InkChemistry

QUESTION WORKBOOK

Lattice enthalpy and Born–Haber cycles

Thermodynamics · Unit C08

AQA 3.1.8.1 · OCR A 5.2.1

17 questions · 53 marks

NAVY SCREEN EDITION

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SECTION A · Short, 1 to 2 marks

A1 LE-Q1
State what is meant by the term lattice enthalpy of formation. [2]

A2 LE-Q3
Give equations, with state symbols, for the enthalpy of atomisation of chlorine and for the second ionisation energy of calcium. [2]

A3 LE-Q22
Give equations, with state symbols, for the thermal decomposition of calcium nitrate and of potassium nitrate. [2]

SECTION B · Standard, 3 to 5 marks

B1 LE-Q4
Explain why the second ionisation energy of magnesium is larger than its first, and why the second electron affinity of oxygen is endothermic although its first electron affinity is exothermic. [4]

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B2 LE-Q12

Explain why the difference between the experimental and the theoretical lattice enthalpies of the silver halides increases from silver fluoride to silver iodide. [4]

B3 LE-Q15

Compare the lattice enthalpies of formation of potassium chloride, -718 kJ mol^{-1}, and calcium oxide, -3454 kJ mol^{-1}, and account for the difference. [4]

B4 LE-Q16

Evaluate this statement: 'The experimental lattice enthalpy of silver chloride is 72 kJ mol^{-1} more exothermic than the theoretical value, so the Born–Haber cycle for silver chloride must contain an experimental error.' [4]

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B5 LE-Q20

Explain why magnesium carbonate decomposes on heating at a lower temperature than barium carbonate. [4]

B6 LE-Q2

State what is meant by the first electron affinity of an element, and write an equation, with state symbols, for the first electron affinity of oxygen. [3]

B7 LE-Q11

Describe the perfect ionic model used to calculate a theoretical lattice enthalpy. [3]

B8 LE-Q13

Suggest why the experimental and theoretical lattice enthalpies of caesium fluoride agree to within 1%. [3]

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B9 LE-Q14 Suggest why magnesium forms $MgCl_2$ with chlorine rather than MgCl, even though forming Mg^{2+} needs the second ionisation energy of magnesium, +1451 kJ mol^{-1}. [3]

B10 LE-Q17 Explain why the lattice enthalpy of an ionic compound cannot be measured directly, and how a Born–Haber cycle is used to find it. [3]

B11 LE-Q18 Explain why the first electron affinity of bromine, −325 kJ mol^{-1}, is less exothermic than that of chlorine, −349 kJ mol^{-1}. [3]

B12 LE-Q19 Suggest why the first electron affinity of fluorine, −328 kJ mol^{-1}, is less exothermic than that of chlorine, −349 kJ mol^{-1}, although a fluorine atom is smaller. [3]

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B13 LE-Q21

Suggest why lithium carbonate decomposes when heated with a Bunsen burner but sodium carbonate does not. [3]

B14 LE-Q23

Justify the inclusion of two enthalpies of atomisation of chlorine, and of both the first and the second ionisation energies of magnesium, in the Born–Haber cycle for magnesium chloride, $MgCl_2$. [3]

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