15.1 Energy Cycles

Question Paper

Course	DP IB Chemistry
Section	15. Energetics/Thermochemistry (HL only)
Topic	15.1 Energy Cycles
Difficulty	Hard

Time allowed: 10

Score: /5

Percentage: /100

Question 1

Which of the following correctly explains the trend in enthalpy of hydration of the metal ions down Group 1?

A. The lone pair of the oxygen atom becomes more available for bonding

B. The attraction between the ion and the delta negative oxygen atoms in the water decreases down the group

C. The attraction between the ion and the hydrogen ions in water decreases down the group

D. The attraction between the ion and the delta positive hydrogen atoms in water decreases down the group

[1 mark]

Question 2

Which ionic compound has the most endothermic lattice enthalpy?

A. $SrCl_2$

B. CaO

C. SrO

D. $CaCl_2$

[1 mark]

Question 3

Which expression represents the first electron affinity of iodine?

Name of enthalpy change	Enthalpy change / kJ mol^{-1}
Enthalpy of atomisation of calcium	+178
1st ionisation energy of calcium	+590
2nd ionisation energy of calcium	+1145
Enthalpy of atomisation of iodine	+107
Lattice energy of calcium iodide	-2074
Enthalpy of formation of calcium iodide	-534

A. -534 - 178 - 590 - 1145 - (2 x 107) - (-2074)

B. -534 - 178 - 590 - 1145 - 107 - (-2074)

C. $\frac{-534 - 178 - 590 - 1145 - (2 \times 107) - (-2074)}{2}$

D. $\frac{+534 - 178 - 590 - 1145 - (2 \times 107) + 2074}{2}$

[1 mark]

Question 4

Which equation represents the correct working to determine the lattice enthalpy of magnesium chloride, $\Delta H^{\theta}_{latt}(MgCl_2)$?

Enthalpy change	Representation
$\Delta H^{\theta}_{sol}(MgCl_2)$	x
$\Delta H^{\theta}_{hyd}(Mg^{2+})$	y
$\Delta H^{\theta}_{hyd}(Cl^{-})$	z

A. $x - (y + z)$

B. $x + (y + z)$

C. $x + (y + 2z)$

D. $x - (y + 2z)$

[1 mark]

Question 5

Which row of the table correctly represents the equations for the lattice enthalpy of substance W_2X and the ionisation energy of atom W?

	Lattice enthalpy	Ionisation energy
A.	$2W(s) + X_2(g) \rightarrow W_2X$	$W(g) \rightarrow W^{+}(g) + e^{-}$
B.	$W_2X(s) \rightarrow 2W^{+}(g) + X^{2-}(g)$	$W(g) \rightarrow W^{2+}(g) + 2e^{-}$
C.	$W_2X(s) \rightarrow 2W^{+}(g) + X^{2-}(g)$	$W(g) \rightarrow W^{+}(g) + e^{-}$
D.	$W_2X(s) \rightarrow 2W(g) + X(g)$	$W(g) \rightarrow W^{2+}(g) + 2e^{-}$

[1 mark]