

Paper 3 C1F Foundation

Question number	Answer	Mark
1(a)(i)	liquid solid gas <ul style="list-style-type: none"> All three correct (2) One/two correct (1) 	(2)

Question number	Answer	Mark
1(a)(ii)	<ul style="list-style-type: none"> Bunsen burner (1) test tube (1) 	(2)

Question number	Answer	Additional guidance	Mark
1(b)	evaporation	do not accept 'boiling'	(1)

Question number	Answer	Mark
1(c)(i)	An answer that provides a description by making reference to two of the following points: <ul style="list-style-type: none"> molecules become closer (1) molecules lose energy (1) molecules slow down (1) 	(2)

Question number	Answer	Mark
1(c)(ii)	B	(1)

Question number	Answer	Mark
2(a)	B	(1)

Question number	Answer	Mark
2(b)(i)	iron (1) carbon dioxide/carbon monoxide (1)	(2)

Question number	Answer	Mark
2(b)(ii)	D	(1)

Question number	Answer	Mark
2(c)	All the original atoms have simply been rearranged in the products.	(1)

Question number	Answer	Mark
2(d)	Heating with carbon is used as it is cheaper than using electrolysis.	(1)

Question number	Answer	Mark
2(e)	<ul style="list-style-type: none"> Tin costs {much/about 10 times more} than aluminium (1) Amount of tin in Earth much smaller than the amount of aluminium (1) 	(2)

Question number	Answer	Mark
3(a)(i)	<ul style="list-style-type: none"> connect {lamp/ammeter} in series (1) 	(1)

Question number	Answer	Mark
3(a)(ii)	<ul style="list-style-type: none"> a substance that conducts electricity (1) when molten or in aqueous solution (1) 	(2)

Question number	Answer	Mark
3(a)(iii)	B	(1)

Question number	Answer	Additional guidance	Mark
3(b)	<ul style="list-style-type: none"> Copper is deposited on the cathode, therefore mass deposited = $1.57 - 1.28$ (1) = 0.29 (g) (1) 	Award full marks for correct numerical answer without working.	(2)

Question number	Answer	Mark
3(c)	<ul style="list-style-type: none"> iodine at the anode (1) potassium at the cathode (1) 	(2)

Question number	Answer	Mark
3(d)	<ul style="list-style-type: none"> 84 g sodium fluoride → 46 g of sodium (1) so 168 g sodium fluoride → 92 g of sodium (1) or $168 \div 42 = 4$ (mol NaF) (1) $4 \times 23 = 92$ (g) (1) 	(2)

Question number	Answer	Additional guidance	Mark
4(a)(i)	<ul style="list-style-type: none"> Axes with linear scale that use more than half of each edge of the grid (1) All points correctly plotted to \pm half a square (1) Single straight line passing through all points except result 5 (1) 	5 points plotted correctly (i.e. one error) allow ecf from plotting error	(3)

Question number	Answer	Mark
4(a)(ii)	Any one reason from: <ul style="list-style-type: none"> not all magnesium reacted incomplete reaction some magnesium oxide lost 	(1)

Question number	Answer	Mark
4(b)	$2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}/\text{Mg} + \frac{1}{2} \text{O}_2 \rightarrow \text{MgO}$	(1)

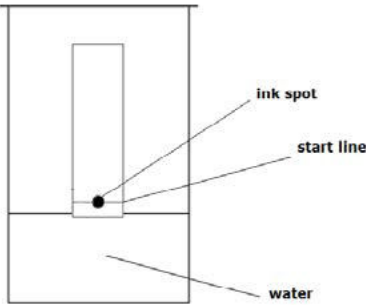
Question number	Answer	Additional guidance	Mark
4(c)	$40 + 2 \times (14 + 16 \times 3)$ (1) = 164 (1)	Award full marks for correct numerical answer without working.	(2)

Question number	Answer	Mark
4(d)	<ul style="list-style-type: none"> divide mass by relative atomic mass <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> $\frac{0.207}{207} = 0.001$ </div> <div style="text-align: center;"> $\frac{0.032}{16} = 0.002$ </div> </div> divide by the smaller <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> $\frac{0.001}{0.001} = 1$ </div> <div style="text-align: center;"> $\frac{0.002}{0.001} = 2$ (1) </div> </div> empirical formula PbO_2 which is different to that of compound R (1)	(3)

Question number	Answer	Mark
5(a)	D	(1)

Question number	Answer	Mark				
5(b)	One mark for each correct row.					
	substance to separate		method of separation			
			crystallisation	filtration	simple distillation	fractional distillation
	sand from a mixture of sand and sodium chloride solution			✓		
	copper sulfate crystals from copper sulfate solution		✓			
useful liquids from crude oil				✓		
		(3)				

Question number	Answer	Mark
5(c)(i)	Pencil is insoluble in the solvent (but chromatography would separate the ink in an ink line)	(1)

Question number	Answer	Mark
5(c)(ii)	<p>Correct position of chromatography paper with start line and ink spot above surface of water</p> 	(1)

Question number	Answer	Additional guidance	Mark
5(c)(iii)	<ul style="list-style-type: none"> • $R_f = 14.5 / 15.3 = 0.9477$ (1) • = 0.95 answer to 2 significant figures (1) 	Award full marks for correct numerical answer without working.	(2)

Question number	Answer	Mark
5(d)(i)	B	(1)

Question number	Answer	Mark
5(d)(ii)	use a different solvent.	(1)

Question number	Answer	Mark
5(d)(iii)	<p>An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark):</p> <ul style="list-style-type: none"> • mixture S (1) • because it gives the greatest number of spots/gives four spots (1) 	(2)

Question number	Answer	Additional guidance	Mark
6(a)	<p>An explanation that combines identification via a judgement (1 mark) to reach a conclusion via justification/reasoning (1 mark):</p> <ul style="list-style-type: none"> • a negative ion must have more electrons than protons in the particle (1) • therefore Z will have a 2- charge (1) 	Do not allow any comparison involving neutrons.	(2)

Question number	Answer	Mark
6(b)	<ul style="list-style-type: none"> • Li ion with empty outer shell (1) • 1+ charge on Li (1) • 8 electrons on outer shell of F (1) • 1- charge on F (1) 	(4)

Question number	Indicative content
*6(c)	<p>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.</p> <p>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.</p> <p style="text-align: center;">AO2 (6 marks)</p> <ul style="list-style-type: none"> • solid calcium chloride contains ions/cations/anions which are charged particles • solid calcium chloride does not conduct because charged particles are not free to move because they are held together by strong electrostatic forces/ionic bonds in lattice • molten calcium chloride solution conducts because ions/cations/anions are present which are charged particles and are free to move • the ions have separated and move to electrode of opposite charge • diamond does not conduct because it is giant molecular covalent with no free electrons • outer electrons of carbon atoms used in bonding • zinc metallic structure consists of delocalised free electrons which can move between layers of metals atoms/cations

Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	<ul style="list-style-type: none"> • The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. (AO2) • Lines of reasoning are unsupported or unclear. (AO2)
Level 2	3-4	<ul style="list-style-type: none"> • The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. (AO2) • Lines of reasoning mostly supported through the application of relevant evidence. (AO2)
Level 3	5-6	<ul style="list-style-type: none"> • The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of the question. (AO4) • Lines of reasoning are supported by sustained application of relevant evidence. (AO2)