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

Name of the Student:_____
Max. Marks : 18 Marks **Time : 18 Minutes**

Q1.

This table contains some values of lattice dissociation enthalpies.

Compound	$MgCl_2$	$CaCl_2$	MgO
Lattice dissociation enthalpy / kJ mol^{-1}	2493	2237	3889

(a) Write an equation, including state symbols, for the reaction that has an enthalpy change equal to the lattice dissociation enthalpy of magnesium chloride.

_____

(1)

(b) Explain why the lattice dissociation enthalpy of magnesium chloride is greater than that of calcium chloride.

_____

_____

_____

_____

(2)

(c) Explain why the lattice dissociation enthalpy of magnesium oxide is greater than that of magnesium chloride.

_____

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_____

(2)

(d) When magnesium chloride dissolves in water, the enthalpy of solution is −155 kJ mol^{-1}. The enthalpy of hydration of chloride ions is −364 kJ mol^{-1}.

Calculate the enthalpy of hydration of magnesium ions.

_____

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(3)

(e) Energy is released when a magnesium ion is hydrated because magnesium ions attract water molecules.

Explain why magnesium ions attract water molecules.
You may use a labelled diagram to illustrate your answer.

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(2)

(f) Suggest why a value for the enthalpy of solution of magnesium oxide is **not** found in any data books.

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(1)

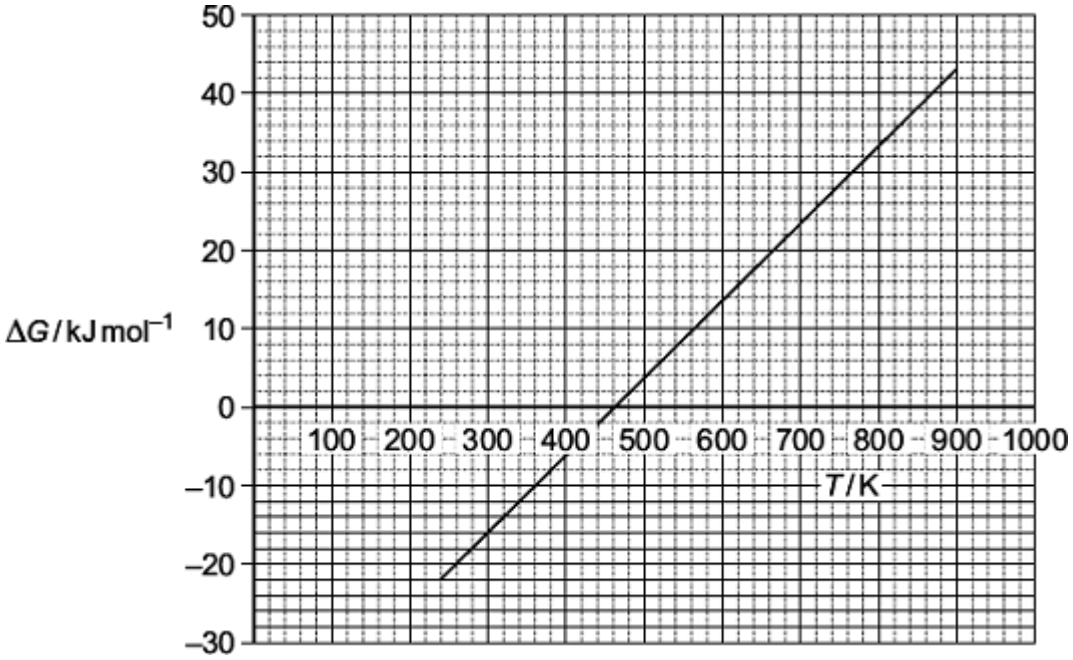
(Total 11 marks)

Q2.

The following equation shows the formation of ammonia.

$$\frac{1}{2}N_2(g) + \frac{3}{2}H_2(g) \longrightarrow NH_3(g)$$

The graph shows how the free-energy change for this reaction varies with temperature above 240 K.



(a) Write an equation to show the relationship between ΔG, ΔH and ΔS.

_____

(1)

(b) Use the graph to calculate a value for the slope (gradient) of the line. Give the units of this slope and the symbol for the thermodynamic quantity that this slope represents.

Value of the slope _____

_____

Units _____

Symbol _____

(3)

(c) Explain the significance, for this reaction, of temperatures below the temperature value where the line crosses the temperature axis.

_____

_____

_____

_____

(2)

(d) The line is not drawn below a temperature of 240 K because its slope (gradient) changes at this point.

Suggest what happens to the ammonia at 240 K that causes the slope of the line to change.

_____

_____

(1)

(Total 7 marks)