO_2 do **not** allow quick lime maximum **1** mark for unbalanced symbol equation	1
(b)(ii)	thermal decomposition	accept endothermic do **not** accept reversible / equilibrium	1
(c)	any **one** from: • lowers energy / temperature needed **or** conserves energy • decreases the amount of fuel needed • no / less glass going to landfill	do **not** accept no energy ignore cheaper / easier ignore conserves raw materials **or** more quarries needed	1
total			7

4.1.1.1 Atoms, elements and compounds

Answer 08 · Mark scheme

Question 4

question	answers	extra information	mark
(a)(i)	ionic		1
(a)(ii)	elements		1
(b)(i)	chlorine (gas)	allow Cl_2 / Cl / Cl^2 allow chloride	1
(b)(ii)	hydrogen (gas)	allow H / H_2 / H^2	1
(b)(iii)	sodium hydroxide (solution)	allow NaOH allow sodium solution	1
total			5

4.1.1.1 Atoms, elements and compounds

Answer 08 · Mark scheme January 2008 | CHY2F | Original Q4 | Legacy

CHY2F

Answer 09 · Mark scheme March 2008 | CHY1AP | Original Q3 | Legacy

Three	**A**	this compound contains hydrogen	**4**
	B	this compound is a carbonate	**1**
	C	this formula has only two atoms	**2**
	D	this formula has only two oxygen atoms	**3**

Answer 10 · Mark scheme June 2008 | CHY1AP | Original Q3 | Legacy

Three	**A**	alkane	**3**
	B	engine	**1**
	C	oxygen	**2**
	D	petrol vapour	**4**

Answer 11 · Mark scheme June 2008 | CHY1AP | Original Q5 | Legacy

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

Answer 12 · Mark scheme June 2008 | CHY1AP | Original Q6 | Legacy

Six	**A**	C_2H_5OH	**3**
	B	C_3H_8	**2**
	C	C_2H_4	**1**
	D	S	**4**

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

4.1.1.1 Atoms, elements and compounds

Answer 13 · Mark scheme

June 2008 | CHY3F | Original Q2 | Legacy

question	answers	extra information	mark
2(a)(i)	floated / (moved on) surface	accept does not sink ignore it melted	1
2(a)(ii)	melted / molten	ignore heat is given off	1
2(a)(iii)	hydrogen	allow H_2	1
2(b)(i)	potassium / rubidium / caesium / francium	accept: K / Rb / Cs / Fr	1
2(b)(ii)	they are metals they form ions with a 1+ charge		1 1
2(c)(i)	atomic weight		1
2(c)(ii)	similar		1
2(c)(iii)	groups		1
2(d)	left gaps owtte		1
Total			**10**

4.1.1.1 Atoms, elements and compounds

Answer 13 · Mark scheme June 2008 | CHY3F | Original Q2 | Legacy

COMPONENT NUMBER: CHY3F

COMPONENT NAME: Chemistry

STATUS: Final

DATE: June 2008

Answer 14 · Mark scheme November 2008 | CHY1AP | Original Q2 | Legacy

Two	**A**	a nucleus	**1**
	B	a compound	**4**
	C	a group	**3**
	D	an element	**2**

Answer 15 · Mark scheme March 2009 | CHY1AP | Original Q3 | Legacy

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

Answer 16 · Mark scheme June 2009 | CHY1AP | Original Q3 | Legacy

Three	**A**	a compound	**4**
	B	an electron	**2**
	C	a bond	**3**
	D	an element	**1**

Answer 17 · Mark scheme November 2009 | CHY1AP | Original Q3 | Legacy

Three	**A**	atoms	**4**
	B	electrons	**3**
	C	compounds	**2**
	D	elements	**1**

4.1.1.1 Atoms, elements and compounds

Answer 18 · Mark scheme

November 2009 | CHY1AP | Original Q5 | Legacy

Five	**A**	Calcium (Ca)	**2**
	B	Lithium (Li)	**3**
	C	Gold (Au)	**1**
	D	Iron (Fe)	**4**

	A	B	C	D

4.1.1.1 Atoms, elements and compounds

Answer 19 · 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**

4.1.1.1 Atoms, elements and compounds

Answer 19 · Mark scheme

January 2010 | CHY1F | Original Q4 | Legacy

CHY1F

4.1.1.1 Atoms, elements and compounds

Answer 20 · Mark scheme

January 2010 | CHY2F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	protons		1
3(a)(ii)	neutrons		1
3(b)	heavier than H-2 atoms are heavier than H-1 atoms **or** the hydrogen atoms are heavier / more particles in the nucleus of the hydrogen atoms / one more particle in each hydrogen atom / a neutron in each hydrogen atom etc **or** molecule A has more particles / neutrons **or** molecule A has a larger nuclear mass / atomic mass A has two more neutrons than B	 can be awarded even if they do not circle heavier than must be linked to heavier than a correct explanation of the increase in mass by ref. to the particles in the hydrogen atoms ignore reference to particles in the oxygen atoms do **not** accept incorrect numbers of particles accept molecule A has more protons and neutrons molecule A has higher mass numbers hydrogen has a greater mass number in A all the numbers in the molecule A add up to 6 and in molecule B add up to 4 molecule A has $^{2}_{1}H$ and B $^{1}_{1}H$	1 1 1
Total			**4**

4.1.1.1 Atoms, elements and compounds

Answer 20 · Mark scheme January 2010 | CHY2F | Original Q3 | Legacy

CHY2F

Answer 21 · Mark scheme March 2010 | CHY1AP | Original Q3 | Legacy

Three	**A**	atoms	**2**
	B	compounds	**4**
	C	non-metal elements	**3**
	D	elements	**1**

Answer 22 · Mark scheme June 2010 | CHY1AP | Original Q3 | Legacy

Three	**A**	bonds	**4**
	B	electrons	**3**
	C	elements	**2**
	D	nuclei	**1**

Answer 23 · Mark scheme June 2010 | CHY1AP | Original Q9 | Legacy

Nine	**3**	**4**	**3**	**1**

4.1.1.1 Atoms, elements and compounds

Answer 24 · Mark scheme

June 2010 | CHY2F | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)(i)	nucleus		1
2(a)(ii)	neutron		1
2(a)(iii)	electron		1
2(b)(i)	6		1
2(b)(ii)	12		1
2(c)	14 C 6		1
2(d)(i)	CH_4		1
2(d)(ii)	compound		1
2(d)(iii)	covalent		1
Total			**9**

4.1.1.1 Atoms, elements and compounds

Answer 24 · Mark scheme

June 2010 | CHY2F | Original Q2 | Legacy

CHY2F

4.1.1.1 Atoms, elements and compounds

Answer 25 · Mark scheme

June 2010 | CHY3F | Original Q3 | Legacy

Question 3

question	answers	extra information	mark
3(a)(i)	**A**		1
3(a)(ii)	**F**		1
3(a)(iii)	**E**		1
3(a)(iv)	**C**		1
3(a)(v)	**A or B**		1
3(b)(i)	Rb K Na	allow rubidium, potassium, sodium do **not** accept RB or NA	1
3(b)(ii)	decrease **or** become lower / smaller / less	allow from 180° C to 27° C	1
3(c)	They are harder than Group 1 metals. They have higher melting points than Group 1 metals. They often form coloured compounds but Group 1 compounds are usually white.		1 1 1
Total			**10**

4.1.1.1 Atoms, elements and compounds

Answer 25 · Mark scheme

June 2010 | CHY3F | Original Q3 | Legacy

CHY3F

4.1.1.1 Atoms, elements and compounds

Answer 26 · Mark scheme

June 2010 | CHY3F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)(i)	sodium hydroxide green solid		1 1 1
4(a)(ii)	barium chloride white sulfate ions, SO_4^{2-}		1 1 1
4(b)	some indication of contact between (colourless) flame and the chemical	ignore colour of flame	1
4(c)	any **one** from: • accurate • precise • sensitive • reliable • rapid • only small amount needed	ignore reference to cost / safer	1
Total			**8**

4.1.1.1 Atoms, elements and compounds

Answer 26 · Mark scheme

June 2010 | CHY3F | Original Q4 | Legacy

CHY3F

Answer 27 · Mark scheme

November 2010 | CHY1AP | Original Q8 | Legacy

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

4.1.1.1 Atoms, elements and compounds

Answer 28 · Mark scheme

January 2011 | CHY1F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)	less dense than air		1
1(b)(i)	water	accept hydrogen oxide do **not** accept hydrogen dioxide / hydro oxide	1
1(b)(ii)	unreactive		1
1(c)	atoms		1
1(d)	electron(s) nucleus		1 1
Total			**6**

4.1.1.1 Atoms, elements and compounds

Answer 28 · Mark scheme

January 2011 | CHY1F | Original Q1 | Legacy

CHY1F

Answer 29 · Mark scheme

March 2011 | CHY1AP | Original Q8 | Legacy

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

Answer 30 · Mark scheme

June 2011 | CHY1AP | Original Q2 | Legacy

Two	**A**	compounds	**4**
	B	groups	**2**
	C	properties	**3**
	D	symbols	**1**

4.1.1.1 Atoms, elements and compounds

Answer 31 · Mark scheme

June 2011 | CHY1F | Original Q4 | Legacy

Question 4

question	answers	extra information	mark
4(a)	(carbon =) 1 (oxygen =) 3		1 1
4(b)(i)	heated		1
4(b)(ii)	carbon dioxide		1
4(c)(i)	combustion		1
4(c)(ii)	carbon is more reactive than zinc		1
4(c)(iii)	zinc boils (in the furnace / below 1300°C) lead does not boil / (only) melts in the furnace / boils above 1300°C	ignore melting point / changes of state if no other mark awarded allow zinc has a lower boiling point **or** lead has a higher boiling point **or** they / zinc **and** lead have different boiling points for **1** mark	1 1
Total			**8**

4.1.1.1 Atoms, elements and compounds

Answer 31 · Mark scheme

June 2011 | CHY1F | Original Q4 | Legacy

CHY1F

4.1.1.1 Atoms, elements and compounds

Answer 32 · Mark scheme

June 2011 | CHY3F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)(i)	Sb		1
1(a)(ii)	Se		1
1(a)(iii)	Sn		1
1(a)(iv)	Si		1
1(b)(i)	elements		1
1(b)(ii)	potassium (K)		1
1(b)(iii)	0		1
Total			7

4.1.1.1 Atoms, elements and compounds

Answer 32 · Mark scheme

June 2011 | CHY3F | Original Q1 | Legacy

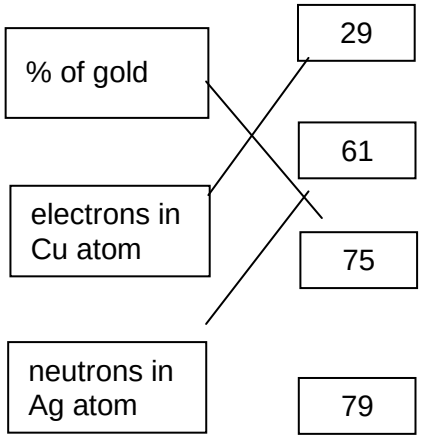
CHY3F

4.1.1.1 Atoms, elements and compounds

Answer 33 · Mark scheme

January 2012 | CH1FP | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)	+1/+ electron	do **not** accept 1 without the + allow phonetic spelling	1 1
1(b)(i)	elements		1
1(b)(ii)	non-metal		1
1(c)	soft an alloy		1 1
1(d)		**one** mark for each correct link extra lines lose the mark	3
Total			9

4.1.1.1 Atoms, elements and compounds

Answer 33 · Mark scheme

January 2012 | CH1FP | Original Q1 | Legacy

CH1FP

4.1.1.1 Atoms, elements and compounds

Answer 34 · Mark scheme

June 2012 | CH1FP | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)(i)	nucleus		1
1(a)(ii)	protons		1
1(b)	protons / + / positive electrons / – / negative	both words needed in any order for **1** mark	1
1(c)	nitrogen	allow N or N_2	1
1(d)	B **and** C (both) have one electron **or** same number of electrons in the outer energy level / shell	both letters needed in any order for **1** mark allow Li **and** Na allow both are in Group **1** allow both are alkali metals allow both can lose only one electron **or** become +1 ions allow this mark if no letters given in boxes	1 1
Total			**6**

4.1.1.1 Atoms, elements and compounds

Answer 34 · Mark scheme

June 2012 | CH1FP | Original Q1 | Legacy

CH1FP

4.1.1.1 Atoms, elements and compounds

Answer 35 · Mark scheme

June 2012 | CH1FP | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)	6 oxygen		1 1
6(b)(i)	heating the hydrocarbon to a high temperature the presence of a catalyst		1 1
6(b)(ii)	all bonds correct four C—H bonds **and** one C=C bond		1
6(b)(iii)	water	accept hydrogen oxide/steam allow H_2O	1
6(c)(i)	carbon dioxide	allow CO_2	1
6(c)(ii)	by filtering/decanting/centrifuging (to remove yeast) (fractional) distillation (to separate ethanol from water)	ignore sieving accept a description of (fractional) distillation	1 1
Total			**9**

4.1.1.1 Atoms, elements and compounds

Answer 35 · Mark scheme

June 2012 | CH1FP | Original Q6 | Legacy

CH1FP

4.1.1.1 Atoms, elements and compounds

Answer 36 · Mark scheme

question	answers	extra information	mark
1(a)	proton 1 electron very small owtte	ignore ± allow zero allow values from 1/1800 to 1/2000 **or** 0.0005 – 0.00055	1 1
1(b)	8 16		1 1
1(c)(i)	Isotopes		1
1(c)(ii)	$^{18}_{8}\mathbf{O}$		1
1(d)(i)	compound		1
1(d)(ii)	H-O-H		1
1(d)(iii)	covalent		1
1(d)(iv)	sharing		1
Total			**10**

4.1.1.1 Atoms, elements and compounds

Answer 36 · Mark scheme

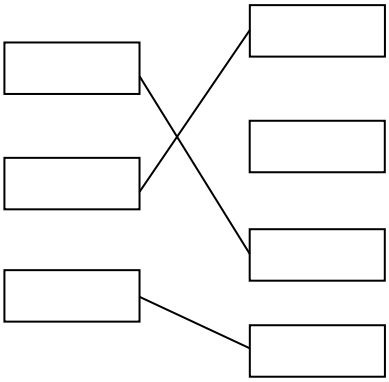
January 2013

CH2FP

4.1.1.1 Atoms, elements and compounds

Answer 37 · 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		

4.1.1.1 Atoms, elements and compounds

Answer 37 · Mark scheme

June 2014 | CH1FP | Original Q1 | Legacy



4.1.1.1 Atoms, elements and compounds

Answer 38 · 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**		

4.1.1.1 Atoms, elements and compounds

Answer 38 · Mark scheme

June 2014 | CH2FP | Original Q3 | Legacy



4.1.1.1 Atoms, elements and compounds

Answer 39 · Mark scheme June 2015 | CH1FP | Original Q1 | Legacy

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

4.1.1.1 Atoms, elements and compounds

Answer 39 · Mark scheme

June 2015 | CH1FP | Original Q1 | Legacy



4.1.1.1 Atoms, elements and compounds

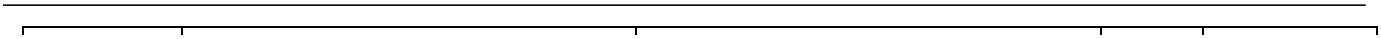
Answer 40 · Mark scheme June 2015 | CH2FP | Original Q1 | Legacy

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**	

4.1.1.1 Atoms, elements and compounds

Answer 40 · Mark scheme

June 2015 | CH2FP | Original Q1 | Legacy



4.1.1.1 Atoms, elements and compounds

Answer 41 · Mark scheme

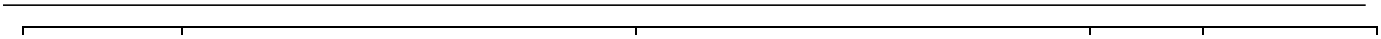
June 2015 | CH3FP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	Na	allow sodium	1	**AO1** 3.1.3.a
2(a)(ii)	Cu	allow copper	1	**AO2** 3.1.3.c
2(a)(iii)	C	allow carbon	1	**AO2** 3.1.2.b
2(a)(iv)	He	allow helium	1	**AO1** 3.1.2.b
2(b)	H	allow hydrogen do **not** allow H_2	1	**AO2** 3.1.2.b
Total			**5**	

4.1.1.1 Atoms, elements and compounds

Answer 41 · Mark scheme

June 2015 | CH3FP | Original Q2 | Legacy



4.1.1.1 Atoms, elements and compounds

Answer 42 · Mark scheme

June 2016 | CH1FP | Original Q1 | Legacy

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1(a)(i)	7		1	AO2 1.1.1g
1(a)(ii)	-1		1	AO1 1.1.1d
1(a)(iii)	neutrons		1	AO1 1.1.1c
1(b)	number of protons		1	AO1 1.1.1f
1(c)	atom **Y**		1	AO2 1.1.1 h; 1.1.2a
1(d)(i)	Ne	allow neon	1	AO2 1.1.2a/b
1(d)(ii)	has a full outer shell **or** full outer energy level **or** has 8 electrons in its outer shell	allow in Group 0 allow a noble gas allow the shells are full ignore in Group 8	1	AO2 1.1.2b; 1.1.3a
Total			**7**	

4.1.1.1 Atoms, elements and compounds

Answer 43 · 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**	

4.1.1.1 Atoms, elements and compounds

Answer 44 · Mark scheme

June 2016 | CH1FP | Original Q3 | Legacy

Question 3

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

4.1.1.1 Atoms, elements and compounds

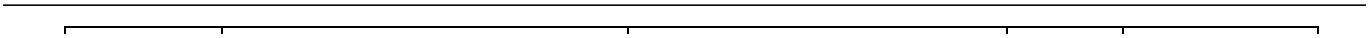
Answer 45 · Mark scheme June 2016 | CH2FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
1(a)(i)	7 / seven		1	AO1 2.1.1e
1(a)(ii)	1 Electron	do **not** accept -1	1 1	AO1 2.3.1b
1(a)(iii)	isotopes		1	AO1 2.3.1d
1(b)(i)	(sodium +) fluorine → sodium fluoride		1	AO2 2.1.1d,e
1(b)(ii)	compounds		1	AO1 2.1.1a
1(b)(iii)	mole		1	AO1 2.3.1g
1(b)(iv)	 sodium (atom) loses fluorine (atom) gains one electron ions formed	**max 3** if reference to incorrect particle / bonding allow sodium forms positive (ion) **or** fluorine forms negative (ion) allow form ionic bond allow to gain a full outer shell of electrons allow forms noble gas structure	 1 1 1 1	AO1 / AO2 2.1.1b,c,d,e,f
1(b)(v)	Dissolve in water High melting point		1 1	AO1 2.2.2a,b
Total			**13**	

4.1.1.1 Atoms, elements and compounds

Answer 45 · Mark scheme

June 2016 | CH2FP | Original Q1 | Legacy



4.1.1.1 Atoms, elements and compounds

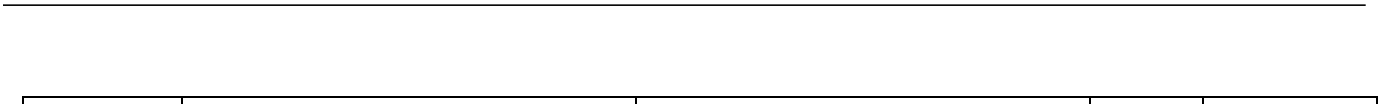
Answer 46 · Mark scheme June 2017 | CH1FP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)	hydrogen	allow H ignore numbers	1	AO2 1.1.2
2(b)	about 100		1	AO1 1.1.1a
2(c)	same number of electrons in the outer shell similar chemical reactions		1 1	AO1 1.1.2a
2(d)	noble transition	ignore inert	1 1	AO1 1.1.2b 1.3.3a
2(e)	ions molecules	in this order	1 1	AO2 1.1.3a
Total			8	

4.1.1.1 Atoms, elements and compounds

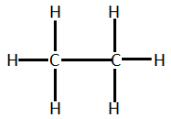
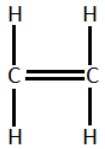
Answer 46 · Mark scheme

June 2017 | CH1FP | Original Q2 | Legacy



4.1.1.1 Atoms, elements and compounds

Answer 47 · Mark scheme June 2017 | CH1FP | Original Q6 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(a)(i)	electronic structure drawn	allow any representation of an electron allow 2,4	1	**AO2** 1.1.1h
6(a)(ii)	six / 6 protons (protons) are positively charged	 do **not** allow electrons in nucleus otherwise ignore electrons do **not** allow nucleus is neutral allow (protons are) + / +1 / 1+ ignore statements about mass if no other mark awarded allow one mark for nucleus	1 1 1	**AO1** **AO2** 1.1.1c;d;e
6(b)	(a hydrocarbon is) made up of hydrogen and carbon (atoms) only	do **not** allow mixture	1	**AO1** 1.4.1a;c
6(c)(i)	 	ethane correctly drawn with another hydrogen on each carbon and another three single bonds ethene correctly drawn with a double bond between the carbon atoms	1 1	**AO1** 1.4.2a 1.5.1c
6(c)(ii)	as the number of carbon atoms increases the boiling point increases	allow converse ignore alkene	1	**AO3** 1.4.2c

4.1.1.1 Atoms, elements and compounds

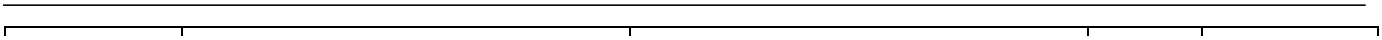
Answer 47 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
6(c)(iii)	the boiling points of alkanes are higher than the boiling points of alkenes	allow the boiling points of alkenes are lower than the boiling points of alkanes	1	AO2 1.4.2b;c
	that has the same number of carbon atoms	consequential on first marking point	1	
	or state a correct example	e.g. hexane has a higher boiling point than hexene **or** hexane boils at 69°C hexene boils at 64°C		
		if no other mark awarded allow both alkanes and alkenes have the same pattern of the more carbon atoms the higher the boiling point for one mark		
6(d)	(alkane molecules are) cracked	allow break down / up **or** decompose **or** split up	1	AO1 AO2 AO3
	to produce small(er) molecules / alkanes / hydrocarbons	allow short chain for small	1	1.5.1a;b;d
	and alkenes **or** a named alkene	allow molecules that have a double bond **or** are unsaturated	1	
		if no other mark awarded allow evaporate **or** boil for one mark		
		ignore turns to gas		
Total			**13**	

4.1.1.1 Atoms, elements and compounds

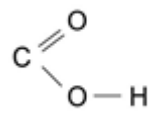
Answer 47 · Mark scheme

June 2017 | CH1FP | Original Q6 | Legacy



4.1.1.1 Atoms, elements and compounds

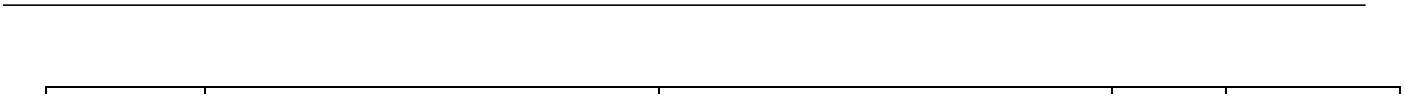
Answer 48 · Mark scheme June 2017 | CH3FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
1 (a)(i)	numbers	allow number allow numbers circled in the box	1	AO1 3.1.2b
1 (a)(ii)	electrons	allow electron allow electrons circled in the box	1	AO1 3.1.2b
1 (b)(i)	Cl/chlorine	allow CL / cL / cl	1	AO1 3.1.3f
1 (b)(ii)	Cu/copper	allow CU / cU / cu	1	AO2 3.1.3c
1 (b)(iii)	7/seven		1	AO1 3.1.3e
1(c)(i)	tick (✓) by: displacement		1	AO1 3.1.3g
1(c)(ii)	tick (✓) by: Fluorine		1	AO3 3.1.3g
1(d)	tick (✓) by: yellow		1	AO1 3.4.1e
1(e)(i)	circle around: 		1	AO2 3.6.2a
1(e)(ii)	carbon dioxide	allow carbon dioxide circled in the box	1	AO2 3.6.2b
1(e)(iii)	esters	allow esters circled in the box allow ethers	1	AO2 3.6.2b
Total			11	

4.1.1.1 Atoms, elements and compounds

Answer 48 · Mark scheme

June 2017 | CH3FP | Original Q1 | Legacy



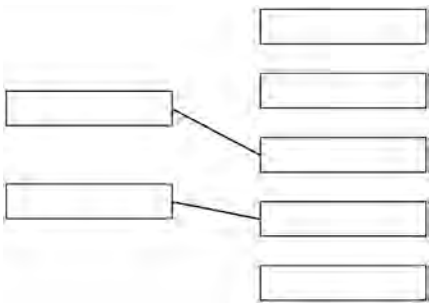
Answer 49 · Mark scheme

June 2018 | 8462/1F | Original Q9

The full source mark scheme begins on page 91. Follow original question 9 in that document.

4.1.1.1 Atoms, elements and compounds

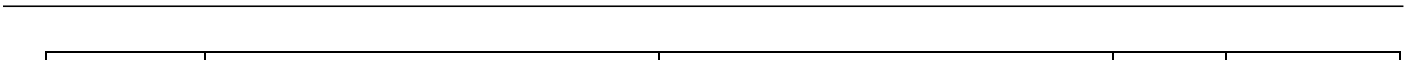
Answer 50 · Mark scheme June 2018 | 8462/2F | Original Q1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	reactant		1	AO1 4.6.2.1
01.2	reversible		1	AO1 4.6.2.1
01.3	blue	allow shades of blue, eg pale blue	1	AO1 4.6.2.2
01.4	1.6 (g)		1	AO2 4.6.2.2
01.5	$\frac{0.9}{2.5} \times 100$ = 36 (%)	an answer of 36 (%) scores **2** marks	1 1	AO2 4.6.2.2
01.6		copper sulfate – $CuSO_4$ water – H_2O	1 1	AO2 4.1.1.1 AO1 4.1.1.1
Total			**8**	

4.1.1.1 Atoms, elements and compounds

Answer 50 · Mark scheme

June 2018 | 8462/2F | Original Q1



4.1.1.1 Atoms, elements and compounds

Answer 51 · Mark scheme

June 2019 | 8462/1F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	B		1	AO2 4.1.1.1 4.1.1.2
03.2	D		1	AO2 4.1.1.1 4.1.1.2
03.3	E		1	AO2 4.1.1.1 4.1.1.2
03.4	chromatography – blue food colour from a mixture of food colours chromatography – copper from an alloy of copper and zinc crystallisation – copper sulfate from copper sulfate solution crystallisation – ethanol from a mixture of ethanol and water additional line from a box negates the mark for that box		1 1	AO2 4.1.1.2
03.5	(filter) funnel containing filter paper suitable vessel for collecting filtrate sand **and** water labelled in correct place		1 1 1	AO1 AO1 AO2 4.1.1.2
03.6	100 °C		1	AO2 4.1.1.2

4.1.1.1 Atoms, elements and compounds

Answer 51 · Mark scheme

June 2019 | 8462/1F | Original Q3

03.7	any **four** from: • solution is heated • water evaporates • the vapour cools in the condenser • the vapour condenses **or** the vapour turns to a liquid • (pure) water collects in the beaker	allow water boils / vaporises	4	AO1 4.1.1.2
Total			**13**	

4.1.1.1 Atoms, elements and compounds

Answer 52 · Mark scheme

November 2020 | 8462/1F | Original Q2

Question 2

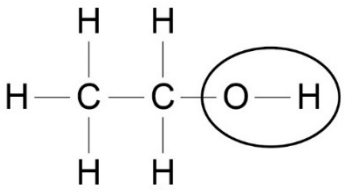
Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	electron		1	AO1 4.1.1.3
02.2	plum pudding		1	AO1 4.1.1.3
02.3	alpha		1	AO1 4.1.1.3
02.4	Bohr		1	AO1 4.1.1.3
02.5	protons neutrons protons (and) electrons	 either order	1 1 1	AO1 4.1.1.4 4.1.1.5
02.6	a sports arena of radius 100 m		1	AO2 4.1.1.5
Total			**8**	

4.1.1.1 Atoms, elements and compounds

Answer 53 · Mark scheme

November 2020 | 8462/2F | Original Q7

Question 7

<table>
<tr><th>Question</th><th>Answers</th><th>Extra information</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td>07.1</td><td></td><td></td><td>1</td><td>AO1
4.7.2.3</td></tr>
<tr><td>07.2</td><td><table>
<tr><td>Name of element</td><td>Symbol for element</td><td>Number of atoms in one molecule of ethanol</td></tr>
<tr><td>carbon</td><td>C</td><td>2</td></tr>
<tr><td>hydrogen</td><td>H</td><td>6</td></tr>
<tr><td>oxygen</td><td>O</td><td>1</td></tr>
</table></td><td>ignore O_2</td><td>1
1
1</td><td>AO1
AO1
AO2
4.1.1.1
4.7.2.3</td></tr>
<tr><td>07.3</td><td>a solvent</td><td></td><td>1</td><td>AO2
4.7.2.3</td></tr>
<tr><td>07.4</td><td>sugar</td><td>allow named sugar
allow saccharide</td><td>1</td><td>AO3
4.7.2.3</td></tr>
<tr><td>07.5</td><td>yeast</td><td></td><td>1</td><td>AO1
4.7.2.3</td></tr>
<tr><td>07.6</td><td>ethyl ethanoate</td><td></td><td>1</td><td>AO1
4.7.2.4</td></tr>
</table>

Question 7 (continued)

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7	water	ignore H_2O	1	AO1 4.1.1.1 4.2.2.2 4.7.2.4
07.8	400 cm^3 = 0.40 dm^3 $\frac{1.00}{0.40}$ × 20 = 50 (g) **alternative approach:** 1.0 dm^3 = 1000 cm^3 (1) $\frac{1000}{400}$ × 20 (1) = 50 (g) (1)	 allow correct use of incorrectly converted or unconverted volume allow correct use of incorrectly converted or unconverted volume	1 1 1	AO2 4.7.2.4
Total			**12**	

4.1.1.1 Atoms, elements and compounds

Answer 54 · Mark scheme

November 2021 | 8462/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	non-metallic element		1	AO3 4.1.1.1 4.1.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	compound		1	AO1 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	noble gases		1	AO1 4.1.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	the boiling points increase down the group		1	AO1 4.1.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	atoms		1	AO1 4.1.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	XO_2		1	AO2 4.2.1.3

Answer 54 · Mark scheme

Question 1 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	$(2.8)^2 \times 6$ $= 47.04$ $= 47$ (nm^2)	 allow an answer correct to 2 significant figures resulting from an incorrect attempt at the calculation	1 1 1	AO2 4.2.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.8	the surface area to volume ratio of the fine particle is 10 times greater		1	AO1 4.2.4.1

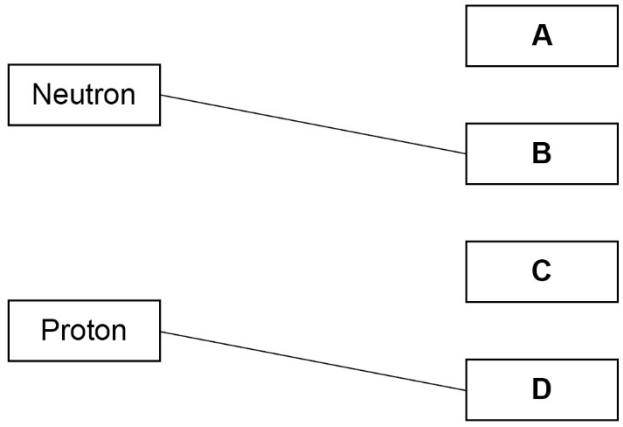
Total			10

4.1.1.1 Atoms, elements and compounds

Answer 55 · Mark scheme

June 2022 | 8462/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	 do **not** accept more than one line from a box on the left		1 1	AO1 4.1.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	(number of electrons) 9 (number of neutrons) 10		1 1	AO2 4.1.1.5

4.1.1.1 Atoms, elements and compounds

Answer 55 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3 Mark with question 01.4	(relative atomic mass =) $\frac{(39 \times 93.3) + (41 \times 6.7)}{100}$	allow (relative atomic mass =) $\frac{(3638.7) + (274.7)}{100}$	1	AO2 4.1.1.6
		allow (relative atomic mass =) 36.387 + 2.747		
	= 39.134		1	
	= 39.1	allow an answer correctly rounded to 3 significant figures from an incorrect calculation which uses all the values in **Table 1**	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4 Mark with question 01.3	potassium / K	allow ecf from question **01.3**	1	AO3 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	neutrons		1	AO1 4.1.1.5

Total Question 1		**9**

4.1.1.1 Atoms, elements and compounds

Answer 56 · Mark scheme

June 2022 | 8462/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	element		1	AO1 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	**A**		1	AO2 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	**B**		1	AO2 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.4	filtration	allow filtering allow a description of filtration	1	AO2 4.1.1.2

4.1.1.1 Atoms, elements and compounds

Answer 56 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5	C	allow 78 (°C)	1	AO3 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	increases	allow becomes warmer / hotter	1	AO3 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	heat (the solution) until crystallisation point is reached	allow heat (the solution) until crystals start to form allow heat (the solution) to reduce the volume allow heat (the solution) to evaporate (some of the water)	1	AO1 4.1.1.2 4.4.2.3 RPA1
	leave the solution (to cool / crystallise)	if no other mark is awarded allow **1** mark for heat the solution to dryness	1	

Total Question 2		8

4.1.1.1 Atoms, elements and compounds

Answer 57 · Mark scheme

June 2022 | 8462/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	for elements that had not been discovered (at that time) **or** so that elements with similar properties are grouped together	ignore references to atomic number / mass / weight allow for missing elements	1	AO1 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	Mendeleev		1	AO1 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	noble gases		1	AO3 4.1.2.2 4.1.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	the elements all have one electron in the outer shell		1	AO1 4.1.2.5

4.1.1.1 Atoms, elements and compounds

Answer 57 · Mark scheme

June 2022 | 8462/1F | Original Q4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	63 (°C)	allow a value in the range 49 to 88 (°C)	1	AO3 4.1.2.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	any **one** from: • floats • moves (on the surface) • melts • fizzes / bubbles • flame	allow forms a ball ignore colour of flame allow explodes / disappears ignore references to heat / temperature / sounds	1	AO1 4.1.2.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7			1 1	AO3 4.1.2.6

Element	State at 150 °C	Symbol	Formula of the compound with hydrogen
Fluorine	gas	F	HF
Chlorine	**gas**	Cl	HCl
Bromine	gas	Br	HBr
Iodine	liquid	I	HI
Astatine	solid	At	**HAt**

4.1.1.1 Atoms, elements and compounds

Answer 57 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.8	Br_2		1	AO1 4.1.2.6

Total Question 4		**9**

4.1.1.1 Atoms, elements and compounds

Answer 58 · Mark scheme

June 2023 | 8462/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	neutron		1	AO1 4.1.1.4

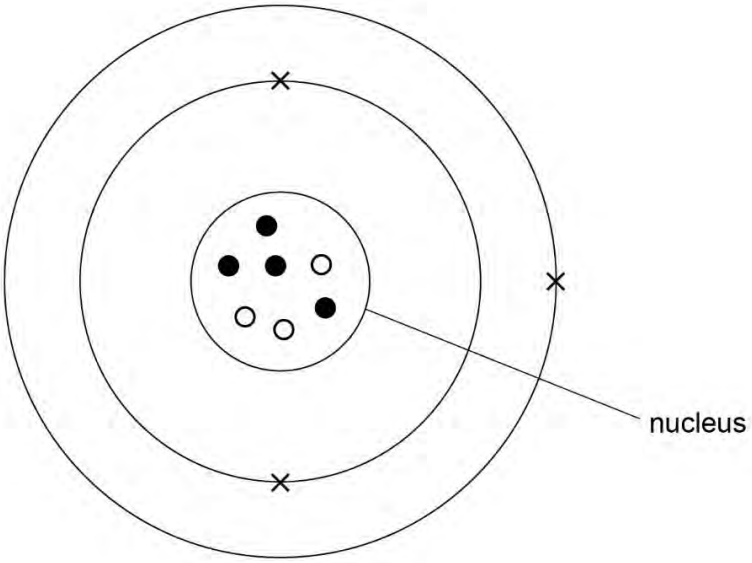
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	a neutron and a proton		1	AO1 4.1.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	(nitrogen) 2 / two (oxygen) 1 / one		1 1	AO2 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	lithium	allow Li	1	AO2 4.1.1.1

4.1.1.1 Atoms, elements and compounds

Answer 58 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	3 x protons (○) in the nucleus		1	AO1
	4 x neutrons (●) in the nucleus		1	AO1
	3 x electrons (✕) in the shells		1	AO1
	electrons (✕) arranged 2, 1		1	AO2
	an answer of  scores **4** marks			4.1.1.4 4.1.1.7

Total Question 1	9

4.1.1.1 Atoms, elements and compounds

Answer 59 · Mark scheme

June 2023 | 8462/1F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	element		1	AO1 4.1.1.1

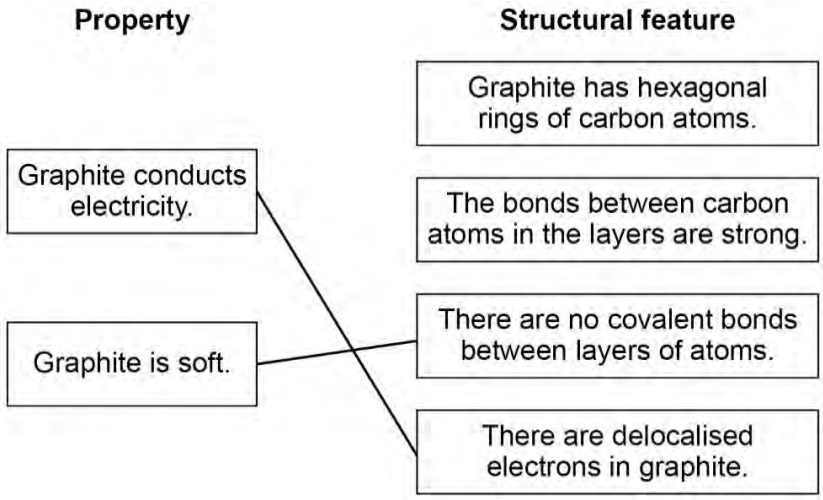
Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	protons neutrons	must be in this order allow electrons	1 1	AO1 4.1.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	$\frac{12}{6.02 \times 10^{23}}$		1	AO2 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	B		1	AO1 4.2.3.3

4.1.1.1 Atoms, elements and compounds

Answer 59 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
03.5	 do **not** accept more than **one** line from a box on the left	1 1	AO1 4.2.3.2

Total Question 3	7

4.1.1.1 Atoms, elements and compounds

Answer 60 · Mark scheme

June 2023 | 8462/1F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	a ball of positive charge with (negative) electrons embedded	do **not** accept references to protons, nuclei, neutrons	1 1	AO1 4.1.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	(earliest) electrons protons (latest) neutrons		1	AO1 4.1.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	(number of outer shell electrons) 7 (reason) (tennessine is in) Group 7	 allow the number of outer electrons is the same as the group number allow tennessine is a halogen MP2 is dependent on MP1 being awarded	1 1	AO2 4.1.2.1 4.1.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	(time needed for) peer review	allow the idea that other scientists had to check the results	1	AO3 4.1.2.2

4.1.1.1 Atoms, elements and compounds

Answer 60 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	(A_r =) $\frac{(6 \times 7.6) + (7 \times 92.4)}{100}$	allow $\frac{45.6 + 646.8}{100}$ allow (6 × 0.076) + (7 × 0.924) allow 0.456 + 6.468	1	AO2 4.1.1.6
	= 6.924		1	
	= 6.9	allow an answer correctly rounded to 1 decimal place from an incorrect calculation which uses all the data in the table	1	

Total Question 9	9

4.1.1.1 Atoms, elements and compounds

Answer 61 · Mark scheme

June 2023 | 8462/2F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	(the poly(propene) beaker will begin to) melt	allow poly(propene) has a low melting point	1	AO3 4.7.3.1
	(the poly(propene) beaker will) burn / ignite	allow poly(propene) is flammable	1	

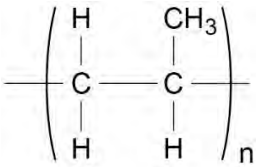
Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.2	(poly(propene) beakers are) less easily broken	allow (poly(propene) beakers are) less likely to shatter allow (poly(propene) beakers are) tougher allow (poly(propene) beakers have a) higher resistance to impact	1	AO3 4.7.3.1 4.10.3.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.3	boron trioxide		1	AO1 4.10.3.3

Question	Answers	Mark	AO / Spec. Ref.
02.4	<table><tr><th>Symbol for element</th><th>Name of element</th><th>Number of atoms of element in one molecule of propene</th></tr><tr><td>C</td><td>carbon</td><td>3</td></tr><tr><td>H</td><td>hydrogen</td><td>6</td></tr></table> if no other mark awarded allow **1** mark for a correct column	1 1	AO1 AO2 4.1.1.1 4.7.2.1

4.1.1.1 Atoms, elements and compounds

Answer 61 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.5			1	AO2 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	(**Stage 1** is) fractional distillation		1	AO1
	(**Stage 2** is) cracking		1	AO2
	(**Stage 3** is) polymerisation		1	AO2
				4.7.1.2 4.7.1.4 4.7.3.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.7	alkene		1	AO2 4.7.2.1
	monomer		1	4.7.3.1

Total Question 2	12

4.1.1.1 Atoms, elements and compounds

Answer 62 · Mark scheme

June 2024 | 8462/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	D		1	AO2 4.1.1.1

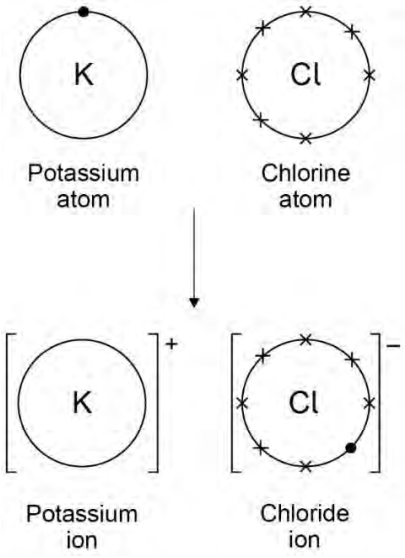
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	C		1	AO2 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	sections **A**, **B** and **C**		1	AO1 4.1.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	can be bent and shaped good conductor of electricity		1 1	AO1 4.1.2.3 4.1.3.1 4.2.2.7

4.1.1.1 Atoms, elements and compounds

Answer 62 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5		allow any combination of ×, •, ○, $e^{(-)}$ for electrons ignore any inner shells		AO2 4.1.2.5 4.2.1.2
	evidence of the outer electron on the potassium atom moving to leave a potassium ion with no outer electrons	allow potassium ion with eight outer electrons	1	
	chloride ion with eight outer electrons		1	
		an answer of  scores **2** marks		

4.1.1.1 Atoms, elements and compounds

Answer 62 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	B		1	AO2 4.1.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	A		1	AO1 4.1.1.2

Total Question 1	**9**

4.1.1.1 Atoms, elements and compounds

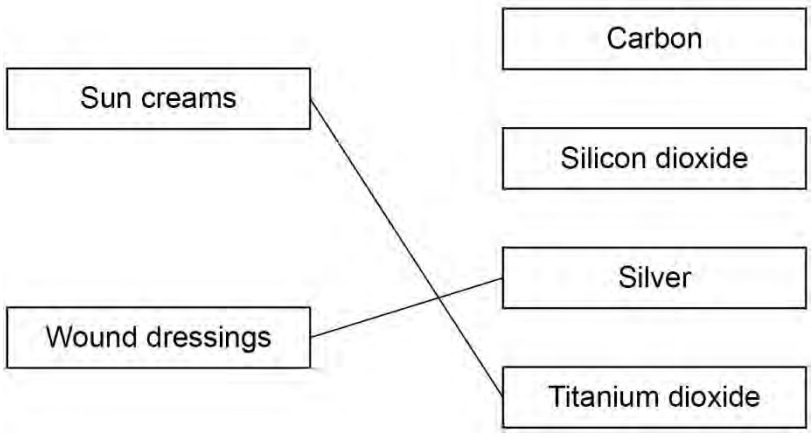
Answer 63 · Mark scheme

June 2024 | 8462/1F | Original Q4

Question 4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	a few hundred atoms		1	AO1 4.2.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	iron		1	AO3 4.1.3.2

Question	Answers	Mark	AO / Spec. Ref.
04.3	**Use** **Substance**  do **not** accept more than one line from a box on the left	1 1	AO3 4.2.4.2

4.1.1.1 Atoms, elements and compounds

Answer 63 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	(surface area =) 6×4^2		1	AO2 4.2.4.1
	= 96 (nm^2)		1	
	(volume =) 4^3		1	
	= 64 (nm^3)		1	
	(ratio =) 96 : 64	allow correct use of incorrectly determined area and/or volume	1	
	= 3 : 2	allow correct use of an incorrectly determined ratio	1	

Total Question 4	**10**

4.1.1.1 Atoms, elements and compounds

Answer 64 · Mark scheme

June 2025 | 8462/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	zinc bromide		1	AO2 4.1.1.1

Question	Answers	Mark	AO / Spec. Ref.
01.2	<table><tr><th>Symbol of element</th><th>Name of element</th><th>Number of atoms of the element in a molecule of C_2H_6O</th></tr><tr><td>C</td><td>Carbon</td><td>2</td></tr><tr><td>H</td><td>Hydrogen</td><td>6</td></tr><tr><td>O</td><td>Oxygen</td><td>1</td></tr></table>	1 1 1	AO1 AO2 AO1 4.1.1.1

Question	Answers	Mark	AO / Spec. Ref.
01.3	potassium + sulfur → potassium sulfide allow $2\,K + S \rightarrow K_2S$	1	AO2 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	$\mathbf{2}\,Al + \mathbf{3}\,F_2 \rightarrow 2\,AlF_3$	allow multiples allow **1** mark for $2\,Al$ **or** allow **1** mark for $3\,F_2$	2	AO2 4.1.1.1

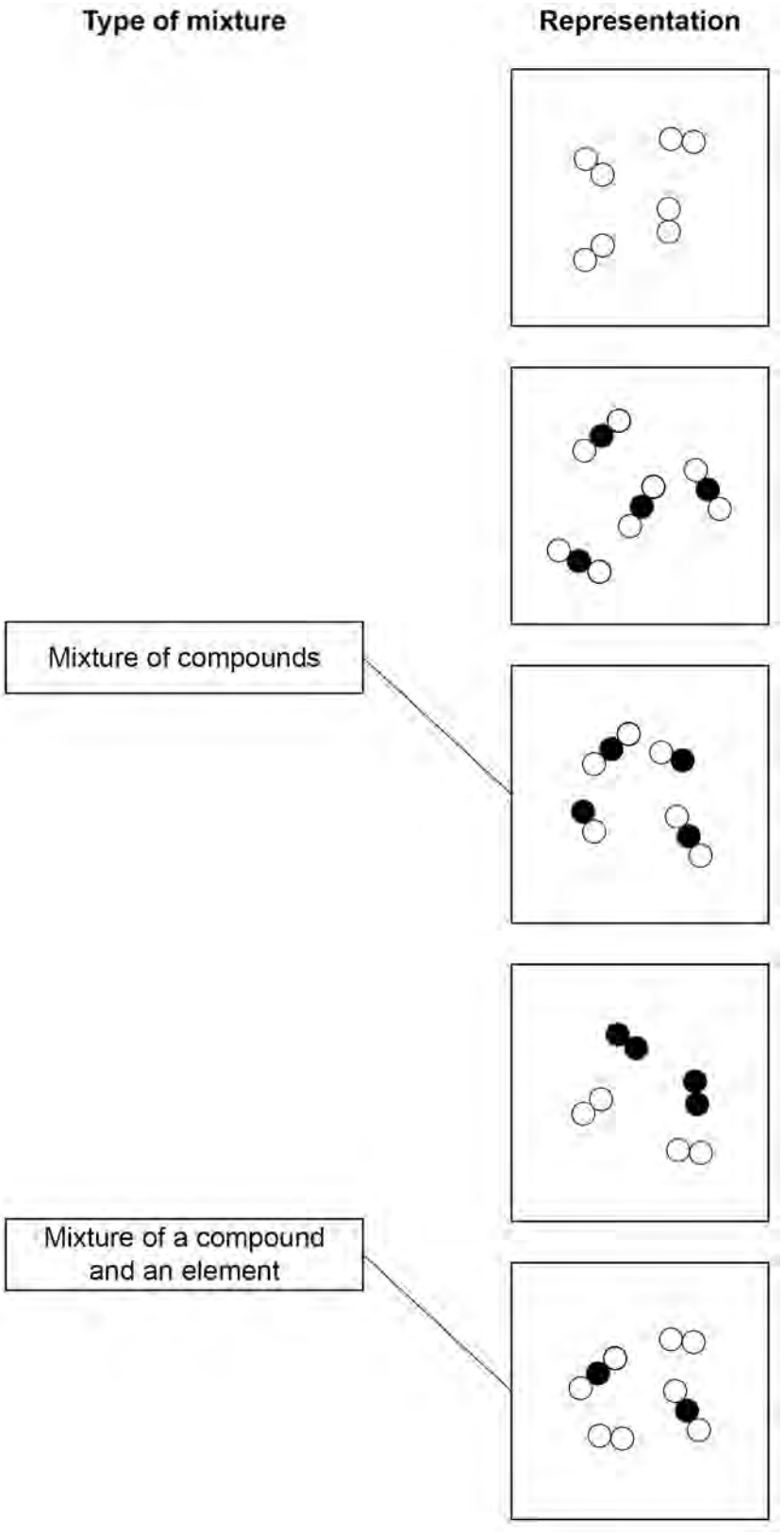
Total Question 1	7

4.1.1.1 Atoms, elements and compounds

Answer 65 · Mark scheme

June 2025 | 8462/1F | Original Q7

Question 7

Question	Answers	Mark	AO / Spec. Ref.
07.1	 do **not** accept more than one line from a box on the left	1 1	AO2 4.1.1.1 4.1.1.2

4.1.1.1 Atoms, elements and compounds

Answer 65 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
07.2	**Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.	5–6	AO3 4.1.1.2 4.4.2.3 RPA1
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content **add mixture to water** • in a beaker • place beaker on a tripod and gauze • heat • using a Bunsen burner • stir • using a glass rod • to dissolve the salt **filter using filter paper and funnel** • to remove the sand • the sand collects in the filter paper • rinse the sand • leave to dry **heat the salt solution** • in an evaporating dish • heat the solution to half volume **or** heat to crystallisation point • leave the remaining solution to form salt crystals • heat to dryness to obtain salt		

4.1.1.1 Atoms, elements and compounds

Answer 65 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.3	(% yield =) $\frac{13.6}{16.0} \times 100$		1	AO2 4.3.3.1
	= 85 (%)		1	

Total Question 7	**10**

AQA

GCSE
CHEMISTRY

8462/1F - PAPER 1 FOUNDATION TIER

Mark scheme

8462

June 2018

Version/Stage: 1.0 Final

4.1.1.1 Atoms, elements and compounds

Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' 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 from aqa.org.uk

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MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

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
- the Assessment Objectives and specification content that each question is intended to cover.

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 and underlining

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 bullet points 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.

2.4 Any wording that is underlined is essential for the marking point to be awarded.

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

3. Marking points

3.1 Marking of lists

This applies to questions requiring a set number of responses, but for which students 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.

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

[1 mark]

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

Example 2: Name two planets in the solar system.

[2 marks]

Student	Response	Marks awarded
1	Neptune, Mars, Moon	1
2	Neptune, Sun, Mars, Moon	0

3.2 Use of chemical symbols / formulae

If a student 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

Marks should be awarded for each stage of the calculation completed correctly, as students are instructed to show their working. Full marks can, however, be given for a correct numerical answer, without any working shown.

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.

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

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 is 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 ecf 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 Allow

In the mark scheme additional information, 'allow' is used to indicate creditworthy alternative answers.

3.9 Ignore

Ignore is used when the information given is irrelevant to the question or not enough to gain the marking point. Any further correct amplification could gain the marking point.

3.10 Do not accept

Do **not** accept means that this is a wrong answer which, even if the correct answer is given as well, will still mean that the mark is not awarded.

4. Level of response marking instructions

Extended response questions are marked on level of response mark schemes.

- Level of response mark schemes are broken down into levels, each of which has a descriptor.
- The descriptor for the level shows the average performance for the level.
- There are two marks in each level.

Before you apply the mark scheme to a student's answer, read through the answer and annotate it (as instructed) to show the qualities that are being looked for. You can then apply the mark scheme.

Step 1: Determine a level

Start at the lowest level of the mark scheme and use it as a ladder to see whether the answer meets the descriptor for that level. The descriptor for the level indicates the different qualities that might be seen in the student's answer for that level. If it meets the lowest level then go to the next one and decide if it meets this level, and so on, until you have a match between the level descriptor and the answer.

When assigning a level you should look at the overall quality of the answer. Do **not** look to penalise small and specific parts of the answer where the student has not performed quite as well as the rest. If the answer covers different aspects of different levels of the mark scheme you should use a best fit approach for defining the level.

Use the variability of the response to help decide the mark within the level, ie if the response is predominantly level 2 with a small amount of level 3 material it would be placed in level 2 but be awarded a mark near the top of the level because of the level 3 content.

Step 2: Determine a mark

Once you have assigned a level you need to decide on the mark. The descriptors on how to allocate marks can help with this.

The exemplar materials used during standardisation will help. There will be an answer in the standardising materials which will correspond with each level of the mark scheme. This answer will have been awarded a mark by the Lead Examiner. You can compare the student's answer with the example to determine if it is the same standard, better or worse than the example. You can then use this to allocate a mark for the answer based on the Lead Examiner's mark on the example.

You may well need to read back through the answer as you apply the mark scheme to clarify points and assure yourself that the level and the mark are appropriate.

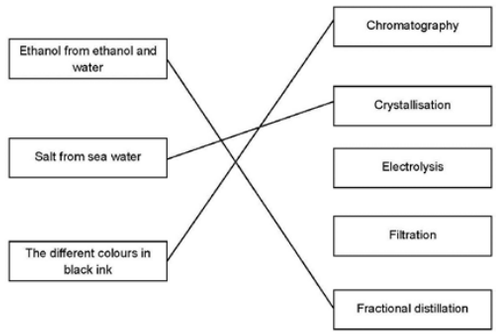
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

You should ignore any irrelevant points made. However, full marks can be awarded only if there are no incorrect statements that contradict a correct response.

An answer which contains nothing of relevance to the question must be awarded no marks.

4.1.1.1 Atoms, elements and compounds

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1			1 1 1	AO1 4.1.1.2
01.2	include a (filter) funnel	allow funnel drawn on the diagram ignore clamp stand	1	AO3 4.1.1.2
01.3	evaporate condense	must be this order	1 1	AO1 4.1.1.2
01.4	$\frac{2}{20} \times 100$ = 10 (%)	an answer of 10 (%) scores **2** marks an answer of 11.1(%) **or** 90 (%) scores **1** mark	1 1	AO2 4.2.2.7
01.5	an alloy		1	AO1 4.2.2.7
01.6	the layers in the mixture are distorted		1	AO1 4.2.2.7

4.1.1.1 Atoms, elements and compounds

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	8000 nm^3		1	AO2 4.2.4.1
Total			**11**	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	7		1	AO1 4.1.2.6
02.2	small molecule		1	AO2 4.1.2.6 4.2.2.4
02.3	F_2		1	AO1 4.1.1.1 4.1.2.6
02.4	the reactivity decreases (going down Group 7)	allow the reactivity decreases from chlorine to iodine	1	AO1 4.1.2.6
	(because) chlorine displaces bromine and iodine	allow (because) chlorine has two reactions allow (because) neither bromine nor iodine can displace chlorine	1	AO3 4.1.2.6
	(and) bromine displaces iodine **or** iodine does not react	allow (and) bromine has one reaction **or** iodine has no reactions allow (and) iodine cannot displace bromine	1	AO3 4.1.2.6
02.5	80		1	AO2 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.6	(1.2 kg =) 1200 (g) **or** (900 g =) 0.9 (kg)	an answer of 75 (%) scores **2** marks	1	AO2 4.3.3.1
	$(\frac{900}{1200} \times 100) = 75(\%)$ **or** $(\frac{0.9}{1.2} \times 100) = 75(\%)$	allow an answer correctly calculated from: $(\frac{900}{\text{incorrect attempt at conversion of 1.2}} \times 100)$ **or** $(\frac{\text{incorrect attempt at conversion of 900}}{1.2} \times 100)$	1	
Total			**9**	

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	nucleus neutron neutron electron proton	must be in this order	1 1 1 1 1	AO1 4.1.1.3 4.1.1.4 4.1.1.5
03.2	$(A_r)\ \frac{(63 \times 70) + (65 \times 30)}{100}$ = 63.6	an answer of 63.6 scores **2** marks	1 1	AO2 4.1.1.6
03.3	copper / Cu	allow ecf from answer to question **03.2**	1	AO2 4.1.1.1
03.4	$\frac{1.2 \times 10^{-10}}{10\,000}$ **or** $1.2 \times 10^{-10} \times 1 \times 10^{-4}$ $= 1.2 \times 10^{-14}$ (m)	an answer of 1.2×10^{-14} (m) scores **2** marks a correct answer not in standard form scores **1** mark	1 1	AO2 4.1.1.5
Total			**10**	

4.1.1.1 Atoms, elements and compounds

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.1	3.6 (cm^3)		1	AO2 4.4.3.4
04.2	hydrogen line only		1	AO3 4.4.3.4
04.3	both lines		1	AO3 4.4.3.4
04.4	graphite has delocalised electrons		1	AO1 4.2.3.2
04.5	**cathode** zinc (1) **anode** chlorine (1) hydrogen (1) bromine (1)	do **not** accept chloride allow **1** mark if chlorine and zinc the wrong way around do **not** accept bromide allow **1** mark if bromine and hydrogen the wrong way around	1+1 1+1	AO2 4.4.3.2 4.4.3.4
Total			**8**	

4.1.1.1 Atoms, elements and compounds

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	gas		1	AO1 4.2.2.2
05.2	the gas escapes	allow carbon dioxide escapes do **not** accept references to evaporation	1	AO1 4.3.1.3
05.3	5.12 (g)		1	AO2 4.3.1.3
05.4	4.00 (g) trial 1	allow 2.89 written in either space, or ringed in the table, unless contradicted by mass of copper carbonate or trial number	1	AO3 4.3.1.3
05.5	reheat (and reweigh) until constant mass	 an answer of heat to constant mass scores **2** marks if no other mark scored allow for **1** mark heat for longer **or** (heat at a) higher temperature **alternative approach**: (1) continue heating and pass gas through limewater (1) until the (lime)water stops bubbling **or** until the limewater no longer turns cloudy	1 1	AO3 4.3.1.3

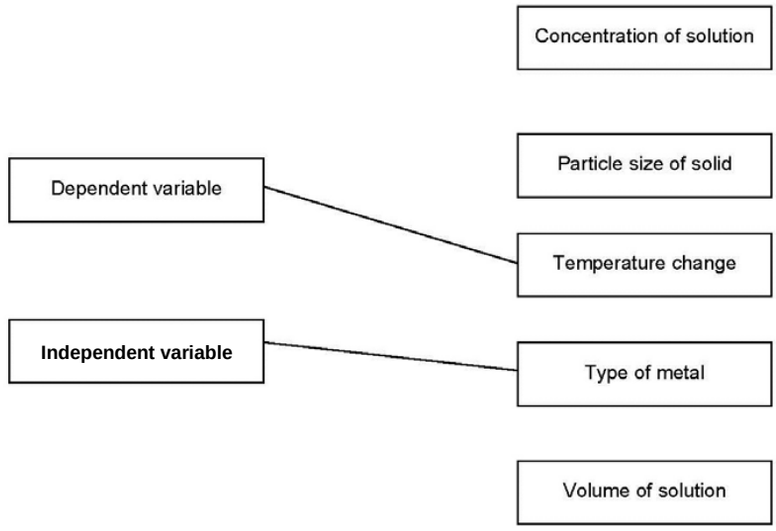
4.1.1.1 Atoms, elements and compounds

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	straight line of best fit	must touch at least 5 of the 6 plots	1	AO2 4.3.1.3
05.7	correct value read from line of best fit in Figure 8	allow tolerance of ± ½ small square	1	AO2 4.3.1.3
05.8		a correctly calculated value from their answer to question **05.7** scores **2** marks		AO2 4.3.1.3
	(mass =) $168 \times \frac{\text{answer from question } \mathbf{05.7}}{8.4}$	allow (mass =) answer from question **05.7** × 20	1	
	correctly calculated value (g)		1	
Total			**10**	

4.1.1.1 Atoms, elements and compounds

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.1	 allow **one** mark if answers are reversed		1 1	AO1 4.5.1.1
06.2	polystyrene is a better insulator		1	AO3 4.5.1.1
06.3	both bars labelled both bars correctly plotted	 allow tolerance of ± ½ small square ignore width and spacing of bars if no other mark scored, allow **1** mark for any one bar correctly plotted and labelled	1 1	AO2 4.5.1.1

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.4	temperature increases **or** temperature does not decrease	ignore because it is exothermic allow (because) energy / 'heat' is transferred to the surroundings energy / 'heat' is not taken in from the surroundings allow the energy of the products is less than the energy of the reactants	1	AO3 4.5.1.1
06.5	(most reactive) magnesium (zinc) nickel	this order only	1	AO3 4.5.1.1 4.4.1.2
06.6	suitable method described the observations / measurements required to place in order an indication of how results would be used to place the unknown metal in the reactivity series **approaches that could be used:** **approach 1:** add the unknown metal to copper sulfate solution (1) measure temperature change (1) place the metals in order of temperature change (1)		1 1 1	AO3 4.4.1.2 4.5.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
06.6 cont.	**approach 2:** add the metal to salt solutions of the other metals **or** heat the metal with oxides of the other metals (1) measure temperature change (only if salt solutions used) **or** observe whether a chemical change occurs (1) compare temperature change or whether there is a reaction to place in correct order (1) **approach 3:** add all of the metals to an acid (1) measure temperature change or means of comparing rate of reaction (1) place the metals in order of temperature change or rate of reaction (1) **approach 4:** set up electrochemical cells with the unknown metal as one electrode and each of the other metals as the other electrode (1) measure the voltage of the cell (1) place the metals in order of voltage (1)			
06.7	D		1	AO1 4.5.1.2
06.8	C		1	AO1 4.5.1.2
Total			**12**	

4.1.1.1 Atoms, elements and compounds

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.1	sodium oxide	allow Na_2O	1	AO2 4.1.1.1 4.1.2.5 4.4.1.1
07.2	oxidation		1	AO1 4.4.1.1
07.3	13		1	AO1 4.4.2.4
07.4	sodium hydroxide		1	AO2 4.1.1.1
07.5	OH^-		1	AO1 4.4.2.4
07.6	(volume =) $\frac{250}{1000}$ or ¼ or 0.25 (dm^3) **or** (mass per cm^3 =) $\frac{40}{1000}$ (g) or 0.04 (g) ($\frac{250}{1000}$ × 40 =) 10 (g)	an answer of 10 (g) scores **2** marks	1 1	AO2 4.3.2.5

4.1.1.1 Atoms, elements and compounds

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
07.7	all points correct	allow a tolerance of ± ½ a small square allow **1** mark for 3 points correct ignore any attempt at a line of best fit	2	AO2 4.1.2.5
07.8	39 (°C)	allow any value from 34 to 46 (°C)	1	AO2 4.1.2.5
Total			**10**	

4.1.1.1 Atoms, elements and compounds

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	any **one** from: • metal • (metal) hydroxide • (metal) carbonate • alkali	allow named example allow correct formula ignore base allow ammonium hydroxide allow ammonium carbonate allow soluble base allow ammonia	1	AO1 4.4.2.1 4.4.2.2 4.4.2.3
08.2	$Ca(NO_3)_2$	allow $Ca^{2+}(NO_3^-)_2$	1	AO2 4.4.2.2

4.1.1.1 Atoms, elements and compounds

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Mark	AO / Spec. Ref.
01.3	**Level 3:** The method would lead to the production of a valid outcome. All key steps are identified and logically sequenced.	5–6	AO1 4.4.2.3
	Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.	3–4	
	Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.	1–2	
	No relevant content	0	
	Indicative content • use magnesium oxide and sulfuric acid • add sulfuric acid to a beaker • warm sulfuric acid • add magnesium oxide • stir • continue adding until magnesium oxide is in excess • filter • using a filter paper and funnel • to remove excess magnesium oxide • heat solution in an evaporating basin • to crystallisation point • leave to crystallise • pat dry with filter paper credit may be given for diagrams		
Total			**8**

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	FeS_2	do **not** accept equations	1	AO2 4.2.1.3
09.2	26 30 26	must be this order	1 1 1	AO2 4.1.1.4 4.1.1.5
09.3	any **two** from: • iron has a high(er) melting / boiling point • iron is dense(r) • iron is hard(er) • iron is strong(er) • iron is less reactive • iron has ions with different charges • iron forms coloured compounds • iron can be a catalyst	allow the converse statements for sodium allow transition metal for iron allow Group 1 metal for sodium ignore references to atomic structure ignore iron rusts allow iron is less malleable / ductile allow specific reactions showing difference in reactivity allow iron is magnetic	2	AO1 4.1.2.5 4.1.3.1 4.1.3.2

4.1.1.1 Atoms, elements and compounds

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	carbon is more reactive (than nickel)	allow converse	1	AO1 4.4.1.2 4.4.1.3
	(so) carbon will displace / replace nickel (from nickel oxide) **or** (so) carbon will remove oxygen (from nickel oxide)	allow (so) nickel ions gain electrons allow (so) carbon transfers electrons to nickel (ions)	1	
09.5		an answer of 67.8 (%) scores **3** marks an answer of 67.8160919 (%) or correctly rounded answer to 2, 4 or more sig figs scores **2** marks an incorrect answer for one step does **not** prevent allocation of marks for subsequent steps		AO2 4.3.3.2
	(total M_r of reactants =) 87		1	
	(percentage atom economy) $= \frac{59}{87} \times 100$	allow (percentage atom economy) $= \frac{59}{\text{incorrectly calculated } M_r} \times 100$	1	
	= 67.8 (%)	allow an answer from an incorrect calculation to 3 sig figs	1	
Total			**11**	

4.1.1.1 Atoms, elements and compounds

MARK SCHEME – GCSE CHEMISTRY – 8462/1F – JUNE 2018

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	copper, zinc, sodium chloride solution		1	AO2 4.5.2.1
10.2	a reactant is used up	allow the reaction stops allow electrolyte / electrode / ions / metal / metal hydroxide / alkali for reactant	1	AO1 4.5.2.1
10.3	the reaction is not reversible		1	AO1 4.5.2.1
10.4	$2H_2 + O_2 \rightarrow 2H_2O$	allow fractions / multiples allow **1** mark for O_2	2	AO1 AO2 4.1.1.1 4.5.2.2

<table>
<tr><th>Question</th><th>Answers</th><th>Mark</th><th>AO / Spec. Ref.</th></tr>
<tr><td rowspan="5">10.5</td><td>Level 3: A judgement, strongly linked and logically supported by a sufficient range of correct reasons, is given.</td><td>5–6</td><td rowspan="5">AO3

AO3

AO2

4.4.3.4
4.5.2.1
4.5.2.2</td></tr>
<tr><td>Level 2: Some logically linked reasons are given. There may also be a simple judgement.</td><td>3–4</td></tr>
<tr><td>Level 1: Relevant points are made. This is not logically linked.</td><td>1–2</td></tr>
<tr><td>No relevant content</td><td>0</td></tr>
<tr><td colspan="2">Indicative content

reasons why fuel cells could be judged as better

<table><tr><th>from the table</th><th>from other knowledge</th></tr><tr><td>• time for refuelling a fuel cell is faster than recharging
or
a fuel cell does not need to be recharged
• a fuel cell has a greater range</td><td>• hydrogen can be renewable if made by electrolysis using renewable energy
• lithium-ion batteries can catch fire
• produces only water
or
no pollutants produced
• lithium-ion batteries may release toxic chemicals on disposal
• lithium-ion batteries (eventually cannot be recharged so) have a finite life</td></tr></table>
reasons why the lithium-ion battery could be judged as better

<table><tr><th>from the table</th><th>from other knowledge</th></tr><tr><td>• lithium-ion uses energy more efficiently
• cost of lithium-ion car much less
• cost of recharging much less than refuelling with hydrogen</td><td>• hydrogen is often made from fossil fuels so is not renewable
• charging points are more widely available than hydrogen filling stations
• hydrogen takes up a lot of space
or
is difficult to store
• hydrogen can be highly flammable / explosive
• no emissions produced
• (catalyst in the hydrogen fuel-cell eventually becomes poisoned so) have a finite life</td></tr></table></td><td></td><td></td></tr>
<tr><td>Total</td><td colspan="2"></td><td>11</td></tr>
</table>

Answer 49 · Examiner comments

June 2018 | 8462/1F | Original Q9

Question 9 (standard demand)

09.1 Because the question asked for the formula rather than the empirical formula, an answer of Fe_9S_{18} was accepted. Even so, 21% of students were able to answer this correctly.

Many students ignored the necessity for correct capital and lower case letters, with a lower case 'f' being seen quite frequently. Others did not count the atoms correctly, or used a large figure '2' in an inappropriate position.

09.2 This question worked very well. 84% of students managed to achieve at least one mark, with 51% achieving two or more. The most frequent error was in the number of neutrons.

09.3 Whilst 56% of students achieved at least one mark, 34% of these students achieved both.

- Many students repeated information in the stem of the question. And some appeared to ignore it as they declared sodium to be a non-metal.
- Many gave differences in the structure of the atoms instead of differences in properties of the substances.
- Some effectively gave the same difference twice, for example writing that sodium is soft on one line and iron is hard on the other.

09.4 26% of students achieved at least one mark on this question, although some very good answers were seen. As with some other questions, students were sometimes prone to imprecise use of language.

Many students thought that carbon is more reactive than oxygen rather than nickel, or said that carbon is reacting with oxygen (it is not, it is reacting with nickel oxide to remove the oxygen). Those who tried to answer in terms of electron transfer often struggled to gain all the marks.

09.5 Students struggled with this calculation; with 9% of students providing a fully correct answer. This question relies on knowledge of the expression for atom economy. Those who quoted the expression often did not know what was meant by 'reactants'.

It was also common to include the M_r of all the products instead of just the nickel, leading to an answer of 100%, which is clearly incorrect as there is more than one product.

There seemed to be trouble with the interpretation of some calculator displays. Many students lost the final mark because they gave an answer of $67.\dot{8}$. This answer is neither correct (it is not 67.8888888…) nor to three significant figures (it is to an infinite number of significant figures). Some even recognised this latter point and rounded, incorrectly, to 67.9.

4.1.1.1 Atoms, elements and compounds

Answer 50 · Examiner comments June 2018 | 8462/2F | Original Q1

Question 1 (low demand)

01.1 58% of answers were correct, although 'product' was given by 25% of students.

01.2 95% of students could correct identify the reversible reaction symbol.

01.3 69% of the responses were correct.

01.4 Again, this question was answered well with 72% of students realising that this was a subtraction and carried it out correctly.

01.5 55% of students could answer this percentage calculation correctly. Where errors occurred it was usually caused by the student involving the mass of anhydrous copper sulfate (1.6 g) calculated in the previous part of the question.

01.6 99% of students got the formula for water, with 71% able to identify sulfuric acid's formula.

Answer 51 · Examiner comments June 2019 | 8462/1F | Original Q3

Question 3 (low and standard demand)

03.1 This question tested recognition of a diagram representing only one compound.

Almost half of the students identified the correct option.

The diagram representing only one element was a strong distractor.

03.2 This question tested recognition of a diagram representing a mixture of elements.

Approximately 55% of students identified the correct option.

03.3 This question tested recognition of a diagram representing a mixture of an element and a compound.

Approximately 60% of students identified the correct option.

03.4 This question tested students' ability to apply their knowledge and understanding of chromatography and crystallisation.

Approximately two-thirds of students scored both marks.

03.5 The diagram showing how a mixture of sand and water can be separated by filtration was often drawn and labelled clearly enough to score all 3 marks. The most common omissions were a filter funnel or filter paper.

03.6 Approximately two-thirds of students correctly predicted the temperature of 100 °C.

4.1.1.1 Atoms, elements and compounds

Answer 51 · Examiner comments June 2019 | 8462/1F | Original Q3

03.7 This question which required a description of distillation was generally answered well. Almost 60% of students scored at least 3 marks.

The marks for the solution being heated and for the water being collected in the beaker were the most often scored.

Marks for the vapour cooling in the condenser and for the vapour condensing were the least often scored. Here, the term vapour / gas / steam needed to be used rather than, for example, evaporated water.

Answer 55 · Examiner comments June 2022 | 8462/1F | Original Q1

Question 1 (Low and standard demand)

01.1 The great majority of students scored both marks.

01.2 The majority of students scored at least one mark, with just under half scoring both marks.

01.3 Most students could substitute the values into the equation and obtain a correct value for the relative atomic mass. However, only about half could then give their answer to three significant figures. Some students did not appear to understand how to input their expression into a calculator and incorrectly calculated the value as

$$(39 \times 93.3) + \left(\frac{41 \times 6.7}{100}\right)$$

which gave a value of 3641.

01.4 Students who had correctly calculated the relative atomic mass were less successful at identifying the element, with some giving the response argon, and others mistakenly using the atomic number, giving a response of yttrium.

01.5 Fewer than 40% of students gave the correct answer.

4.1.1.1 Atoms, elements and compounds

Answer 56 · Examiner comments — June 2022 | 8462/1F | Original Q2

Question 2 (Low and standard demand)

02.1 This was answered correctly by the great majority of students.

02.2 About 60% of students correctly identified diagram **A** as a mixture of compounds. **D**, a pure compound, was the most popular incorrect response .

02.3 Just over half of students correctly identified **B** as a mixture of elements. About a quarter chose **A**, which was a mixture of compounds.

Answer 56 · Examiner comments — June 2022 | 8462/1F | Original Q2

02.4 Most students correctly named filtration as the method to be used. Distillation and evaporation were common incorrect responses.

02.5 Most students gave **C** as the correct liquid. A few wrote water, despite the boiling point of water not being given in the table.

02.6 This question was poorly answered. Many students seemed to think that the question was about vapours passing through the condenser rather than the water used to cool the vapours.

02.7 Very few complete descriptions of the process of crystallisation were seen; over half of students scored one of the marks, but very few scored both. Many students did not realise the starting point was sodium chloride solution and tried to produce sodium chloride from a chemical reaction before crystallising the solution. Few realised that crystallisation is a two step process - heating to concentrate the solution and then leaving the remaining solution to cool and crystallise.

Answer 57 · Examiner comments — June 2022 | 8462/1F | Original Q4

Question 4 (Low and standard demand)

04.1 This was well answered, with the majority of students giving a correct answer. Most answered in terms of elements that had not been discovered; very few answered in terms of preserving the pattern of similar properties in the same group.

04.2 Nearly three-quarters of students correctly identified Mendeleev as the scientist.

04.3 The majority of students correctly identified the missing group as the noble gases, but a significant minority gave a response of halogens.

04.4 This was well answered with over 70% of students giving the correct answer.

4.1.1.1 Atoms, elements and compounds

Answer 57 · Examiner comments June 2022 | 8462/1F | Original Q4

04.5 Nearly all students gave a sensible estimate of the melting point.

04.6 This was well answered, with over 80% of students giving a correct observation. Most described fizzing or bubbling. A few gave observations that could not be seen, such as popping sounds.

04.7 The vast majority of students managed to score at least one mark but fewer than 60% scored both. Liquid was a common incorrect answer, as were At and HAT.

04.8 Nearly half of the students chose the correct formula. The most popular incorrect response was Br, which is the formula of an atom, not a molecule.

Answer 58 · Examiner comments June 2023 | 8462/1F | Original Q1

Question 1 (low demand)

01.1 The vast majority of students gave the correct answer, neutrons, with the others evenly split between protons and electrons.

01.2 Fewer than half of students gave the correct answer, with more choosing an electron and a neutron than the correct answer.

01.3 The great majority of students answered correctly, with the most common error being two oxygen atoms and one nitrogen.

Answer 58 · Examiner comments June 2023 | 8462/1F | Original Q1

01.4 Three quarters of students identified the element correctly as lithium. The most common incorrect response was zinc.

01.5 This question discriminated well. Fewer than a third of students scored all the marks. Many students drew their protons and neutrons around the edge of the nucleus instead of inside it. Many of those who did do this part correctly however then used the edge of the nucleus as the first electron shell. The need for clear presentation in answers applies to diagrams as well as to written answers. Many students caused confusion by not using the symbols given in the key in the question.

4.1.1.1 Atoms, elements and compounds

Answer 59 · Examiner comments — June 2023 | 8462/1F | Original Q3

Question 3 (low and standard demand)

03.1 Three quarters of students recognised that carbon is an element. Most of the others thought carbon is a compound.

03.2 A third of students scored both marks, with another third scoring just one. Few students chose ions or molecules, but many could not select the correct sub-atomic particles for the correct space. Protons and neutrons were often seen the wrong way round.

03.3 A third of students gave the correct answer on this standard demand question. The most common incorrect response was the inverted expression.

03.4 Only a half of students recognised diagram B as buckminsterfullerene, with nearly as many selecting **C**, which was a diagram of a nanotube.

Answer 59 · Examiner comments — June 2023 | 8462/1F | Original Q3

03.5 The majority of students scored at least one mark. The role of the delocalised electrons in electrical conduction was well known. The lack of covalent bonds between layers causing the softness was less well known, with many opting for the hexagonal rings being the cause.

Answer 60 · Examiner comments — June 2023 | 8462/1F | Original Q9

Question 9 (standard demand)

09.1 The description of the plum pudding model in the specification (a ball of positive charge with negative electrons embedded in it) is not well known. Very few students scored both marks and fewer than a quarter scored one. Many students believed that the positive

Answer 60 · Examiner comments June 2023 | 8462/1F | Original Q9

charge represented a proton, or that the atom as a whole is positively charged. Some referred to a ‘sea’ or ‘cloud’ of positive charge, but these terms do not convey the shape.

09.2 Fewer than a third of students knew the correct order of discovery of the particles.

09.3 About a third of students scored both marks. Most missed the relevance of the instruction to use the period table. Many tried to work out the electron configuration, instead of simply locating element 117 in Group 7 and deducing that there must be 7 outer shell electrons.

09.4 This question was very poorly answered and did not discriminate well. Students seemed unfamiliar with the concept of the need for peer review. Most answered in terms of the rarity of the element, but this was also true for the original scientists and does not explain the time lag before acceptance.

09.5 Whilst one in ten students scored all three marks, overall, few remembered how to do this standard calculation. The four numbers in the table were manipulated in various random ways. Some students did not even use all the data. Most did not realise that the answer must lie somewhere between 6 and 7, the two mass numbers. One in five students made no attempt to answer.

4.1.1.1 Atoms, elements and compounds

Answer 61 · Examiner comments June 2023 | 8462/2F | Original Q2

Question 2 (Low demand)

02.1 More than two thirds of students were able to use the information provided in the table to provide two correct reasons as to why poly(propene) beakers should not be used to heat liquids. More students suggested that poly(propene) would burn rather than melt. Common incorrect responses did not refer to the effect of heat on poly(propene) instead referring to the effect of the liquid being heated on the polymer.

02.2 More than half of students used the information in the table to suggest a reason why using poly(propene) beakers could save money. The most common incorrect responses did not include a comparison to the glass beakers so that the unqualified 'because they are tough' added no value to the data in the table. Some students used the wrong column and said the poly(propene) does shatter (on impact) even though this then made no sense in the context of saving money.

02.3 More than half of students successfully identified boron trioxide as a raw material for making borosilicate glass.

02.4 More that 90% of students obtained at least one mark on this question (usually for completing the 'name' column correctly) with just over 50% achieving both marks. The most common incorrect response was to incorrectly identify the number of carbon atoms. A minority of students failed to identify the number of atoms but instead calculated the mass of each element.

02.5 This question was very well answered with over 80% of students correctly identifying the repeating unit of poly(propene). The distractors attracted roughly equal support.

02.6 Students struggled to recognise and correctly identify the stages needed to produce poly(propene) from the descriptions provided in the question. Quite often, correct processes were identified but sequenced incorrectly. Less than one-third of students obtained all three marks and less than half achieved 2 marks.

02.7 Just over one third of students achieved 2 marks to identify both of the words that described a hexene molecule during a polymerisation reaction. About half of students achieved 1 mark by identifying hexene as an alkene or by identifying it as a monomer.

Answer 62 · Examiner comments June 2024 | 8462/1F | Original Q1

Question 1 (low demand)

01.1 More than two thirds of students identified the pure compound, with the three distractors being approximately equally popular.

01.2 Just over one third of students identified the correct mixture. Distractor **A**, which is a mixture of two compounds, proved more popular than the correct answer.

01.3 More than four fifths of students identified the position of metals in the periodic table. Sections **B**, **C** and **D** was the most popular distractor.

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4.1.1.1 Atoms, elements and compounds

Answer 62 · Examiner comments June 2024 | 8462/1F | Original Q1

01.4 Fewer than one third of students scored both marks, with nearly one in ten scoring neither. Low melting point was a popular distractor.

01.5 Over half of students scored both marks. Some students placed the electron from the potassium atom on the chlorine atom, rather than completing the structure of the chloride ion. Some added to the potassium ion diagram unnecessarily. A few showed an electron moving from chlorine to potassium. There were some blank answers, perhaps because the students did not realise there was something to do; students need to read the whole paper, not just the parts above an answer line.

01.6 More than four fifths of students identified the distillation apparatus.

01.7 Nearly all students identified the filtration apparatus. The most popular distractor was diagram **B**.

Answer 63 · Examiner comments June 2024 | 8462/1F | Original Q4

Question 4 (low and standard demand)

04.1 Fewer than one in eight students knew that a nanoparticle is only a few hundred atoms, despite this being clearly stated in the specification. The correct answer was a less popular option than all three distractors. The most popular answer was a few million atoms.

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Answer 63 · Examiner comments June 2024 | 8462/1F | Original Q4

04.2 Fewer than a third of students could apply their knowledge that transition metals make good catalysts and select iron as the most likely element. By far the most popular distractor was magnesium.

04.3 More than four fifths of students scored both marks. Nearly all students identified the use of titanium dioxide for sun creams, and most also identified silver for wound dressings. There was no apparent pattern to incorrect responses.

04.4 Two fifths of students scored all six marks, with well over four fifths scoring at least 1 mark. The most common error was in the surface area, where the answer was often given as 6 times the volume, ie 384 nm^3. Most students were able to cancel down their numbers to give the simplest whole number ratio and gained credit for doing so.

4.1.1.1 Atoms, elements and compounds

Answer 64 · Examiner comments — June 2025 | 8462/1F | Original Q1

Question 1 (low demand)

01.1 Nearly all students chose the correct name.

01.2 Most students filled in the table correctly, with the vast majority scoring at least two marks and about five sixths scoring all three marks. The most common error was 1 for the number of hydrogen atoms in the molecule. Occasionally chlorine was given as the name for the symbol C.

Answer 64 · Examiner comments — June 2025 | 8462/1F | Original Q1

01.3 More than three quarters of students gave a correct word equation. The most common errors were 'potassium sulfuride' and potassium sulphate for the name of the product. A few tried unsuccessfully to write a symbol equation despite the instruction to write a word equation.

01.4 About five sixths of students could balance the Al atoms but there were more errors with the F atoms, with under a half of students scoring both marks. 1 F_2 and 2 F_2 were commonly seen.

4.1.1.1 Atoms, elements and compounds

Answer 65 · Examiner comments

June 2025 | 8462/1F | Original Q7

Question 7 (low and standard demand)

07.1 Many could identify one mixture but not the other; two thirds of students scored one mark but fewer than a third scored both. Many chose the second box (a pure compound) for one of their answers.

07.2 Unlike some 6-mark questions in previous years, most students attempted this question with about 1 in 10 making no attempt. Three fifths of students were able to reach at least level 2 and a third scored full marks. The question provided lots of useful information to prompt and assist with creating a suitable method. Most students could state that the mixture needed to be dissolved in water. Where this happened varied, with many stating a beaker, but a number suggested doing this in a filter funnel. When this happened, some lost credit as they did not mention using a filter paper. Most could suggest evaporating the solution in an evaporating dish. Other common alternatives included leaving the solution to evaporate slowly or with a water bath.

Some students mixed up the correct order in which steps should be undertaken. Those who scored zero marks often described the set up of a water bath without providing any further indicative content. Some thought the glass rod was to measure temperature. Others used it to push the mixture through the filter paper. Those who did not add water to the mixture as their first step had difficulty in producing a method that would work. Many only used the water for a water bath, not as a solvent for the salt.

Answer 65 · Examiner comments

June 2025 | 8462/1F | Original Q7

07.3 Four fifths of students scored both marks. A few inverted the expression provided.