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

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Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Q1.

Which one of the equations below represents a reaction that is feasible at all temperatures?

A $P(s) \rightarrow Q(s) + R(g)$ endothermic

B $2L(g) + M(g) \rightarrow 2N(g)$ exothermic

C $S(g) \rightarrow 2T(g)$ exothermic

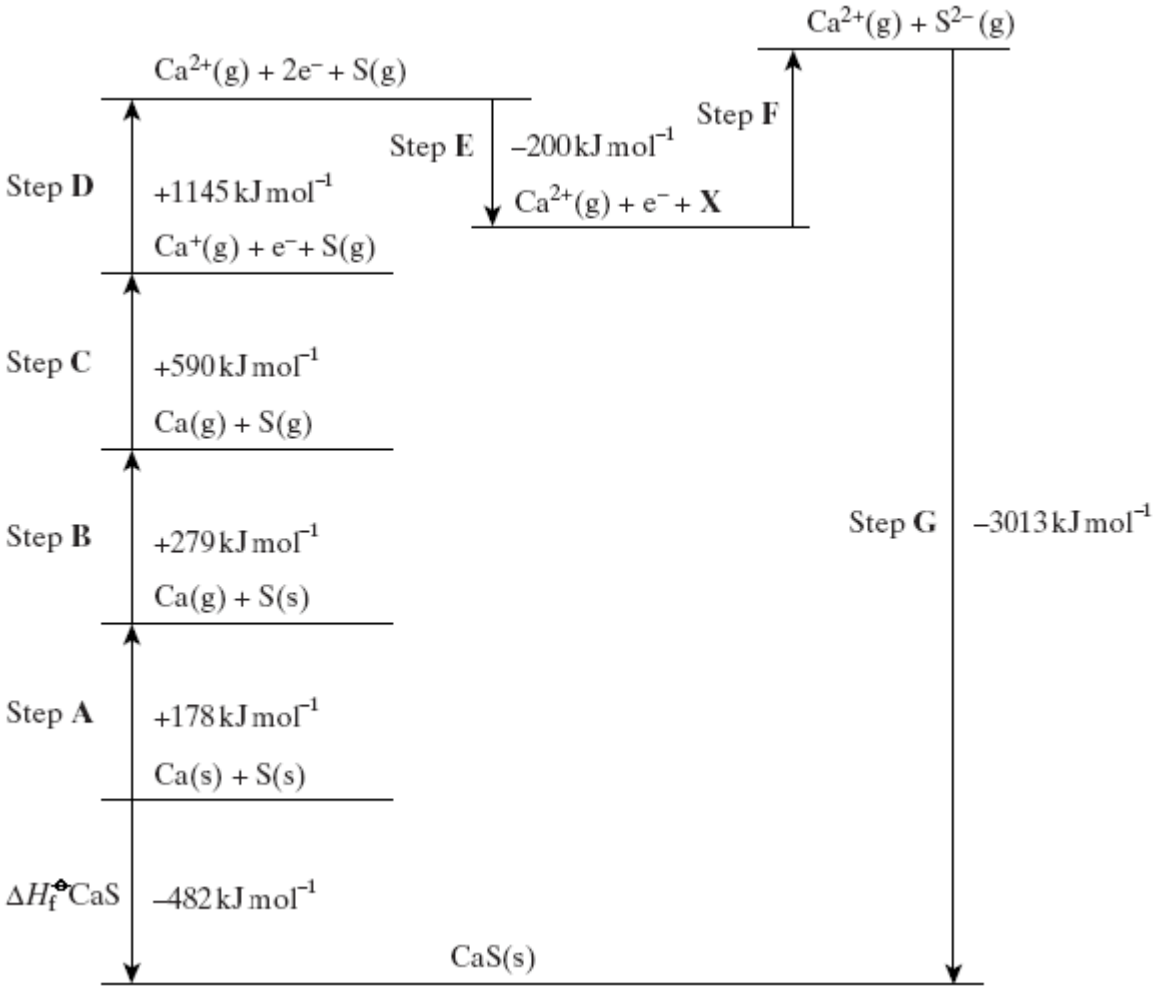
D $A(g) + B(g) \rightarrow C(g)$ endothermic

(Total 1 mark)

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Q2.

A Born–Haber cycle for the formation of calcium sulphide is shown below. The cycle includes enthalpy changes for all Steps except Step **F**. (The cycle is not drawn to scale.)



(a) Give the full electronic arrangement of the ion S^{2-}

_____

(1)

(b) Identify the species **X** formed in Step **E**.

_____

(1)

(c) Suggest why Step **F** is an endothermic process.

_____

_____

(2)

(d) Name the enthalpy change for each of the following steps.

(i) Step **B** _____

(ii) Step **D** _____

(iii) Step **F** _____

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(3)

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

_____

_____

(2)

(f) Use the data shown in the cycle to calculate a value for the enthalpy change for Step **F**.

_____

_____

_____

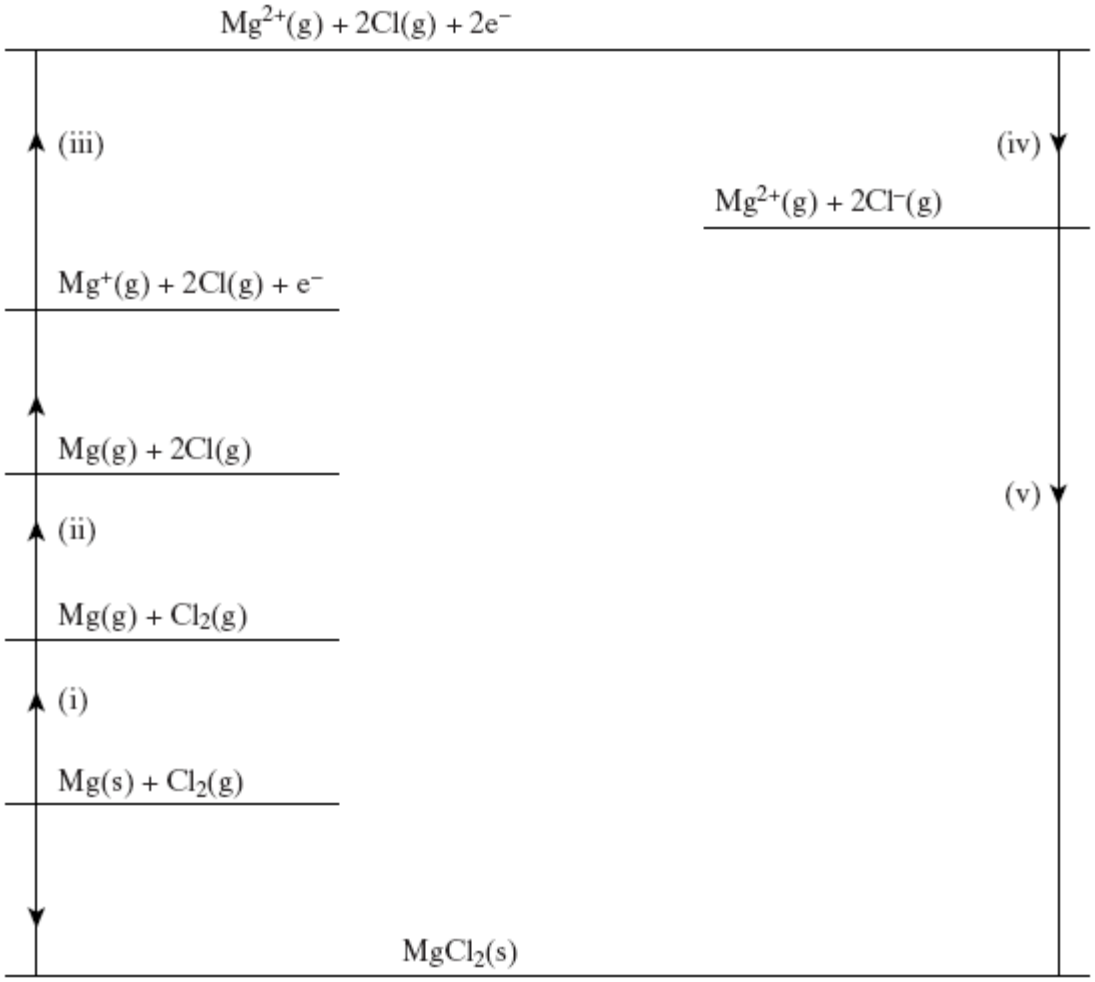
(2)

(Total 11 marks)

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Q3.

(a) A Born–Haber cycle for the formation of magnesium(II) chloride is shown below.



Taking care to note the direction of the indicated enthalpy change and the number of moles of species involved, give each of the enthalpy changes (i) to (v) above.

Enthalpy change (i) _____

Enthalpy change (ii) _____

Enthalpy change (iii) _____

Enthalpy change (iv) _____

Enthalpy change (v) _____

(5)

(b) Write an equation for the decomposition of MgCl(s) into $MgCl_2(s)$ and Mg(s) and use the following data to calculate a value for the enthalpy change of this reaction.

$\Delta H_f^{\ominus}$ MgCl(s) = –113 kJ mol^{-1}

$\Delta H_f^{\ominus}$ $MgCl_2(s)$ = –653 kJ mol^{-1}

Equation _____

Calculation _____

_____

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(4)

(c) Use the data below to calculate a value for the molar enthalpy of a solution of $MgCl_2(s)$.

Lattice formation enthalpy of $MgCl_2(s)$ = –2502 kJ mol^{-1}

$\Delta H^{\ominus}_{hydration}$ of $Mg^{2+}(g)$ = –1920 kJ mol^{-1}

$\Delta H^{\ominus}_{hydration}$ of $Cl^{-}(g)$ = –364 kJ mol^{-1}

(3)

(Total 12 marks)

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