Practice Question Set For A-Level
Subject : Chemistry
Paper-1 Topic: Physical 1_Thermodynamics

Merit Minds
www.merit-minds.com
Exam Preparation and Free Resources

Name of the Student:_____
Max. Marks : 16 Marks **Time : 16 Minutes**

Q1.

This question is about metal chlorides.

(a) **Table 1** shows some enthalpy change data.

Table 1

	Enthalpy change / kJ mol^{-1}
$Ca^{2+}(g) \rightarrow Ca^{2+}(aq)$	–1650
$Cl^{-}(g) \rightarrow Cl^{-}(aq)$	–364
$Ca^{2+}(g) + 2\ Cl^{-}(g) \rightarrow CaCl_2(s)$	–2237

Use the data in **Table 1** to calculate the molar enthalpy change when calcium chloride dissolves in water.

Molar enthalpy change _____ kJ mol^{-1}

(2)

(b) Use your answer to part (a) to deduce how the temperature changes when calcium chloride dissolves in water.

_____

_____

(1)

(c) Explain why the enthalpy of hydration of fluoride ions is more negative than the enthalpy of hydration of chloride ions.

_____

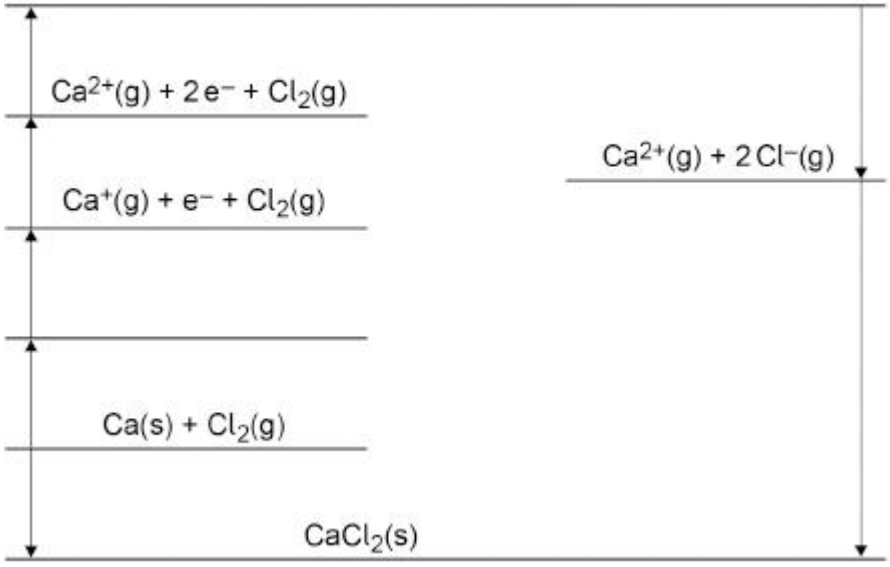
_____

_____

Downloaded from www.merit-minds.com

(2)

(d) The figure below shows an incomplete Born–Haber cycle for calcium chloride.



Complete the Born–Haber cycle by writing the formulas of the missing species on each of the two blank lines.

(2)

(e) **Table 2** shows some enthalpy change data.

Table 2

	Enthalpy change / kJ mol^{-1}
Enthalpy of atomisation of calcium	+193
First ionisation energy of calcium	+590
Enthalpy of atomisation of chlorine	+121
Electron affinity of chlorine	–364
Enthalpy of formation of calcium chloride	–795
Enthalpy of lattice formation of calcium chloride	–2237

Use the figure in (d) and data from **Table 2** to calculate the second ionisation energy of calcium.

Second ionisation energy _____ kJ mol^{-1}

(2)

(f) Explain why the second ionisation energy of calcium is greater than the first ionisation energy of

Downloaded from www.merit-minds.com

calcium.

_____

_____

(1)

(g) **Table 3** shows lattice enthalpies based on a perfect ionic model and lattice enthalpies from Born–Haber cycles for three metal chlorides.

Table 3

	Lattice enthalpy of dissociation / kJ mol^{-1}	
	Perfect ionic model	**Born–Haber cycle**
Calcium chloride	2223	2237
Potassium chloride	690	701
Silver chloride	770	905

Discuss the values in **Table 3**.

In your answer you should

- compare the three values based on a perfect ionic model
- compare the values based on a perfect ionic model to the values from a Born–Haber cycle for each compound.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(Total 16 marks)

Downloaded from www.merit-minds.com