

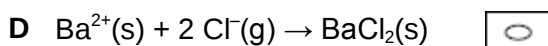
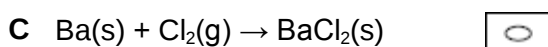
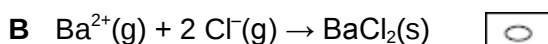
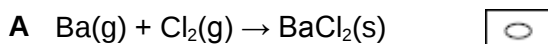
Name of the Student: _____

Max. Marks : 19 Marks

Time : 19 Minutes

Q1.

Which reaction has a standard enthalpy change equal to the standard enthalpy of formation for barium chloride?



(Total 1 mark)

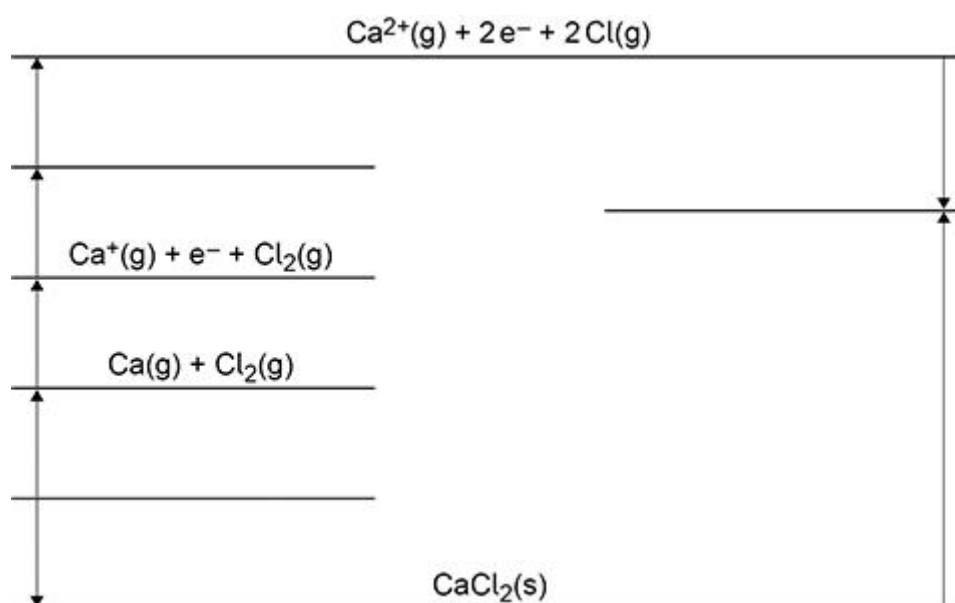
Q2.

This question is about enthalpy changes for calcium chloride and magnesium chloride.

(a) State the meaning of the term enthalpy change.

(1)

The figure below shows an incomplete Born–Haber cycle for the formation of calcium chloride.



(b) Complete the figure above by writing the formulas, including state symbols, of the appropriate

species on each of the three blank lines.

(3)

- (c) **Table 1** shows some enthalpy data.

Table 1

	Enthalpy change / kJ mol^{-1}
Enthalpy of formation of calcium chloride	-795
Enthalpy of atomisation of calcium	+193
First ionisation energy of calcium	+590
Second ionisation energy of calcium	+1150
Enthalpy of atomisation of chlorine	+121
Electron affinity of chlorine	-364

Use the figure in part (a) and the data in **Table 1** to calculate a value for the enthalpy of lattice dissociation of calcium chloride.

Enthalpy of lattice dissociation _____ kJ mol^{-1}

(2)

- (d) Magnesium chloride dissolves in water.

Give an equation, including state symbols, to represent the process that occurs when the enthalpy of solution of magnesium chloride is measured.

(1)

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

Table 2

Enthalpy change / kJ

	mol^{-1}
Enthalpy of lattice dissociation of MgCl_2	+2493
Enthalpy of hydration of $\text{Mg}^{2+}(\text{g})$	−1920
Enthalpy of hydration of $\text{Cl}^{-}(\text{g})$	−364

Use your answer to part (d) and the data in **Table 2** to calculate a value for the enthalpy of solution of magnesium chloride.

Enthalpy of solution _____ kJ mol^{-1}

(2)

- (f) The enthalpy of hydration of $\text{Ca}^{2+}(\text{g})$ is $-1650 \text{ kJ mol}^{-1}$

Suggest why this value is less exothermic than that of $\text{Mg}^{2+}(\text{g})$

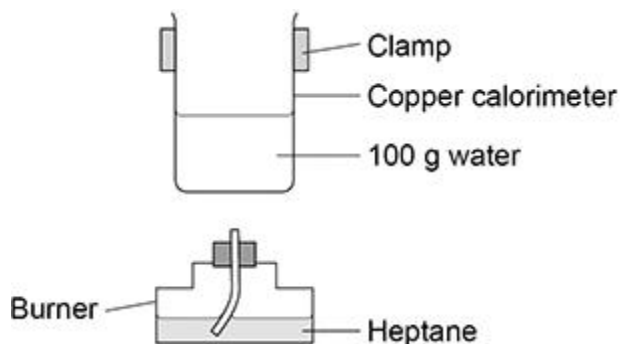
(2)

(Total 11 marks)

Q3.

A student does an experiment to determine a value for the enthalpy of combustion of heptane.

The figure below shows some of the apparatus used.



- (a) Design a table to record all the readings necessary to determine an experimental value for the enthalpy of combustion for heptane in this experiment.

(2)

- (b) The student considered using a glass beaker on a tripod and gauze instead of the clamped copper calorimeter.

Suggest **two** disadvantages of using a glass beaker on a tripod and gauze.

Disadvantage 1 _____

Disadvantage 2 _____

(2)

- (c) Suggest **two** reasons why the value of enthalpy of combustion from this experiment is less exothermic than a data book value.

Reason 1 _____

Reason 2 _____

(2)

- (d) Suggest **one** addition to this apparatus that would improve the accuracy of the enthalpy value obtained.

(1)

(Total 7 marks)