PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

CHEMISTRY



MARK SCHEME

TOPIC 1: KEY CONCEPTS IN CHEMISTRY: ATOMIC STRUCTURE (PAPER 1)

SCORE	PERCENTAGE
/111	%

STEMUP

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Mark Scheme

Q1.

Question number	Answer	Additional guidance	Mark
(i)	<table><tr><td>proton</td><td>+1 (1)</td><td>1</td></tr><tr><td>neutron</td><td>0</td><td>1 (1)</td></tr><tr><td>electron</td><td>-1 (1)</td><td>negligible</td></tr></table>	allow 1(+) / +,reject -1 reject +1, -1 allow (1)-, reject +1 / 1	**(3)** **AO1-1**

Question number	Answer	Additional guidance	Mark
(ii)	A description including • 10 protons (1) • 10 electrons (1)	allow {'how many'/ 'number of'} protons allow {'how many'/ 'number of'} electrons / (electronic configuration) 2.8 allow 'number of protons and (number of) electrons' (2) ignore any reference to location of subatomic particles ignore neutrons	**(2)** **AO1-1**

Question number	Answer	Additional guidance	Mark
(iii)	An explanation linking • <u>same number</u> of protons and electrons (1) • (so) the (+ and -) <u>charges</u> cancel (1)	ignore reference to neutrons allow <u>charge</u> (on neon atom) = <u>0</u> +10 plus -10 = 0 (2)	**(2)** **AO2-1**

(**QU05a 1SC0/1CF, June 2025**)

Q2.

Question number	Answer	Additional guidance	Mark
(i)	<table><tr><td>proton</td><td>+1 (1)</td><td>1</td></tr><tr><td>neutron</td><td>0</td><td>1 (1)</td></tr><tr><td>electron</td><td>-1 (1)</td><td>negligible</td></tr></table>	allow 1(+) / +, reject -1 reject +1, -1 allow (1)-, reject +1 / 1	**(3)** **AO1-1**

Question number	Answer	Additional guidance	Mark
(ii)	A description including • 10 protons (1) • 10 electrons (1)	allow {'how many'/ 'number of'} protons allow {'how many'/ 'number of'} electrons / (electronic configuration) 2.8 allow 'number of protons and (number of) electrons' (2) ignore any reference to location of subatomic particles ignore neutrons	**(2)** **AO1-1**

Question number	Answer	Additional guidance	Mark
(iii)	An explanation linking • same number of protons and electrons (1) • (so) the (+ and -) charges cancel (1)	ignore reference to neutrons allow charge (on neon atom) = 0 +10 plus -10 = 0 (2)	**(2)** **AO2-1**

(**QU01a 1SC0/1CH, June 2025**)

Q3.

	Answer	Acceptable answers	Mark
(i)	number of protons (in nucleus of atom)	ignore number of electrons eg number of protons and electrons worth (1)	**(1)**
(ii)	An explanation including		

	• (atoms of) both contain 5 /same number of protons/same atomic number (1) • boron-10 atoms contain 5 neutrons but boron-11 atoms contain 6 neutrons / different numbers of neutrons/ different mass number (1)	ignore electrons boron-11 atoms contain 1 more neutron / boron-10 atoms contain 1 less neutron	**(2)**

(**Q24 1SC0/1CH, June 2013**)

Q4.

	Answer	**Acceptable answers**	**Mark**
(i)	number of protons (in nucleus of atom)	ignore number of electrons eg number of protons and electrons worth (1)	**(1)**
(ii)	An explanation including • (atoms of) both contain 5 /same number of protons/same atomic number (1) • boron-10 atoms contain 5 neutrons but boron-11 atoms contain 6 neutrons / different numbers of neutrons/ different mass number (1)	ignore electrons boron-11 atoms contain 1 more neutron / boron-10 atoms contain 1 less neutron	**(2)**

(**Q15 1SC0/2CH, June 2013**)

Q5.

	Answer	**Acceptable answers**	**Mark**

(a)	C smaller than the mass of a proton		**(1)**
(b)	An description linking • 8 protons (1) • (and) {17-8/9} neutrons (1)	 ignore references to electrons in shells / charges on particles if electrons in nucleus max 1 protons and neutrons with incorrect numbers (1)	**(2)**
(c)	Explanation linking • (both have) same number (of electrons) in outer shell(1) • 6 (electrons in outer shell) (consequent on first point) (1)	correct electronic configurations or diagrams alone max 1 'they both have 6 in the outer shell' scores both marks allow 'both need 2 (more) (electrons) to fill outer shell' for both marks	**(2)**
(d)	A description to include • 2.8 (in 1st and 2nd shell)(1) • 5 (in outer shell)(1)	suitable diagram in place of 2.8(1).5(1) electrons in {shells / orbits / rings}(1)	**(2)**
(e)(i)	A description to include • electron(s) shared (1) • {**pair(s) of / two**} (electrons) (1)	can be shown in a diagram of a covalent bond any mention of ions scores zero	**(2)**
(e)(ii)	P_2O_5	Reject P2O5 / P^2O^5	**(1)**

(**Q46 1SC0/1CH, June 2013**)

Q6.

	Answer	**Acceptable answers**	**Mark**
(a)(i)	C T		**(1)**
(a)(ii)	C Q and S		**(1)**
(b)(i)	number of protons (in nucleus of atom)	ignore number of electrons eg number of protons and electrons worth (1)	**(1)**
(b)(ii)	An explanation including • (atoms of) both contain 5 /same number of protons/same atomic number (1) • boron-10 atoms contain 5 neutrons but boron-11 atoms contain 6 neutrons / different numbers of neutrons/ different mass number (1)	 ignore electrons boron-11 atoms contain 1 more neutron / boron-10 atoms contain 1 less neutron	**(2)**

(c)(i)	An explanation including the following • M1 {average/mean} mass (of atoms of an element) (1) • M2 compared to {1/12 mass carbon-12 (atom)/ (mass of) carbon-12 (atom) taken as 12} (1)	For M1 reject weight reject if mass of molecule reject if mass of neutrons and protons any reference to carbon-12 scores mark	**(2)**
(c)(ii)	[19.7 × 10] (1) +[80.3 × 11] (1) /100 (1) (=10.8) [0.197 ×10] (1) + [0.803 ×11] (1) = [1.97 + 8.83] (1) (=10.8)	If no working shown 10.8(03) worth 3 marks	**(3)**

(**Q14 1SC0/1CH, June 2013**)

Q7.

	Answer	Acceptable answers	Mark
(a)	C smaller than the mass of a proton		**(1)**
(b)	An description linking • 8 protons (1) • (and) {17-8/9} neutrons (1)	ignore references to electrons in shells / charges on particles if electrons in nucleus max 1 protons and neutrons with incorrect numbers (1)	**(2)**
(c)	Explanation linking • (both have) same number (of electrons) in outer shell(1) • 6 (electrons in outer shell) (consequent on first point) (1)	correct electronic configurations or diagrams alone max 1 'they both have 6 in the outer shell' scores both marks allow 'both need 2 (more) (electrons) to fill outer shell' for both marks	**(2)**
(d)	A description to include • 2.8 (in 1st and 2nd shell)(1) • 5 (in outer shell)(1)	suitable diagram in place of 2.8(1).5(1) electrons in {shells / orbits / rings}(1)	**(2)**
(e)(i)	A description to include • electron(s) shared (1)	can be shown in a diagram of a covalent bond	**(2)**

	• {**pair(s) of / two**} (electrons) (1)	any mention of ions scores zero		

(e)(ii)	P_2O_5	Reject P2O5 / P^2O^5	**(1)**

(**Q43 1SC0/2CH, June 2013**)

Q8.

	Answer	**Acceptable answers**	**Mark**
(a)(i)	C T		**(1)**
(a)(ii)	C Q and S		**(1)**
(b)(i)	number of protons (in nucleus of atom)	ignore number of electrons eg number of protons and electrons worth (1)	**(1)**
(b)(ii)	An explanation including • (atoms of) both contain 5 /same number of protons/same atomic number (1) • boron-10 atoms contain 5 neutrons but boron-11 atoms contain 6 neutrons / different numbers of neutrons/ different mass number (1)	ignore electrons boron-11 atoms contain 1 more neutron / boron-10 atoms contain 1 less neutron	**(2)**
(c)(i)	An explanation including the following • M1 {average/mean} mass (of atoms of an element) (1) • M2 compared to {1/12 mass carbon-12 (atom)/ (mass of) carbon-12 (atom) taken as 12} (1)	For M1 reject weight reject if mass of molecule reject if mass of neutrons and protons any reference to carbon-12 scores mark	**(2)**
(c)(ii)	[19.7 × 10] (1) +[80.3 × 11] (1) /100 (1) (=10.8) [0.197 ×10] (1) + [0.803 ×11] (1) = [1.97 + 8.83] (1) (=10.8)	If no working shown 10.8(03) worth 3 marks	**(3)**

(**Q04 1SC0/2CH, June 2013**)

Q9.

Question Number	Answer	Acceptable answers	Mark
(a)	<table><tr><th>particle</th><th>relative mass</th></tr><tr><td>proton</td><td>1</td></tr><tr><td>neutron</td><td>**1** (1)</td></tr><tr><td>electron</td><td>1/1837 / negligible / very small (1)</td></tr></table>	if any minus sign(s) MAX 1 anything less than 1/1500 or 0.00067/(almost) 0	**(2)**

Question Number	Answer	Acceptable answers	Mark
(b)	**B** the same number of electrons and protons		**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)	3 protons **(1)** {4/7-3} neutrons **(1)** maximum 1 mark if electrons mentioned	if numbers incorrect but state both protons and neutrons (and not electrons) allow (1) but can score both marks if clearly stated electrons not in nucleus eg in shells	**(2)**

(**Q22 1SC0/1CF, June 2015**)

Q10.

<table>
<tr><th>Question Number</th><th>Answer</th><th>Acceptable answers</th><th>Mark</th></tr>
<tr><td>(a)</td><td><table><tr><th>particle</th><th>relative mass</th></tr><tr><td>proton</td><td>1</td></tr><tr><td>neutron</td><td>1 (1)</td></tr><tr><td>electron</td><td>1/1837 / negligible / very small (1)</td></tr></table></td><td>if any minus sign(s) MAX 1

anything less than 1/1500 or 0.00067/(almost) 0</td><td>(2)</td></tr>
</table>

Question Number	Answer	Acceptable answers	Mark
(b)	**B** the same number of electrons and protons		**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)	3 protons **(1)** {4/7-3} neutrons **(1)** maximum 1 mark if electrons mentioned	 if numbers incorrect but state both protons and neutrons (and not electrons) allow (1) but can score both marks if clearly stated electrons not in nucleus eg in shells	**(2)**

(**Q10 1SC0/2CF, June 2015**)

Q11.

Question number	Answer	Additional guidance	Mark
	6.92 with or without working scores 4 7.59 x 6 (1) (= 45.54) 92.41 x 7 (1) (= 646.87) (1) $\frac{45.54 + 646.87}{100}$ (1) (= 6.9241) 6.92 (1)	penalise early rounding once only $\frac{(7.59 \times 6) + (92.41 \times 7)}{100}$ (3) 6 x 0.0759 (1) (= 0.4554) 7 x 0.9241 (1) (= 6.4687) 0.4554 + 6.4687 (1) = 6.92 (1) allow 7.59% of 6 (1) (= 0.4554) 92.41% of 7 (1) (= 6.4687) 0.4554 + 6.4687 (1) = 6.92 (1) allow ecf allow MP4 for incorrect answer with working to 2 dp if using most data in question	**(4)**

(**Q04c 1SC0/2CH, June 2019**)

Q12.

Question number	Answer	Additional guidance	Mark
	90.48x20 + 0.27x21 + 9.25x22 = 2018.77 (1) $\frac{2018.77}{100}$ = 20.1877 (1)	20.2 / 20.19 with or without working scores 2 marks 20.18 / 20.187 with or without working scores 1 mark 2018.77 with or without working (1) allow 90.48x20 + 0.27x21 + 9.25x22 unevaluated (1) or 90.48x0.20 + 0.27x0.21 + 9.25x 0.22 unevaluated (1) incorrect / early rounding loses MP2 allow 3 or more sf	**(2)** **AO2-1**

(**QU01b 1SC0/1CH, June 2025**)

Q13.

Question number	Answer	Additional guidance	Mark
	final answer of 47.91 / 47.9 with or without working (3) All percentages given as: Ti–46 = 8 Ti–47 = 7 Ti–48 = 75 Ti–49 = 6 Ti–50 = 4 (1) 46 x 8 = (368) 47 x 7 = (329) 48 x 75 = (3600) 49 x 6 = (294) 50 x 4 = (200) (= 4791) (1) $\frac{4791}{100}$ = 47.91 (1)	48 without working = 0 allow 7-7.5 for Ti-47 (7.5 gives 48.145) allow ECF for MP2 [Note: answer of 48 can score MP3 but must have correct working] Allow ECF but answer for MP3 must be between 46 and 50	**(3)**

(**Q04a 1SC0/1CH, Nov 2020**)

Q14.

Question Number	Answers	Acceptable Answers	Mark
(a)(i)	<table><tr><td></td><td>chlorine-35</td><td>chlorine-37</td></tr><tr><td>number of protons</td><td>**17**</td><td>**17**</td></tr><tr><td>number of neutrons</td><td>**18**</td><td>**20**</td></tr><tr><td>number of electrons</td><td>**17**</td><td>**17**</td></tr></table> the four 17s (1) the 18 and 20 (1)		**(2)**

Question Number	Answers	Acceptable Answers	Mark
(a)(ii)	An explanation linking M1 average (mass of atoms/isotopes present) (1) M2 more chlorine-35 than chlorine-37 / higher {percentage / abundance} of Cl-35 / lower {percentage / abundance} of Cl-37 / (1)	 mean ignore weight 75% chlorine-35 / 25% chlorine-37/ chlorine-35 and chlorine-37 in ratio 3:1 / correct calculation to obtain 35.5 (2) eg[(75x35) + (25x37)]/100	**(2)**

Question Number	Answers	Acceptable Answers	Mark
(b)	Diagram showing one carbon and four chlorines four pairs of electrons shared between the carbon and chlorine atoms (1) fully correct (1)	use of dots or crosses or mixture of both ignore inner shells even if incorrect ignore symbols	**(2)**

Question Number		Indicative Content	Mark
QWC	*** (c)**	A response including some of the following points Note: (carbon to carbon) strong bonds is given in question Diamond: Uses and Properties • in cutting tools/engraving • drill bit • jewellery • diamond very hard/strong • attractive/lustrous • high melting point Explanations • giant molecular/covalent • each carbon atom bonded to four other carbon atoms • three dimensional structure • to break it lots of bonds would need to be broken • would need lot of energy/force Graphite: Uses and Properties • to make electrodes • a lubricant • sporting equipment • in pencils/drawing • graphite conducts electricity • soft Explanations • giant molecular/covalent • each carbon atom bonded to three other carbon atoms • each carbon atom has a free electron • delocalised electrons • (delocalised) electrons move to carry current • layers of carbon atoms • weak forces/bonds between layers/sheets • so layers/sheets can slide/rub off or over each other	**(6)**

Level	0	No rewardable content
1	1 - 2	• a limited description eg for either diamond ***or*** graphite states a correct Use ***or*** Property • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	3 - 4	• a simple description/explanation eg for ***both*** diamond ***and*** graphite states a correct Use ***or*** Property linked with at least **one relevant** explanation point **OR** for ***either*** diamond ***or*** graphite States a correct Use or Property linked to at least **two relevant** explanation points • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	5 - 6	• a detailed explanation eg for ***both*** diamond ***and*** graphite States a correct Use or Property linked to at least **three relevant** explanation points (in total) **OR** for ***either*** diamond ***or*** graphite States a correct Use or Property linked to at least **four relevant** explanation points (in total) • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

(**Q06 1SC0/1CH, June 2014**)

Q15.

Question Number	Answers	Acceptable Answers	Mark
(a)(i)	<table><tr><td></td><td>chlorine-35</td><td>chlorine-37</td></tr><tr><td>number of protons</td><td>**17**</td><td>**17**</td></tr><tr><td>number of neutrons</td><td>**18**</td><td>**20**</td></tr><tr><td>number of electrons</td><td>**17**</td><td>**17**</td></tr></table> the four 17s (1) the 18 and 20 (1)		**(2)**

Question Number	Answers	Acceptable Answers	Mark
(a)(ii)	An explanation linking M1 average (mass of atoms/isotopes present) (1) M2 more chlorine-35 than chlorine-37 / higher {percentage / abundance} of Cl-35 / lower {percentage / abundance} of Cl-37 / (1)	 mean ignore weight 75% chlorine-35 / 25% chlorine-37/ chlorine-35 and chlorine-37 in ratio 3:1 / correct calculation to obtain 35.5 (2) eg[(75x35) + (25x37)]/100	**(2)**

Question Number	Answers	Acceptable Answers	Mark
(b)	Diagram showing one carbon and four chlorines four pairs of electrons shared between the carbon and chlorine atoms (1) fully correct (1)	use of dots or crosses or mixture of both ignore inner shells even if incorrect ignore symbols	**(2)**

Question Number		Indicative Content	Mark
QWC	*** (c)**	A response including some of the following points Note: (carbon to carbon) strong bonds is given in question Diamond: Uses and Properties • in cutting tools/engraving • drill bit • jewellery • diamond very hard/strong • attractive/lustrous • high melting point Explanations • giant molecular/covalent • each carbon atom bonded to four other carbon atoms • three dimensional structure • to break it lots of bonds would need to be broken • would need lot of energy/force Graphite: Uses and Properties • to make electrodes • a lubricant • sporting equipment • in pencils/drawing • graphite conducts electricity • soft Explanations • giant molecular/covalent • each carbon atom bonded to three other carbon atoms • each carbon atom has a free electron • delocalised electrons • (delocalised) electrons move to carry current • layers of carbon atoms • weak forces/bonds between layers/sheets • so layers/sheets can slide/rub off or over each other	**(6)**

Level	0	No rewardable content
1	1 - 2	• a limited description eg for either diamond ***or*** graphite states a correct Use ***or*** Property • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	3 - 4	• a simple description/explanation eg for ***both*** diamond ***and*** graphite states a correct Use ***or*** Property linked with at least **one relevant** explanation point **OR** for ***either*** diamond ***or*** graphite States a correct Use or Property linked to at least **two relevant** explanation points • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	5 - 6	• a detailed explanation eg for ***both*** diamond ***and*** graphite States a correct Use or Property linked to at least **three relevant** explanation points (in total) **OR** for ***either*** diamond ***or*** graphite States a correct Use or Property linked to at least **four relevant** explanation points (in total) • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

(**Q05 1SC0/2CH, June 2014**)

Q16.

Question number	Answer	Additional guidance	Mark
	An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (1 mark): • all magnesium atoms have 12 protons (1) • however Mg-24 has 12 neutrons, Mg-25 has 13 neutrons, Mg-26 has 14 neutrons (1)	Ignore references to atomic number and to mass number/relative atomic mass. Allow magnesium atoms contain same number of protons but different numbers of neutrons (1)	**(2)**

(**Q05c 1SC0/2CF, SAM 2016**)

Q17.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	A metal		**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	Any one of Li B C N O F Ne Ignore numbers with the symbols eg $^{7}_{3}Li$		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(i)	4 (protons) (1) 4 (electrons) (1) 5 (neutrons) (1)		**(3)**

Question Number	Answer	Acceptable answers	Mark
(b)(ii)	C -1		**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)	An explanation linking 5 electrons (1) (in the) {outer/last/final/end} {shell/energy level} (1)	 it has 5 {outer/valence} electrons fully correct diagram showing electronic configuration **and** electron(s) labelled the group (number) is the number of electrons in the outer shell orbit/ring for shell fully correct diagram showing electronic configuration without labelled electron **OR** 5 in the {outer/last} {shell / energy level} do not allow just '5 at the end' do not award the first mark if proton/neutron/atom (in the outer shell)	**(2)**

(Total for Question 2 = marks)

(**Q02 1SC0/1CF, June 2014**)

Q18.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	A metal		**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	Any one of Li B C N O F Ne Ignore numbers with the symbols eg $^{7}_{3}Li$		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(i)	4 (protons) (1) 4 (electrons) (1) 5 (neutrons) (1)		**(3)**

Question Number	Answer	Acceptable answers	Mark
(b)(ii)	C -1		**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)	An explanation linking 5 electrons (1) (in the) {outer/last/final/end} {shell/energy level} (1)	 it has 5 {outer/valence} electrons fully correct diagram showing electronic configuration **and** electron(s) labelled the group (number) is the number of electrons in the outer shell orbit/ring for shell fully correct diagram showing electronic configuration without labelled electron **OR** 5 in the {outer/last} {shell / energy level} do not allow just '5 at the end' do not award the first mark if proton/neutron/atom (in the outer shell)	**(2)**

(Total for Question 2 = marks)

(**Q02 1SC0/2CF, June 2014**)

Q19.

Question number	Answer	Additional guidance	Mark
	An explanation linking • electrons (1) • can move / are delocalised (1)	 MP2 depends on MP1 allow charged particles can move / are delocalised (1)	**2**

(**Q03e 1SC0/1CF, Nov 2020**)

Q20.

Question number	Answer	Additional guidance	Mark
	An explanation linking • (atoms) {of same element / with same number of protons} / all contain 19 protons / same atomic number (1) • different number of neutrons / different mass number / have 20, 21, 22 neutrons (1)	reject compound / molecule / ion / elements once allow same protons ignore electrons reject different protons allow different / extra / more / fewer neutrons ignore different mass / relative atomic mass reject different electrons	**(2)** **AO1-1**

(**QU06d 1SC0/2CF, June 2023**)

Q21.

Question number	Answer	Additional guidance	Mark
(i)	An explanation linking • (atoms) {of same element / with same number of protons} / all contain 19 protons / same atomic number (1) • different number of neutrons / different mass number / have 20, 21, 22 neutrons (1)	reject compound/ molecule/ ion / elements once allow same protons ignore electrons reject different protons allow different / extra / more / fewer neutrons ignore different mass / relative atomic mass reject different electrons	(2) AO1-1

Question number	Answer	Additional guidance	Mark
(ii)	39.1348/39.135/ 39.13/ 39.1 with or without working scores 2 93.25 x 39 + 40 x 0.02 + 6.73 x 41 = 3913.48 (1) $\frac{3913.48}{100}$ = 39.1348 (1) OR $\frac{39 \times 93.25}{100}$ and $\frac{0.02 \times 40}{100}$ and $\frac{6.73 \times 41}{100}$ (1) 36.3675 + 0.008 + 2.7593 = 39.1348 (1)	Final answer of 39 with no working scores 0. Final answer of 39 rounded from correct working scores 2. allow rounding of values in the 3 sums allow ecf for MP2 if transcription error(s) e.g 93.52 allow ecf for MP2 if formula is correct but error in calculation	(2) AO2-1

(**QU02d 1SC0/2CH, June 2023**)

Q22.

Question Number	Answer	Additional guidance	Mark
(i)	An explanation linking: • (atoms with) same (number of) protons (1) • (atoms with) different (number of) neutrons (1)	ignore any mention of electrons reject answers in terms of element**s** (plural) but allow element (singular) if no other mark: allow same atomic number **and** different mass number (1)	**(2)**

Question Number	Answer	Mark
(ii)	**A** 5 protons is the only correct answer **B** is not correct because there are 5 or 6 neutrons **C** is not correct because the atomic number is 5 **D** is not correct because there are 5 or 6 neutrons	**(1)**

(**Q05b 1SC0/1CF, June 2019**)

Q23.

Question number	Answer	Additional guidance	Mark
(i)	An explanation linking: • (atoms with) same (number of) protons (1) • (atoms with) different (number of) neutrons (1)	ignore any mention of electrons reject answers in terms of element**s** (plural) but allow element (singular) if no other mark: allow same atomic number **and** different mass number (1)	**(2)**

Question number	Answer	Mark
(ii)	**A** 5 protons is the only correct answer **B** is not correct because there are 5 or 6 neutrons **C** is not correct because the atomic number is 5 **D** is not correct because there are 5 or 6 neutrons	**(1)**

(**Q01b 1SC0/1CH, June 2019**)

Q24.

Question number	Answer	Additional guidance	Mark
(i)	**A 20 20 is the only correct answer** **B, C** and **D** are incorrect because calcium does not have 40 protons; calcium does not have 60 neutrons; calcium does not have 60 protons		**(1)**

Question number	Answer	Additional guidance	Mark
(ii)	an explanation linking • period 4 (1) • four shells of electrons (1)	 reject four outer shells	**(2)**

(**Q05a 1SC0/1CH, Nov 2020**)

Q25.

Question number	Answer	Additional guidance	Mark
(i)	An explanation linking • same number of electrons and protons (1) • so charges {cancel / balance one another} (1)	 allow same number of positive and negative charges	**2**

Question number	Answer	Additional guidance	Mark
(ii)	37 – 17 (1) (= 20) (neutrons)	allow 20 without working reject '– 20'	**1**

Question number	Answer	Additional guidance	Mark
(iii)	An explanation linking • atoms {of same element / with same number of protons} / same atomic number (1) • different number of neutrons / different mass number (1)	 ignore electrons reject neutrons reject protons /electrons	**2**

(**Q02b 1SC0/1CF, Nov 2020**)

Q26.

Question number	Answer	Additional guidance	Mark
	An explanation linking outer (electron) • shell (1) • (both have) {same number / 1} electron(s) (1)	allow both lose 1 electron (to form ion / to form noble gas configuration) reject same number of outer shells / same number of electrons MP2 depends on MP1	**(2)**

(**Q01b 1SC0/2CH, Nov 2020**)

Q27.

Question Number	Answer	Mark
(i)	<table><tr><th>isotope</th><th>mass number</th><th>number of protons</th><th>number of neutrons</th></tr><tr><td>magnesium-24</td><td>24</td><td>12</td><td>12</td></tr><tr><td>magnesium-25</td><td>25</td><td>**12**</td><td>**13**</td></tr><tr><td>magnesium-26</td><td>26</td><td>**12**</td><td>**14**</td></tr></table> all four numbers correct (2) any two numbers correct (1)	**(2)**

Question Number	Answer	Mark
(ii)	total mass of Mg-24 atoms = 78.60 x 24 = 1886.4 total mass of Mg-25 atoms = 10.11 x 25 = 252.75 total mass of Mg-26 atoms = 11.29 x 26 = 293.54 mass of 100 atoms = (78.60 x 24) + (10.11 x 25) + (11.29 x 26) (1) relative atomic mass = $\frac{(78.60 \times 24) + (10.11 \times 25) + (11.29 \times 26)}{100}$ (1) = 24.3 (2) allow (1) only for any other number of significant figures	(4)

(Q04d 1SC0/1CH, SAM)

Q28.

Question number	Answer	Mark
	B	**(1)**

(Q05a 1SC0/2CF, SAM 2016)

Q29.

Question number	Answer	Additional guidance	Mark
	protons – 15 (1) neutrons – 16 (1) electrons – 15 (1)	accept ONLY whole numbers if no marks scored then maximum 1 mark for number of electrons = number of protons OR p + n = 31	**(3)** **AO1-1**

(**QU01d 1SC0/2CF, June 2023**)

Q30.

Question number	Answer	Additional guidance	Mark
	Any two from (in modern model) • atoms are formed of sub-atomic particles (1) • atoms have a nucleus (1) • atoms contain protons (1) • atoms contain neutrons (1) • atoms contain (shells of) **electrons** (1) • atoms of same element can have different numbers of neutrons / isotopes exist (1)	allow (for Dalton's model) atoms are indivisible ignore statements that are simply the negative of those in the question reject each comparison with 'plum pudding model'	(2) AO1

(**Q01a 1SC0/1CH, Nov 2021**)

Q31.

Question number	Answer	Additional guidance	Mark
	Any two from (in modern model) • atoms are formed of sub-atomic particles (1) • atoms have a nucleus (1) • atoms contain protons (1) • atoms contain neutrons (1) • atoms contain (shells of) **electrons** (1) • atoms of same element can have different numbers of neutrons / isotopes exist (1)	allow (for Dalton's model) atoms are indivisible ignore statements that are simply the negative of those in the question reject each comparison with 'plum pudding model'	(2) AO1

(**Q05a 1SC0/1CF, Nov 2021**)

Q32.

	Answer	Acceptable answers	Mark
	Explanation linking • (both have) same number (of electrons) in outer shell(1) • 6 (electrons in outer shell) (consequent on first point) (1)	correct electronic configurations or diagrams alone max 1 'they both have 6 in the outer shell' scores both marks allow 'both need 2 (more) (electrons) to fill outer shell' for both marks	**(2)**

(**Q19 1SC0/1CF, June 2013**)

Q33.

	Answer	Acceptable answers	Mark
	Explanation linking • (both have) same number (of electrons) in outer shell(1) • 6 (electrons in outer shell) (consequent on first point) (1)	correct electronic configurations or diagrams alone max 1 'they both have 6 in the outer shell' scores both marks allow 'both need 2 (more) (electrons) to fill outer shell' for both marks	**(2)**

(**Q15 1SC0/2CF, June 2013**)

Q34.

Question Number	Answer	Additional guidance	Mark
(i)	35	reject 35.5	**(1)** AO 1 1

Question Number	Answer	Additional guidance	Mark
(ii)	2.8.7	allow any separator including gaps e.g. 2 8 7 send to review any diagrams	**(1)** AO 1 1

(**Q20 1SC0/2CF, June 2018**)

Q35.

Question Number	Answer	Additional guidance	Mark
(i)	35	reject 35.5	(1) AO 1 1

Question Number	Answer	Additional guidance	Mark
(ii)	2.8.7	allow any separator including gaps *e.g.* 2 8 7	(1) AO 1 1

(**Q04 1SC0/2CH, June 2018**)

Q36.

	Answer	Acceptable answers	Mark
	C smaller than the mass of a proton		**(1)**

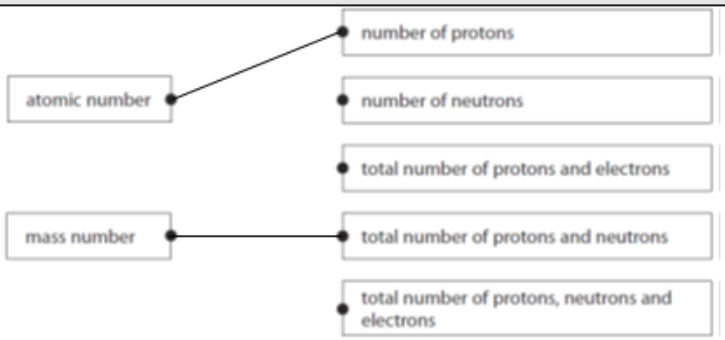
(**Q17 1SC0/1CF, June 2013**)

Q37.

	Answer	Acceptable answers	Mark
	C smaller than the mass of a proton		**(1)**

(**Q13 1SC0/2CF, June 2013**)

Q38.

Question number	Answer	Additional guidance	Mark
	 1 mark for each line	Each line 1 mark Do not award mark if more than one line joins the left-hand boxes with those on the right	**(2)**

(**Q01c 1SC0/2CF, June 2019**)

Q39.

	Answer	Acceptable answers	Mark
(a)(i)	C cations in a sea of electrons		**(1)**
(a)(ii)	(metals have) high melting <u>point</u>	a lot of energy needed to break/overcome (metallic) bonds energy needed to break/overcome strong (metallic) bonds Ignore references to boiling point Reject reference to intermolecular forces/covalent (bonds) /attraction between ions/breaking ionic bonds/ breaking covalent bonds	**(1)**
(a)(iii)	An explanation including two of the following points • argon is inert/does not react/is unreactive (1) • because it has 8 electrons in its outer shell (1)	Ignore argon is in group 0/8 argon is a noble gas Ignore argon does not burn does not {gain/lose/share} electrons has a full outer shell (of electrons) has a stable electron configuration	**(2)**

	• metals would react in/with air/oxygen (1) • argon will exclude air from welding point (1)	form (metal) oxide prevents oxidation	
(b)	$2\ Fe + 3\ Br_2 \rightarrow 2\ FeBr_3$ M1 Correct symbol/formulae (1) M2 balancing of correct symbol/formulae (1)	Reject incorrect use of upper/lower case / subscripts for M1 but allow ECF for M2	**(2)**
(c)	C – grey solid		**(1)**
(d)	A explanation including M1 order of reactivity chlorine > bromine > iodine (1) and M2 one of the following points • chlorine displaces bromine (from bromide) AND chlorine displaces iodine (from iodide) (1) • bromine displaces iodine (from iodide) AND bromine does not displace chlorine (from chloride) (1) • iodine does not displace chlorine(from chloride) AND iodine does not displace bromine (from bromide) (1)	For M1 reject reference to reactivity of halide ions eg chlorine more reactive than bromide halogens/they decrease in reactivity down the group/table chlorine is most reactive and iodine is least reactive Ignore reference to displacement of halide ions eg chlorine displaces bromide Ignore "replaces" chlorine reacts with bromide AND iodide chlorine takes part in two (displacement) reactions bromine reacts with iodide AND does not react with chloride bromine takes part in one (displacement) reactions iodine does not react with chloride or bromide iodine does not take part in any (displacement) reactions	**(2)**

(**Q11 1SC0/1CH, June 2013**)

Q40.

Question number	Answer	Mark
	particle A proton particle B neutron particle C electron all three correct 2 marks one or two correct 1 mark	(2)

(**Q04a 1SC0/1CF, SAM**)