

SECTION B

Question		Answer	Marks	AO element	Guidance	
16	(a)	s-block AND highest energy or outer electron is in a s orbital or s sub-shell ✓	1	1.1	ALLOW 'outer' or 'valence' for 'highest energy' IGNORE electron configurations DO NOT ALLOW s shell / energy level	
	(b)	FIRST CHECK THE ANSWER ON ANSWER LINE If answer = 25.982 award 2 marks $\frac{78.99 \times 23.985 + 10.00 \times 24.986 + 11.01 \times m}{100} = 24.305 \checkmark$ Relative isotopic mass = 25.982 (must be 5 SF) ✓	2	2.2 x2	ALLOW any correct rearrangement of this sum for first mark eg 11.01 x m = 2430.5 – 1894.575 – 249.86 ALLOW ecf for transcription errors in first sum but answer must be 5 sf	
	(c)	(i)	CaO + H ₂ O → Ca(OH) ₂ ✓	1	2.8	ALLOW multiples IGNORE state symbols ALLOW CaO + 2H ₂ O → Ca(OH) ₂ + H ₂ O AND CaO + H ₂ O → Ca ²⁺ + 2OH ⁻
		(ii)	both pH values > 7 AND ≤ 14 AND pH with SrO > pH with CaO ✓	1	1.2	ALLOW ranges within these values but ranges must not overlap

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16	(d)	(i)		4	1.2 × 4	<p>Mark each marking point independently</p> <p>Correct species AND state symbols required for each mark</p> <p>For e⁻, ALLOW e</p> <p>For e⁻ only, IGNORE any state symbols added</p>
16		(ii)	<p>FIRST CHECK THE ANSWER ON ANSWER LINE</p> <p>If answer = $-2277 \text{ (kJ mol}^{-1}\text{)}$ award 2 marks</p>	2	2.2 × 2	<p>IF there is an alternative answer, check to see if there is any ECF credit possible using</p>

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			$-363 - (2 \times +89 + 249 + 2 \times 419 - 141 + 790) \checkmark$ $-363 - 1914$ $= -2277 \checkmark \text{ (kJ mol}^{-1}\text{)}$			<p>working below</p> <p>See list below for marking of answers from common errors</p> <p>ALLOW for 1 mark ONE mistake with sign OR use of 2 ×: +2277 (wrong sign) -601 (2 × -419 instead of 2 × +419) -697 (-790 instead of +790) -1551 (+363 instead of -363) -1858 (2 × +419 not used for K) -1921 (2 × -89 instead of 2 × +89) -2152.5 or -2153 (+249 ÷ 2) -2188 (2 × +89 not used for K) -2280 (rounded to 3SF) -2559 (+141 instead of -141)</p> <p>For other answers, check for a single transcription error or calculator error which could merit 1 mark</p>
16	(e)	(i)	For sodium atomic radius smaller	2	1.1 ×2	ALLOW 'Na/sodium is smaller' IGNORE smaller radius / fewer shells / less

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			<p>OR fewer shells ✓</p> <p>nuclear attraction increases OR (outer) electron(s) experience more attraction ✓</p>			<p>shielding if applied to ions but DO NOT ALLOW responses which refer to ions losing electrons DO NOT ALLOW molecules</p> <p>ALLOW energy levels for shells IGNORE fewer orbitals OR fewer sub-shells</p> <p>ALLOW less (electron) shielding OR electron repulsion between shells IGNORE just 'shielding'</p> <p>ALLOW more/stronger/bigger nuclear attraction etc</p> <p>IGNORE 'pull' for attraction IGNORE electrons more tightly held IGNORE 'nuclear charge' for 'nuclear attraction' IGNORE more energy (in question)</p> <p>ALLOW reverse argument for potassium throughout</p>
16	(ii)	Comparison of size of cations For sodium ions		2	1.2 x2	comparison of IONS is essential

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			ionic radius of sodium / Na^+ is smaller ✓ Comparison of attraction of cation and anion Na^+ has stronger attraction to O^{2-} ✓			ALLOW Na^+ has a larger charge density IGNORE 'Na has smaller atomic radius' but DO NOT ALLOW contradictory sentences eg 'Na ⁺ ions have smaller atomic radius' IGNORE pull for attraction ALLOW 'sodium ion' and 'oxygen ion' IGNORE just 'oxygen' or just 'O' for oxygen ion ALLOW stronger attraction between oppositely charged ions
			Total	15		