<table>
<tr><th>Question Number</th><th>Acceptable Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>8(a)(i)</td><td>• any 2 correct (1)
• all 3 correct (2)</td><td><u>Example of table</u>
<table><tr><th>1st IE</th><th>2nd IE</th><th>3rd IE</th></tr><tr><td>(590)</td><td>(1145)</td><td>(4912)</td></tr><tr><td>4s</td><td>4s</td><td>3p</td></tr></table>
Accept $3p_x$ / $3p_y$ / $3p_z$ for 3rd IE

Ignore any superscript numbers by 4s and 3p

Allow (1) for just ‘s, s, p’ or ‘s, s, p’ with one or more incorrect numbers in front</td><td>(2)</td></tr>
</table>

<table>
<tr><th>Question Number</th><th>Acceptable Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr><td>8(a)(ii)</td><td>• correct equation</td><td><u>Examples of equations</u>
$Ca^{2+}(g) \rightarrow Ca^{3+}(g) + e^{(-)}$
or
$Ca^{2+}(g) - e^{(-)} \rightarrow Ca^{3+}(g)$

Correct state symbols are required

Ignore any state symbol for the electron</td><td>(1)</td></tr>
</table>

Question Number	Acceptable Answer	Additional Guidance	Mark
8(a)(iii)	An explanation that makes reference to the following points: • (there is a much larger difference between the 2nd and 3rd ionisation energies because the) 3rd electron is lost from a shell / energy level / sub-shell / (3p) orbital closer to the nucleus **or** the 3rd electron is lost from a shell / energy level / sub-shell / (3p) orbital of lower energy **(1)** • (there is a smaller difference between the 1st and 2nd ionisation energies because the) 1st and 2nd electrons removed from the same shell / energy level / sub-level / orbital **or** the first two electrons experience similar shielding (from the inner electrons) **or** there is only a small change in electron-electron repulsion as the first two electrons are removed **(1)**	Ignore electron is lost from a full (sub-)shell / a full (sub-)shell is more stable Ignore just '3rd electron lost is more strongly attracted to the nucleus' Allow the same amount of shielding Allow the 3rd electron (to be lost) experiences less shielding (from inner electrons)	**(2)**

Question Number	Answer	Mark
8(b)	**The only correct answer is B** ***A*** *is incorrect because (−1031) + (79 + 520 + 159) is incorrect* ***C*** *is incorrect because (−1031) + (79 + 520) is incorrect* ***D*** *is incorrect because (−1031) + 79 +520 +159 − 616 is incorrect*	**(1)**

Question Number	Acceptable Answers	Additional Guidance	Mark
8(c)*	This question assesses a student's ability to show a coherent and logically structured answer with linkages and fully-sustained reasoning. Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning. The following table shows how the marks should be awarded for indicative content. <table><tr><th>Number of indicative marking points seen in answer</th><th>Number of marks awarded for indicative marking points</th></tr><tr><td>6</td><td>4</td></tr><tr><td>5-4</td><td>3</td></tr><tr><td>3-2</td><td>2</td></tr><tr><td>1</td><td>1</td></tr><tr><td>0</td><td>0</td></tr></table> The following table shows how the marks should be awarded for structure and lines of reasoning.	Guidance on how the mark scheme should be applied: The mark for indicative content should be added to the mark for lines of reasoning. For example, an answer with five indicative marking points that is partially structured with some linkages and lines of reasoning scores 4 marks (3 marks for indicative content and 1 mark for partial structure and some linkages and lines of reasoning). If there are no linkages between points, the same five indicative marking points would yield an overall score of 3 marks (3 marks for indicative content and no marks for linkages). In general it would be expected that 5 or 6 indicative points would get 2 reasoning marks, and 3 or 4 indicative points would get 1 mark for reasoning, and 0, 1 or 2 indicative points would score zero marks for reasoning.	**(6)**

	Number of marks awarded for structure of answer and sustained line of reasoning
Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout.	2
Answer is partially structured with some linkages and lines of reasoning.	1
Answer has no linkages between points and is unstructured.	0

Comment:
Look for the indicative marking points first, then consider the mark for structure of answer and sustained line of reasoning

General points to note
If there is any incorrect chemistry, deduct mark(s) from the reasoning. If no reasoning mark(s) awarded do not deduct mark(s).
e.g.
penalise any reference to 'molecule' once only
or
penalise 'ion' not mentioned in word or formula at least once in answer, once only

Allow reverse arguments for IP3 to IP6 Ignore mention of stoichiometry Ignore references to electronegativity

	Indicative content		
	• **IP1 - Ionic** lithium chloride / LiCl (has very similar theoretical and experimental lattice energy values so) is (almost 100%) ionic	Allow **very** small amount of / no covalent character in LiCl Allow assumption that ions act as point charges / are spherical is true for LiCl	
	• **IP2 - Covalency** magnesium iodide / MgI_2 (has different theoretical and experimental lattice energy values so) has (some) covalent character	Allow MgI_2 more covalent character than LiCl	
	• **IP3 - Charge on cations** magnesium is Mg^{2+} and lithium is Li^{+}	Allow magnesium has 2+ charge and lithium has 1+ charge / magnesium ion has a larger charge than a lithium ion Allow charge density for charge	
	• **IP4 - Polarising** – what does the polarising magnesium ion/Mg^{2+} is (more) polarising / has a large(r) polarising power (than lithium ion)		
	• **IP5 - Size of anion** iodide ion / I^- is larger (than chloride ion / Cl^-)	Allow iodine ion / I^- is a large atom / has a large atomic radius Ignore size of cation Do not award iodide has a larger charge density	
	• **IP6 – Polarisable** – what is polarised iodide ion / I^- is (more easily) polarised / distorted	Allow this shown in a diagram Ignore just 'greater attraction to cation'	

(Total for Question 8 = 12 marks)