

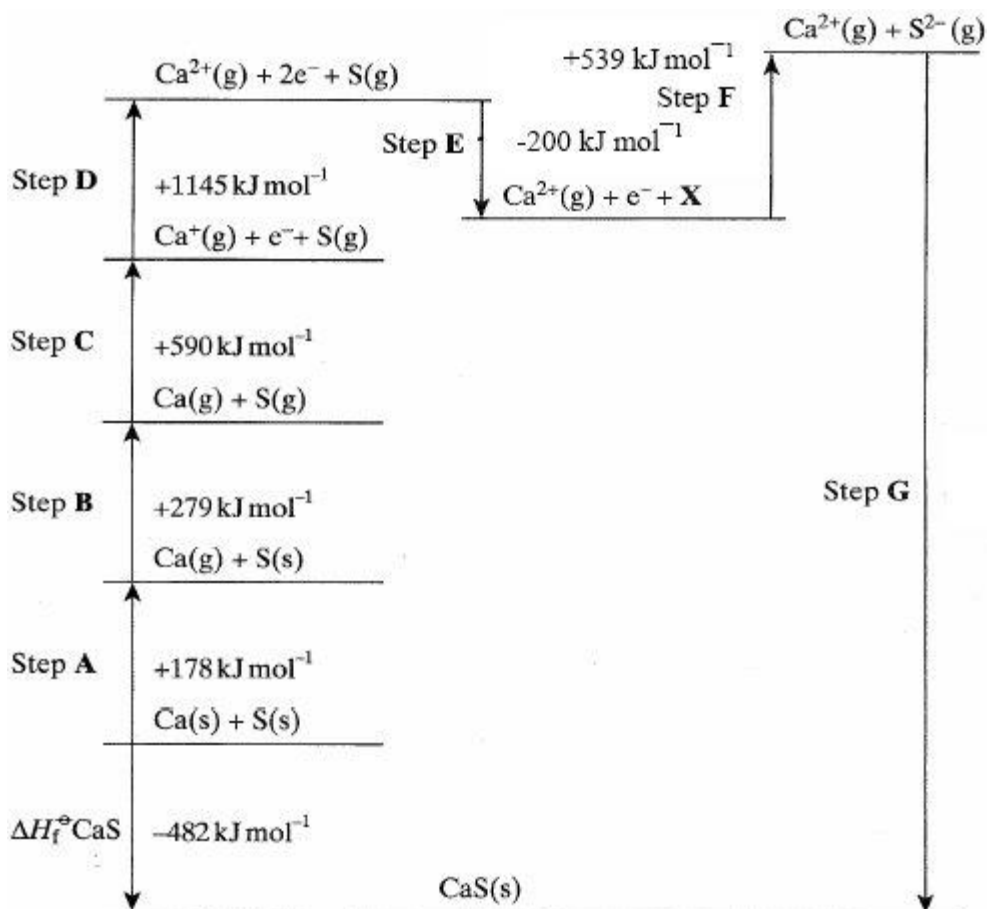
Name of the Student: _____

Max. Marks : 18 Marks

Time : 18 Minutes

Q1.

- (a) A Born–Haber cycle for the formation of calcium sulphide is shown below. The cycle includes enthalpy changes for all steps except step **G**. (The cycle is not drawn to scale.)



- (i) Give the full electronic configuration of the ion S^{2-}

- (ii) Suggest why step **F** is an endothermic process.

- (iii) Name the enthalpy changes in steps **B** and **D**.

Step **B** _____Step **D** _____

(iv) Explain why the enthalpy change for step **D** is larger than that for step **C**.

(v) Use the data shown in the cycle to calculate a value for the enthalpy change for step **G**.

(9)

- (b) Using a Born–Haber cycle, a value of -905 kJ mol^{-1} was determined for the lattice enthalpy of silver chloride. A value for the lattice enthalpy of silver chloride using the ionic model was -833 kJ mol^{-1} .

Explain what a scientist would be able to deduce from a comparison of these values.

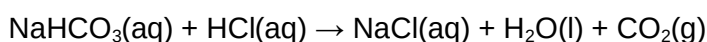
(3)

- (c) Some endothermic reactions occur spontaneously at room temperature. Some exothermic reactions do not occur if the reactants are heated together to a very high temperature.

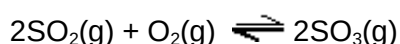
In order to explain the following observations, another factor, the entropy change, ΔS , must be considered. The equation which relates ΔS to ΔH is given below.

$$\Delta G = \Delta H - T\Delta S$$

- (i) Explain why the following reaction occurs at room temperature even though the reaction is endothermic.



- (ii) Explain why the following reaction does not occur at very high temperatures even though the reaction is exothermic.



(6)
(Total 18 marks)