PEARSON EDEXCEL GCSE COMBINED SCIENCE (HIGHER) · 1SC0

CHEMISTRY



MARK SCHEME

TOPIC 6: GROUPS IN THE PERIODIC TABLE: GROUP 7 (PAPER 2)

SCORE	PERCENTAGE
/129	%

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Mark Scheme

Q1.

Question Number	Answer	Acceptable answers	Mark
(a)	magnesium nitrate water carbon dioxide all three correct (2) magnesium nitrate + one other correct (1)	allow correct formulae	**(2)**

Question Number	Answer	Acceptable answers	Mark
(b)(i)	C – neutralisation		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(ii)	$ZnO + 2HCl \rightarrow ZnCl_2 + H_2O$ (3) LHS (1) RHS (1) balancing of correct formula (1)	correct multiples ignore state symbols	**(3)**

Question Number		Indicative Content	Mark
QWC	*** (c)**	A description including some of the following points experiment set up • hydrochloric acid in container • carbon rods in acid • attach rods to electrical supply • d.c. supply(or reference to positive and negative) • test tubes to collect gases test hydrogen • lighted splint • squeaky pop (with air)/burns test chlorine • (damp blue) litmus paper • (turns red then) bleaches/white	**(6)**
Level	**0**	No rewardable content	
1	**1 – 2**	• a limited description e.g. simple description/diagram of electrolysis set up OR description of test for one of the gases. • 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 e.g. a full description of electrolysis OR test for both gases OR simple description of electrolysis and the test for one of the gases. • 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 description e.g. description of electrolysis and test for both gases OR a full description of electrolysis and of one gas test. • The answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

(**Q10 1SC0/2CH, June 2014**)

Q2.

Question number	Answer	Additional guidance	Mark
	$2\ K(s) + Br_2(g) \rightarrow 2\ KBr(s)$ balancing (1) state symbol s (1)	allow multiples ignore 'two' ignore 'solid'	**(2)** **AO2-1**

(**QU02c 1SC0/2CH, June 2023**)

Q3.

Question number	Answer	Additional Guidance	Mark
	$2\ K(s) + Br_2(g) \rightarrow 2\ KBr(s)$ balancing (1) state symbol s (1)	allow multiples ignore 'two' ignore 'solid'	**(2) AO2-1**

(**QU06c 1SC0/2CF, June 2023**)

Q4.

Question number	Answer	Additional guidance	Mark
(i)	hydrogen + brom**ine** → hydrogen brom**ide** (2) hydrogen + brom**ine** → (1) → hydrogen brom**ide** (only) (1)	if balanced equation attempted, must have correct formulae and correct balancing: $H_2 + Br_2 \rightarrow 2\ HBr$ (2)	**(2) AO2 1**

Question number	Answer	Additional guidance	Mark
(ii)	neutralisation	allow exothermic / acid-base	**(1) AO1 1**

(**QU04b 1SC0/2CF, June 2024**)

Q5.

Question number	Answer	Mark
(i)	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material that is indicated as relevant. Additional content included in the response must be scientific and relevant. **method** • react each salt solution with each halogen solution (relevant 6 mixtures, or all 9) • no need to add halogen to its own sodium salt **reaction of sodium chloride with halogen solutions** • bromine and iodine do not react • because chlorine is the most reactive halogen **reaction of sodium bromide with halogen solutions** • iodine will not react • because iodine is less reactive than bromine • chlorine will react • because chlorine is more reactive than bromine • sodium bromide + chlorine will turn orange/yell • bromine is displaced • $Cl_2 + 2NaBr \rightarrow 2NaCl + Br_2$ / word equation **reaction of sodium iodide with halogen solutions** • chlorine and bromine solutions both react • because chlorine and bromine are more reactive than iodine • solutions turn brown/ yellow/ black-grey solid	(6) AO2 2 AO3 1
	• iodine is displaced • $Cl_2 + 2NaI \rightarrow 2NaCl + I_2$ / word equation • $Br_2 + 2NaI \rightarrow 2NaBr + I_2$ / word equation **order of reactivity** • chlorine > bromine > iodine / less reactive down group	

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	The explanation attempts to link and apply knowledge and understanding of scientific enquiry, techniques and procedures, flawed or simplistic connections made between elements in the context of the question. Lines of reasoning are unsupported or unclear. (AO2) Analyses the scientific information but understanding and connections are flawed. (AO3) An incomplete plan that provides limited synthesis of understanding. (AO3)
Level 2	3–4	The explanation is mostly supported through linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, some logical connections made between elements in the context of the question. Lines of reasoning mostly supported through the application of relevant evidence. (AO2) Analyses the scientific information and provides some logical connections between scientific enquiry, techniques and procedures. (AO3) A partially completed plan that synthesises mostly relevant understanding, but not entirely coherently. (AO3)
Level 3	5–6	The explanation is supported throughout by linkage and application of knowledge and understanding of scientific enquiry, techniques and procedures, logical connections made

		between elements in the context of the question. Lines of reasoning are supported by sustained application of relevant evidence. (AO2) Analyses the scientific information and provide logical connections between scientific enquiry, techniques and procedures throughout. (AO3) A well-developed plan that synthesises relevant understanding coherently. (AO3)

Level	Mark	Descriptor Discard all incorrect material (including additional observations) and reject contradictory material. Allow potassium salts instead of sodium salts. Ignore explanations of reactivity.
	0	No awardable content
Level 1	1-2 **Additional Guidance** describes at least one suitable experiment AND one result/ at least 2 halogens put in order	• add chlorine to sodium bromide and reaction occurs (2) • add chlorine to sodium bromide and orange colour seen (2) • add chlorine, bromine and iodine to each of the three solutions (1) • $Cl_2 + 2NaI \rightarrow 2NaCl + I_2$ (2) • bromine + sodium iodide = sodium bromide + iodine (2) • order of reactivity is chlorine > bromine > iodine (1) • table with the 9 combinations with no/ no correct results (1)

Level 2	3-4 **Additional Guidance** describes sufficient experiments that the order of reactivity can be determined **with results**	• mix every halogen with every salt. Chlorine with bromide goes orange, chlorine with iodide goes brown, bromine with iodide goes brown. (4) • table with the 9 combinations and correct ticks/ colours (4) • mix every halogen with every salt. Chlorine with bromide goes orange (3) • table with the 9 combinations and one correct tick/ colour (3)
Level 3	5-6 **Additional Guidance** describes sufficient experiments that the order of reactivity can be determined **with results** AND gives order of reactivity AND at least one equation showing displacement	• mix chlorine/bromide, chlorine/iodide, bromine/iodide. These three all react therefore chlorine> bromine> iodine. Cl_2 + 2NaI → 2NaCl + I_2 (6) • mix every halogen with every salt. Only reactions are: chlorine with bromide goes orange, chlorine with iodide goes brown, bromine with iodide goes brown. chlorine> bromine> iodine. chlorine + sodium bromide = sodium chloride + bromine (6) • mix every halogen with every salt. Chlorine with bromide goes orange, chlorine with iodide goes brown, bromine with iodide goes brown. chlorine> bromine> iodine. chlorine + sodium bromide = sodium chlorine + bromide (5)

Question number	Answer	Additional guidance	Mark
(ii)	an explanation linking • **halide** (ions) {lose electrons / are oxidised} (1) • halogen (atoms/ molecules) {gain electrons / are reduced} (1)	half-equations can score MP1 and/or MP2 ignore halogens lose electrons reject the {halogen in the salt/ halogen being displaced} is reduced/ gains electrons	(2) AO1 1

(**QU06d 1SC0/2CH, June 2024**)

Q6.

Question number	Answer	Mark
	2 Na + F_2 → **2** NaF (2) F_2 (1) 2 (1)	**(2)**

(**Q05c 1SC0/2CF/S2, SAM**)

Q7.

Question number	Answer	Mark
	2 Na + F_2 → **2** NaF (2) F_2 (1) 2 (1)	**(2)**

(**Q01c 1SC0/2CH/S2, SAM**)

Q8.

Question number	Answer	Additional guidance	Mark
	$\frac{1.19}{119}$ and $\frac{1.42}{35.5}$ (1) 0.01 : 0.04 (1) $SnCl_4$ (1)	allow ECF	**(3)** **AO2**

(**Q03b 1SC0/2CF, Nov 2021**)

Q9.

Question number	Answer	Mark
	B chlorine is the only correct answer. **A**, **C** and **D** are incorrect because only chlorine bleaches litmus.	**(1)** **AO1 1**

(**QU02b 1SC0/2CH, June 2022**)

Q10.

Question number	Answer	Additional guidance	Mark
	mass of potassium = 164 (g) **AND** mass of bromine = 336 (g) with or without working scores 3 potassium : $\frac{32.8}{100}$ x 500 (1) = 164 (g) (1) bromine : 500 – 164 = 336 g (1)	mass of potassium = 164 (g) **OR** mass of bromine = 336 (g) with or without working scores 2 If answers on answer line are the wrong way round with or without working, score 2 marks If 164 or 336 appear on the incorrect final answer line, score 1 ecf for correct evaluation of a percentage for bromine allow 100 – 32.8= 67.2 $\frac{67.2}{100}$ x 500 = 336	**(3)** **AO2 1**

(**QU04d 1SC0/2CF, June 2024**)

Q11.

Question number	Answer	Mark
(i)	(liquid changes from colourless to) yellow / orange/ brown / red	**(1)**

Question number	Answer	Mark
(ii)	$Cl_2 + 2I^- \rightarrow 2Cl^- + I_2$ LHS (1) RHS (1) balancing of correct species (1)	**(3)**

Question number	Answer	Mark
(iii)	An explanation that combines identification - understanding (1 mark) and reasoning/justification - understanding (1 mark): • when chlorine and iodine react, their atoms gain an electron (1) • electron attracted into chlorine atom more strongly than into an iodine atom (1) • because chlorine atom is smaller / outer electrons in chlorine atom closer to the nucleus / more shielding between nucleus of iodine atom and outer electrons (1)	(2)

Question number	Answer	Additional guidance	Mark
(iv)	An explanation that combines identification - understanding (1 mark) and reasoning/justification - understanding (1 mark): • iodide ion loses an electron (1) • oxidation is loss of electrons / iodine is oxidised (1) • chlorine atom gains an electron (1) • reduction is gain of electrons / chlorine is reduced (1)	if no reference made to gain or loss of electrons, allow (1) for redox reaction involves both oxidation and reduction	(4)

(**Q05b 1SC0/2CH/S2, SAM**)

Q12.

Question number	Answer	Additional guidance	Mark
	astatine (1) + potassium bromide (1)	Allow products in either order.	(2)

(**Q02c 1SC0/2CF, SAM 2016**)

Q13.

Question number	Answer	Additional guidance	Mark
	$2K\ (s) + F_2(g) \rightarrow 2KF\ (s)$ 2 K (1) 2 KF (1) s, s (1)	 ignore words	(3)

(**Q05d 1SC0/2CF, Nov 2020**)

Q14.

Question number	Answer	Additional guidance	Mark
	$2K\ (s) + F_2(g) \rightarrow 2KF\ (s)$ 2 K (1) 2 KF (1) s, s (1)	ignore words	(3)

(**Q01d 1SC0/2CH, Nov 2020**)

Q15.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	**2** Na **(1)** + Cl_2 → **2** NaCl (1) Ignore + in front of the 2s	maximum 1 mark if any balancing number is added in front of Cl_2 or if any of the formulae are changed eg 4Na + $2Cl_2$ → 4NaCl or Na + 1/2 Cl_2 → NaCl score (1) do not allow negative signs in front of balancing numbers	**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	2.5 / 4.0 (1) their fraction x 100 (1) (=62.5)	0.625 or 5/8 62.5/63 with {no/incorrect} working correct working with {no/wrong}	**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(iii)	A ionic		**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(iv)	23 + 35.5 (=58.5) Ignore g	58.5 with {no/incorrect} working 23 + 35.5 with {no/wrong} answer do not allow 58/59 without working	**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)	$\frac{24}{120}$ (1) their fraction x 100 (1) (=20%)	1/5 or 0.2 20 with {no/incorrect} working correct working with {no/wrong} answer	**(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(i)	CH_3	2 CH_3 / C_1H_3 / H_3C do not allow just 1:3	**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)(ii)	An explanation linking any **two** from weak {forces/attractions} (1) between {molecules/particles/them}/ intermolecular (1) little {heat/energy} needed {to separate the molecules/overcome force(s) between molecules} (1)	maximum **1** mark if breaking bonds between atoms/breaking down {molecules/ particles}/breaking covalent bonds specific weak forces eg Van der Waals/London weak bonds do not allow covalent bonds are weak /weak bonds between atoms ignore weak hydrogen bonds weak bonds between {molecules / particles} do not allow intramolecular 'little energy is needed to break the bonds' only if it is clear that {covalent/single} bonds are not being broken	**(2)**

(Total for Question = 11 marks)

(**Q04 1SC0/2CF, June 2014**)

Q16.

Question number	Answer	Additional guidance	Mark
(i)	a description including: • (boiling point) increases (1) • as atomic number increases / down the group (1)	MP2 dependent on MP1. allow ORA allow 'goes up', 'gets higher' etc for increases allow temperature increases ignore hotter/ warmer down the group allow 'down the halogens' allow 'from fluorine to iodine' allow 'down the periodic table' ignore down the table alone 'positive correlation between bpt and atomic number' scores 2	AO3 1 (2)

Question number	Answer	Mark
(ii)	allow any number greater than 59	AO3 2 (1)

(**QU01c 1SC0/2CF, June 2025**)

Q17.

Question number	Answer	Additional guidance	Mark
	A description to include (damp) litmus / indicator paper bleaches / goes white (1)	 allow dip litmus into solution reject bleaches then goes red MP2 dependent on MP1	(2)

(**Q06a 1SC0/2CH, June 2019**)

Q18.

Question Number	Answer	Acceptable answers	Mark
(i)	An explanation including • decomposing / breaking down of (compounds) (1) • using electrical energy / electricity /direct current /d.c. supply (1)	 allow 'splitting up' ignore 'separate' reject breaking down of elements	**(2)**

Question Number	Answer	Acceptable answers	Mark
(ii)	A description including • (damp blue) litmus • turns (red then) white / bleached	use of any suitable indicator (1) with correct result (1) eg universal indicator paper is bleached (2)	**(2)**

Question Number	Answer	Acceptable answers	Mark
(iii)	An explanation including any two of • (chlorine) could escape/leak (1) • (chlorine is) toxic / corrosive / poisonous (1) • an effect on people eg death / injury / damage lungs /damage eye	 Ignore 'chlorine is dangerous' Allow harmful to people	**(2)**

Question Number	Answer	Acceptable answers	Mark
(iv)	Any one of • (to make) plastics / PVC / bleach • to purify / sterilise water	 Ignore '(cleans) swimming pools'	**(1)**

(**Q20 1SC0/2CF, June 2015**)

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Q19.

	Answer	Acceptable answers	Mark
	an explanation linking the following • decomposition (of compound/substance /electrolyte)(1) • using (direct) current (1)	 splitting up/breaking down/breaking up ignore separating reject splitting of atoms/elements/molecules for M1 using {electrical energy /electricity} reject alternating current/ac	(2)
	• (damp blue) litmus (paper) (1) • (turns red then) {bleaches / goes white} (1)	 allow bleaches indicator for 1 mark ignore indicator goes lighter ignore smells of chlorine/swimming pools ignore any incorrect middle colour mentioned use of suitable named indicator with correct result e.g. (damp) universal indicator paper (1) (turns red then) bleaches (1) starch-iodide paper(1) turns blue-black(1)	(2)
	poly(chloroethene)	PVC/polyvinylchloride/ polychloroethene/poly(chlorethene)	(1)

(**Q25 1SC0/2CH, June 2013**)

Q20.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	D the transition metals		**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	D malleable		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(i)	non-flammable		**(1)**

Question Number	Answer	Acceptable answers	Mark
(b)(ii)	has a low density		**(1)**

Question Number	Answer	Acceptable answers	Mark
(c)(i)	A description including (yellow-) green (1) gas (1)	 any shade of green do not allow just 'yellow' do not allow green in combination with other colours eg blue-green	 **(2)**

Question Number	Answer	Acceptable answers	Mark
(c)(ii)	hydrogen + chlorine → hydrogen chloride lhs (1) rhs (1) Ignore formulae in addition to all of the names	if formulae are used, do not allow h or CL or superscripts H_2 + Cl_2 on lhs 2HCl on rhs reactants in either order do not allow a mixture of words and formulae for both marks eg H_2 + Cl_2 → hydrogen chloride scores 1 mark for rhs do not allow hydrochloric acid /hydrochloride/hydrogen chlorine	 **(2)**

(Total for Question = 8 marks)

(**Q01 1SC0/2CF, June 2014**)

Q21.

Question Number	Answer	Additional guidance	Mark
	$2Al + 3Cl_2 \rightarrow 2AlCl_3$ (3) LHS (1) RHS (1) balancing of correct formulae (1)	penalise the use of 'CL' or 'AL' once only ignore state symbols allow multiples ignore use of capital L for MP3	**(3)** AO 2 1

(**Q18 1SC0/2CH, June 2018**)

Q22.

Question number	Answer	Additional guidance	Mark
	Any temperature > 184 (°C).	Ignore units.	**(1)**

(**Q02b 1SC0/2CF, SAM 2016**)

Q23.

Question number	Indicative content	Mark
*	Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. **AO1 (6 marks)** • order of reactivity: chlorine > bromine > iodine The order of reactivity supported by suitable experiments from: • add (aqueous) chlorine to a solution of potassium bromide • the solution turns orange/yellow • bromine is produced / $Cl_2 + 2KBr \rightarrow Br_2 + 2KCl$ / $Cl_2 + 2Br^- \rightarrow Br_2 + 2Cl^-$ • (so) chlorine is more reactive than/displaces bromine /oxidises bromide ions • add (aqueous) bromine to a solution of potassium iodide • the solution turns yellow/red/ brown • iodine is produced / $Br_2 + 2KI \rightarrow I_2 + 2KBr$ / $Br_2 + 2I^- \rightarrow I_2 + 2Br^-$ • (so) bromine is more reactive than/displaces iodine/ oxidises iodide ions • add (aqueous) chlorine to a solution of potassium iodide • the solution turns yellow/red/ brown • iodine is produced / $Cl_2 + 2KI \rightarrow I_2 + 2KCl$ / $Cl_2 + 2I^- \rightarrow I_2 + 2Cl^-$ • (so) chlorine is more reactive than/displaces iodine/oxidises iodide ions Allow use of suggested reactions which do not produce a displacement reaction, e.g. add (aqueous) bromine to a solution of a potassium chloride with suitable conclusion/explanation	**(6)**

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1–2	• Demonstrates elements of chemical understanding, some of which is inaccurate. Understanding of scientific ideas, enquiry, techniques and procedures lacks detail. (AO1) • Presents an explanation with some structure and coherence. (AO1)
Level 2	3–4	• Demonstrates chemical understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas, enquiry, techniques and procedures is not fully detailed and/or developed. (AO1) • Presents an explanation that has a structure, which is mostly clear, coherent and logical. (AO1)
Level 3	5–6	• Demonstrates accurate and relevant chemical understanding throughout. Understanding of the scientific ideas, enquiry, techniques and procedures is detailed and fully developed. (AO1) • Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)

(**Q05b 1SC0/2CH, SAM 2016**)

Q24.

Question number	Answer	Additional guidance	Mark
	an explanation linking 4 of the following • {chlorine / bromine} are more reactive than iodine / iodine is the least reactive (1) • (in the reaction of chlorine with potassium iodide) chlorine displaces iodine / iodine formed / iodide ions oxidised (1) • (in the reaction of bromine with potassium iodide) bromine displaces iodine / iodine formed / iodide ions oxidised (1) • brown colour of final mixture is due to iodine (1) • iodine with KI has no reaction / iodine cannot displace iodine from its compound (1)	ignore iodide in MP1 In MP2 and MP3: allow 'iodide displaced' mark(s) could be scored in word or symbol equations (symbol equations do not have to be balanced and allow I for I_2) allow iodine cannot displace itself	**(4)**

(**Q06d 1SC0/2CH, June 2019**)

Q25.

Question number	Answer	Mark
	An explanation that combines identification – application of knowledge (1 mark) and reasoning/justification – application of understanding (1 mark): • bromine atoms are reduced (1) • because electrons are gained to form bromide ions (1)	**(2)**

(**Q05cii 1SC0/2CH, SAM 2016**)

Q26.

Question number	Answer	Additional guidance	Mark
	an explanation linking • the solution forms ions (1) • (so) (ions) can move (1)	mention of covalent = 0 score 0 if answer suggests non-conductor reject delocalised electrons (because) (solutions containing ions) **conduct** electricity (1) mp2 depends on mp1	**(2)** **AO1-1**

(**QU06c 1SC0/2CH, June 2025**)

Q27.

Question number	Answer	Additional guidance	Mark
	An explanation linking • outer {shell / electron(s)} is further from nucleus in iodine/ORA (1) • {force / attraction} between nucleus and (electrons in) outer shell is less in iodine/ORA(1) • iodine does not gain (an) electron(s) as readily/ORA (1)	accept reverse argument throughout allow iodine has more shells / larger atomic radius / ORA reject 'more outer shells' chlorine has {fewer (electron) shells / smaller atomic radius} allow shielding arguments for either MP1 OR MP2 for either iodine or chlorine allow outer electrons / incoming electron if no other mark scored (group 7 elements) gain one electron (when they react) (1)	**(3)** **AO1 1**

(**QU04b 1SC0/2CH, June 2022**)

Q28.

Question number	Answer	Additional guidance	Mark
	An explanation linking fluorine has fewer electron shells (1) (so) electron more easily attracted to nucleus (1)	 allow less shielding (1) ignore fewer electrons ignore fewer outer electron shells	**(2)** **AO1**

(**Q03c 1SC0/2CF, Nov 2021**)

Q29.

Question number	*Answer*	Additional guidance	Mark
	chlorine is more reactive than bromine / chlorine can displace bromine	ignore "chlorine is more reactive" alone	**(1)**

(**Q03c 1SC0/2CF, Nov 2020**)

Q30.

Question number	Answer	Mark
(i)	any value between 51 (°C) and 70 (°C)	(1)

Question number	Answer	Mark
(ii)	iodine and astatine	(1)

(**Q05f 1SC0/2CF, Nov 2020**)

Q31.

Question number	Answer	Additional guidance	Mark
(i)	iodine	reject iodide; ignore formulae	(1)

Question number	Answer	Additional guidance	Mark
(ii)	An explanation to include: • bromine **(1)** • because electrons are gained **(1)**	Mark independently allow any number of electrons	**(2)**

(**Q03b 1SC0/2CH, Nov 2020**)

Q32.

Question number	Answer	Mark
(i)	bromine	(1) AO2-2

Question number	Answer	Additional guidance	Mark
(ii)	Cl_2 + 2 KBr → 2 KCl + Br_2 (3) reactant formulae: Cl_2 + KBr → (1) product formulae: → KCl + Br_2 (1) balancing correct formulae (1)	allow correct balanced ionic equation (3) allow ClK ignore correct charges on KCl & KBr ignore state symbols even if incorrect	(3) AO2-1

(**QU06d 1SC0/2CH, June 2025**)

Q33.

Question Number	Answer	Acceptable answers	Mark
(a)	Fe Cl 2.8/56 3.55/35.5 (1) 0.05 0.1 or 1 2 (1) $FeCl_2$ (1)	Cl_2Fe $FeCl_2$ with no working (3) Consequential errors: if "upside down" ie 56 / 2.8 and 35.5 / 3.55 ratio 20 : 10 or 2 : 1 (1) empirical formula Fe_2Cl (1) allow 3 marks for 2.8 / 56 and 3.55 / 71 ratio 0.05: 0.05 or 1 : 1 empirical formula $FeCl_2$ allow 2 marks for 2.8 / 56 and 3.55 / 71 ratio 0.05: 0.05 or 1 : 1 empirical formula FeCl allow 2 marks for Fe Cl 2.8/56 3.55/35.5 (1) 0.5 0.1 (0) Fe_5Cl (1) - ECF	**(3)**

Question Number	Answer	Acceptable answers	Mark
(b)	**EITHER** 2x23 (1) g Na makes 2x58.5 (1) g NaCl 9.2 g Na makes $\frac{(2\times58.5)\times9.2}{46}$ g NaCl (1) (= 23.4 g) **OR** 23 g Na makes 58.5 (1) g NaCl 9.2 g Na makes $\frac{(58.5)\times9.2(1)}{23(1)}$ g NaCl (1) (= 23.4 g) mark consequentially eg 46 (1) g Na makes (2x23+35.5) (0) g NaCl 9.2 g Na makes $\frac{(2\times23+35.5)\times9.2}{46}$ (1) g NaCl (= 16.3 g)	23.4 g with no working (3) 23.4 g from any method (3) do not accept 23(.0) mol Na used = 9.2/23 (1) (= 0.4) mol NaCl = 0.4 (1) mass NaCl = 0.4 x 58.5 (1) (= 23.4 g) Ignore units throughout unless incorrect mark consequentially awarding 2 marks for 46.8 g,11.7 g and 16.3 g (see last example opposite).	**(3)**

Question Number		Indicative Content	Mark
	* **(c)**	A description, comparison and explanation including some of the following points Order of reactivity: chlorine > bromine > iodine Experiment • add (aqueous) chlorine to a solution of potassium bromide • the solution turns orange/yellow • bromine is produced Conclusion/Explanation and equation: (so) chlorine is more reactive than / displaces bromine $Cl_2 + 2KBr \rightarrow Br_2 + 2KCl$ / $Cl_2 + 2Br^- \rightarrow Br_2 + 2Cl^-$ Experiment • add (aqueous) bromine to a solution of potassium iodide • the solution turns brown • iodine is produced Conclusion/Explanation and equation: (so) bromine is more reactive than / displaces iodine $Br_2 + 2KI \rightarrow I_2 + 2KBr$ / $Br_2 + 2I^- \rightarrow I_2 + 2Br^-$	

		Experiment • add (aqueous) bromine to a solution of potassium iodide • the solution turns brown • iodine is produced Conclusion/Explanation and equation: (so) bromine is more reactive than / displaces iodine $Br_2 + 2KI \rightarrow I_2 + 2KBr$ / $Br_2 + 2I^- \rightarrow I_2 + 2Br^-$ Experiment • add (aqueous) chlorine to a solution of potassium iodide • the solution turns brown • iodine is produced Conclusion/Explanation and equation: (so) chlorine is more reactive than / displaces iodine $Cl_2 + 2KI \rightarrow I_2 + 2KCl$ / $Cl_2 + 2I^- \rightarrow I_2 + 2Cl^-$ ▪ Allow use of organic solvents to identify halogens ▪ Allow use of suggested reactions which do not produce a displacement reaction eg add (aqueous) bromine to a solution of a potassium chloride with suitable conclusion/explanation ▪ Allow use of table of suggested experiments	**(6)**

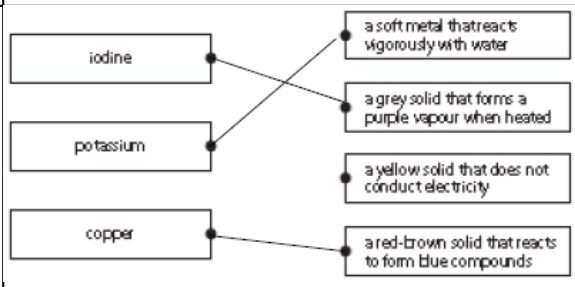
Level	0	No rewardable content
1	1 - 2	• a limited description of at least one experiment in which any halogen solution is added to any halide solution (not of the same halogen) **OR** describes order of reactivity as Cl > Br > I • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy
2	3 - 4	• a simple description of at least two displacement experiments AND • EITHER at least one correct explanation/conclusion OR • at least one correct observation of a displacement reaction that works/balanced equation. • 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 description of at least two displacement experiments **AND** • (a total of) at least two correct explanations/conclusions **AND** • at least one correct observation of a displacement reaction that works/ balanced equation • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors

(**Q06 1SC0/2CH, June 2014**)

Q34.

	Answer	Acceptable answers	Mark
(a)	B elements		**(1)**
(b)	D alkali metals		**(1)**
(c)(i) 1	any value in range 1.45 to 2.99	any answer which, to 1 sf, is in the range	**(1)**
(c)(i) 2	Kr	Reject KR, kr	**(1)**
(c)(i) 3	no reaction	'nothing'	**(1)**
(c)(ii)	An explanation linking any two of: • argon is {inert / unreactive} (1) • argon does not react with	ignore noble gas doesn't react with anything argon does not corrode the metal ignore references to electrical conductivity	**(2)**

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	{metal/filament}/{metal/ filament} would react with air or oxygen / ORA (1) • atom has {eight electrons in outer shell / full (outer) shell} (1)		
(d)	 all 3 correct – 2 marks any two correct – 1 mark one correct – 0 marks	if two answer lines from one element, then ignore	**(2)**

(**Q01 1SC0/2CF, June 2013**)

Q35.

Question Number	Answer	Acceptable answers	Mark
	A description linking any two of use fume cupboard (1) do not inhale/breathe in vapour (1) (use) gloves (1) do not spill on the skin (1)	 keep room well ventilated use gas mask ignore face mask/respirator goggles/safety glasses/safety spectacles /do not splash in the eyes Ignore wear protective clothing/equipment Ignore cover mouth Ignore do not spill it/drink it/eat it/swallow it/spill on surfaces/wash off spills Ignore burns skin	**(2)**

(**Q02 1SC0/2CF, June 2015**)

Q36.

Question Number	Answer	Acceptable answers	Mark
	colour / physical state **(yellow-)green (1)** / gas **red-brown (1)** / liquid grey / **solid (1)**	chlorine: any shade of green eg light/pale do not allow any colour in combination with green except yellow do not allow yellow on its own bromine: accept brown or red alone OR any shade of red or brown eg light/dark brown reject orange/combinations with orange reject yellow/combinations with yellow	**(3)**

(**Q01 1SC0/2CF, June 2015**)

Q37.

Question Number	Answer	Acceptable answers	Mark
	magnesium + bromine → magnesium bromide LHS (1) RHS (1)	allow reactants in either order allow = instead of arrow if formulae are used, do not allow MG or BR or superscripts $Mg + Br_2$ $MgBr_2$ Ignore formulae if both names and formulae given for any substance do not allow a mixture of words and formulae for both marks eg magnesium + bromine → $MgBr_2$ scores 1 mark	**(2)**

Q38.

	Answer	**Acceptable answers**	**Mark**
(a)(i)	an explanation linking the following • decomposition (of compound/substance /electrolyte)(1) • using (direct) current (1)	splitting up/breaking down/breaking up ignore separating reject splitting of atoms/elements/molecules for M1 using {electrical energy /electricity} reject alternating current/ac	(2)
(a)(ii)	• (damp blue) litmus (paper) (1) • (turns red then) {bleaches / goes white} (1)	allow bleaches indicator for 1 mark ignore indicator goes lighter ignore smells of chlorine/swimming pools ignore any incorrect middle colour mentioned use of suitable named indicator with correct result e.g. (damp) universal indicator paper (1) (turns red then) bleaches (1) starch-iodide paper(1) turns blue-black(1)	(2)
(a) (iii)	poly(chloroethene)	PVC/polyvinylchloride/ polychloroethene/poly(chlorethene)	(1)
(b)(i)	D AgCl(s)		(1)
(b)(ii)	same/no change		(1)
(b)(iii)	$HCl + AgNO_3 \rightarrow AgCl + HNO_3$ • reactant formulae (1) • product formulae (1)	$Ag^+ + Cl^- \rightarrow AgCl$ max 1 if any incorrect attempt to balance reject incorrect use of cases and non-subscripts	(2)

(**Q21 1SC0/2CH, June 2013**)

Q39.

Question number	Answer	Mark
(i)	**A** yellow-green is the only correct answer **B** is not correct because this is the colour of bromine **C** is not correct because this the colour of iodine vapour **D** is not correct because this the (assumed) colour of astatine	**AO1 1 (1)**

Question number	Answer	Additional guidance	Mark
(ii)	red (1) white (1)	mark independently allow 1 mark for white then red	**AO1 1 (2)**

(**QU01b 1SC0/2CF, June 2025**)

Q40.

Question number	Answer	Mark
	C yellow-green red-brown is the only correct answer **A** gives the colours for iodine vapour and chlorine gas **B** gives the colours for solid iodine and iodine vapour **D** gives the colours for bromine liquid and iodine vapour	**(1)**

(**Q02b 1SC0/2CF, June 2019**)