AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.1.2.1

The periodic table

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**64**
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.

4.1.2.1 The periodic table

Answer 01 · Mark scheme March 2007 | CHY1A | Original Q4 | Legacy

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

Answer 02 · 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 03 · Mark scheme June 2007 | CHY1B | Original Q4 | Legacy

Four	**A**	boiling point	**4**
	B	colour	**2**
	C	density	**3**
	D	reactivity	**1**

4.1.2.1 The periodic table

Answer 04 · Mark scheme

January 2008 | CHY3F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
(a)(i)	B		1
(a)(ii)	A		1
(a)(iii)	E		1
(a)(iv)	D		1
(b)(i)	Mendeleev and Newlands		1
(b)(ii)	atomic weight		1
(b)(iii)	chemical reactions		1
(b)(iv)	electrons		1
total			8

4.1.2.1 The periodic table

Answer 04 · Mark scheme January 2008 | CHY3F | Original Q1 | Legacy

CHY3F

Answer 05 · 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**

4.1.2.1 The periodic table

Answer 05 · Mark scheme June 2008 | CHY3F | Original Q2 | Legacy

COMPONENT NUMBER: CHY3F

COMPONENT NAME: Chemistry

STATUS: Final

DATE: June 2008

Answer 06 · 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 07 · 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 08 · 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 09 · Mark scheme March 2009 | CHY1AP | Original Q8 | Legacy

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

4.1.2.1 The periodic table

Answer 10 · Mark scheme

June 2009 | CHY2F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)	4		1
1(b)	9		1
Total			**2**

4.1.2.1 The periodic table

Answer 10 · Mark scheme

June 2009 | CHY2F | Original Q1 | Legacy

CHY2F

4.1.2.1 The periodic table

Answer 11 · Mark scheme

June 2009 | CHY2F | Original Q6 | Legacy

Question 6

question	answers	extra information	mark
6(a)(i)	gives out a large amount of energy only water produced / product is non polluting (owtte)	 allow it does not harm the environment	1 1
6(a)(ii)	does not explode / burst into flames owtte	ignore will not react	1
6(a)(iii)	hydrogen absorbed and released much faster	allow more efficient allow can store a larger amount	1
6(b)(i)	B		1
6(b)(ii)	a lithium atom loses an electron		1
6(b)(iii)	C		1
6(c)	reversible		1
6(d)(i)	much smaller		1
6(d)(ii)	surface area		1
Total			**10**

4.1.2.1 The periodic table

Answer 11 · Mark scheme June 2009 | CHY2F | Original Q6 | Legacy

CHY2F

Answer 12 · Mark scheme November 2009 | CHY1AP | Original Q2 | Legacy

Two	**A**	metal ore	**1**
	B	reactive metal	**4**
	C	transition metal	**3**
	D	metal alloy	**2**

Answer 13 · Mark scheme November 2009 | CHY1AP | Original Q3 | Legacy

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

Answer 14 · 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**

4.1.2.1 The periodic table

Answer 15 · Mark scheme

Question 1

question	answers	extra information	mark
1(a)(i)	E		1
1(a)(ii)	B		1
1(a)(iii)	C		1
1(a)(iv)	A		1
1(b)(i)	quickly melted	allow melts in contact with water, allow bp 100 °C (of water) shows mp is low ignore one other piece of information	1
1(b)(ii)	easily cut	ignore one other piece of information	1
1(b)(iii)	effervescence / fizzing / bubbling	ignore named gas ignore one other piece of information	1
Total			**7**

4.1.2.1 The periodic table

Answer 15 · Mark scheme

January 2010 | CHY3F | Original Q1 | Legacy

CHY3F

Answer 16 · Mark scheme

March 2010 | CHY1AP | Original Q8 | Legacy

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

Answer 17 · Mark scheme

March 2010 | CHY1BP | Original Q1 | Legacy

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

4.1.2.1 The periodic table

Answer 18 · 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**

4.1.2.1 The periodic table

Answer 18 · Mark scheme June 2010 | CHY3F | Original Q3 | Legacy

CHY3F

Answer 19 · Mark scheme November 2010 | CHY1AP | Original Q8 | Legacy

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

4.1.2.1 The periodic table

Answer 20 · Mark scheme

Question 7

question	answers	extra information	mark
7(a)(i)	65	correct answer with or without working = **2** marks if answer incorrect evidence of (81 – 16) for **1** mark ignore units	2
7(a)(ii)	zinc	accept error carried forward from (a)(i) allow correct symbol answer given should be element / metal closest to their answer do **not** allow compounds	1
7(b)(i)	• it loses electrons • three electrons	sharing / covalency = max **1** mark	1 1
7(b)(ii)	8 electrons shown in second shell.	accept dots / crosses / mixture of dots and crosses / e electrons do not need to be paired do **not** allow extra electrons in first shell	1
Total			**6**

4.1.2.1 The periodic table

Answer 21 · Mark scheme

Question 1

question	answers	extra information	mark
1(a)(i)	B		1
1(a)(ii)	E		1
1(a)(iii)	F		1
1(a)(iv)	D		1
1(a)(v)	C		1
1(b)(i)	Br	do not accept BR or br or bR ignore numbers allow written in table if answer blank	1
1(b)(ii)	I Br Cl	allow iodine, bromine, chlorine allow I,B,C allow capitals or lower case allow 184, 58, –34 ignore numbers	1
1(c)	they are halogens they become less reactive down Group 7		1 1
Total			**9**

4.1.2.1 The periodic table

Answer 21 · Mark scheme January 2011 | CHY3F | Original Q1 | Legacy

CHY3F

Answer 22 · Mark scheme June 2011 | CHY1AP | Original Q2 | Legacy

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

4.1.2.1 The periodic table

Answer 23 · 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

4.1.2.1 The periodic table

Answer 23 · Mark scheme

June 2011 | CHY3F | Original Q1 | Legacy

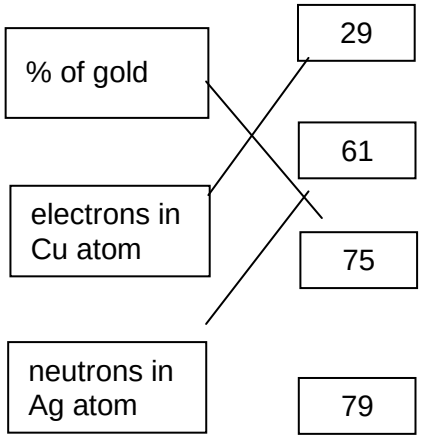
CHY3F

4.1.2.1 The periodic table

Answer 24 · 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

4.1.2.1 The periodic table

Answer 24 · Mark scheme January 2012 | CH1FP | Original Q1 | Legacy

CH1FP

4.1.2.1 The periodic table

Answer 25 · 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**

4.1.2.1 The periodic table

Answer 25 · Mark scheme

June 2012 | CH1FP | Original Q1 | Legacy

CH1FP

4.1.2.1 The periodic table

Answer 26 · Mark scheme

June 2012 | CH2FP | Original Q2 | Legacy

Question 2

question	answers	extra information	mark
2(a)	79 79		1 1
2(b)	hundred		1
2(c)(i)	electron(s)		1
2(c)(ii)	three		1
2(d)	changes rate of reaction **or** speeds up / slows down reaction	accept lowers activation energy accept reduces costs	1
2(e)(i)	melt		1
2(e)(ii)	crosslinking **or** (covalent) bonds between polymers / chains	allow answers on diagram allow bonds between layers do **not** allow intermolecular	1
Total			**8**

4.1.2.1 The periodic table

Answer 26 · Mark scheme

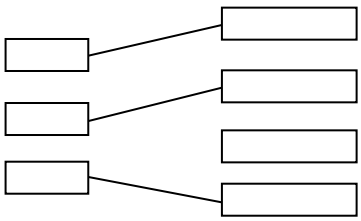
June 2012 | CH2FP | Original Q2 | Legacy

CH2FP

4.1.2.1 The periodic table

Answer 27 · Mark scheme

January 2013 | CH1FP | Original Q1 | Legacy

question	answers	extra information	mark
1(a)(i)	nucleus		1
1(a)(ii)	an energy level (shell)		1
1(b)			1 1 1
1(c)	2/two(%)		1
1(d)(i)	10/ten		1
1(d)(ii)	(group) 0	accept noble gases ignore (group) 8	1
Total			**8**

4.1.2.1 The periodic table

Answer 27 · Mark scheme

January 2013 | CH1FP | Original Q1 | Legacy

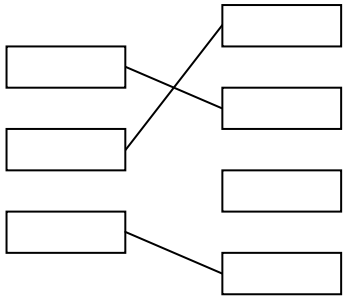
CH1FP

4.1.2.1 The periodic table

Answer 28 · Mark scheme

June 2013 | CH1FP | Original Q1 | Legacy

Question 1

question	answers	extra information	Mark
1(a)		one mark for each substance linked correctly to its description do **not** accept more than one line from each substance	3
1(b)	0 / zero / none / no charge electron		1 1
1(c)(i)	nucleus		1
1(c)(ii)	atomic number		1
1(c)(iii)	mass number		1
Total			8

4.1.2.1 The periodic table

Answer 29 · Mark scheme

June 2013 | CH2FP | Original Q1 | Legacy

Question 1

question	answers	extra information	Mark
1(a)	1 / one		1
1(b)(i)	protons		1
1(b)(ii)	neutrons		1
1(b)(iii)	7		1
1(c)(i)	losing		1
1(c)(ii)	a positive		1
1(c)(iii)	electrostatic		1
1(d)	high melting points strong bonds		1 1
1(e)(i)	58.5		1
1(e)(ii)	mole		1
1(f)	very small (particles) **or** 1-100nm in size **or** (particle with a) few hundred atoms	ignore tiny / small / smaller / microscopic etc.	1
Total			**12**

4.1.2.1 The periodic table

Answer 30 · Mark scheme

June 2013 | CH3FP | Original Q3 | Legacy

Question 3

question	Answers	extra information	Mark
3(a)	number 0	 allow 8	1 1
3(b)	beryllium **or** magnesium **or** strontium **or** barium **or** radium	allow correct symbols	1
3(c)(i)	an alkali metal		1
3(c)(ii)	a transition metal		1
3(d)	for undiscovered elements	accept so elements with similar properties were in the same groups accept so elements fitted the pattern of properties	1
Total			**6**

4.1.2.1 The periodic table

Answer 31 · Mark scheme

June 2013 | CH3FP | Original Q7 | Legacy

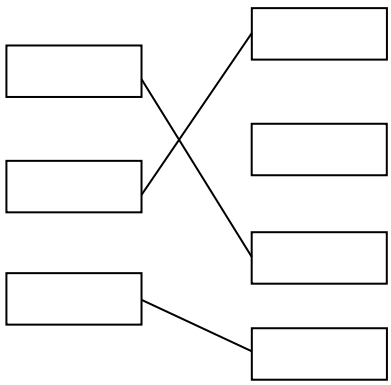
Question 7

question	Answers	extra information	Mark
7(a)(i)	hydrogen	accept H_2 allow H	1
7(a)(ii)	hydroxide	accept OH^- allow OH do **not** accept lithium hydroxide	1
7(b)	any **two** from: potassium: • reacts / dissolves faster • bubbles / fizzes faster • moves faster (on the surface) • melts • produces (lilac / purple) flame	'it' = potassium accept converse for lithium allow reacts more vigorously / quickly / violently / explodes ignore reacts more allow fizzes more allow more gas allow moves more allow forms a sphere allow catches fire / ignites do **not** accept other colours	2
Total			**4**

4.1.2.1 The periodic table

Answer 32 · 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		

4.1.2.1 The periodic table

Answer 32 · Mark scheme

June 2014 | CH1FP | Original Q1 | Legacy



4.1.2.1 The periodic table

Answer 33 · Mark scheme

June 2014 | CH3FP | Original Q1 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
1(a)(i)	atomic weight		1	1 / 3.1.1a	A
1(a)(ii)	groups		1	1 / 3.1.1a	A
1(a)(iii)	left a gap		1	1 / 3.1.1b	A
1(a)(iv)	had not been discovered by 1869		1	3 / 3.1.1b	A
1(b)	protons electrons	*must be in correct order*	1 1	1 / 3.1.2a/b	G
1(c)	sodium and nickel are both metals sodium is more reactive than nickel		1 1	1 / 3.1.3c	A
1(d)(i)	bromine	allow Br_2 / *Br* do **not** allow bromide	1	2 / 3.1.3g	E
1(d)(ii)	iodine is less reactive (than bromine)	*it = iodine* allow converse do **not** allow bromide	1	1 / 3.1.3g	E
Total			**10**		

4.1.2.1 The periodic table

Answer 33 · Mark scheme

June 2014 | CH3FP | Original Q1 | Legacy



4.1.2.1 The periodic table

Answer 34 · 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**	

4.1.2.1 The periodic table

Answer 34 · Mark scheme

June 2015 | CH1FP | Original Q1 | Legacy



4.1.2.1 The periodic table

Answer 35 · Mark scheme June 2015 | CH1FP | Original Q2 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)(i)	central block		1	1 / 1.3.3a
2(a)(ii)	conducts electricity		1	1 / 1.3.3a
2(b)	any **two** from: • visual pollution • noise pollution • dust pollution • habitat destruction		2	2 / 1.3.1b
2(c)(i)	to concentrate the ore/copper carbonate **or** to remove / separate the rock		1	2 / 1.3.1b
2(c)(ii)	12 (tonnes)	If answer is incorrect allow one mark for (127 + 132) – 247 or 259 - 247	2	2 / 1.1.3c
2(c)(iii)	any **one** from: • so no reactant is wasted/left unreacted • so they know how much product they will make • need to record/compensate for the carbon dioxide produced	allow so they can work out their carbon footprint	1	3 / 1.1.3c
Total			**8**	

4.1.2.1 The periodic table

Answer 35 · Mark scheme

June 2015 | CH1FP | Original Q2 | Legacy



4.1.2.1 The periodic table

Answer 36 · Mark scheme

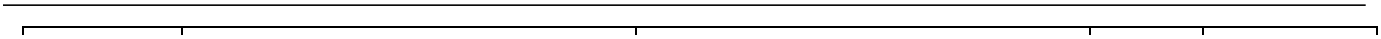
June 2015 | CH3FP | Original Q2 | Legacy

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**	

4.1.2.1 The periodic table

Answer 36 · Mark scheme

June 2015 | CH3FP | Original Q2 | Legacy



4.1.2.1 The periodic table

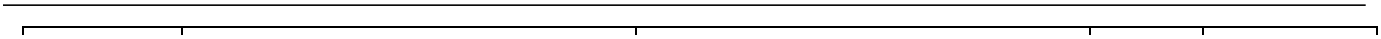
Answer 37 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
8(a)	(iron) is a metal	accept transition element allow (iron) had different properties (to oxygen and sulfur) ignore electrons	1	**AO2** 3.1.1.a
8(b)	so that elements with similar properties could be placed together	allow to make the pattern fit ignore undiscovered elements	1	**AO1** 3.1.1.b
8(c)	atomic number(s)	allow proton number(s)	1	**AO1** 3.1.2.a
8(d)	all have one electron in the outer shell (highest energy level) (so they) have similar properties **or** react in the same way	allow same number of electrons in the outer shell (highest energy level) allow specific reactions e.g. with water	1 1	**AO1** 3.1.2.b
Total			**5**	

4.1.2.1 The periodic table

Answer 37 · Mark scheme

June 2015 | CH3FP | Original Q8 | Legacy



4.1.2.1 The periodic table

Answer 38 · 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**	

4.1.2.1 The periodic table

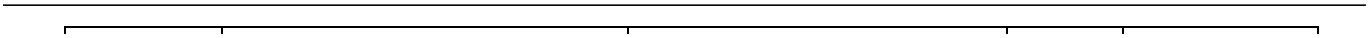
Answer 39 · Mark scheme June 2016 | CH2FP | Original Q1 | Legacy

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**	

4.1.2.1 The periodic table

Answer 39 · Mark scheme

June 2016 | CH2FP | Original Q1 | Legacy



4.1.2.1 The periodic table

Answer 40 · Mark scheme

Question	Answers	Extra information	Mark	AO / SpecRef
1(a)	atomic weights electrons proton numbers	must be in this order	1 1 1	AO1 3.1.1a, 3.1.2a
1(b)(i)	H/hydrogen	allow H_2 or h	1	AO3 3.1.3b,c
1(b)(ii)	one / 1	allow alkali metals	1	AO2 3.1.3a
1(b)(iii)	Potassium (K)		1	AO1 3.1.3b
1(b)(iv)	Iron has a higher density than potassium Iron forms ions that have different charges		1 1	AO1/AO2 3.1.3c,d
1(c)	any **three** from: • melts • fizzes / bubbles / effervesces • sodium floats • size of the sodium decreases • sodium moves	allow gas produced allow dissolves / disappears allow two marks for moves around on the surface of the water	3	2AO1 / 1AO2 3.1.3a
Total			**11**	

4.1.2.1 The periodic table

Answer 41 · Mark scheme

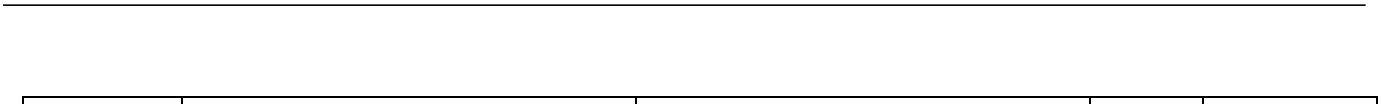
June 2017 | CH1FP | Original Q2 | Legacy

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	

4.1.2.1 The periodic table

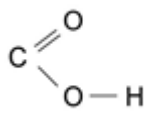
Answer 41 · Mark scheme

June 2017 | CH1FP | Original Q2 | Legacy



4.1.2.1 The periodic table

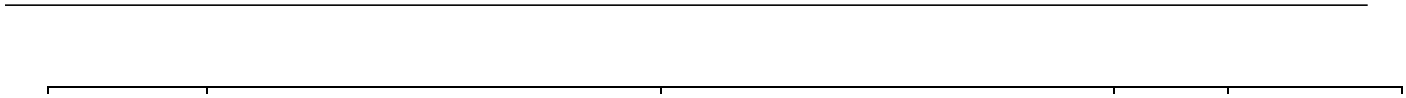
Answer 42 · Mark scheme June 2017 | CH3FP | Original Q1 | Legacy

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	

4.1.2.1 The periodic table

Answer 42 · Mark scheme

June 2017 | CH3FP | Original Q1 | Legacy



Answer 43 · Mark scheme

June 2018 | 8462/1F | Original Q3

The full source mark scheme begins on page 93. Follow original question 3 in that document.

Answer 44 · Mark scheme

June 2018 | 8462/1F | Original Q7

The full source mark scheme begins on page 93. Follow original question 7 in that document.

4.1.2.1 The periodic table

Answer 45 · Mark scheme

June 2019 | 8462/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	**A** nucleus **B** electron		1 1	AO1 4.1.1.4 4.1.1.7
01.2	electron		1	AO1 4.1.1.5
01.3	3 / three		1	AO2 4.1.2.1
01.4	(atomic number) 5 (mass number) 11		1 1	AO2 4.1.1.5
01.5	isotope		1	AO1 4.1.1.5
01.6	there are the same number of $^{79}_{35}Br$ atoms and $^{81}_{35}Br$ atoms		1	AO2 4.1.1.6
Total			**8**	

4.1.2.1 The periodic table

Answer 46 · Mark scheme

June 2019 | 8462/1F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	any **one** from: • so elements / iodine / tellurium were in groups with similar properties • iodine has similar properties to Br / Cl / F / Group 7 • iodine has different properties to Se / S / O / Group 6	ignore reference to atomic structure ignore references to Cr, Mn and Mo allow corresponding argument in terms of tellurium	1	AO1 4.1.2.2
08.2	Mendeleev had predicted properties of missing elements elements were discovered (that filled the spaces / gaps) properties (of these elements) matched Mendeleev's predictions	ignore reference to atomic structure allow atomic weights (of these elements) fitted in the spaces / gaps if no other mark awarded, allow **1** mark for in previous versions of the periodic table the pattern of similar properties broke down	1 1 1	AO1 4.1.2.2
08.3	relative atomic mass		1	AO1 4.1.1.6
08.4	(increasing) atomic / proton number	ignore (increasing) electron number do **not** accept relative atomic / proton number	1	AO1 4.1.2.1
08.5	(formula) At_2 (state) solid	ignore incorrect state symbol allow (s) ignore s	1 1	AO1 4.1.2.6

4.1.2.1 The periodic table

Answer 46 · Mark scheme

08.6	any **two** from: • flame • (white) solid forms • colour of gas / chlorine disappears / fades	allow burns allow (white) smoke forms	2	AO1 4.1.2.5
Total			**10**	

4.1.2.1 The periodic table

Answer 47 · Mark scheme

November 2020 | 8462/1F | Original Q1

Question 1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	gas		1	AO2 4.1.2.6 4.2.2.1
01.2	-35 (°C)	allow any value between -35 °C and -100 °C	1	AO2 4.1.2.6 4.2.2.1
01.3	increase increase	 allow become stronger	1 1	AO1 AO2 4.1.2.6 4.2.2.4
01.4	chlorine gas is toxic		1	AO3 4.1.2.6
01.5	increased chlorine (atoms) are now part of the solid (iron chloride) **or** the mass of the chlorine (atoms) is now also measured		1 1	AO2 4.1.2.6 4.3.1.3
01.6	burns very vigorously	allow burns violently allow brighter (orange) glow allow (orange) flame allow explodes	1	AO3 4.1.2.1 4.1.2.6

4.1.2.1 The periodic table

Answer 47 · Mark scheme

November 2020 | 8462/1F | Original Q1

Question 1 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	$2\ Fe + 3\ Br_2 \longrightarrow 2\ FeBr_3$	allow multiples	1	AO2 4.1.1.1 4.1.2.6
01.8	56 + (3 × 80) = 296	 ignore units	1 1	AO2 4.3.1.2
Total			**11**	

4.1.2.1 The periodic table

Answer 48 · 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**	

4.1.2.1 The periodic table

Answer 49 · 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

4.1.2.1 The periodic table

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

4.1.2.1 The periodic table

Answer 50 · Mark scheme

November 2021 | 8462/1F | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	2,8,8,1		1	AO2 4.1.1.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	they have the same number of outer shell electrons		1	AO1 4.1.2.1 4.1.2.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	metallic		1	AO1 4.2.1.5 1-3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4	any **two** from: • bubbles (very) quickly • melts (into a ball) • floats • moves (very) quickly	allow flame	2	AO1 4.1.2.5 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	(reactivity) increases (down the group)		1	AO1 4.1.2.5

Question 3 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	any **two** from: • increasing speed of movement • increasing rate of bubble production • doesn't melt → melts • no flame → flame **or** flame → explosion		2	AO3 4.1.2.5 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.7	hydrogen		1	AO1 4.1.2.5 4.4.1.2

4.1.2.1 The periodic table

Question 3 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.8	sodium ion structure 2,8 fluoride ion structure 2,8 + charge on sodium ion **and** – charge on fluoride ion	allow any combination of circles, dots, crosses or $e^{(-)}$	1 1 1	AO2 4.2.1.2
	an answer of  sodium ion fluoride ion scores **3** marks			

Total		12

4.1.2.1 The periodic table

Answer 51 · Mark scheme

November 2021 | 8462/1F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	(atoms with the) same number of protons	allow atoms with the same atomic number allow atoms of the same element ignore the same number of electrons	1	AO1 4.1.1.4 4.1.1.5
	(but with) different numbers of neutrons	ignore (but with) different mass numbers do **not** accept (but with) different relative atomic mass	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	$(A_r =) \frac{(69 \times 60) + (71 \times 40)}{100}$		1	AO2 4.1.1.6
	= 69.8		1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	(number of electrons) = 31		1	AO2 4.1.1.4
	(number of neutrons) = 38		1	4.1.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	Ga^{3+}		1	AO3 4.2.1.2

4.1.2.1 The periodic table

Question 9 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	(gallium) fitted in a gap (Mendeleev had left)		1	AO2 4.1.2.2
	(gallium's) properties were predicted correctly (by Mendeleev)	allow (gallium's) properties matched the rest of the group	1	

Total			**9**

4.1.2.1 The periodic table

Answer 52 · Mark scheme

November 2021 | 8462/1F | Original Q10

Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	(3 × M_r H_2O = 3 × (2 + 16) =) 54 (A_r **R** = 150 – 54 =) 96 **alternative approach**: (M_r **R**O_3 = 150 – 6 =) 144 (1) (A_r **R** = 144 – (3 × 16) =) 96 (1)	 ignore units ignore units	1 1	AO2 4.3.1.1 4.3.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.2	(**R** =) molybdenum / Mo	allow ecf from question **10.1**	1	AO3 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.3	(total M_r of reactants) = 163 (% atom economy =) $\frac{119}{163}$ (×100) = 73 (%)	 allow correct use of an incorrectly calculated value of total M_r allow 73.00613 (%) correctly rounded to at least 2 significant figures	1 1 1	AO2 4.3.1.2 4.3.3.2

Question 10 continued

Question	Answers	Mark	AO/ Spec. Ref
10.4	**Level 2:** Some logically linked reasons are given. There may also be a simple judgement.	3–4	AO3 4.4.1.3
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content	0	
	Indicative content • carbon and iron are the cheapest reactants • hydrogen is the most expensive reactant • separating solid products is expensive • separating solid products is time consuming • in method 1, tungsten needs to be separated from tungsten carbide • in method 1, some tungsten is lost as tungsten carbide • in method 1, the carbon dioxide produced will escape • in method 2, the water vapour produced will escape • in method 2, no separation of solids is needed • in method 3, tungsten needs to be separated from iron oxide		

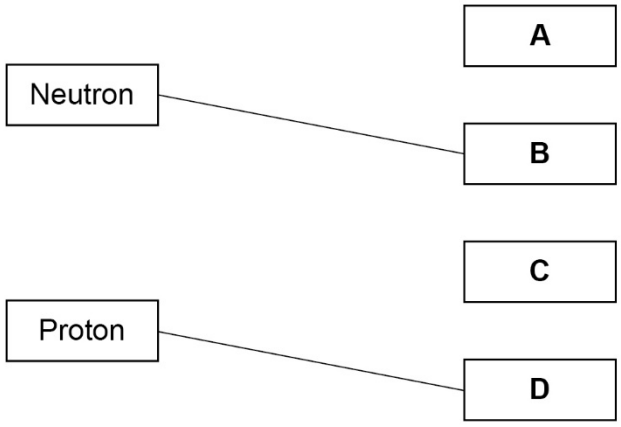
Total			10

4.1.2.1 The periodic table

Answer 53 · 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

4.1.2.1 The periodic table

Answer 53 · 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**

4.1.2.1 The periodic table

Answer 54 · 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

4.1.2.1 The periodic table

Answer 54 · 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**

4.1.2.1 The periodic table

Answer 54 · Mark scheme

June 2022 | 8462/1F | Original Q4

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

Total Question 4		9

4.1.2.1 The periodic table

Answer 55 · Mark scheme

June 2022 | 8462/1F | Original Q9

Question 9

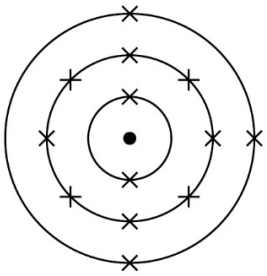
Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	D		1	AO3 4.1.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	B		1	AO3 4.1.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	any **two** from: (Group 1 elements) • have lower melting / boiling points • have lower densities • are less strong • are softer	allow converse statements for transition elements allow (Group 1 elements are) more malleable / ductile allow (Group 1 elements) are not useful as catalysts ignore transition elements form coloured compounds ignore transition elements form ions with different charges ignore references to chemical properties	2	AO1 4.1.3.1 4.1.3.2

4.1.2.1 The periodic table

Answer 55 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4		allow any combination of x, •, o, $e^{(-)}$ for electrons	1	AO2 4.1.1.7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	delocalised electrons (the electrons) carry (electrical) charge (the electrons move) through the metal / aluminium / structure	allow free electrons ignore current / electricity for charge ignore throughout for through	1 1 1	AO1 4.2.1.5 4.2.2.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.6	ionic		1	AO1 4.2.1.1

4.1.2.1 The periodic table

Answer 55 · Mark scheme

June 2022 | 8462/1F | Original Q9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.7	magnesium (atom) loses electrons		1	AO2 4.2.1.1 4.2.1.2
	oxygen (atom) gains electrons		1	
	two electrons (are transferred)		1	
	magnesium ions **and** oxide ions are formed	allow Mg^{2+} (ions) **and** O^{2-} (ions) are formed allow magnesium forms positive ions and oxygen forms negative ions allow (both) form a complete outer shell	1	

Total Question 9		**13**

4.1.2.1 The periodic table

Answer 56 · 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

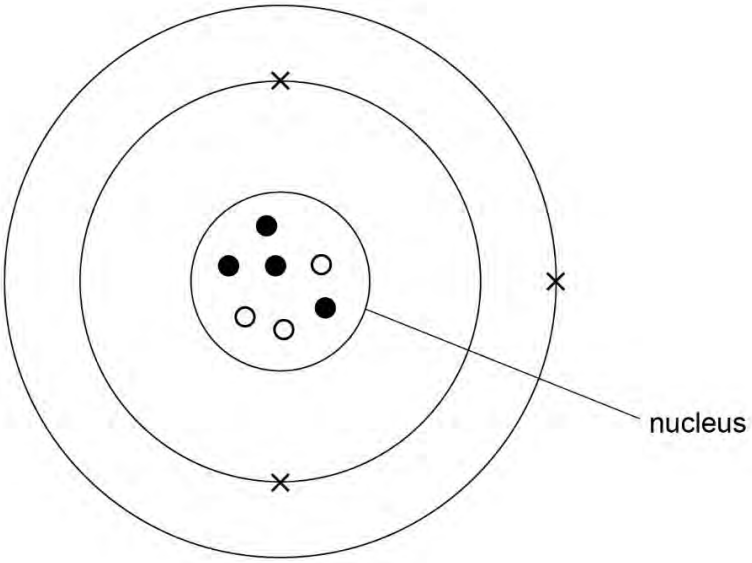
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	(nitrogen) 2 / two (oxygen) 1 / one		1 1	AO2 4.1.1.1

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

4.1.2.1 The periodic table

Answer 56 · Mark scheme

June 2023 | 8462/1F | Original Q1

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**	

4.1.2.1 The periodic table

Answer 57 · 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

4.1.2.1 The periodic table

Answer 57 · Mark scheme

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

Total Question 9	9

4.1.2.1 The periodic table

Answer 58 · 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

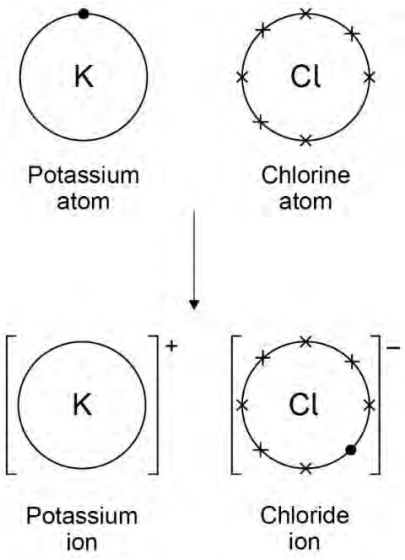
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	C		1	AO2 4.1.1.1

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

4.1.2.1 The periodic table

Answer 58 · 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		

4.1.2.1 The periodic table

Answer 58 · 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

4.1.2.1 The periodic table

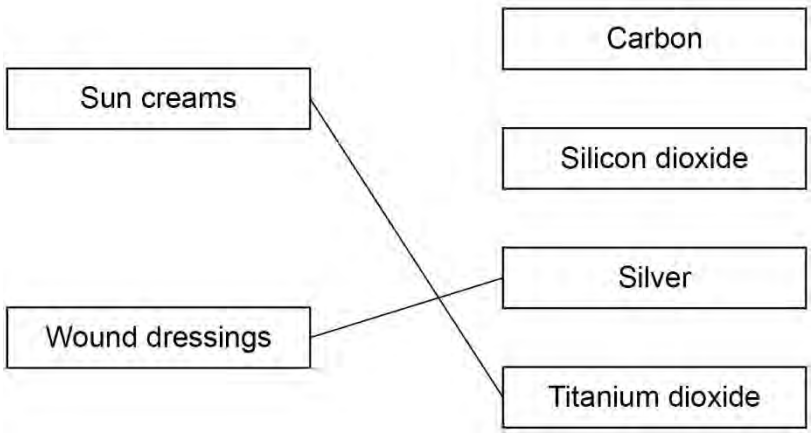
Answer 59 · Mark scheme

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

4.1.2.1 The periodic table

Answer 59 · 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**

4.1.2.1 The periodic table

Answer 60 · Mark scheme

June 2024 | 8462/1F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	(similarity) both have one outer (shell) electron	allow energy level for shell allow same number of outer (shell) electrons	1	AO1 4.1.2.1
	(difference) sodium has 3 shells but potassium has 4 shells	allow potassium has more shells allow (different) number of shells	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	any **two** from: • effervescence / bubbles / fizzing • (potassium) floats • (potassium) moves around • (potassium) becomes smaller • (potassium) melts • flame • explosion	ignore gas produced allow (potassium) forms a ball ignore colour of flame	2	AO1 4.1.2.5 4.4.1.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.3	blue / violet / purple		1	AO2
	(the solution is) alkaline	allow (the solution) contains OH^- (ions) allow (the solution) contains hydroxide ions allow the solution is basic	1	AO1 4.1.2.5 4.4.2.4

4.1.2.1 The periodic table

Answer 60 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	all five points correctly plotted	allow a tolerance of ± ½ a small square allow **1** mark for three or four points correctly plotted	2	AO2 4.1.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	3.4 (mg/cm^3)	allow a value in the range 3.0 to 3.8 (mg/cm^3)	1	AO3 4.1.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.6	chlorine and potassium bromide		1	AO2 4.1.2.6

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.7	relative molecular mass increases and boiling point increases		1	AO1 4.1.2.6

Total Question 9	**11**

4.1.2.1 The periodic table

Answer 61 · 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 → K_2S	1	AO2 4.1.1.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	**2** Al + **3** F_2 → 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

4.1.2.1 The periodic table

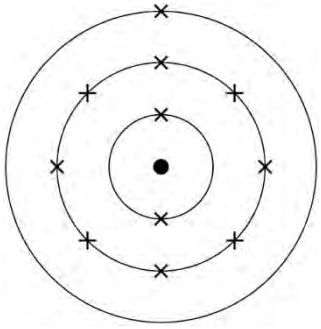
Answer 62 · Mark scheme

June 2025 | 8462/1F | Original Q8

Question 8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.1	towards the right **and** the top	allow a description of the position in the periodic table allow in Groups (3) 4 to 0	1	AO1 4.1.2.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.2	a melting point below 100 °C		1	AO3 4.1.2.3 4.2.2.7 4.2.2.8

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.3		allow any combination of ×, ●, o, $e^{(-)}$ for electrons	1	AO1 4.1.1.7

4.1.2.1 The periodic table

Answer 62 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.4	any **one** from: • so elements / tellurium / iodine were in groups with similar properties • iodine has similar properties to Group 7 elements • iodine has different properties to Group 6 elements	ignore reference to atomic structure allow named elements for Group 6 / 7 elements allow converse arguments in terms of tellurium	1	AO1 4.1.2.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.5	argon has a full outer shell (of electrons)	allow energy level for shell allow argon has eight outer shell electrons ignore argon has no outer shell electrons	1	AO1 4.1.2.4
	(so argon) has a stable arrangement of electrons **or** (so argon) has a stable electronic structure	allow (so argon) does not gain / lose / share electrons	1	

4.1.2.1 The periodic table

Answer 62 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.6	atoms with the same number of protons (but with) different numbers of neutrons	allow atoms of the same element allow atoms with the same atomic number ignore atoms with the same number of electrons	1 1	AO1 4.1.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
08.7	~115		1	AO2 4.1.1.6

Total Question 8	**9**

4.1.2.1 The periodic table

Answer 63 · Mark scheme

June 2025 | 8462/1F | Original Q9

Question 9

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	CaS		1	AO2 4.2.1.3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.2	calcium (atom) loses electrons		1	AO2 4.2.1.1 4.2.1.2
	sulfur (atom) gains electrons		1	
	reference to transfer of two electrons		1	
	calcium forms positive ions **and** sulfur forms negative ions	allow Ca^{2+} (ions) **and** S^{2-} (ions) are formed allow calcium ions **and** sulfide ions are formed	1	

4.1.2.1 The periodic table

Answer 63 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
09.3	**Level 2:** Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3–4	AO1 4.2.1.1 4.2.1.4 4.2.2.6 4.2.3.2
	Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1–2	
	No relevant content	0	
	Indicative content • giant structure • layers • of hexagonal rings • each (carbon) atom forms three bonds • has no covalent bonds between layers • with delocalised electrons • one delocalised electron from each carbon atom • the bonds are covalent • with shared (pairs of) electrons • the (covalent) bonds are strong		

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.4	the molecules do not have an (overall electric) charge	allow there are no ions allow there are no delocalised electrons	1	AO1 4.2.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.5	poly(ethene) has stronger intermolecular forces to overcome than methane		1	AO1 4.2.2.4 4.2.2.5

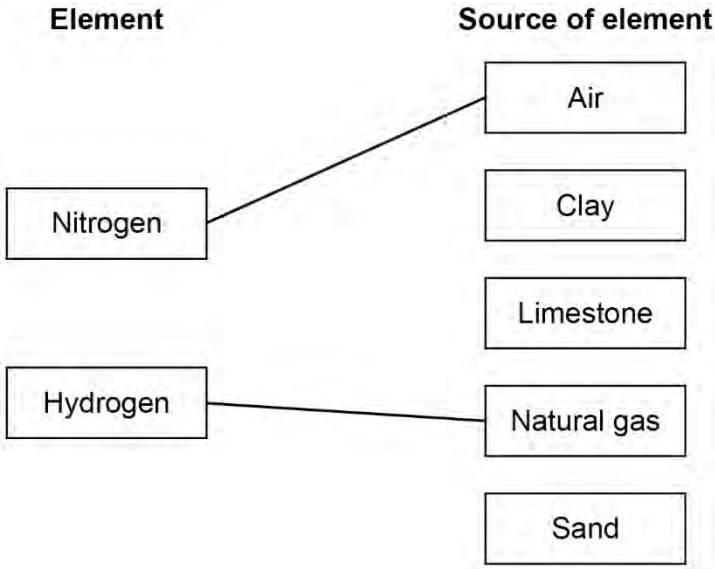
Total Question 9	11

4.1.2.1 The periodic table

Answer 64 · Mark scheme

June 2025 | 8462/2F | Original Q4

Question 4

Question	Answers	Mark	AO / Spec. Ref.
04.1	 do **not** accept more than one line from a box on the left	1 1	AO1 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.2	cooling		1	AO3 4.2.2.1 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.3	catalyst		1	AO1 4.10.4.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.4	(world production of ammonia) increased		1	AO3 4.10.4.1

4.1.2.1 The periodic table

Answer 64 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.5	(change in mass = 165 – 130 =) 35 (arbitrary units)		1	AO2 4.10.4.1
	(number of years = 2020 – 2000 =) 20		1	
	(mean change =) $\frac{35}{20}$	allow correct use of incorrectly determined change in mass and / or number of years	1	
	= 1.75 (arbitrary units per year)	allow 1.75 (arbitrary units per year) correctly rounded to at least 2 significant figures	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.6	change in world population		1	AO3 4.10.4.1 4.10.4.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
04.7	$Ca(NO_3)_2$		1	AO2 4.1.1.1 4.10.4.2
	$(NH_4)_2SO_4$		1	

Total Question 4	12

4.1.2.1 The periodic table

AQA

GCSE
CHEMISTRY

8462/1F - PAPER 1 FOUNDATION TIER

Mark scheme

8462

June 2018

Version/Stage: 1.0 Final

4.1.2.1 The periodic table

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.

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.

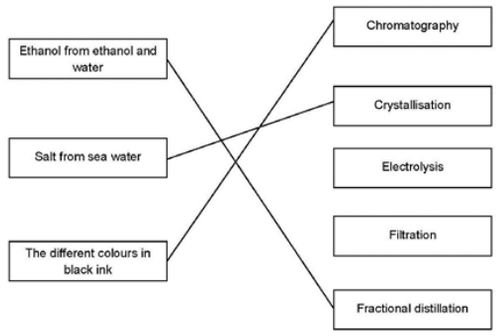
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

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.

4.1.2.1 The periodic table

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

4.1.2.1 The periodic table

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**	

4.1.2.1 The periodic table

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

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) (because) chlorine displaces bromine and iodine (and) bromine displaces iodine **or** iodine does not react	allow the reactivity decreases from chlorine to iodine allow (because) chlorine has two reactions allow (because) neither bromine nor iodine can displace chlorine allow (and) bromine has one reaction **or** iodine has no reactions allow (and) iodine cannot displace bromine	1 1 1	AO1 4.1.2.6 AO3 4.1.2.6 AO3 4.1.2.6
02.5	80		1	AO2 4.3.1.2

4.1.2.1 The periodic table

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

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**	

4.1.2.1 The periodic table

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**	

4.1.2.1 The periodic table

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**	

4.1.2.1 The periodic table

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

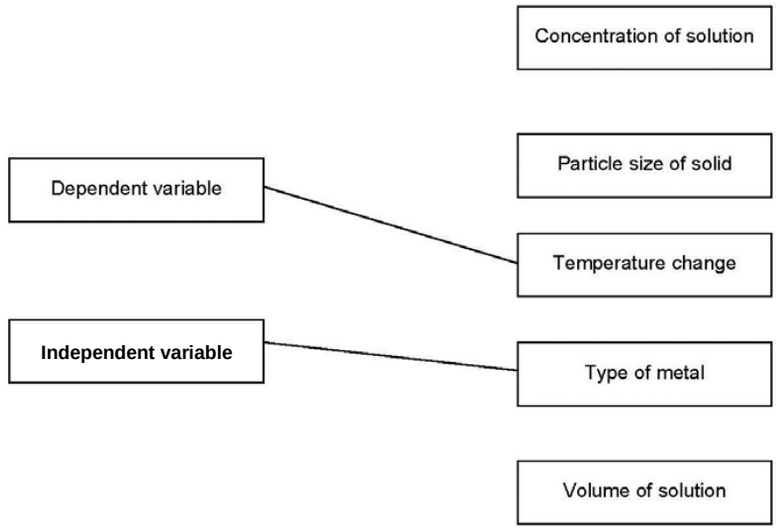
4.1.2.1 The periodic table

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	(mass =) $168 \times \frac{\text{answer from question } \mathbf{05.7}}{8.4}$	a correctly calculated value from their answer to question **05.7** scores **2** marks allow (mass =) answer from question **05.7** × 20	1	AO2 4.3.1.3
	correctly calculated value (g)		1	
Total			**10**	

4.1.2.1 The periodic table

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

4.1.2.1 The periodic table

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

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**	

4.1.2.1 The periodic table

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

4.1.2.1 The periodic table

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**	

4.1.2.1 The periodic table

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

4.1.2.1 The periodic table

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**

4.1.2.1 The periodic table

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

4.1.2.1 The periodic table

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**	

4.1.2.1 The periodic table

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>AO3</td></tr>
<tr><td>Level 2: Some logically linked reasons are given. There may also be a simple judgement.</td><td>3–4</td><td>AO3</td></tr>
<tr><td>Level 1: Relevant points are made. This is not logically linked.</td><td>1–2</td><td>AO2</td></tr>
<tr><td>No relevant content</td><td>0</td><td></td></tr>
<tr><td>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>4.4.3.4
4.5.2.1
4.5.2.2</td></tr>
<tr><td>Total</td><td></td><td></td><td>11</td></tr>
</table>

4.1.2.1 The periodic table

Answer 43 · Examiner comments June 2018 | 8462/1F | Original Q3

Question 3 (low and standard demand)

03.1 This question was answered very well, with 60% of students achieving four or five marks. 11% of students achieved all five marks, the key difference being that they knew Chadwick proved the existence of the neutron, which is a new area of the specification.

03.2 78% of students were able to substitute in the values and calculate the relative atomic mass correctly. However, some calculator errors were seen which often led to an answer of 45.1 instead of 63.6. A few students, having looked at the periodic table, 'corrected' their answer to 63.5, thereby forfeiting a mark.

03.3 This question was answered well, with 76% of students able to identify the element as copper. Those who had calculated their relative atomic mass incorrectly were able to gain credit, for example, by giving the answer scandium after a value of 45.1.

Some looked at the mass numbers of the isotopes and were able to identify copper in that way. However, those who looked at the isotope of mass number 65 and gave the answer zinc did not gain credit.

03.4 Students found this calculation difficult, with 39% achieving both marks. Many multiplied by 10 000 or divided by 1×10^{-4}. A few introduced the relative atomic mass of copper.

Partial credit was given for a correct answer not expressed in standard form. 12% of students did not attempt the question.

Answer 44 · Examiner comments June 2018 | 8462/1F | Original Q7

Question 7 (low and standard demand)

07.1 This question was answered well with 80% of students giving the correct name of the product. Some students tried to add in other products such as water or hydrogen.

07.2 85% of students knew this was an oxidation reaction.

07.3 68% of students could relate the colour of the universal indicator to the correct pH. The most common distractor was 'pH 7'.

07.4 73% of students could name sodium hydroxide correctly.

4.1.2.1 The periodic table

Answer 44 · Examiner comments

June 2018 | 8462/1F | Original Q7

07.5 This question assessed recall directly from the specification. 43% of students could identify the OH^- ion as being present in all alkalis.

More than a 25% thought that the Na^+ ion was responsible, with nearly as many opting for the H^+ ion.

07.6 Students found this calculation very difficult, with 7% achieving full marks. 13% of students made no attempt to answer.

It was necessary to convert either the volume to dm^3 or the concentration to mol/cm^3 to gain partial credit, but most students either failed to attempt a conversion or did not know how many cm^3 are in one dm^3.

07.7 58% of students achieved both marks. It was very common to see the scale on the *x*-axis misread so that the plots for sodium and potassium were incorrect. Some students were using a pen or a very thick pencil so were unable to correct their answer or were compromising accuracy.

07.8 This question was answered very well, with 82% of students answering correctly.

4.1.2.1 The periodic table

Answer 45 · Examiner comments

June 2019 | 8462/1F | Original Q1

Question 1 (low demand)

01.1 Approximately 80% of students identified both the nucleus and the electron in the diagram of an atom.

01.2 Approximately 60% of students identified the electron as having the lowest mass.

01.3 Approximately three-quarters of students correctly applied their knowledge and understanding of the link between electronic structure and group number.

01.4 Almost 60% of students scored both marks. Here, they applied their knowledge and understanding of the links between atomic structure and both atomic number and mass number.

01.5 Approximately 70% of students knew the term 'isotope' for the type of atom described.

01.6 Students found this multiple choice question about the link between isotope ratios and relative atomic mass difficult.

The first incorrect option was chosen more often than the correct one. This suggests that, in many cases, students did not understand how the relative atomic mass is determined from the average mass of all isotope atoms and were perhaps drawn towards the word 'fewer' alongside the smaller number '79'.

Answer 46 · Examiner comments

June 2019 | 8462/1F | Original Q8

Question 8 (standard demand)

08.1 Less than 10% of students scored this mark which required an appropriate reference to the properties of tellurium and/or iodine.

Many referred to atomic number or electron arrangement rather than properties.

08.2 Students found this question difficult. In many cases, they simply repeated the information in the question that Mendeleev thought there were undiscovered elements.

Less than 20% of students gained any marks. The most commonly scored mark was for the idea that these elements were eventually discovered.

08.3 Approximately 70% of students correctly identified relative atomic mass as the modern name for atomic weight.

08.4 Approximately 40% of students scored this mark.

The most common correct response was 'atomic number'.

4.1.2.1 The periodic table

Answer 46 · Examiner comments June 2019 | 8462/1F | Original Q8

Common responses seen that were not credited included:

- reactivity
- relative atomic mass
- mass
- number of electrons in the outer shell.

08.5 Approximately 60% of students scored 0 marks on this question, with approximately 10% not attempting it.

More students scored the mark for the state of astatine than for its formula. For the formula, At_2, the correct casing for the letters needed to be used; also, a subscript for the number.

08.6 Students appeared to be unfamiliar with the reaction in this question.

Many students described the reaction of sodium with water rather than chlorine, referring to the sodium floating, dissolving, fizzing, etc.

The observation of a flame was the most common correct response.

Answer 53 · 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.

4.1.2.1 The periodic table

Answer 54 · 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.

Answer 54 · 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.

4.1.2.1 The periodic table

Answer 55 · Examiner comments

June 2022 | 8462/1F | Original Q9

Question 9 (Standard demand)

09.1 Fewer than a quarter of students recognised that element **Q** must be a non-metal because of the lack of conductivity, and therefore in section **D**. **B** and **C** were both seen more often than the correct answer, though responses were fairly evenly spread across all options.

09.2 This was slightly better answered than the previous question. However, again responses were spread across all options.

09.3 Most students described a property of either a Group 1 element or a transition element without reference to the other; this did not gain credit as a comparison was needed. Of those students who did answer in comparative terms, most knew that Group 1 metals are softer than transition metals, but there was confusion about which had lower melting points. Some students thought that one group or the other would not conduct electricity. Very few students were awarded both marks; about a sixth scored one mark.

09.4 Most students could draw the electronic structure correctly. The most common error was to draw only one electron on the outer shell.

09.5 Most students referred to electrons in their answer as required, but fewer than a third described those electrons as delocalised. Some also referred to the electrons carrying charge. However, very few articulated the idea that the electrons themselves move through the metal in a particular direction. Of those who referred to electrons moving, many implied that the movement was random. Some students incorrectly referred to electrons bumping into other atoms or electrons.

Answer 55 · Examiner comments

June 2022 | 8462/1F | Original Q9

09.6 Just over half of students correctly identified the type of bonding. The most common incorrect response was covalent.

09.7 Many students gave good descriptions of the transfer of two electrons from a magnesium atom to an oxygen atom to produce magnesium ions and oxide ions. However, some students subsequently referred to electrons being shared. About 40% of students were awarded at least one mark, with about a sixth gaining all four marks.

4.1.2.1 The periodic table

Answer 56 · 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 56 · 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.

Answer 57 · 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

4.1.2.1 The periodic table

Answer 57 · 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.

Answer 58 · 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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4.1.2.1 The periodic table

Answer 58 · 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 59 · 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 59 · 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.

4.1.2.1 The periodic table

Answer 60 · Examiner comments — June 2024 | 8462/1F | Original Q9

Question 9 (standard demand)

09.1 This question discriminated well, with one in six students scoring both marks and more than two fifths scoring at least one. Many students did not read the question fully and gave similarities and differences in properties rather than electronic structures. These responses gained no credit. Of those who did reference the electronic structure, most stated correctly that both have one electron on the outer shell, but were less successful in giving a correct difference. Sometimes the wrong number of shells was given for the two elements: usually 2 shells for sodium and 3 for potassium. Some stated that potassium has more outer shells than sodium. This is not correct as the phrase 'outer shell' is always taken to mean the single outermost shell.

09.2 More than a third of students could give two correct observations, and more than four fifths could give one, with bubbling, floating and a flame being the most popular. 'Gas produced' did not gain credit as it is not an observation but a deduction from the observation of bubbling. 'Fizzing' is taken to mean effervescence, so fizzing and bubbling are the same thing rather than two different observations. Credit was not given for any observation requiring extra equipment such as a thermometer or an indicator.

09.3 Only two fifths of students could give a correct colour and even fewer could express the reason in terms of the solution being alkaline; many thought it would be neutral. Some students gave purple as the colour, but gave potassium burning with a purple flame as their reason.

09.4 Nearly three fifths of students scored both marks for plotting the data, with the vast majority scoring at least one. The most commonly mis-plotted point was (86, 9.1) which was often plotted at (92, 9.1). There was no expectation that a line of best fit would be drawn.

09.5 Students were good at estimating the missing value, with nearly three quarters scoring the mark. Sometimes incorrect and inappropriate methods were seen which produced values in the allowed range, such as averaging all five values, or finding the difference between the points adjacent to the missing one. These were not given credit.

09.6 Over a third of students identified the reagents. There was an even distribution of incorrect responses.

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Answer 60 · Examiner comments — June 2024 | 8462/1F | Original Q9

09.7 Two fifths of students identified the correct pair of trends. The most popular error was to identify that the boiling point decreases down the group.

4.1.2.1 The periodic table

Answer 61 · 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 61 · 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.

Answer 62 · Examiner comments

June 2025 | 8462/1F | Original Q8

Question 8 (standard demand)

08.1 Only one student in six could give a correct description of where the non-metals are found, despite there being a clear statement in the specification. Many referred to the right of the table, but few referred to the top. Those who referred to specific groups were often correct but some omitted Group 0. Some referred to a 'staircase' but did not specify what it means; it should be noted that the periodic table provided does not show a staircase.

08.2 About half correctly chose the low melting point, with the three distractors all being popular. Several ticked more than one box, which automatically scores zero when the instruction is to tick **one** box.

08.3 Three fifths of students drew the structure correctly. A few tried to put in 23 electrons and a few 12. One in seven students did not attempt to answer; this is a common occurrence when a question is not accompanied by answer lines. Students do need to read all the words, so they are aware there is a task to do.

08.4 This was answered less successfully. Many stated that Mendeleev left spaces for other elements to be discovered which, while true, does not answer the question. Others answered in terms of atomic number, which was not known in Mendeleev's time. Even those who tried to answer in terms of placing elements in the 'correct' group rarely mentioned properties.

08.5 Whilst about two fifths knew that argon has a full outer shell, not many were able to go on to say that this is a stable electronic structure, or that electrons are not transferred or shared. Many simply repeated information in the question with different words, such as 'argon is a noble gas' or 'argon is stable'.

08.6 Whilst about a quarter of students knew that a different number of neutrons was involved, few stated that isotopes are <u>atoms</u> with the same number of protons or <u>atoms</u> of the same element. Some referred to 'elements' implying more than one element, which contradicts the idea of atoms of the same element. Some students implied incorrectly that an isotope is a single atom in which the number of neutrons is different to the number of protons and electrons.

08.7 Fewer than half of students could correctly estimate that the A_r must be closest to 115 as there was such a high proportion of the 115 isotopes. The most popular answer was ~114, taking a simple mean rather than a weighted mean of the mass numbers.

Answer 63 · Examiner comments

June 2025 | 8462/1F | Original Q9

Question 9 (standard demand)

09.1 Students found this very difficult, with only one in ten scoring the mark. Of those who knew they needed to count the ions of each element, few could then appreciate that the ratio was 1:1 so the formula was therefore CaS. Many just wrote the number of Ca atoms and of S atoms from the diagram.

09.2 Two fifths of students were able to score at least one mark, and one in eight scored all four. Many described electrons transferring from calcium to sulfur, and of those, most realised that 2 electrons would be transferred. Students were less able to gain the final marking point for a correct description of the ions formed. Some students contradicted an answer in terms of electron transfer by also referring to sharing electrons.

09.3 Students were unable to recall many details about the structure and bonding of graphite, even with the diagram as a prompt. Many did describe layers of carbon atoms, but few mentioned the giant structure or covalent bonding. Many focussed on the use of graphite in pencils, which was not relevant in the context of the question. Most responses did not mention the number of bonds per atom, or the delocalised electrons, or the lack of bonds between layers. The hexagonal rings, if mentioned at all, were not described well, with whole layers or even individual atoms being described as hexagonal. Fewer than a quarter of students scored a single mark and very few scored all four.

09.4 Only one in six students scored the mark, despite the clear statement in the specification that the molecules do not have an overall electrical charge. Those who did gain credit usually mentioned there being no delocalised electrons. 'Free' is not the same as delocalised in this context and did not gain credit. Popular incorrect responses were that the molecules are too small or that the molecules cannot move.

09.5 Only a third of students gave the correct reason, with stronger or more covalent bonds to break both being almost as popular.

4.1.2.1 The periodic table

Answer 64 · Examiner comments

June 2025 | 8462/2F | Original Q4

Question 4

04.1 Around 40% of students correctly identified both sources of the gases. There is a strongly held misconception that hydrogen comes from the air.

04.2 Nearly half of students understood that cooling occurs at point X in the diagram. The two distractors were both equally commonly seen.

04.3 Around half of students knew that iron was used as a catalyst in the Haber process.

04.4 Over 90% of students correctly identified the trend from the given data.

04.5 Nearly three fifths of students achieved all four marks on this scaffolded calculation. Taking the correct numbers from the table was the most common step where students did not gain credit.

04.6 About half of students scored the mark for this item. Change in amount of acid rain was the more common distractor seen.

04.7 Nearly 4 in 5 students correctly identified both compounds that contain nitrogen. Most of the remainder gained one of the two marks.