AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.1.1.4

Relative electrical charges of subatomic particles

Mark schemes and examiner comments

Tier	**Foundation**
Question groups	**83**
Available paper years	**2007–2025**

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.1.1.4 Relative electrical charges of subatomic particles

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

Question 1

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

Answer 02 · Mark scheme June 2007 | CHY1A | Original Q3 | Legacy

Three	**A**	a bond	**3**
	B	an electron	**2**
	C	a molecule	**4**
	D	a nucleus	**1**

4.1.1.4 Relative electrical charges of subatomic particles

Question 3

question	answers	extra information	mark
(a)	gives out (heat)		1
(b)	D		1
(c)	L		1
(d)	magnesium chloride		1
total			4

4.1.1.4 Relative electrical charges of subatomic particles

Answer 03 · Mark scheme

January 2008 | CHY2F | Original Q3 | Legacy

CHY2F

4.1.1.4 Relative electrical charges of subatomic particles

Answer 04 · Mark scheme

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

4.1.1.4 Relative electrical charges of subatomic particles

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

CHY3F

Answer 05 · Mark scheme June 2008 | CHY1F | Original Q1 | Legacy

question	answers	extra information	mark
1(a)	electron nucleus	words must be in correct position	1 1
1(b)(i)	oxygen / O_2	ignore air	1
1(b)(ii)	any **one** from: • (water) does not pollute • (only) water is produced • no carbon dioxide (is produced) • no sulfur dioxide (is produced) • no nitrogen oxides (are produced) • no carbon / no particles (are produced)	 accept no harmful gas(es) accept no greenhouse gas(es) / effect accept no acid rain	1
Total			**4**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 05 · Mark scheme

June 2008 | CHY1F | Original Q1 | Legacy

COMPONENT NUMBER: CHY1F

COMPONENT NAME: Science B / Chemistry

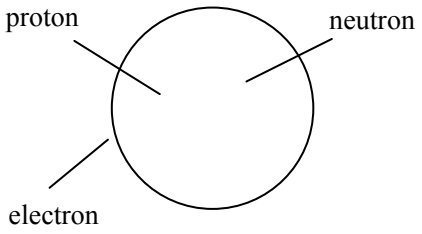
STATUS: Final

DATE: June 2008

4.1.1.4 Relative electrical charges of subatomic particles

Answer 06 · Mark scheme

June 2008 | CHY2F | Original Q5 | Legacy

question	answers	extra information	mark
5(a)(i)		all three correct **2** marks one correct **1** mark	2
5(a)(ii)	14		1
5(b)	A		1
5(c)(i)	ammonia can break up to form nitrogen and hydrogen ammonia is made from nitrogen and hydrogen	list principle applies	2
5(c)(ii)	air		1
5(d)	ammonium nitrate		1
Total			**8**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 06 · Mark scheme

June 2008 | CHY2F | Original Q5 | Legacy

COMPONENT NUMBER: CHY2F

COMPONENT NAME: Additional Science / Chemistry

STATUS: Final

DATE: June 2008

4.1.1.4 Relative electrical charges of subatomic particles

Answer 07 · Mark scheme June 2008 | CHY2F | Original Q7 | Legacy

question	answers	extra information	mark
7(a)	157	correct answer with **or** without working (2 ×19 + 119) for **1** mark only allow (119 + 19 =) 138 for **1** mark only ignore units	2
7(b)	24.2	accept answers in the range 24 to 24.2038..... ignore incorrect rounding after correct answer 25 only without working gains **1** mark **or** 38/157 × 100 gains **1** mark **or** (19/157 × 100 =) 12 to 12.1 gains **1** mark allow error carried forward from part(a) 38/(a) × 100 gains **2** marks if calculated correctly (19/138 ×100 =) 13.8 gains **1** mark	2
7(c)	0.29	accept answers in the range 0.28 to 0.3 allow error carried forward from part (b) (b)/100 × 1.2 correctly calculated ignore units	1

Question 7 continued on the next page…

4.1.1.4 Relative electrical charges of subatomic particles

COMPONENT NUMBER: CHY2F

COMPONENT NAME: Additional Science / Chemistry

STATUS: Final

DATE: June 2008

Question 7 continued…

question	answers	extra information	mark
7(d)	an <u>electron</u>	allow electrons allow electron shared / lost for **1** mark apply list principle for additional particles	1
	is gained owtte	must be linked to electron accept can hold / take in if in correct context eg it can hold another electron (in its outer shell) = **2** marks it can take an electron (from another atom) = **2** marks ignore reference to fluoride ions incorrect number of electrons gained does **not** gain the second mark	1
Total			**7**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 07 · Mark scheme June 2008 | CHY2F | Original Q7 | Legacy

COMPONENT NUMBER: CHY2F

COMPONENT NAME: Additional Science / Chemistry

STATUS: Final

DATE: June 2008

Answer 08 · 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 09 · Mark scheme March 2009 | CHY1AP | Original Q1 | Legacy

One	**A**	elements	**4**
	B	electrons	**3**
	C	atoms	**1**
	D	bonds	**2**

Answer 10 · Mark scheme June 2009 | CHY1AP | Original Q3 | Legacy

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 11 · Mark scheme

June 2009 | CHY1F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)	conducts (electricity) **or** allows electrons / current to flow	accept flexible ignore conducts heat	1
1(b)	electron		1
1(c)(i)	lithium>copper>tungsten **or** Li>Cu>W	all correct allow **1** mark for one metal in the correct position	2
1(c)(ii)	has high / highest melting point **or** can withstand the highest temperature	accept has high / highest boiling point	1
1(d)	unreactive		1
Total			**6**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 11 · Mark scheme

June 2009 | CHY1F | Original Q1 | Legacy

CHY1F

4.1.1.4 Relative electrical charges of subatomic particles

Answer 12 · Mark scheme

Question 1

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 12 · Mark scheme

June 2009 | CHY2F | Original Q1 | Legacy

CHY2F

4.1.1.4 Relative electrical charges of subatomic particles

Answer 13 · 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**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 13 · Mark scheme

June 2009 | CHY2F | Original Q6 | Legacy

CHY2F

Answer 14 · Mark scheme

November 2009 | CHY1AP | Original Q3 | Legacy

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 15 · Mark scheme

Question 4

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 15 · Mark scheme

January 2010 | CHY1F | Original Q4 | Legacy

CHY1F

4.1.1.4 Relative electrical charges of subatomic particles

Answer 16 · Mark scheme January 2010 | CHY2F | Original Q3 | Legacy

Question 3

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 16 · Mark scheme

January 2010 | CHY2F | Original Q3 | Legacy

CHY2F

4.1.1.4 Relative electrical charges of subatomic particles

Answer 17 · Mark scheme

Question 4

question	answers	extra information	mark
4(a)	the diameter of the tube is very small		1
4(b)(i)	three		1
4(b)(ii)	covalent		1
4(b)(iii)	bonds		1
Total			**4**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 17 · Mark scheme

January 2010 | CHY2F | Original Q4 | Legacy

CHY2F

4.1.1.4 Relative electrical charges of subatomic particles

Answer 18 · Mark scheme

Question 6

question	answers	extra information	mark
6(a)(i)	mix (owtte)	accept to allow more collisions / helps particles to collide (owtte) idea of more efficient heat transfer do **not** allow heat is a catalyst	1
6(a)(ii)	higher **and** more powder **and** big concentrated **and** more		1 1 1
6(b)	electrons		1
6(c)	H^+		1
Total			**6**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 18 · Mark scheme

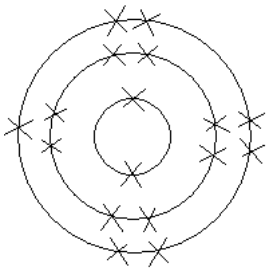
January 2010 | CHY2F | Original Q6 | Legacy

CHY2F

4.1.1.4 Relative electrical charges of subatomic particles

Answer 19 · Mark scheme January 2019 | CHY2F | Original Q7 | Legacy

Question 7

question	answers	extra information	mark
7(a)		accept dots / crosses / e must be drawn on diagram electrons do not need to be paired ignore brackets or + or −charges ignore 2,8,7	1
7(b)	(one) electron lost / given away / transferred from sodium / transferred to chlorine owtte	recognition that electrons are involved must be linked to electrons accept loses electron(s) for **2** marks NB loses 2 or more electrons gains **1** mark reference to sharing / covalent max **1** mark ignore charges on ions formed	1 1
7(c)(i)	any **one** from: • ions / atoms / they are / it is negatively charged / anions • opposite (charges) attract	 accept they are negative accept they are attracted or it is oppositely charged ignore opposite forces attract	1
7(c)(ii)	hydrogen	accept H_2 ignore H or H^+	1

Question 7 continues on next page

4.1.1.4 Relative electrical charges of subatomic particles

CHY2F

Question 7 continued

question	answers	extra information	mark
7(d)(i)	poisons released into environment (owtte)	accept any sensible idea of harm / harmful / poisons / poisonous / pollution / damaging do **not** accept answers such as global warming / ozone layer etc. ignore safety unless qualified	1
7(d)(ii)	any **one** sensible idea eg • loss of work / unemployment **or** company goes out of business • any adverse effect on local economy (owtte) • any adverse effect on paper production / cost of paper / cost of water (treatment) • chlorine (compounds) have been used (for many years) without causing harm owtte • only a tiny amount of chlorine is released so it would not cause harm	eg shops / house prices etc. allow less expensive to use chlorine or converse ignore uses of chlorine to treat drinking water unless qualified	1
7(d)(iii)	ideas related to bias	accept more reliable or valid or fair ignore more accurate / fair test	1
Total			**8**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 19 · Mark scheme January 2010 | CHY2F | Original Q7 | Legacy

CHY2F

Answer 20 · Mark scheme June 2010 | CHY1AP | Original Q3 | Legacy

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 21 · Mark scheme

June 2010 | CHY2F | Original Q2 | Legacy

Question 2

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 21 · Mark scheme

June 2010 | CHY2F | Original Q2 | Legacy

CHY2F

4.1.1.4 Relative electrical charges of subatomic particles

Answer 22 · Mark scheme

June 2010 | CHY2F | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)(i)	precipitation		1
5(a)(ii)	filtration		1
5(a)(iii)	lead nitrate sodium iodide		1 1
5(b)	any **four** from: • magnesium (atom) reacts with **two** iodine (atoms) • magnesium (atom) loses • **2** electrons • iodine (atom) gains • **1** electron **or** an electron • iodide ion formed • iodide has negative charge / is a negative ion / particle • magnesium ion formed • magnesium has positive charge • oppositely charged ions attract • a giant structure / lattice is formed	sharing / covalent / metallic = max **3** allow iodine ion allow iodine ignore I^{2-} if reference to ions being formed is made unqualified, allow **1** mark	4
Total			**8**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 22 · Mark scheme

June 2010 | CHY2F | Original Q5 | Legacy

CHY2F

4.1.1.4 Relative electrical charges of subatomic particles

Answer 23 · Mark scheme

June 2010 | CHY3F | Original Q3 | Legacy

Question 3

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 23 · Mark scheme

June 2010 | CHY3F | Original Q3 | Legacy

CHY3F

4.1.1.4 Relative electrical charges of subatomic particles

Answer 24 · Mark scheme

Question 1

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 24 · Mark scheme

January 2011 | CHY1F | Original Q1 | Legacy

CHY1F

4.1.1.4 Relative electrical charges of subatomic particles

Answer 25 · Mark scheme

Question 3

question	answers	extra information	mark
3(a)	diagram **A**		1
3(b)	the atoms can slide over each other. the atoms are in layers		1 1
3(c)(i)	sulfuric		1
3(c)(ii)	bubbles are produced the magnesium disappears		1 1
3(c)(iii)	crystallisation		1
Total			7

4.1.1.4 Relative electrical charges of subatomic particles

Answer 25 · Mark scheme

January 2011 | CHY2F | Original Q3 | Legacy

CHY2F

4.1.1.4 Relative electrical charges of subatomic particles

Answer 26 · 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**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 27 · 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**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 27 · Mark scheme

January 2011 | CHY3F | Original Q1 | Legacy

CHY3F

Answer 28 · Mark scheme

June 2011 | CHY1AP | Original Q5 | Legacy

Five	**A** electrons			**2**
	B bonds			**3**
	C products			**1**
	D elements			**4**
	A	**B**	**C**	**D**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 29 · Mark scheme June 2011 | CHY2F | Original Q1 | Legacy

Question 1

question	answers	extra information	mark
1(a)(i)	NH_3		1
1(a)(ii)	electrons		1
1(a)(iii)	covalent		1
1(b)(i)	air natural gas		1 1
1(b)(ii)	reversible		1
1(b)(iii)	iron		1
1(c)	nitric acid		1
1(d)(i)	any **one** from: • lost jobs / unemployment • meant that they had to move away from Humberstone **or** no one lives there • loss of income (owtte)	 allow closed down the town ignore it closed the mine unless it is further qualified by some effect of this on the local community	1

Question 1 continues on the next page

4.1.1.4 Relative electrical charges of subatomic particles

Question 1 continued

question	answers	extra information	mark
1(d)(ii)	any **two** from: • less transport (costs) • less pollution / greenhouse gases / global warming <u>from transport</u> • cheaper to make in country than to import • not dependent on Chile for nitrate supplies **or** reliable source • provides employment to workers in Britain • good for British economy • raw materials readily available • continuous process	ignore reference to environment / ecofriendly allow smaller carbon footprint ignore reference to quicker	2
Total			**11**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 29 · Mark scheme

June 2011 | CHY2F | Original Q1 | Legacy

CHY2F

4.1.1.4 Relative electrical charges of subatomic particles

Answer 30 · Mark scheme June 2011 | CHY2F | Original Q5 | Legacy

Question 5

question	answers	extra information	mark
5(a)	gives out / releases / transfers to surroundings heat / energy	ignore light / burns ignore the wire gets hot	1
5(b)	activation energy		1
5(c)	(aluminium +) oxygen (→) aluminium oxide	accept correct formulae	1
5(d)	C		1
5(e)(i)	a negative		1
5(e)(ii)	loses		1
5(e)(iii)	gains two		1 1
Total			**8**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 30 · Mark scheme

June 2011 | CHY2F | Original Q5 | Legacy

CHY2F

4.1.1.4 Relative electrical charges of subatomic particles

Answer 31 · Mark scheme

June 2011 | CHY3F | Original Q1 | Legacy

Question 1

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 31 · Mark scheme June 2011 | CHY3F | Original Q1 | Legacy

CHY3F

Answer 32 · Mark scheme November 2011 | CHY1AP | Original Q3 | Legacy

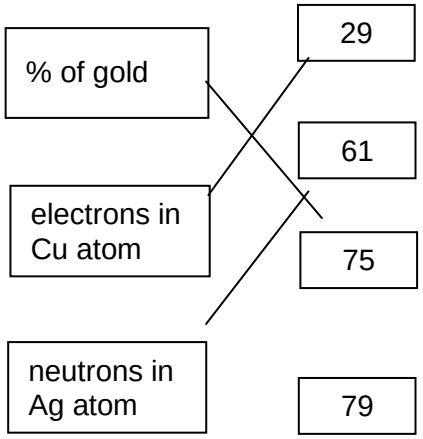
Three	**A**	a bond	**3**
	B	an electron	**2**
	C	a molecule	**4**
	D	a nucleus	**1**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 33 · Mark scheme

January 2012 | CH1FP | Original Q1 | Legacy

Question 1

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 33 · Mark scheme

January 2012 | CH1FP | Original Q1 | Legacy

CH1FP

4.1.1.4 Relative electrical charges of subatomic particles

Answer 34 · Mark scheme June 2012 | CH1FP | Original Q1 | Legacy

Question 1

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 34 · Mark scheme

June 2012 | CH1FP | Original Q1 | Legacy

CH1FP

4.1.1.4 Relative electrical charges of subatomic particles

Answer 35 · Mark scheme June 2012 | CH2FP | Original Q1 | Legacy

Question 1

question	Answers	extra information	mark
1(a)	oxygen **and** water	both needed for mark allow hydrogen oxide for water in any order ignore formulae	1
1(b)(i)	best fit line, omitting point at 10s	straight line drawn through all correct points	1
1(b)(ii)	circle around point at 10 s	allow any indication	1
1(b)(iii)	7.5	allow ecf from candidate's line	1
1(b)(iv)	increases (with time)	accept goes from 0 to 12.5	1
1(c)(i)	higher		1
1(c)(ii)	more concentrated		1
1(d)(i)	share		1
1(d)(ii)	covalent		1
1(d)(iii)	simple molecules		1
1(e)	Water has a boiling point of 100°C Water has a melting point lower than room temperature		1 1
Total			**12**

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4.1.1.4 Relative electrical charges of subatomic particles

Answer 35 · Mark scheme

June 2012 | CH2FP | Original Q1 | Legacy

CH2FP

4.1.1.4 Relative electrical charges of subatomic particles

Answer 36 · 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**

4.1.1.4 Relative electrical charges of subatomic particles

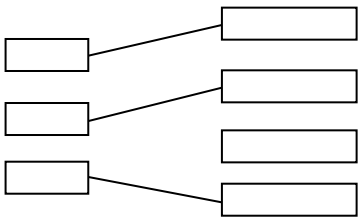
Answer 36 · Mark scheme

June 2012 | CH2FP | Original Q2 | Legacy

CH2FP

4.1.1.4 Relative electrical charges of subatomic particles

Answer 37 · Mark scheme

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**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 37 · Mark scheme

January 2013 | CH1FP | Original Q1 | Legacy

CH1FP

4.1.1.4 Relative electrical charges of subatomic particles

Answer 38 · Mark scheme

January 2013 | CH2FP | Original Q1 | Legacy

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 38 · Mark scheme

January 2013

CH2FP

4.1.1.4 Relative electrical charges of subatomic particles

Answer 39 · Mark scheme

January 2013 | CH2FP | Original Q3 | Legacy

question	answers	extra information	mark
3(a)	exothermic		1
3(b)	‘Should people use kelp instead of oil as an energy source?’ ‘Will kelp be more popular than coal in the next 10 years?’		1 1
3(c)(i)	any **four** from: • potassium (atom) loses (an electron) and iodine (atom) gains (an electron) • 1 electron • iodide (ion) has negative charge • potassium (ion) has positive charge • electrostatic attraction **or** ionic bonding	If atom or ion omitted = max **3** sharing / covalent / metallic = max **3** ignore reference to full outer shells allow iodine ion accept stable (structure) **or** noble gas (structure)	4
3(c)(ii)	because a solid is formed (from two aqueous solutions)		1
3(c)(iii)	filtering **or** centrifuging **or** decanting		1
Total			**9**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 39 · Mark scheme

January 2013 | CH2FP | Original Q3 | Legacy

January 2013

CH2FP

4.1.1.4 Relative electrical charges of subatomic particles

Answer 40 · Mark scheme

question	answers	extra information	mark
8(a)(i)	because they are positively charged	accept they are positive / H^+ accept oppositely charged **or** opposites attract ignore they are attracted	1
8(a)(ii)	gains one / an electron	accept $H^+ + e^- \rightarrow H$ or multiples allow gains electrons	1
8(b)	3 bonding pairs 1 lone pair	 accept 2 non-bonding electrons on outer shell of nitrogen	1 1
8(c)(i)	hydroxide / OH^-	do **not** accept sodium hydroxide	1
8(c)(ii)	$H^+ + OH^- \rightarrow H_2O$	ignore state symbols ignore word equation	1

4.1.1.4 Relative electrical charges of subatomic particles

January 2013

CH2FP

question	answers	extra information	mark
8(d)	Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information on page 5.		6

0 marks	Level 1 (1-2 marks)	Level 2 (3-4 marks)	Level 3 (5-6 marks)
No relevant content.	There are basic descriptions of advantages or disadvantages of the electrolysis cells.	There are clear descriptions of environmental or economic advantages or disadvantages of the electrolysis cells. Comparisons may be implied.	There are detailed descriptions of environmental and economic advantages and disadvantages, comparing the electrolysis cells.

examples of chemistry points made in the response:

Accept converse where appropriate.

- mercury cell is more expensive to construct
- mercury is recycled but membranes must be replaced
- mercury is toxic but membrane / polymer is not
- removing traces of mercury from waste is expensive
- mercury cell uses more electricity
- mercury cell produces chlorine that is purer
- mercury cell produces higher concentration / better quality of sodium hydroxide (solution)

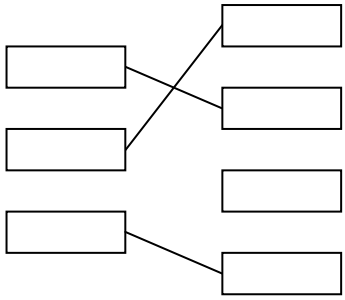
Total			12

UMS conversion calculator www.aqa.org.uk/umsconversion

4.1.1.4 Relative electrical charges of subatomic particles

Answer 41 · Mark scheme

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 42 · 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**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 43 · Mark scheme June 2013 | CH2FP | Original Q3 | Legacy

Question 3

question	answers	extra information	Mark
3(a)	(alloy) atoms / ions / particles not in layers	accept layers are distorted accept different (size) particles / atoms	1
	so, (alloy) layers / atoms / ions / particles can't slide	if no other mark awarded allow (an alloy) is a mixture of metals for **1** mark	1
3(b)	diamonds have a giant covalent structure		1
	diamonds have strong bonds between carbon atoms		1
3(c)(i)	a compound		1
3(c)(ii)	CH_4		1
3(c)(iii)	covalent		1
3(d)	methane has a low boiling point or boiling point less than 20°C		1
	because it has small molecules	accept it has forces between molecules accept weak forces between molecules for **2** marks	1
Total			**9**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 44 · Mark scheme

June 2013 | CH3FP | Original Q5 | Legacy

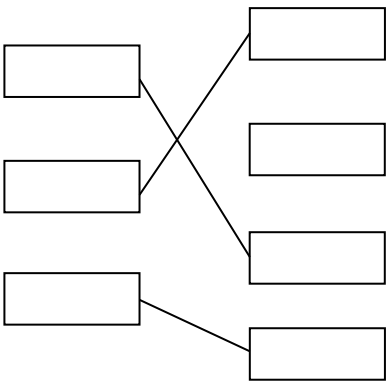
Question 5

question	Answers	extra information	Mark
5(a)(i)	gas		1
5(a)(ii)	Increases		1
5(b)(i)	–1	allow Cl^- allow – allow negative	1
5(b)(ii)	sodium + chlorine → sodium chloride	allow correct symbol equation	1
5(c)	reduce microbes	accept sterilise accept prevent diseases allow disinfect allow kill bacteria / germs / microbes/micro-organisms allow to make it safe to drink ignore get rid of bacteria	1
5(d)	any **one** from: • no freedom of choice • fluoride in toothpaste • too much can cause fluorosis	 allow unethical allow too much can cause damage to teeth	1
Total			**6**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 45 · Mark scheme

June 2014 | CH1FP | Original Q1 | Legacy

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 45 · Mark scheme

June 2014 | CH1FP | Original Q1 | Legacy



4.1.1.4 Relative electrical charges of subatomic particles

Answer 46 · Mark scheme June 2014 | CH2FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
4(a)(i)	14		1	2 / 2.3.1c	G
4(a)(ii)	isotope		1	1 / 2.3.1d	G
4(a)(iii)	(very) small	*accept smaller / tiny / (very) little*	1	1 / 2.3.1b	G
4(b)(i)	C		1	1 / 2.1	A
4(b)(ii)	NH_3		1	1 / 2.1.1g	A
4(c)(i)	nitric (acid)		1	1 / 2.6.2b	G
4(c)(ii)	indicator		1	1 / 2.6.1b	E
4(c)(iii)	crystallisation **or** evaporation	allow by heating **or** cooling **or** leave (on windowsill) *do not accept freezing*	1	1 / 2.6.1c	E
4(c)(iv)	any **one** from: • grass grows faster • grass grows taller **or** thicker	*allow grass grows better / greener*	1	3 / 2.6.2c	E
4(d)	potassium (atom) loses (an electron) chlorine (atom) gains (an electron) 1 (electron) electron	reference to incorrect bonding or particle = max **3** ignore references to full outer shells	1 1 1 1	1 + 2 / 2.1.1c/d/e	E
Total			**13**		

4.1.1.4 Relative electrical charges of subatomic particles

Answer 46 · Mark scheme

June 2014 | CH2FP | Original Q4 | Legacy



4.1.1.4 Relative electrical charges of subatomic particles

Answer 47 · Mark scheme June 2014 | CH2FP | Original Q5 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.	ID
5(a)(i)	ions cannot move	*allow only conducts as a liquid*	1	1 / 2.7.1a	E
5(a)(ii)	chlorine		1	2 / 2.7.1b	G
5(a)(iii)	they are positively / oppositely charged **or** they are attracted		1	1 / 2.7.1c	E
5(a)(iv)	2		1	2 / 2.7.1e	G
5(b)(i)	any **one** from: • not all the magnesium was collected • *used less time* ***or*** *lower current* ***or*** *different battery / power pack* ***or*** *different balance* ***or*** *lower voltage* • error in reading balance • error in recording result	*allow some magnesium was lost*	1	3 / 2.7.1	E
5(b)(ii)	1.11	correct answer with or without working gains **2** marks. if answer incorrect, allow **1** mark for 0.99 **or** for 1.13+1.11+1.09	2	2 + 3 / 2.7.1	E
5(c)(i)	*25 – 25.3*	correct answer with or without working gains **2** marks. If answer incorrect, allow **1** mark for 24/95	2	2 / 2.3.3a	E
5(c)(ii)	71		1	2 / 2.3.1f	A
5(d)(i)	reversible reaction		1	1 / 2.3.3f	A
5(d)(ii)	decreases		1	1 / 2.5.1c	A
Total			**12**		

4.1.1.4 Relative electrical charges of subatomic particles

Answer 47 · Mark scheme

June 2014 | CH2FP | Original Q5 | Legacy



4.1.1.4 Relative electrical charges of subatomic particles

Answer 48 · 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**		

4.1.1.4 Relative electrical charges of subatomic particles

Answer 48 · Mark scheme

June 2014 | CH3FP | Original Q1 | Legacy



4.1.1.4 Relative electrical charges of subatomic particles

Answer 49 · Mark scheme

June 2015 | CH1FP | Original Q1 | Legacy

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 49 · Mark scheme

June 2015 | CH1FP | Original Q1 | Legacy



4.1.1.4 Relative electrical charges of subatomic particles

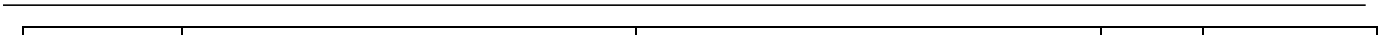
Answer 50 · Mark scheme June 2015 | CH2FP | Original Q1 | Legacy

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 50 · Mark scheme

June 2015 | CH2FP | Original Q1 | Legacy



4.1.1.4 Relative electrical charges of subatomic particles

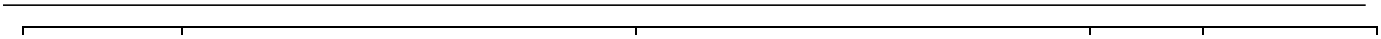
Answer 51 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
2(a)	sharing/covalent/metallic = max 2 sodium loses (electron) chlorine gains (electron) 1 **or** an (electron)		 1 1 1	**AO1/AO2** 2.1.1b,c,d, e,f
2(b)(i)	Have no overall electric charge		1	**AO1** 2.2.1a,c
2(b)(ii)	Should iodine be added to salt? reason: any **one** from: • cannot be done by experiment • based on opinion / view • ethical **or** economic issue	 accept difficult to get / not enough evidence allow must be done by survey	1 1	**AO3** 2.2.1
2(c)(i)	nitric (acid)		1	**AO1** 2.6.2b
2(c)(ii)	an alkali		1	**AO1** 2.6.2a
2(c)(iii)	indicator	accept any named acid base indicator	1	**AO1** 2.6.1b
2(d)(i)	Crystallisation		1	**AO1** 2.6.1c
2(d)(ii)	fertiliser	allow to help crops grow	1	**AO1** 2.6.2c
2(d)(iii)	any **one** from: • pressure • temperature • catalyst	 allow concentration ignore heat	1	**AO1** 2.2.5a
Total			**12**	

4.1.1.4 Relative electrical charges of subatomic particles

Answer 51 · Mark scheme

June 2015 | CH2FP | Original Q2 | Legacy



4.1.1.4 Relative electrical charges of subatomic particles

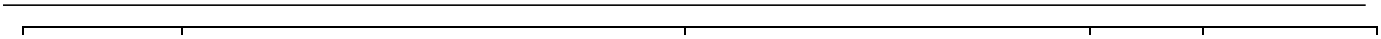
Answer 52 · Mark scheme June 2015 | CH2FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	any **one** from: • protection/improve lifespan • improve appearance		1	**AO2** 2.7.1d
4(b)(i)	Bleach		1	**AO1** 2.7.1i
4(b)(ii)	Hydrogen is less reactive than sodium.		1	**AO2** 2.7.1f
4(b)(iii)	1 bonding pair of electrons 6 unbonded electrons on Cl	accept dot, cross or e or – or any combination	1	**AO1** 2.7.1e
4(b)(iv)	Covalent		1	**AO1** 2.7.1f
4(b)(v)	Hydrogen chloride has a low boiling point. Hydrogen chloride is made of simple molecules.		1 1	**AO1** 2.2.1a 2.1.1g
4(c)(i)	oxygen	accept carbon dioxide	1	**AO1** 2.7.1h
4(c)(ii)	aluminium ions are positive so are attracted (to the negative electrode)	allow opposites attract	1 1	**AO1/AO2** 2.7.1h 2.2.2b
4(c)(iii)	Reduction		1	**AO1** 2.7.1e
4(c)(iv)	slide	allow move	1	**AO1** 2.2.4b
4(d)(i)	C		1	**AO1** 2.2.3a,c
4(d)(ii)	strong covalent bonds		1	**AO1** 2.2.3a
Total			**14**	

4.1.1.4 Relative electrical charges of subatomic particles

Answer 52 · Mark scheme

June 2015 | CH2FP | Original Q4 | Legacy



4.1.1.4 Relative electrical charges of subatomic particles

Answer 53 · Mark scheme

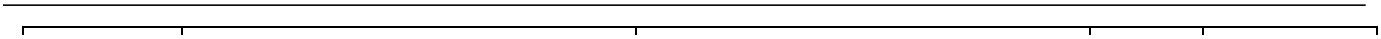
June 2015 | CH3FP | Original Q2 | Legacy

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 53 · Mark scheme

June 2015 | CH3FP | Original Q2 | Legacy



4.1.1.4 Relative electrical charges of subatomic particles

Answer 54 · Mark scheme June 2016 | CH1FP | Original Q1 | Legacy

Question 1

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

4.1.1.4 Relative electrical charges of subatomic particles

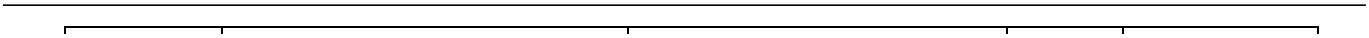
Answer 55 · Mark scheme June 2016 | CH2FP | Original Q1 | Legacy

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 55 · Mark scheme

June 2016 | CH2FP | Original Q1 | Legacy



4.1.1.4 Relative electrical charges of subatomic particles

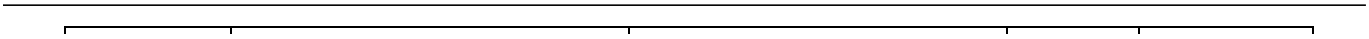
Answer 56 · Mark scheme June 2016 | CH2FP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / SpecRef
3(a)	electricity	allow an electric current	1	AO1 2.7.1a; 2.2.2b
3(b)(i)	chlorine/Cl_2	do **not** accept chloride	1	AO2 2.7.1b
3(b)(ii)	(zinc ions are) positive and (opposite charges) attract	ignore to gain electrons	1 1	AO1/AO2 2.7.1c
3(b)(iii)	reduction		1	AO1 2.7.1e
3(c)(i)	in alloy: different sized atoms/particles **or** no layers/rows so cannot slide	accept converse accept layers distorted	 1 1	AO1/AO2 2.2.4b,c
3(c)(ii)	shape memory (alloys)	accept smart	1	AO1 2.2.4d
Total			**8**	

4.1.1.4 Relative electrical charges of subatomic particles

Answer 56 · Mark scheme

June 2016 | CH2FP | Original Q3 | Legacy



4.1.1.4 Relative electrical charges of subatomic particles

Answer 57 · Mark scheme June 2016 | CH3FP | Original Q1 | Legacy

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**	

4.1.1.4 Relative electrical charges of subatomic particles

Answer 58 · Mark scheme

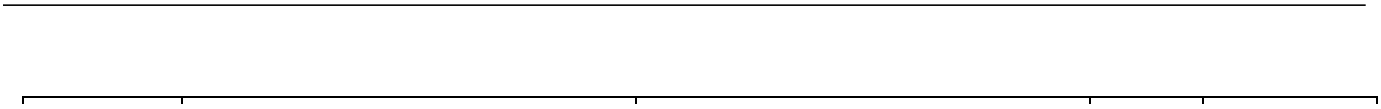
June 2017 | CH1FP | Original Q2 | Legacy

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

4.1.1.4 Relative electrical charges of subatomic particles

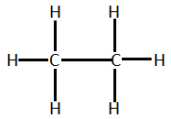
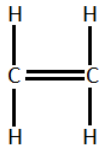
Answer 58 · Mark scheme

June 2017 | CH1FP | Original Q2 | Legacy



4.1.1.4 Relative electrical charges of subatomic particles

Answer 59 · Mark scheme June 2017 | CH1FP | Original Q6 | Legacy

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

4.1.1.4 Relative electrical charges of subatomic particles

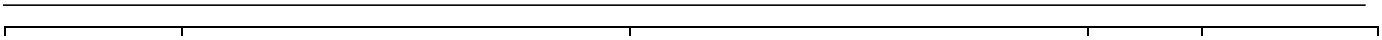
Answer 59 · Mark scheme

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 59 · Mark scheme

June 2017 | CH1FP | Original Q6 | Legacy



4.1.1.4 Relative electrical charges of subatomic particles

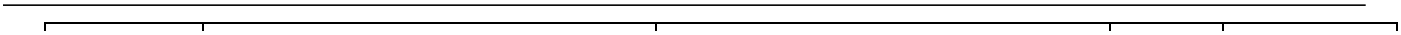
Answer 60 · Mark scheme June 2017 | CH2FP | Original Q3 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
3(a)(i)	tick (✓) by: covalent		 1	**AO1** 2.1.1g
3(a)(ii)	ticks (✓) by: oxygen consists of small molecules oxygen has a low boiling point		 1 1	**AO1** 2.1.1g
3(b)(i)	magnesium (atom) loses (electrons) oxygen (atom) gains (electrons) two (electrons) ions formed	max 3 if reference to incorrect particle or incorrect bonding accept ionic bonding or full outer shells/noble gas structure is formed allow magnesium forms positive (ion) **or** oxygen forms negative (ion)	 1 1 1 1	**AO1** **AO2** 2.1.1a,b,c, d,e,f
3(b)(ii)	ticks (✓) by: nanoparticles contain a few hundred atoms nanoparticles have a high surface area to volume ratio		 1 1	**AO1** 2.2.6a
3(c)	giant covalent		1	**AO1** 2.2.3a
Total			**10**	

4.1.1.4 Relative electrical charges of subatomic particles

Answer 60 · Mark scheme

June 2017 | CH2FP | Original Q3 | Legacy



4.1.1.4 Relative electrical charges of subatomic particles

Answer 61 · Mark scheme June 2017 | CH2FP | Original Q4 | Legacy

Question	Answers	Extra information	Mark	AO / Spec. Ref.
4(a)	58.5		1	AO2 2.5.1b
4(b)	water		1	AO2 2.3.3a
4(c)(i)	prevents loss of thermal energy	allow prevents heat loss	1	AO1 2.6.1
4(c)(ii)	13/thirteen		1	AO3 2.5.1
4(c)(iii)	temperature changes/results are all similar	accept no anomalous results allow they are all similar do **not** accept temperature	1	AO2 2.5.1
4(c)(iv)	exothermic	allow giving out energy	1	AO3 2.5.1
4(d)(i)	ions move	allow they move ignore free ions do not accept movement of electrons	1	AO1 2.7.1a 2.2.2b
4(d)(ii)	(chloride ions are) negative	accept opposites attract do **not** accept chlorine is negative	1	AO1 2.7.1c
4(d)(iii)	Tick (✓) by: soap		1	AO1 2.7.1i
4(d)(iv)	1 bonding pair of electrons 6 unbonded electrons on Cl	accept dot, cross, e or – or any combination	1 1	AO2 2.1

4.1.1.4 Relative electrical charges of subatomic particles

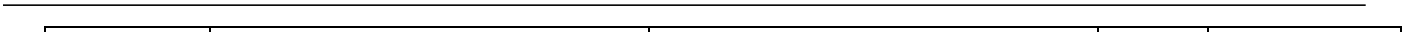
Answer 61 · Mark scheme

4(d)(v)	Tick (✓) by: $\frac{1}{36.5}$ x 100		1	**AO2** 2.3.3a
Total			**12**	

4.1.1.4 Relative electrical charges of subatomic particles

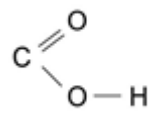
Answer 61 · Mark scheme

June 2017 | CH2FP | Original Q4 | Legacy



4.1.1.4 Relative electrical charges of subatomic particles

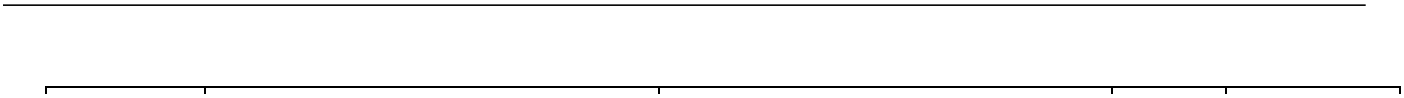
Answer 62 · Mark scheme June 2017 | CH3FP | Original Q1 | Legacy

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 62 · Mark scheme

June 2017 | CH3FP | Original Q1 | Legacy



Answer 63 · Mark scheme

June 2018 | 8462/1F | Original Q2

The full source mark scheme begins on page 144. Follow original question 2 in that document.

Answer 64 · Mark scheme

June 2018 | 8462/1F | Original Q3

The full source mark scheme begins on page 144. Follow original question 3 in that document.

Answer 65 · Mark scheme

June 2018 | 8462/1F | Original Q9

The full source mark scheme begins on page 144. Follow original question 9 in that document.

4.1.1.4 Relative electrical charges of subatomic particles

Answer 66 · Mark scheme

June 2019 | 8462/1F | Original Q1

Question 1

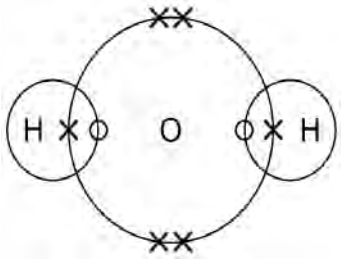
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.1	**A** nucleus **B** electron		1 1	AO1 4.1.1.4 4.1.1.7
01.2	electron		1	AO1 4.1.1.5
01.3	3 / three		1	AO2 4.1.2.1
01.4	(atomic number) 5 (mass number) 11		1 1	AO2 4.1.1.5
01.5	isotope		1	AO1 4.1.1.5
01.6	there are the same number of $^{79}_{35}Br$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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 67 · Mark scheme

June 2019 | 8462/1F | Original Q2

Question 2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	H_2O_2		1	AO2 4.1.1.1 4.2.1.4
02.2	covalent		1	AO1 4.2.1.4
02.3	transition metals		1	AO1 4.1.3.2
02.4	B		1	AO1 4.5.1.2
02.5	A		1	AO2 4.5.1.2
02.6	exothermic		1	AO1 4.5.1.1
02.7	 1 bonding pair of electrons in the right hand overlap 4 non-bonding electrons on oxygen	scores **2** marks allow dots, crosses, circles or $e^{(-)}$ for electrons do **not** accept any change to the number of electrons in the left hand overlap do **not** accept non-bonding electrons on hydrogen ignore inner shell electrons drawn on oxygen	 1 1	AO1 4.2.1.4
Total			**8**	

4.1.1.4 Relative electrical charges of subatomic particles

Answer 68 · Mark scheme June 2019 | 8462/1F | Original Q10

Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	contain delocalised electrons (so) electrons can move through the structure / nanotube	allow contain free electrons allow (so) electrons can carry charge through the structure / nanotube ignore throughout for through ignore current / electricity for charge	1 1	AO1 4.2.3.3

Question	Answers	Mark	AO / Spec. Ref.
10.2	**Level 2:** Some logically linked reasons are given. There may also be a simple judgement.	3–4	AO3 4.2.3.3 4.2.2.7
	Level 1: Relevant points are made. They are not logically linked.	1–2	
	No relevant content	0	
	Indicative content • wood is the least dense so lightest to use • aluminium is the most dense so will make the racket too heavy • carbon nanotube is the strongest so least likely to break • wood / aluminium are too weak so the racket will break more easily • carbon nanotube is the stiffest so least likely to bend out of shape • wood / aluminium are not very stiff so could bend out of shape • justified conclusion		

4.1.1.4 Relative electrical charges of subatomic particles

Answer 68 · Mark scheme

June 2019 | 8462/1F | Original Q10

Question 10 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.3		an answer of 4.0 x 10^4 (nm^2) scores **3** marks an answer of 40344 (nm^2) scores **2** marks		AO2 4.2.4.1
	(82^2 =) 6724 (nm^2)		1	
	(6 x 6724 =) 40344 (nm^2)	allow 40344 (nm^2) correctly rounded to any number of significant figures allow correct calculation using incorrectly calculated value of area of one face from step 1	1	
	= 4.0 x 10^4 (nm^2)	allow 4.0344 x 10^4 (nm^2) correctly rounded to 1 or more significant figures allow a correctly calculated and rounded conversion to standard form of an incorrect calculation of surface area	1	
10.4	any **one** from: • less can be used (for the same effect) • greater surface area (to volume ratio)	allow converse statements about fine particles ignore nanoparticles are smaller	1	AO3 4.2.4.2
Total			**10**	

4.1.1.4 Relative electrical charges of subatomic particles

Answer 69 · Mark scheme November 2020 | 8462/1F | Original Q2

Question 2

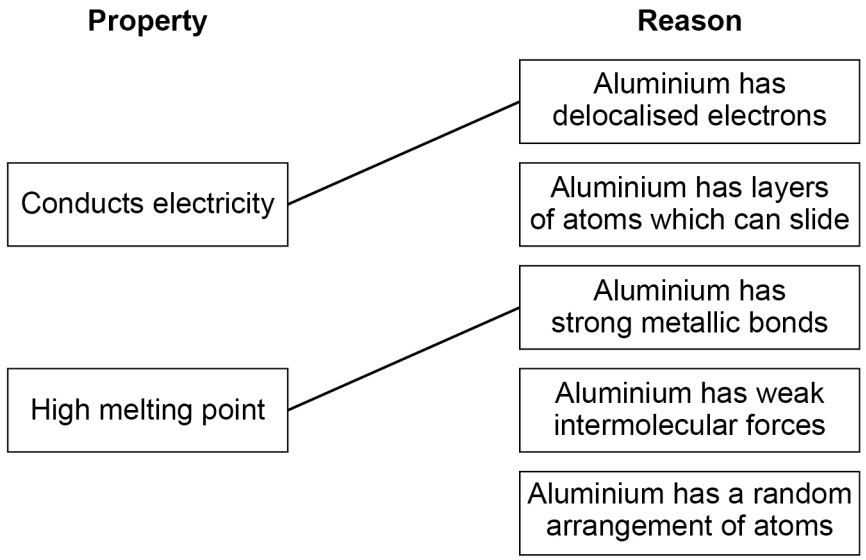
Question	Answers	Extra information	Mark	AO / Spec. Ref.
02.1	electron		1	AO1 4.1.1.3
02.2	plum pudding		1	AO1 4.1.1.3
02.3	alpha		1	AO1 4.1.1.3
02.4	Bohr		1	AO1 4.1.1.3
02.5	protons neutrons protons (and) electrons	 either order	1 1 1	AO1 4.1.1.4 4.1.1.5
02.6	a sports arena of radius 100 m		1	AO2 4.1.1.5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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 70 · Mark scheme

November 2020 | 8462/1F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	 additional line from a box on the left negates the mark from that box		1 1	AO1 4.2.1.5 4.2.2.7 4.2.2.8
05.2	a mixture of metals	allow a mixture of a metal with other elements	1	AO1 4.2.2.7
05.3	bauxite contains a variable percentage of aluminium	allow converse argument allow bauxite does not have a fixed proportion / percentage of aluminium	1	AO3 4.1.1.1
05.4	any **two** from: • danger of dam bursting • leakage of toxic substances from mud to environment • water pollution • damage to habitats • visual pollution • (dam) blocks light • reduces the value of houses	allow the lake (of mud) could overflow allow unpleasant smell	2	AO3 4.4.3.3

4.1.1.4 Relative electrical charges of subatomic particles

Answer 70 · Mark scheme

November 2020 | 8462/1F | Original Q5

Question 5 continued

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	10 / ten		1	AO2 4.1.1.1
05.6	to lower the melting point of the mixture		1	AO1 4.4.3.3
05.7	oxygen carbon	must be in this order	1 1	AO1 4.4.3.3
05.8	$\frac{25}{100}$ × 300 000 =75 000 (kg) = 7.5×10^4 (kg)	 allow correct conversion to standard form of an incorrectly calculated mass	1 1 1	AO2 4.4.3.3
Total			**13**	

4.1.1.4 Relative electrical charges of subatomic particles

Answer 71 · 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

4.1.1.4 Relative electrical charges of subatomic particles

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 71 · Mark scheme

November 2021 | 8462/1F | Original Q3

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 72 · 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

4.1.1.4 Relative electrical charges of subatomic particles

Question 9 continued

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

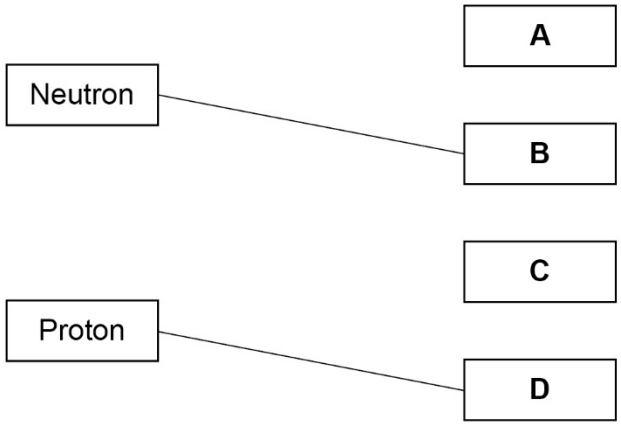
Total			**9**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 73 · Mark scheme

June 2022 | 8462/1F | Original Q1

Question 1

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

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 73 · Mark scheme

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

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

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

Total Question 1		**9**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 74 · Mark scheme

June 2022 | 8462/1F | Original Q9

Question 9

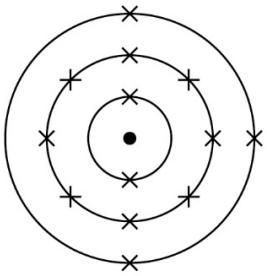
Question	Answers	Extra information	Mark	AO / Spec. Ref.
09.1	D		1	AO3 4.1.2.3

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 74 · 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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 74 · 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**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 75 · Mark scheme

June 2023 | 8462/1F | Original Q1

Question 1

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

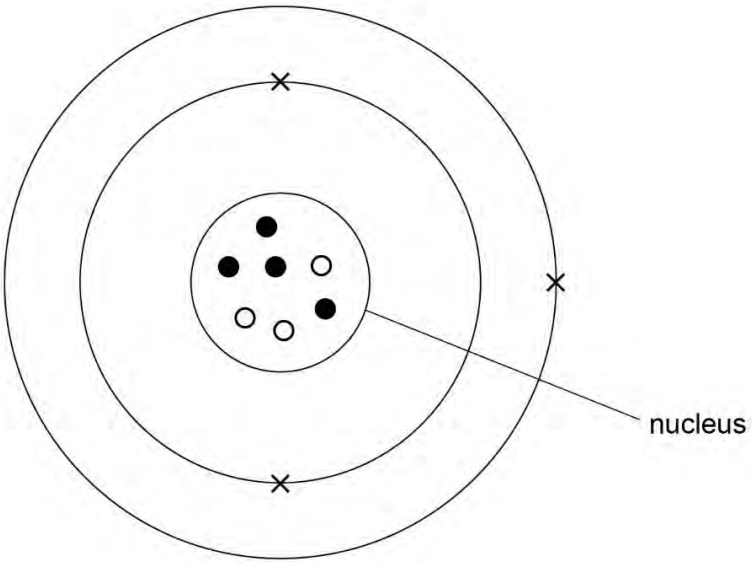
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	a neutron and a proton		1	AO1 4.1.1.5

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

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 75 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	3 x protons (○) in the nucleus		1	AO1
	4 x neutrons (●) in the nucleus		1	AO1
	3 x electrons (×) in the shells		1	AO1
	electrons (×) arranged 2, 1		1	AO2
	an answer of  scores **4** marks			4.1.1.4 4.1.1.7
Total Question 1			**9**	

4.1.1.4 Relative electrical charges of subatomic particles

Answer 76 · Mark scheme June 2023 | 8462/1F | Original Q3

Question 3

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

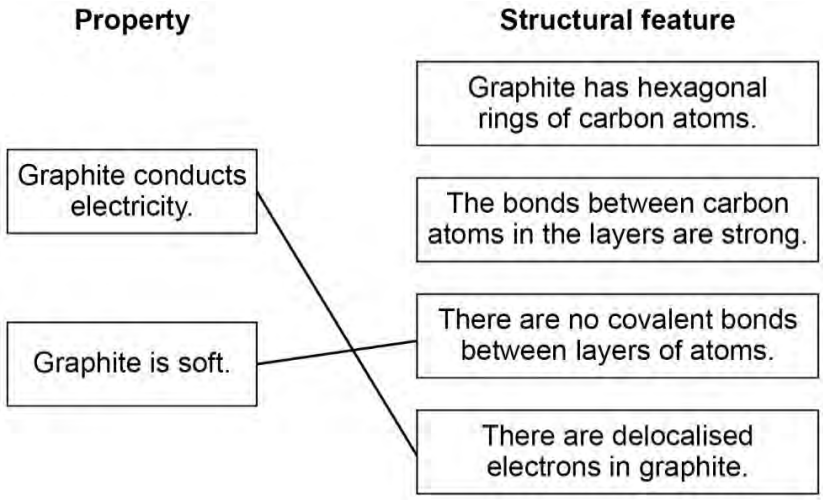
Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	protons neutrons	must be in this order allow electrons	1 1	AO1 4.1.1.5

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

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 76 · Mark scheme

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

Total Question 3	7

4.1.1.4 Relative electrical charges of subatomic particles

Answer 77 · Mark scheme

June 2023 | 8462/1F | Original Q9

Question 9

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

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

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

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 77 · Mark scheme

June 2023 | 8462/1F | Original Q9

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 78 · Mark scheme June 2024 | 8462/1F | Original Q1

Question 1

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

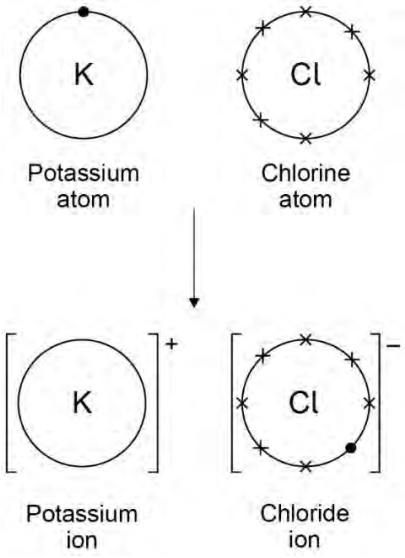
Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	C		1	AO2 4.1.1.1

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

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 78 · Mark scheme June 2024 | 8462/1F | Original Q1

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 78 · Mark scheme

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

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

Total Question 1	**9**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 79 · Mark scheme

June 2024 | 8462/1F | Original Q5

Question 5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	6		1	AO2 4.1.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.2	7		1	AO2 4.1.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.3	6		1	AO2 4.1.1.5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.4	C_2F_6		1	AO2 4.2.1.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.5	only intermolecular forces are weak		1	AO1 4.2.2.4

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.6	spherical		1	AO1 4.2.3.3

4.1.1.4 Relative electrical charges of subatomic particles

Answer 79 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.7	3		1	AO1 4.2.3.2

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.8	giant structure	allow lattice	1	AO1 4.2.3.1
	(of atoms joined by) covalent bonds		1	
	each carbon / atom forms four bonds		1	

Total Question 5	**10**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 80 · 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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 80 · Mark scheme

June 2024 | 8462/1F | Original Q9

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**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 81 · Mark scheme

June 2024 | 8462/1F | Original Q10

Question 10

Question	Answers	Extra information	Mark	AO / Spec. Ref.
10.1	(model **A**) plum pudding (model **B**) Bohr	allow Thomson (model) allow nuclear (model) allow planetary (model) allow Rutherford-Bohr (model)	1 1	AO1 4.1.1.3

4.1.1.4 Relative electrical charges of subatomic particles

Answer 81 · Mark scheme

June 2024 | 8462/1F | Original Q10

Question	Answers	Mark	AO / Spec. Ref.
10.2	**Level 2:** Scientifically relevant features are identified; the way(s) in which they are similar / different is made clear and (where appropriate) the magnitude of the similarity / difference is noted.	3–4	AO1 4.1.1.3
	Level 1: Relevant features are identified and differences noted.	1–2	
	No relevant content	0	
	Indicative content **Similarities** • both contain electrons • both are neutral overall **Differences** • model **A** has no nucleus **or** the model used today has a nucleus • model **A** has no protons **or** the model used today has protons • model **A** has no neutrons **or** the model used today has neutrons • model **A** has positive charge spread throughout the atom **or** model **A** is a ball of positive charge • the model used today has the positive charge in the centre • model **A** the electrons are distributed randomly • the model used today has electrons in shells / energy levels • the mass was spread throughout model **A** • the mass is concentrated at the centre of the model used today • model **A** does not have empty space • model used today is mostly empty space		

4.1.1.4 Relative electrical charges of subatomic particles

Answer 81 · Mark scheme

June 2024 | 8462/1F | Original Q10

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

Total Question 10	**8**

4.1.1.4 Relative electrical charges of subatomic particles

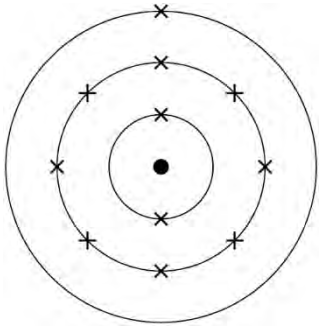
Answer 82 · Mark scheme

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 82 · 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	

4.1.1.4 Relative electrical charges of subatomic particles

Answer 82 · 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**

4.1.1.4 Relative electrical charges of subatomic particles

Answer 83 · 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	

4.1.1.4 Relative electrical charges of subatomic particles

Answer 83 · 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

4.1.1.4 Relative electrical charges of subatomic particles

AQA

GCSE
CHEMISTRY

8462/1F - PAPER 1 FOUNDATION TIER

Mark scheme

8462

June 2018

Version/Stage: 1.0 Final

4.1.1.4 Relative electrical charges of subatomic particles

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.

3.5 Errors carried forward

Any error in the answers to a structured question should be penalised once only.

Papers should be constructed in such a way that the number of times errors can be carried forward is kept to a minimum. Allowances for errors carried forward are most likely to be restricted to calculation questions and should be shown by the abbreviation ecf in the marking scheme.

3.6 Phonetic spelling

The phonetic spelling of correct scientific terminology should be credited **unless** there is a possible confusion with another technical term.

3.7 Brackets

(…..) are used to indicate information which is not essential for the mark to be awarded but is included to help the examiner identify the sense of the answer required.

3.8 Allow

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

3.9 Ignore

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

3.10 Do not accept

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

4. Level of response marking instructions

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

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

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

Step 1: Determine a level

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

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

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

Step 2: Determine a mark

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

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

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

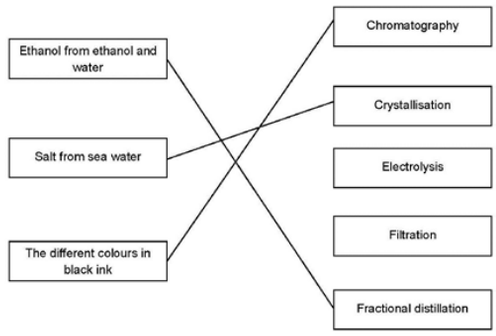
Indicative content in the mark scheme is provided as a guide for examiners. It is not intended to be exhaustive and you must credit other valid points. Students do **not** have to cover all of the points mentioned in the indicative content to reach the highest level of the mark scheme.

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

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

4.1.1.4 Relative electrical charges of subatomic particles

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

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

4.1.1.4 Relative electrical charges of subatomic particles

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**	

4.1.1.4 Relative electrical charges of subatomic particles

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

4.1.1.4 Relative electrical charges of subatomic particles

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**	

4.1.1.4 Relative electrical charges of subatomic particles

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

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

4.1.1.4 Relative electrical charges of subatomic particles

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

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

4.1.1.4 Relative electrical charges of subatomic particles

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

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

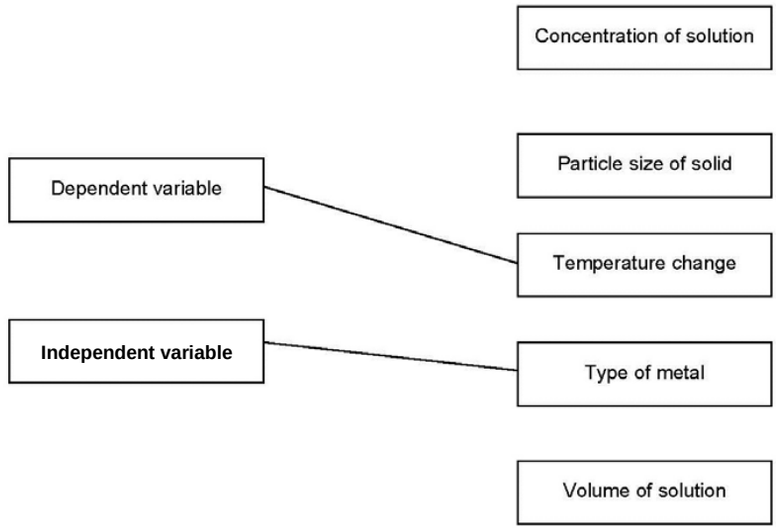
4.1.1.4 Relative electrical charges of subatomic particles

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

4.1.1.4 Relative electrical charges of subatomic particles

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

4.1.1.4 Relative electrical charges of subatomic particles

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

4.1.1.4 Relative electrical charges of subatomic particles

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**	

4.1.1.4 Relative electrical charges of subatomic particles

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

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

4.1.1.4 Relative electrical charges of subatomic particles

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

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

4.1.1.4 Relative electrical charges of subatomic particles

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

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

4.1.1.4 Relative electrical charges of subatomic particles

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**

4.1.1.4 Relative electrical charges of subatomic particles

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

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

4.1.1.4 Relative electrical charges of subatomic particles

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

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

4.1.1.4 Relative electrical charges of subatomic particles

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

4.1.1.4 Relative electrical charges of subatomic particles

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

<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>

Question 2 (low and standard demand)

02.1 42% of students did not realise that the number of outer shell electrons would be the same as the Group number.

02.2 19% of students were able to deduce that hydrogen bromide exists as small molecules. The majority of answers were fairly evenly split between giant covalent and ionic lattice.

02.3 59% of students were able to select F_2 as the correct formula for fluorine, with most of the others opting for F.

02.4 26% of students scored two or more marks, usually for giving the correct trend in reactivity and stating that iodine had no reactions or no changes.

Very few students could articulate their reasoning in terms of displacement. Several tried to answer in terms of reactivity of the potassium halides rather than the halogens, or were misusing the term ‘halide’ instead of ‘halogen’, making it difficult to gain any credit. Others thought that darkness of colour was an indication of reactivity, whilst some referred to melting or boiling points, which were not relevant.

Some students tried to answer in terms of ease of gaining an electron, rather than by using the information in the table as intended. Those who did so were given credit, with the most common mark being for a description of the iodine atom being larger than the chlorine atom.

02.5 74% of students were able to calculate the M_r of TiO_2 correctly. Of those who didn’t gain credit, often they didn’t recognise that there are two oxygen atoms, giving an answer of 64

02.6 This question discriminated well with 32% of students achieving both marks. Many students could convert 1.2 kg to 1200 g. However, many used the mass of reactant, 500 g, as either the numerator or denominator in the percentage yield expression. Others inverted the % yield expression or tried to subtract values.

Answer 64 · 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 65 · Examiner comments

Question 9 (standard demand)

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

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

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

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

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

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

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

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

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

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 66 · 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’.

4.1.1.4 Relative electrical charges of subatomic particles

Answer 67 · Examiner comments June 2019 | 8462/1F | Original Q2

Question 2 (low demand)

02.1 Over 85% of students identified the correct formula of hydrogen peroxide.

02.2 Approximately 70% of students identified covalent bonding as the bonding in a hydrogen peroxide molecule.

02.3 Students found this question about elements as catalysts difficult. The 3 options were chosen in similar proportions.

02.4 Approximately three-quarters of students correctly identified the activation energy on the reaction profile diagram.

02.5 This question proved more difficult with approximately 45% of students being able to identify the energy of hydrogen peroxide on the reaction profile diagram.

02.6 Approximately 80% of students identified the reaction as exothermic, having been given a description.

02.7 Approximately 55% of students were able to score both marks for completing the dot and cross diagram.

The mark for the bonding electrons was scored more often than the mark for the non-bonding electrons.

4.1.1.4 Relative electrical charges of subatomic particles

Answer 68 · Examiner comments

June 2019 | 8462/1F | Original Q10

Question 10 (standard demand)

10.1 Approximately a third of students scored a mark for referring to the presence of delocalised electrons in carbon nanotubes.

Very few scored the mark for explaining the role of these electrons in the conduction of electricity.

10.2 Most students understood that they needed to compare the properties of the three materials. However, a few did not add value and just quoted data from the table, which is insufficient to be credited.

Approximately 45% of students achieved a Level 2 mark by giving a consequence of one of the stated differences in properties. Some gave a justified conclusion in referencing the most suitable material for a racket frame.

For some students, there was a misunderstanding that a high density was good because it made the racket strong, despite strength being one of the other properties given.

10.3 Almost a quarter of students scored full marks for this calculation. A similar proportion correctly calculated the surface area as 40344 nm^2 but did not score the mark for converting this answer to standard form.

Some students calculated the volume of the nanoparticle rather than the surface area.

Even if the answer to their calculation was incorrect, a mark could still be scored for correctly converting this answer to standard form, provided that an attempt to calculate the surface area had been made.

10.4 Students found it difficult to give a reason why it costs less to use nanoparticles in sun-cream with only approximately 10% scoring the mark.

4.1.1.4 Relative electrical charges of subatomic particles

Answer 68 · Examiner comments

Common responses seen that were not credited included:

- nanoparticles are smaller
- nanoparticles are easier to make.

4.1.1.4 Relative electrical charges of subatomic particles

Answer 68 · Examiner comments

June 2019 | 8462/1F | Original Q10

Use of statistics

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

Mark Ranges and Award of Grades

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 73 · 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.

Answer 74 · 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.

4.1.1.4 Relative electrical charges of subatomic particles

Answer 74 · 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.

Answer 75 · 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 75 · Examiner comments June 2023 | 8462/1F | Original Q1

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

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

4.1.1.4 Relative electrical charges of subatomic particles

Answer 76 · Examiner comments June 2023 | 8462/1F | Original Q3

Question 3 (low and standard demand)

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

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

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

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

Answer 76 · Examiner comments June 2023 | 8462/1F | Original Q3

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

Answer 77 · 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

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4.1.1.4 Relative electrical charges of subatomic particles

Answer 77 · 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 78 · Examiner comments

June 2024 | 8462/1F | Original Q1

Question 1 (low demand)

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

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

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

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4.1.1.4 Relative electrical charges of subatomic particles

Answer 78 · 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**.

4.1.1.4 Relative electrical charges of subatomic particles

Answer 79 · Examiner comments June 2024 | 8462/1F | Original Q5

Question 5 (low and standard demand)

05.1 Nearly four fifths of students identified the number of protons. 13 was the most common distractor.

05.1 Over a half of students identified the number of neutrons. 6 was the most common distractor.

05.1 Over a half of students identified the number of electrons. 13 was the most common distractor.

05.4 Nearly three fifths of students scored the mark. Although the vast majority counted 2 carbon and 6 fluorine atoms, many could not write the formula correctly, with numbers discernibly smaller than the letters.

05.5 Only about a third of students identified that only intermolecular forces are weak. The most popular response was that both covalent bonds and intermolecular forces are weak. The myth that covalent bonds are weak is a difficult one to dispel.

05.6 More than a half of students knew that Buckminsterfullerene is spherical. The most common distractor was cylindrical, with the students possibly thinking of nanotubes.

05.7 Just under three quarters of students identified the number of bonds formed by a carbon atom in graphite. The most common distractor was 4.

05.8 Students found this standard demand question difficult, with fewer than one in twenty scoring all three marks, although more than a half did score one mark. Many did not mention the giant structure, or did not state that each carbon atom forms 4 bonds (despite having counted the bonds per atom in graphite in the previous question). Many did mention covalent bonds but then contradicted themselves by referring to intermolecular forces; these are not present, so the type of bonding mark could not be awarded. Many students gave properties of diamond, which were not asked for and gained no credit.

4.1.1.4 Relative electrical charges of subatomic particles

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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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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.

Answer 81 · Examiner comments

Question 10 (standard demand)

10.1 Over a quarter of students could name both models, with four fifths able to name at least one - usually the plum pudding model. Far fewer knew what to call the Bohr model (even though 'nuclear' was accepted). A significant minority called model B the modern model, which contradicts the information that both were early models of the atom.

10.2 More than two fifths of students reached Level 2 in this question. The most common correct comparisons were that the modern model has a nucleus whereas model A does not, and the relative positions of the electrons in each model. Sometimes the electrons in model A were only described as negative charges. A common misconception was that model A contained protons.

10.3 Whilst few students scored both marks, nearly a third scored at least one. Of those who knew what isotopes are, most knew that isotopes had different numbers of neutrons but did not say that isotopes were atoms with the same number of protons or of the same element. Some referred to 'elements' with the same number of protons, which did not gain the first marking point. Many students used the phrase 'subatomic particles' in their answer without realising that subatomic particles means protons, neutrons and electrons. Some students described ions rather than isotopes.

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4.1.1.4 Relative electrical charges of subatomic particles

Mark Ranges and Award of Grades

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

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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 83 · 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.