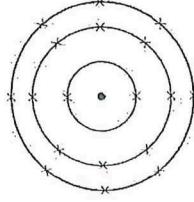


**WJEC Chemistry 1
Dual Award – Higher Tier
1.2 Mark Scheme**

Question	Marking details	Marks Available					
		AO1	AO2	AO3	Total		
8/2	(a)	(i)	E	1		1	
	(ii)	D		1		1	
	(iii)	C and E (1) both needed same number of protons (atomic number) but different number of neutrons (mass number) (1)		1		2	
	(b)	(i)		1		1	
							
		(ii)	full outer shell (of electrons) accept both have 8 electrons in their outer shell	1		1	
			Question 8/2 total	3	3	0	6
					0	0	0

Question	Marking details			Marks Available		
	AO1	AO2	AO3	Total	Maths	Prac
5 (a) (i)	A <chem>FeCl3</chem> B NaCl C Br ₂	(1) (1) (1)		3	3	
	award (1) for correct names of all three substances					
(ii)	<u>fume cupboard</u> – because <u>chlorine / bromine / halogen</u> fumes are <u>toxic</u>		1	1		1
	three parts needed					
	neutral: reference to goggles or general laboratory safety or fumes in general					
(iii)	no reaction / no change / no observable change (1) iodine is less reactive than bromine (1) and is therefore unable to <u>displace</u> the bromide / bromine (from the solution/sodium bromide) (1)		1	3		3
	neutral: iodine less reactive than chlorine gains no credit		2			

Question	Marking details	Marks Available					
		AO1	AO2	AO3	Total	Maths	Prac
(b)	ClO_2 (3) if formula incorrect award credit for correct steps $C\text{l} = \frac{0.71}{35.5} / 0.02$ and $O = \frac{0.64}{16} / 0.04$ (1) conversion of 0.02 and 0.04 to a 1:2 ratio (1) ecf possible award (1) max if A_r divided by mass leading to Cl_2O	3		3	3	3	
(c)	(i) $\text{Ag}^+(\text{aq}) + \text{Br}^-(\text{aq}) \rightarrow \text{AgBr}(\text{s})$ correct formulae for both ions and product (1) state symbols for both ions and product (1) state symbols only credited if ions and product correct $2\text{AgNO}_3 + \text{CaI}_2 \rightarrow 2\text{AgI} + \text{Ca}(\text{NO}_3)_2$ correct reactants (1) correct products (1) balancing (1) balancing mark can only be awarded if both the reactants and products are correct	1	1	2			
	Question 5 total	4	11	0	15	4	4

Question	Marking details					Marks Available	
	AO1	AO2	AO3	Total	Maths	Prac	
7	<p>Indicative content</p> <p>Description</p> <ul style="list-style-type: none"> the metals get more reactive / react more violently as you go down the group lithium fizzes and moves slowly on water surface sodium fizzes, moves quickly on surface, forms a ball and melts potassium fizzes, moves quickly on surface, forms a ball, melts and ignites burning with a lilac flame <p>Explanation</p> <ul style="list-style-type: none"> the metals all have one electron in their outer electron shell they lose this outer electron when they react as you go down the group, the outer electron gets further away from the nucleus, meaning it is easier to lose the more easily the outer electron is lost, the more reactive the metal is 						
				6	6	3	
	Question 7 total	6	0	0	6	0	3

Question	Marking details			Marks available			
	AO1	AO2	AO3	Total	Maths	Prac	
8/2 (a) (i)	increase down the group / decrease up the group			1	1	1	
	(ii)	liquid (1)		2	2	2	
		award (1) for either of following					
		• 400°C is higher than its melting point but lower than its boiling point					
		• 400°C is between its melting point and boiling point					
	(iii)	either of following					
		• it has metal and non-metal properties			1	1	
		• it has a high boiling point/is a semi conductor (metal properties) but it has a low melting point/has a low density (non-metal properties)					
(b) (i)	173			1	1	1	
	(ii)	45.7 / 46 (2)		2	2	2	
		if incorrect award (1) for $\frac{79}{173}$					
		ecf possible from part (i)					
		Question 8/2 total	0	6	1	7	4 0

Higher Tier only questions

Question	Marking details			Marks available		
	AO1	AO2	AO3	Total	Maths	Prac
3 (a) (i)	A, D and E – all three needed they have equal numbers of protons and electrons	(1)		2	2	
(ii)	B and F – both needed for (1) B has a +/+1/1+ charge and F has a +2/2+ – both needed for (1)			2	2	
	award (2) for B ⁺ and F ²⁺					
(b)	any of following for (1) <ul style="list-style-type: none">• atoms having the same number of protons but different number of neutrons• same atomic number but different mass number• atoms of the same element having different number of neutrons / different mass number award (1) for comparison of ¹² C and ¹⁴ C e.g. <ul style="list-style-type: none">• ¹²C has 6 protons and 6 neutrons and ¹⁴C has 6 protons and 8 neutrons• ¹⁴C has two more neutrons than ¹²C	2		2	2	
	Question 3 total	2	4	0	6	0
		0	0	0	0	0

Question	Marks available					
	AO1	AO2	AO3	Total	Maths	Prac
6						
Indicative content						
<ul style="list-style-type: none"> reactivity increases down Group 1 Group 1 elements lose the one electron in their outer shell when they react (to form +1 ions) it becomes easier to lose the electron on going down the group because it is further away from the nucleus and the attractive power of the nucleus becomes less effective reactivity decreases down Group 7 Group 7 elements gain one electron when they react (to form -1 ions) it becomes more difficult to gain an electron on going down the group because the attractive power of the nucleus becomes less effective 						
5-6 marks						
Good explanation of why the ease/difficulty of losing/gaining an electron changes down the groups <i>There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured. The candidate uses appropriate scientific terminology and accurate spelling, punctuation and grammar.</i>						
3-4 marks						
Correct description of both trends and explanation of one in terms of ease/difficulty of losing/gaining an electron <i>There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure. The candidate uses mainly appropriate scientific terminology and some accurate spelling, punctuation and grammar.</i>						
1-2 marks						
Correct description of at least one of the trends <i>There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure. The candidate uses limited scientific terminology and inaccuracies in spelling, punctuation and grammar.</i>						
0 marks						
No attempt made or no response worthy of credit.						
Question 6 total	6	0	0	6	0	2

Common questions

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
8/1 (a)	2,8,7 (1) phosphorus (1) 4 (1)			3	3		
(b) (i)	award (1) for any of following • lilac flame • moves • floats • melts / forms ball • bubbles of gas / effervescence			1	1	1	
(ii)	award (1) for any of following • use a safety screen • add only a small piece of potassium • use excess water • use tongs to hold potassium		1		1	1	
(iii)	KOH		1		1	1	
(iv)	11/12/13/14 accept any value 8-14		1		1	1	
(v)	award (1) for any of following • rubidium • caesium • francium	1		1			
	Question 8/1 total	3	5	0	8	0	3

Higher Tier only questions

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
3 (a)	A – barium bromide (1) B – lithium chloride (1) C – sodium iodide (1) <p>accept correct formulae if not all correct award (2) for any four correct ions award (1) for any two correct ions</p>			3	3		3
(b)	$MgCl_2 + 2AgNO_3 \rightarrow 2AgCl + Mg(NO_3)_2$ award (1) for correct formulae of products award (1) for balancing only if correct formulae given		2		2		
(c)	$M_r(AgNO_3) = 170$ (1) $\frac{0.103}{170}$ (1) 6.06×10^{-4} mol (1) award (2) for 0.000606 mol ecf from incorrect M_r value			3	3	3	
Question 3 total		0	5	3	8	3	3

Question		Marking details	Marks available					
			AO1	AO2	AO3	Total	Maths	Prac
7	(a) (i)	chlorine is more reactive than iodine (1) accept chlorine can gain an electron more easily than iodine award (1) for any of following <ul style="list-style-type: none">• chlorine displaces iodide ion• chlorine takes electron from iodide ion• chlorine oxidises iodide ion	2	2	2	2		
	(ii)	$\text{Cl}_2 + 2\text{KI} \rightarrow 2\text{KCl} + \text{I}_2$ award (1) for correct formulae for reactants and products award (1) for balancing only if correct formulae given		2	2	2		
	(b)	112 g of iron reacts with 213 g of chlorine (1) 1.32 g of iron reacts with $\frac{213}{112} \times 1.32$ g of chlorine (1) 2.51 g (1) ecf possible for incorrect relative mass values i.e. 112 or 213 alternative method moles Fe = $\frac{1.32}{56} = 0.0236$ mol (1) moles Cl ₂ = $\frac{3}{2} \times 0.0236 = 0.0353$ mol (1) mass Cl ₂ = $0.0353 \times 71 = 2.51$ g (1) ecf possible for incorrect mole ratio		3	3	3		

Question	Marking details			Marks available			
		AO1	AO2	AO3	Total	Maths	Prac
(c) (i)	$\text{Cl}_2 + 3\text{Br}_2 \rightarrow 2\text{Cl}\text{Br}_3$		1		1		
(ii)	77.46 / 77.5 / 77		1		1	1	
Question 7 total	2	7	0	9	4	2	

Common questions

Question	Marking details	Marks available			
		AO1	AO2	AO3	Total
8/1 (a) (i)	award (1) for any of following to prevent it from reacting with air / oxygen / water (vapour) (in the air) because it reacts with air / oxygen / water (vapour) (in the air) to prevent oxidation / tarnishing	1		1	1
	(ii)	it gets duller / tarnishes / loses its shine / turns white / turns grey neutral answers – changes colour / changes appearance	1	1	1
	(iii)	Na ₂ O	1	1	1
(b) (i)	chlorine is toxic / poisonous	1	1	1	1
	(ii)	2Na + Cl ₂ → 2NaCl award (2) for correct equation if incorrect award (1) for correct formula of product	2	2	2
	(c) (i)	-25 °C <input type="checkbox"/> 25 °C <input type="checkbox"/> 100 °C <input type="checkbox"/> 150 °C <input checked="" type="checkbox"/>		1	1
	(ii)	award (1) for any of following astatine will react <u>very</u> slowly / more slowly than iodine astatine will not react with hot iron astatine is less reactive than iodine / the least reactive neutral answers – quite slow / takes a long time to react reactivity decreases down the group (1)		2	2
	Question 8/1 total	3	3	3	9
				1	3

Higher Tier only questions

Question		Marking details	Marks available													
			AO1	AO2	AO3	Total	Maths									
3 (a)	F (1) it has six electrons in the outer shell and has three (electron) shells (1)		2			2										
(b)	A and E (1) both have a full outer shell (of electrons) (1)			2		2										
(c)	<table border="1"> <thead> <tr> <th>Isotope</th> <th>Atomic number</th> <th>Mass number</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>17</td> <td>35</td> </tr> <tr> <td>2</td> <td>17</td> <td>37</td> </tr> </tbody> </table> <p>award (1) for each correct row if neither row is correct award (1) for any two correct numbers</p>	Isotope	Atomic number	Mass number	1	17	35	2	17	37			2	2	1	
Isotope	Atomic number	Mass number														
1	17	35														
2	17	37														
		Question 3 total	0	6	0	6	1									
							0									

Question	Marking details	Marks available					
		AO1	AO2	AO3	Total	Maths	Prac
7 (a)	Si (1) award (1) for answer that identifies one property as metallic and another as non-metallic e.g. it has a high melting point but is brittle neutral answers it is a semiconductor it has metal and non-metal properties				2	2	
(b)	The density of metals and non-metals increases The boiling point of metals increases but the boiling point of non-metals shows no trend The density of metals shows no trend but the density of non-metals decreases The boiling point of metals and non-metals shows no trend The density of metals increases but the density of non-metals shows no trend The boiling point of metals shows no trend but the boiling point of non-metals decreases The density of metals decreases but the density of non-metals shows no trend	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	2	

Question		Marking details	Marks available				
			AO1	AO2	AO3	Total	Maths
	(c)	there is no trend in the melting points of the non-metals / the elements preceding chlorine accept description e.g. there is a decrease in melting point from Si to P, then an increase from P to S and then another decrease from S to Cl neutral answer – melting point is unpredictable				1	1
	(d) (i)	liquid (1) award (1) for any of following only if first mark is awarded <ul style="list-style-type: none"> • 60 °C is <u>between</u> its melting point and boiling point • melting point is below 60 °C and boiling point is above 60 °C • 60 °C is <u>between</u> 44 °C and 281 °C • phosphorus has already melted at 60 °C but has not reached its boiling point neutral answer – its melting point is 44 °C and its boiling point is 281 °C			2	2	
	(ii)	$\boxed{3} \text{ Zn} + \boxed{2} \text{ H}_3\text{PO}_4 \longrightarrow \text{Zn}_3(\text{PO}_4)_2 + \boxed{3} \text{ H}_2$			1	1	1
		Question 7 total	0	3	5	8	1 0

Question		Marking details	Marks available					
			AO1	AO2	AO3	Total	Maths	Prac
8	(a) (i)	(metals in Group 1) get more reactive (down the group) (1) award (1) for any of following due to a decrease in attraction between the nucleus and the outer shell electron easier to remove outer electron because there are more shells easier to remove outer electron because it is further from the nucleus	2			2		1
	(ii)	Group 1 metals are more reactive than Group 2 metals (1) award (1) for either of following • because Group 1 metals only need to lose 1 electron (from the outer shell) whereas Group 2 metals need to lose 2 electrons • because it is easier to lose 1 electron than 2 electrons				2		2
	(b)	257.6 / 258 (3) if answer incorrect credit each correct step in one of two possible methods (ecf possible throughout)					3	3
		method 1 $n(H_2) = \frac{11.2}{2} = 5.6$ (1) $n(Na) = 5.6 \times 2 = 11.2$ (1) mass Na = $11.2 \times 23 = 257.6$ (1)					3	3
		method 2 1 mol H ₂ produced by 2 mol Na / 2 g H ₂ produced by 46 g Na (1) 1 g H ₂ produced by 23 g Na (1) 11.2 g H ₂ produced by $23 \times 11.2 = 257.6$ g Na (1)						

Question	Marking details				Marks available		
		AO1	AO2	AO3	Total	Maths	Prac
(c)	$\text{Ca} + 2\text{H}_2\text{O} \rightarrow \text{Ca}(\text{OH})_2 + \text{H}_2$ award (2) for correct equation award (1) if $\text{Ca}(\text{OH})_2$ formula is correct		2		2		1
	Question 8 total	4	5	0	9	3	2

COMMON QUESTIONS

Question	Marking details				Marks available	
	AO1	AO2	AO3	Total	Maths	Prac
7/1 (a)	A and B (1)	both needed both contain two shells (of electrons) (1)		1	1	2
(b)	D (1)	has a full outer shell (of electrons) (1) accept all shells full neutral answers has 8 electrons in outer shell has full shell		2	2	
(c)		award (1) for either of following <ul style="list-style-type: none"> • number of electrons (in the shells) is equal to the number of protons (in the nucleus) • E has 11 electrons so it also has 11 protons award (1) for either of following <ul style="list-style-type: none"> • number of protons is equal to the atomic number • because it has 11 protons its atomic number is 11 number of electrons, number of protons and atomic number must all be linked to gain both marks	2	2		

Question	Marking details					Marks available	
	AO1	AO2	AO3	Total	Maths	Prac	
(d)	$4 \text{K} + \text{O}_2 \rightarrow 2 \text{K}_2\text{O}$ award (1) for K_2O award (1) for balancing only if formula correct		2	2			
	Question 7/1 total	3	5	0	8	0	0

Question	Marks available					
	AO1	AO2	AO3	Total	Maths	Prac
8	(a)	(i)	sodium bromide / NaBr (1) iodine / I ₂ (1)	2	2	2
		(ii)	bromine is more reactive than iodine / elements get less reactive down Group 7 (1) so bromine displaces iodine / takes electrons from iodide / oxidises iodide (1)	2	2	2
	(b)		2Fe + 3Br ₂ → 2FeBr ₃ award (1) for correct product award (1) for balancing only if all formulae are correct	2	2	1
	(c)	(i)	yellow precipitate	1	1	1
		(ii)	Ag ⁺ + I ⁻ → AgI award (1) for reactants award (1) for product	2	2	
			Question 8 total	3	6	0
				9	1	5