

A2 Physical Chemistry

Enthalpies of Solution and Hydration Questions

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A background image showing a complex molecular structure with various colored spheres (red, blue, green, purple) connected by thin rods, representing atoms and bonds in a chemical compound. The structure is partially obscured by a dark gradient on the left side of the slide.

Questions

1) Calculate the enthalpy of hydration of bromide ions given that the hydration enthalpy of barium ions is $-1360 \text{ kJ mol}^{-1}$, the lattice enthalpy of formation for BaBr_2 is $-1937 \text{ kJ mol}^{-1}$ and the enthalpy of solution of $\text{BaBr}_2 = -38 \text{ kJ mol}^{-1}$.

2) Calculate the lattice enthalpy of formation of calcium iodide given that its enthalpy of solution is -120 kJ mol^{-1} and the enthalpies of hydration of calcium and iodide ions are -1650 and -293 kJ mol^{-1} respectively.

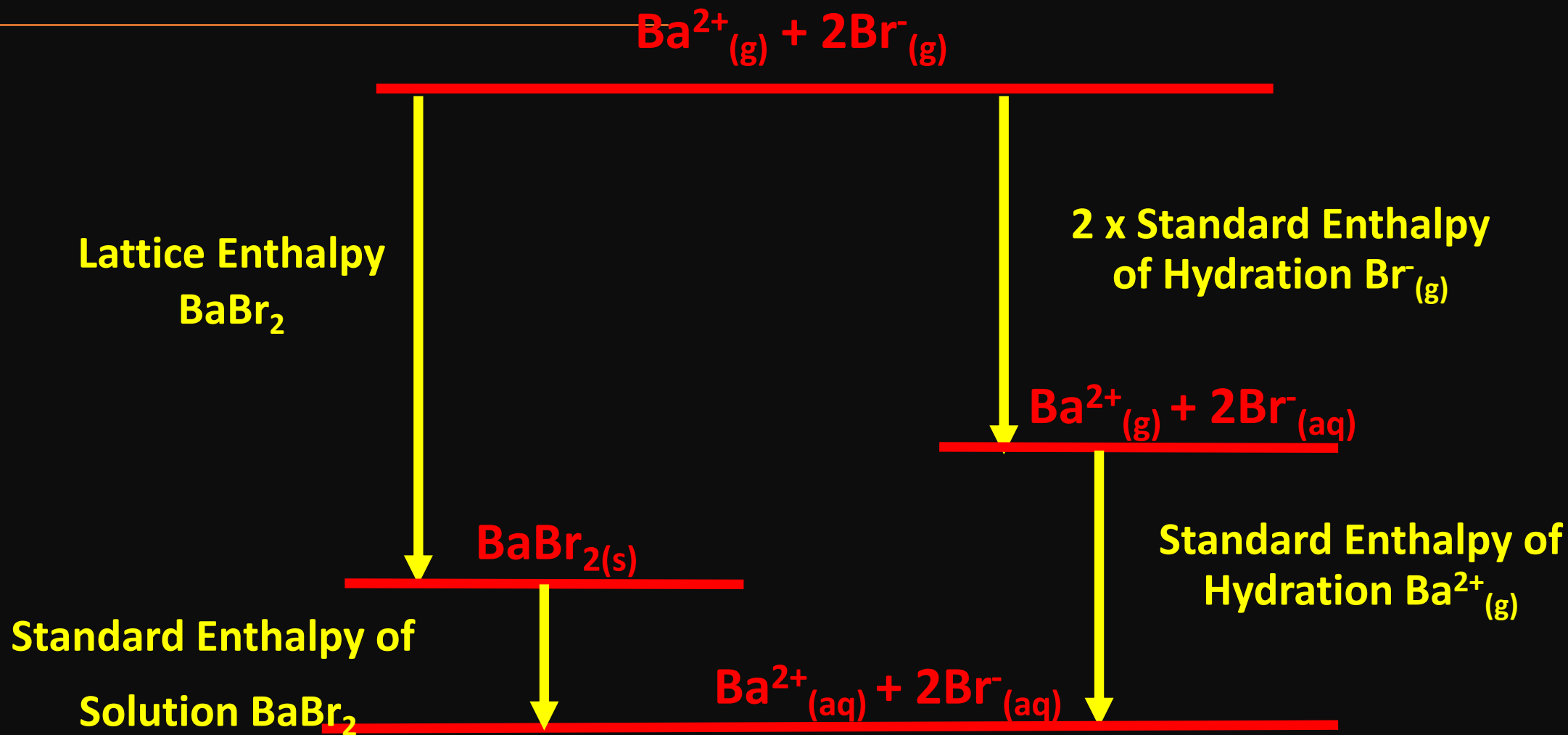
3) Calculate the enthalpy of solution of the ammonium chloride given that ΔH_{hyd} (kJ mol^{-1}): $\text{NH}_4^+ -301$; $\text{Cl} -364$; Lattice enthalpy of ammonium chloride -640 kJ mol^{-1} .

Answers coming
up...

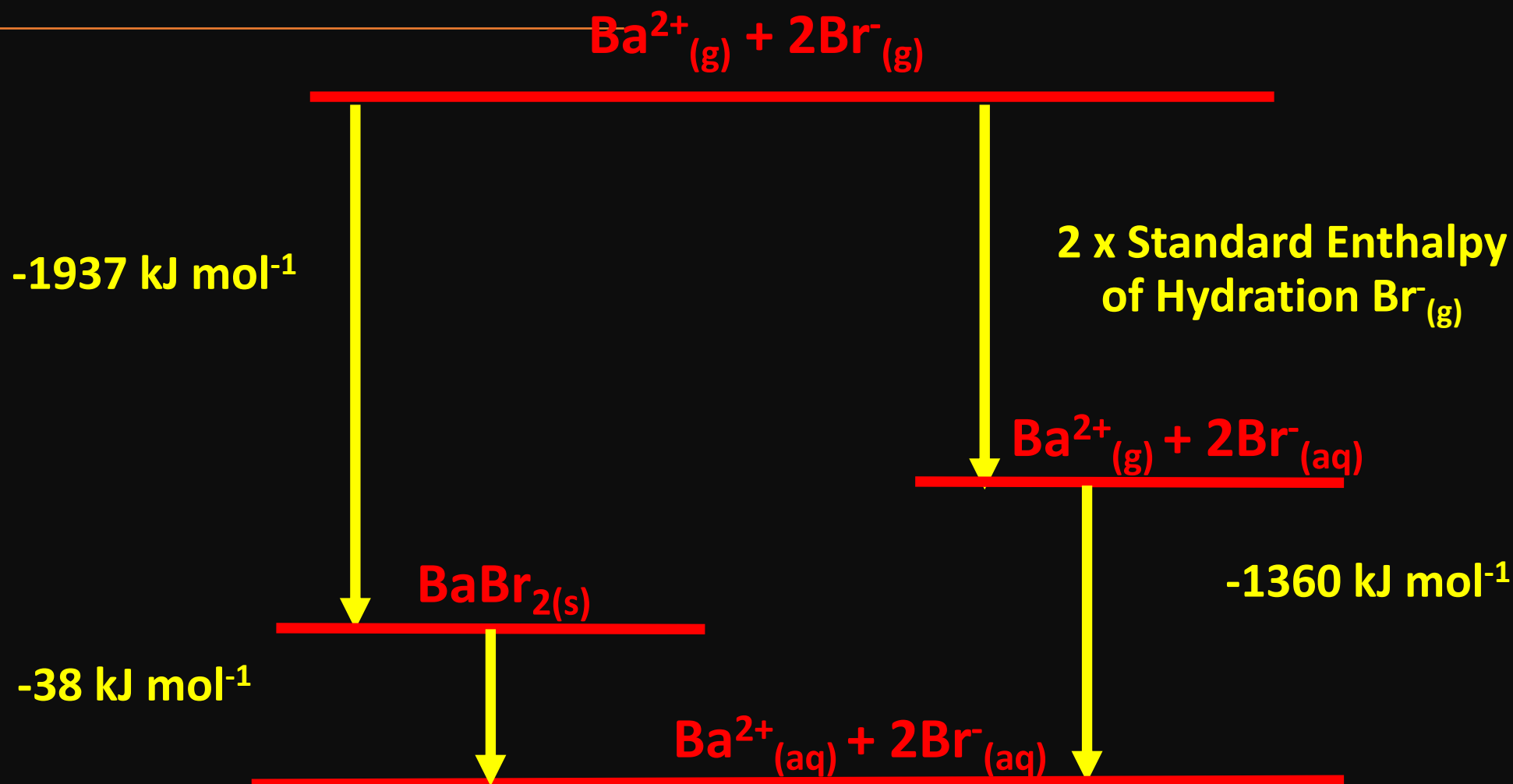


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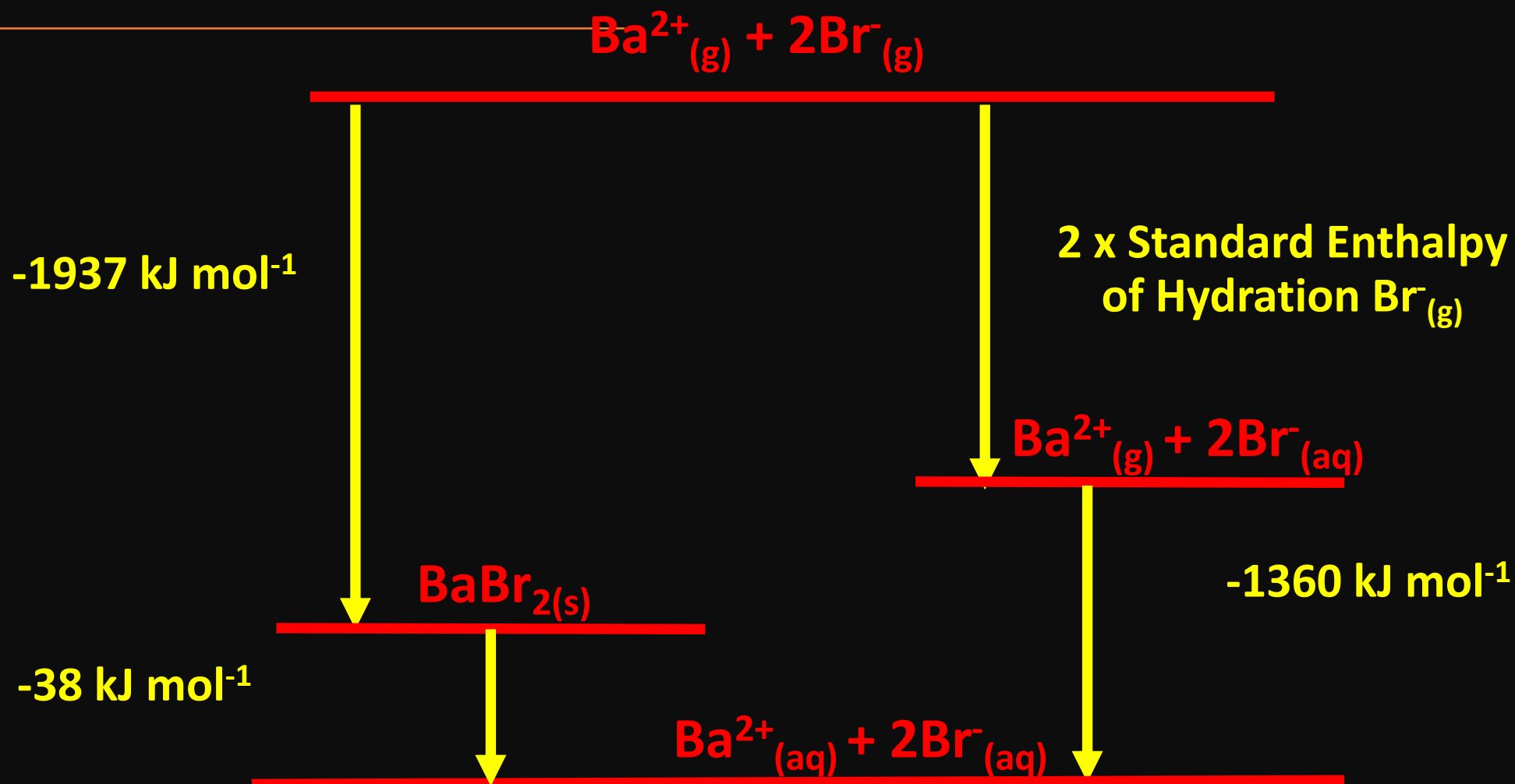
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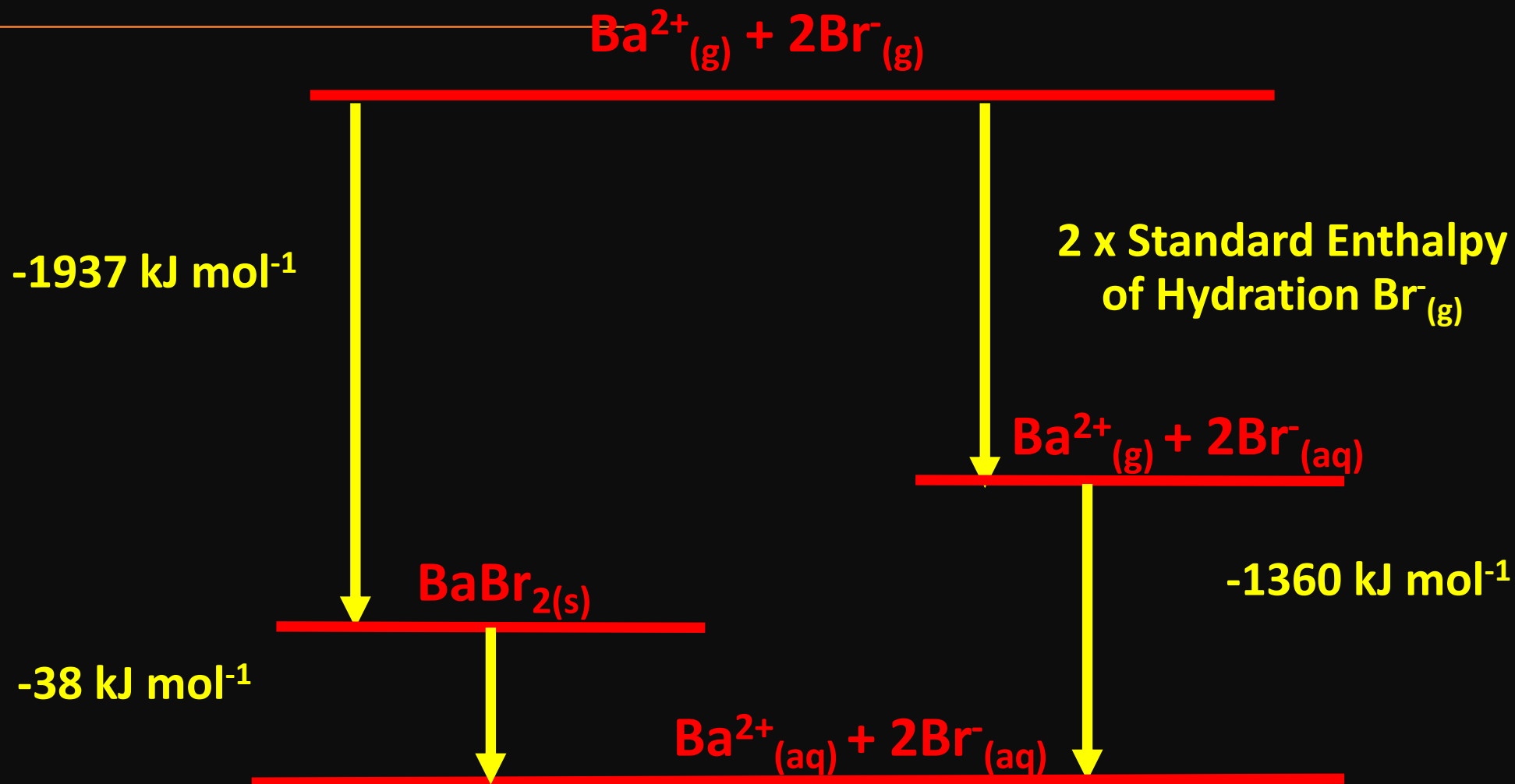


Enthalpy of Solution = Hydration Enthalpies - Lattice Enthalpy



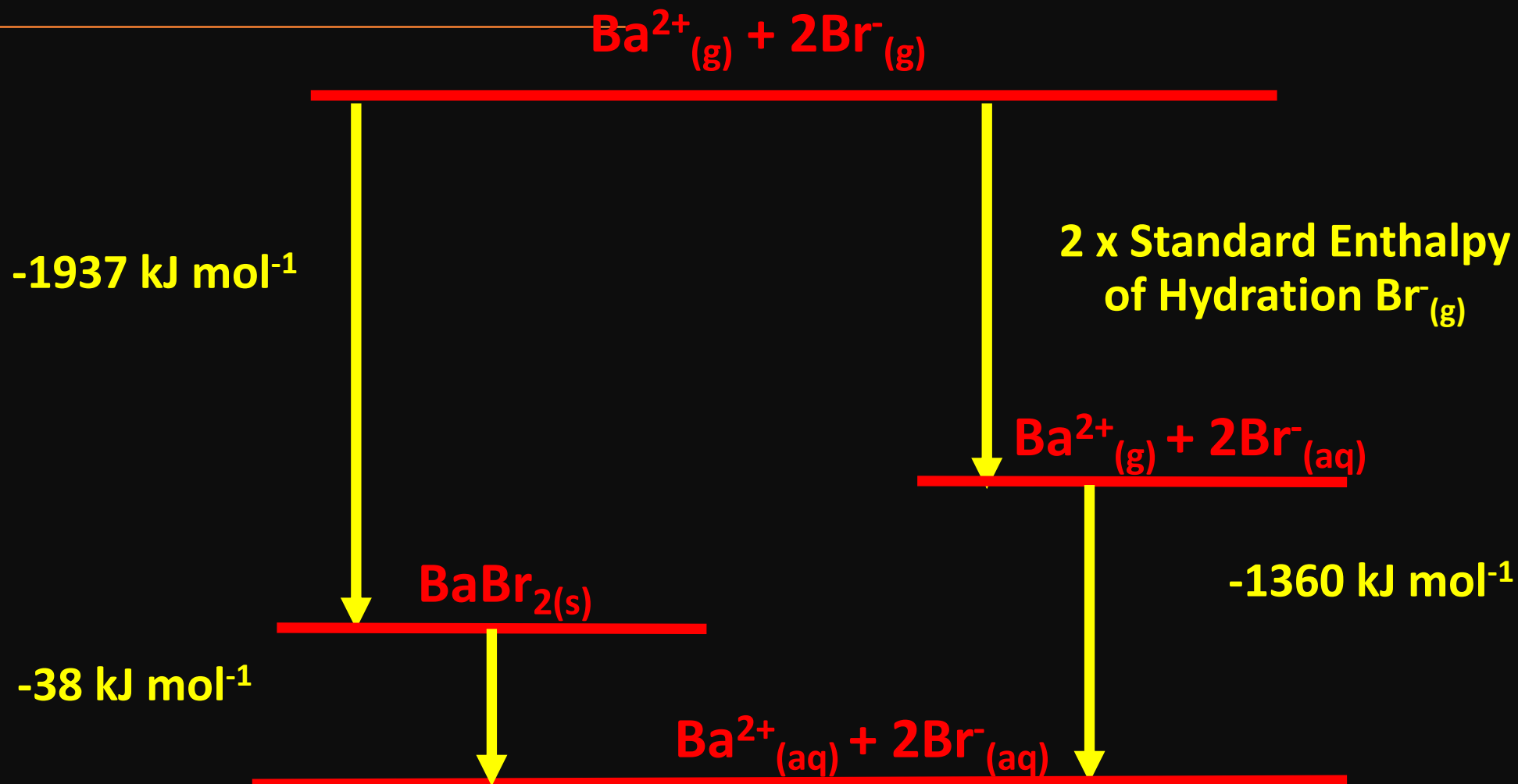
Enthalpy of Solution = Hydration Enthalpies - Lattice Enthalpy

$$-38 = 2\Delta H_{\text{hyd}} - 1360 - (-1937)$$



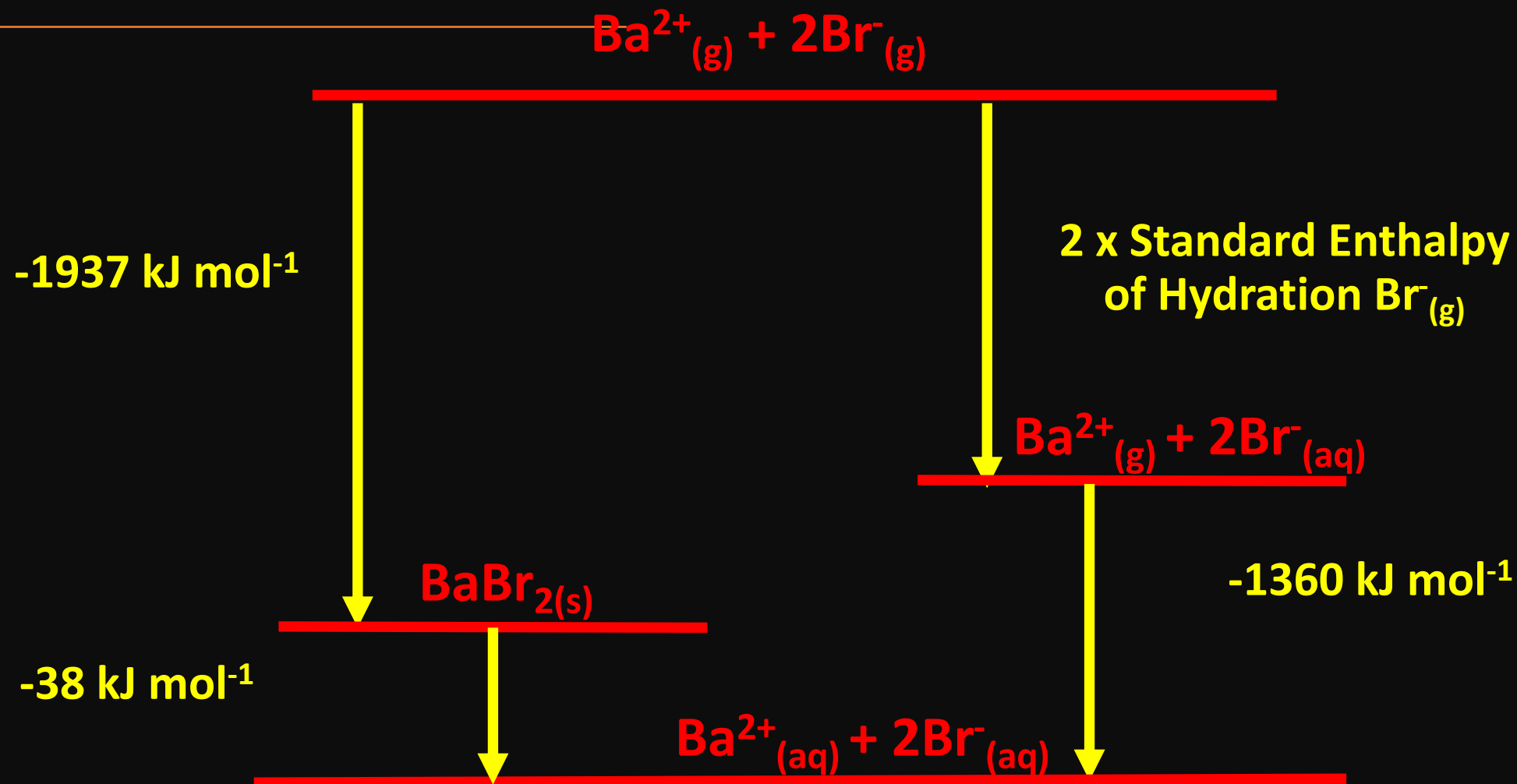
Enthalpy of Solution = Hydration Enthalpies - Lattice Enthalpy

$$-38 = 2\Delta H_{\text{hyd}} + 577$$



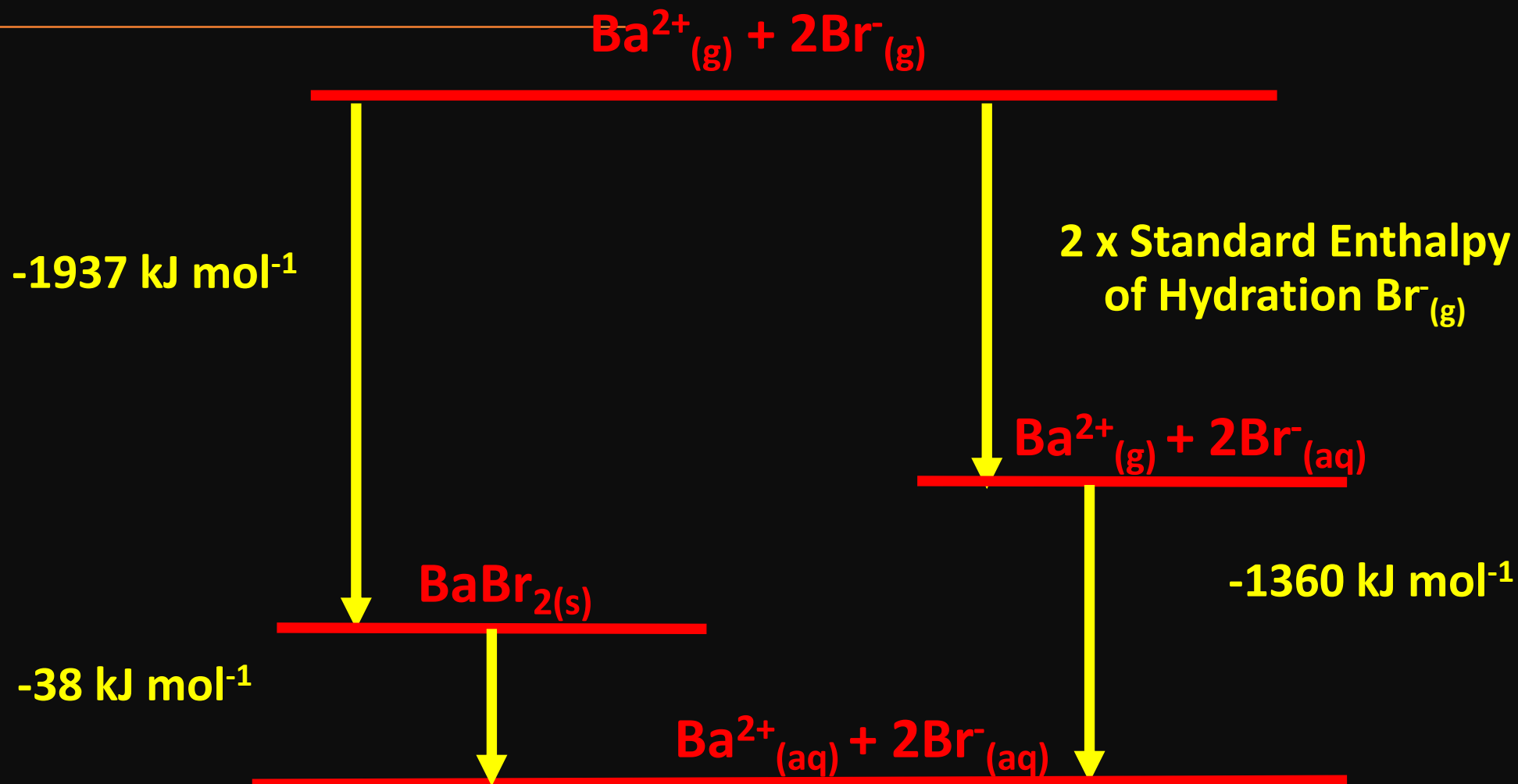
Enthalpy of Solution = Hydration Enthalpies - Lattice Enthalpy

$$-615 = 2\Delta H_{\text{hyd}}$$



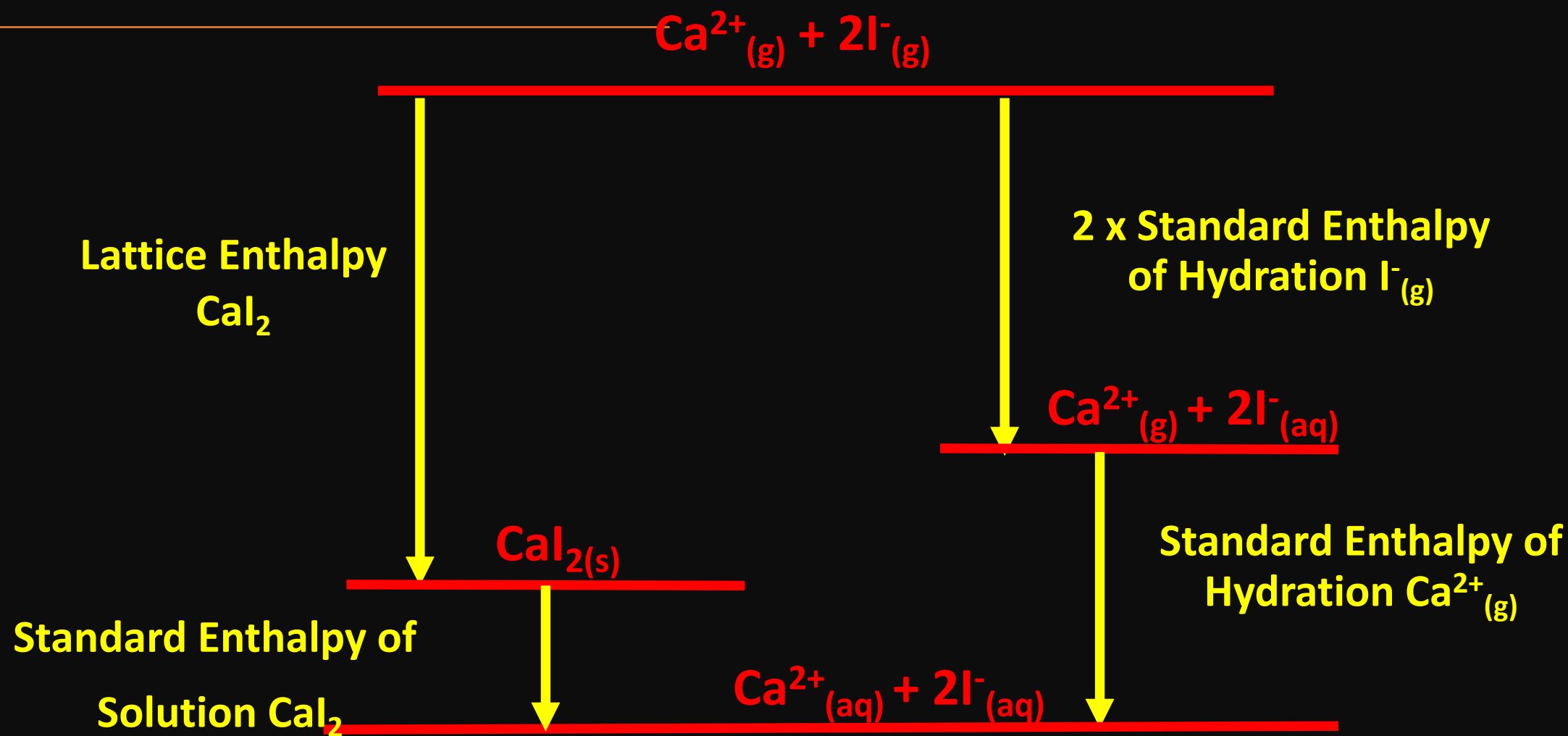
Enthalpy of Solution = Hydration Enthalpies - Lattice Enthalpy

$$\Delta H_{\text{hyd}} = -307.5 \text{ kJ mol}^{-1}$$

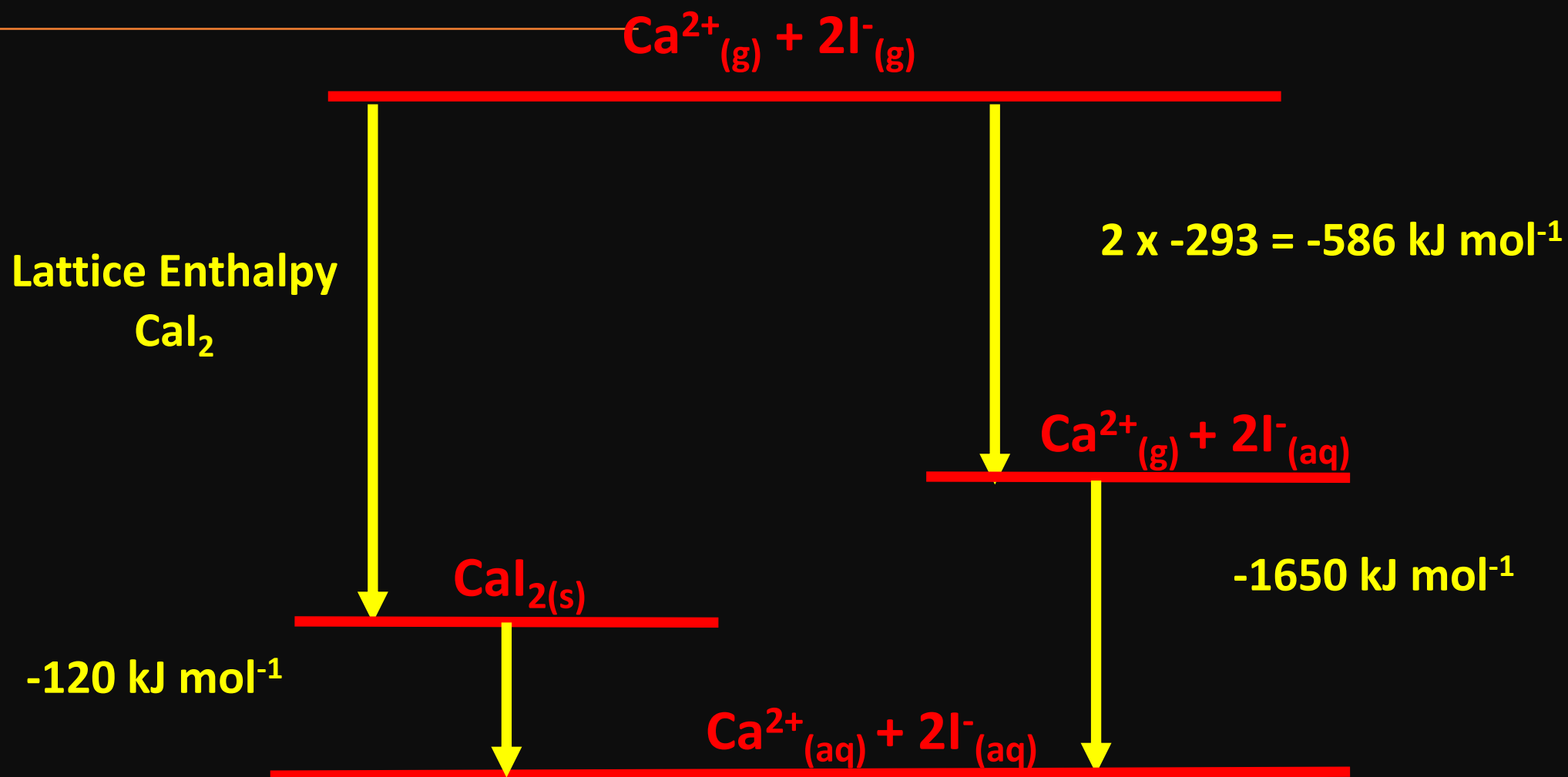


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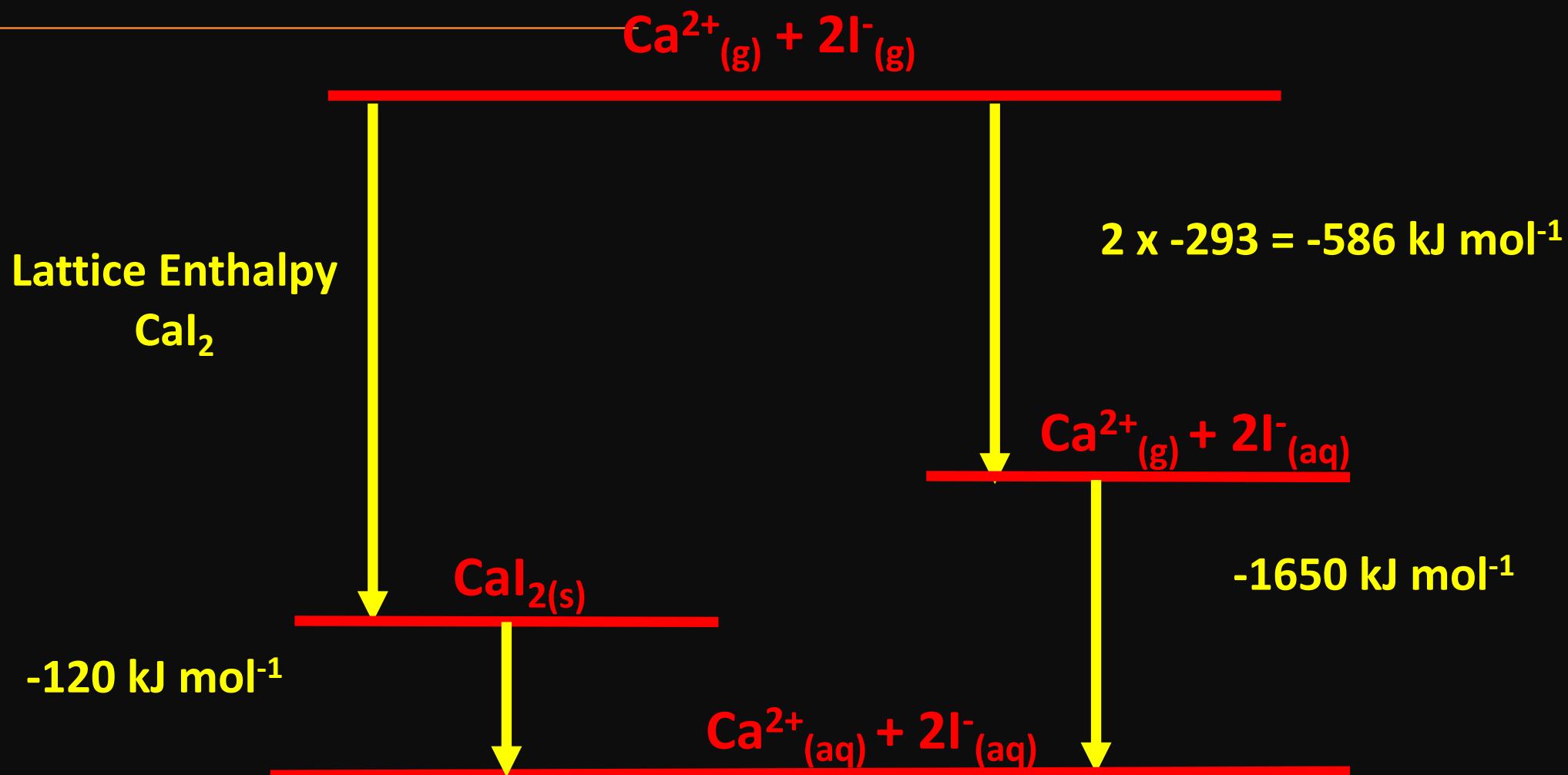
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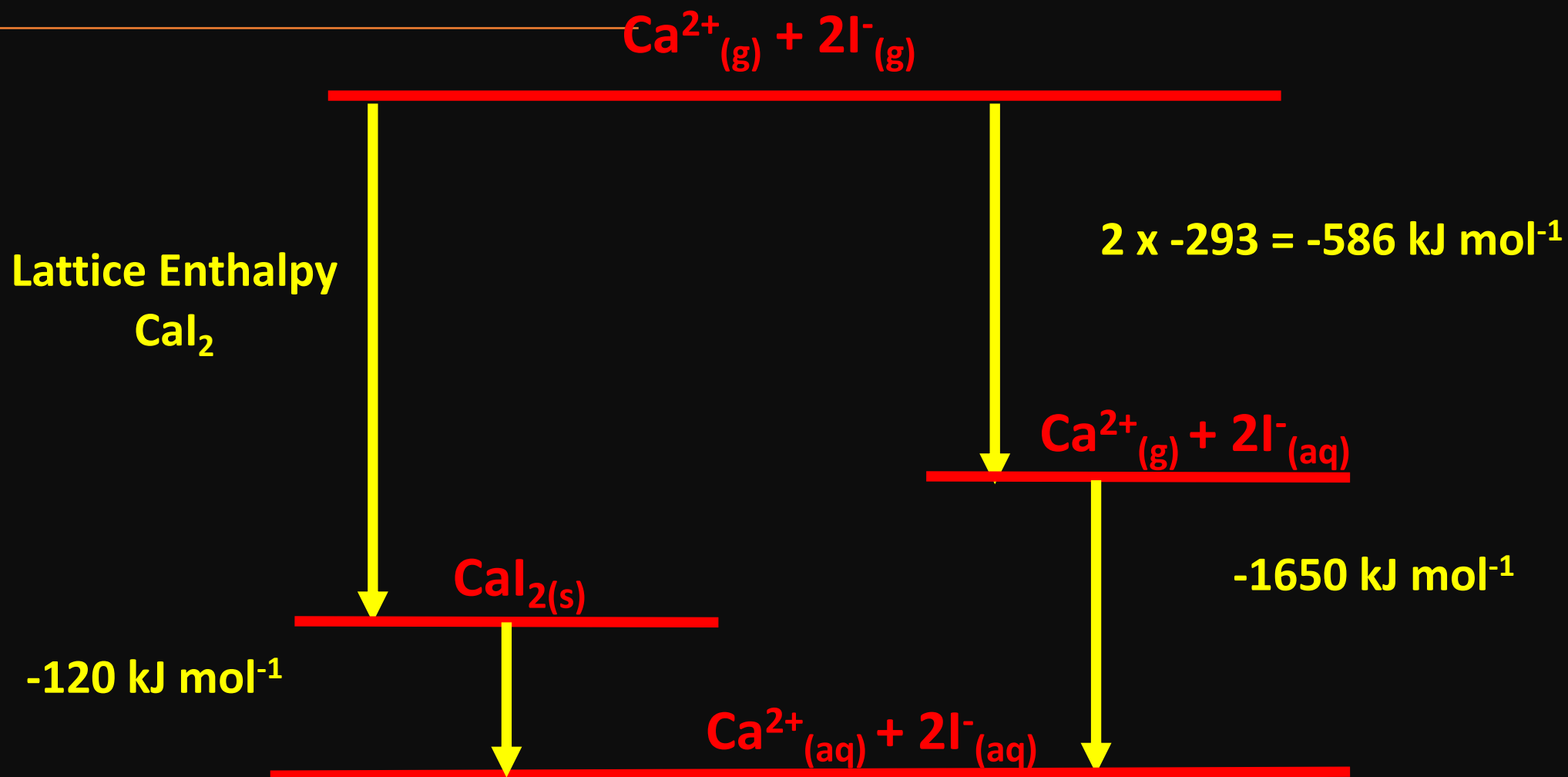


Enthalpy of Solution = Hydration Enthalpies - Lattice Enthalpy



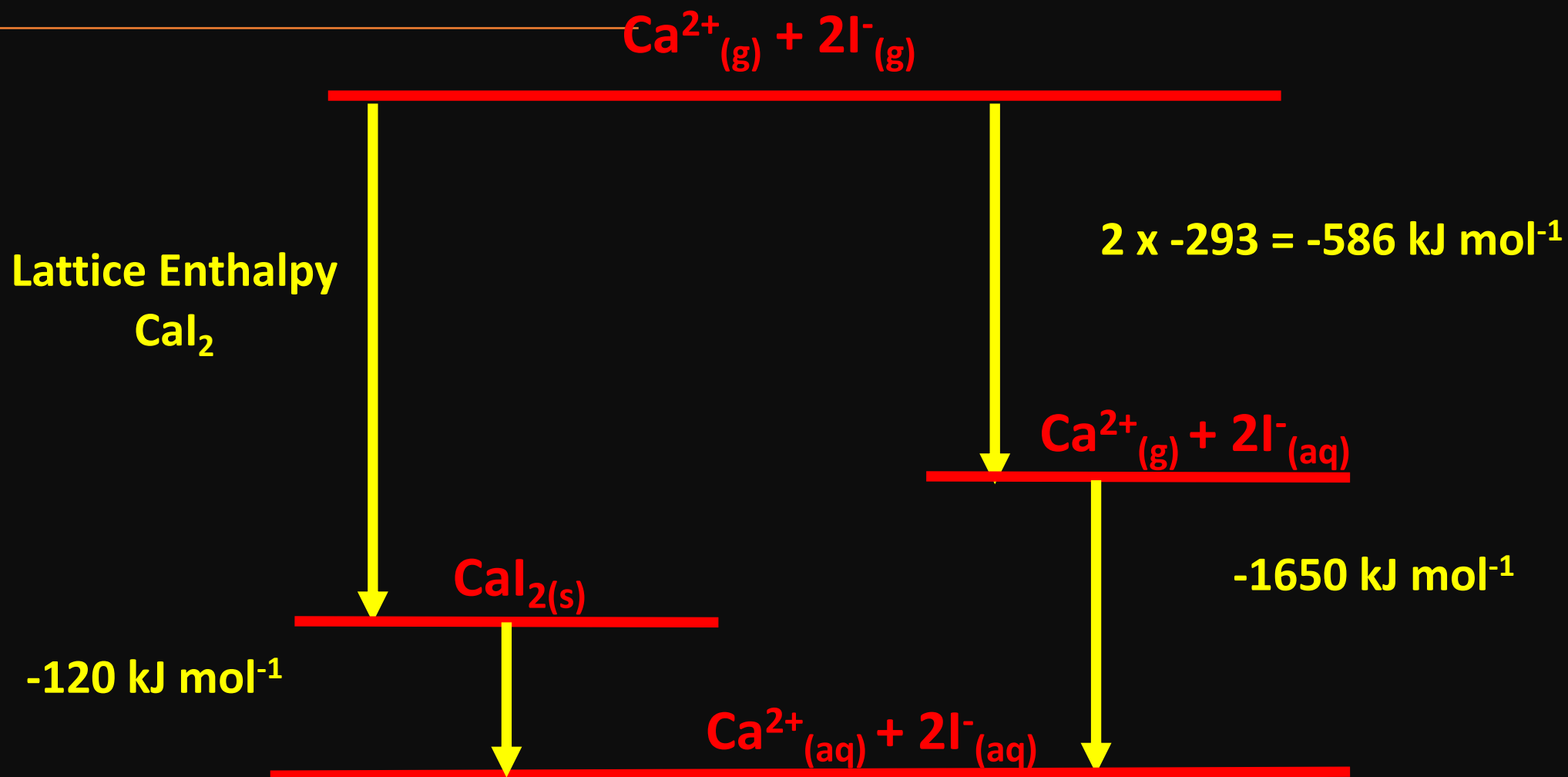
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$$-120 = -586 - 1650 - \text{Lattice Enthalpy}$$



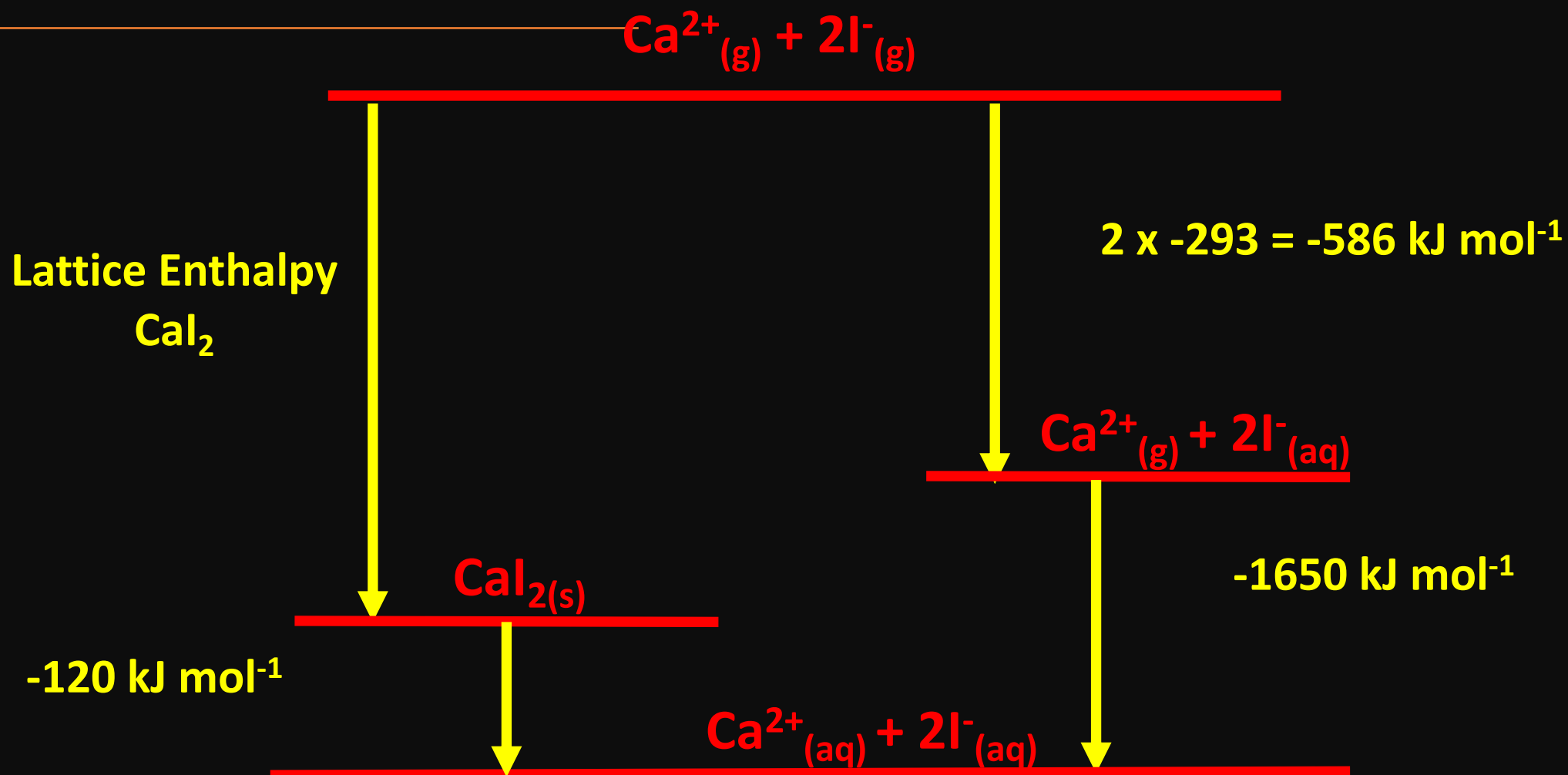
Enthalpy of Solution = Hydration Enthalpies - Lattice Enthalpy

$$-120 = -2236 - \text{Lattice Enthalpy}$$



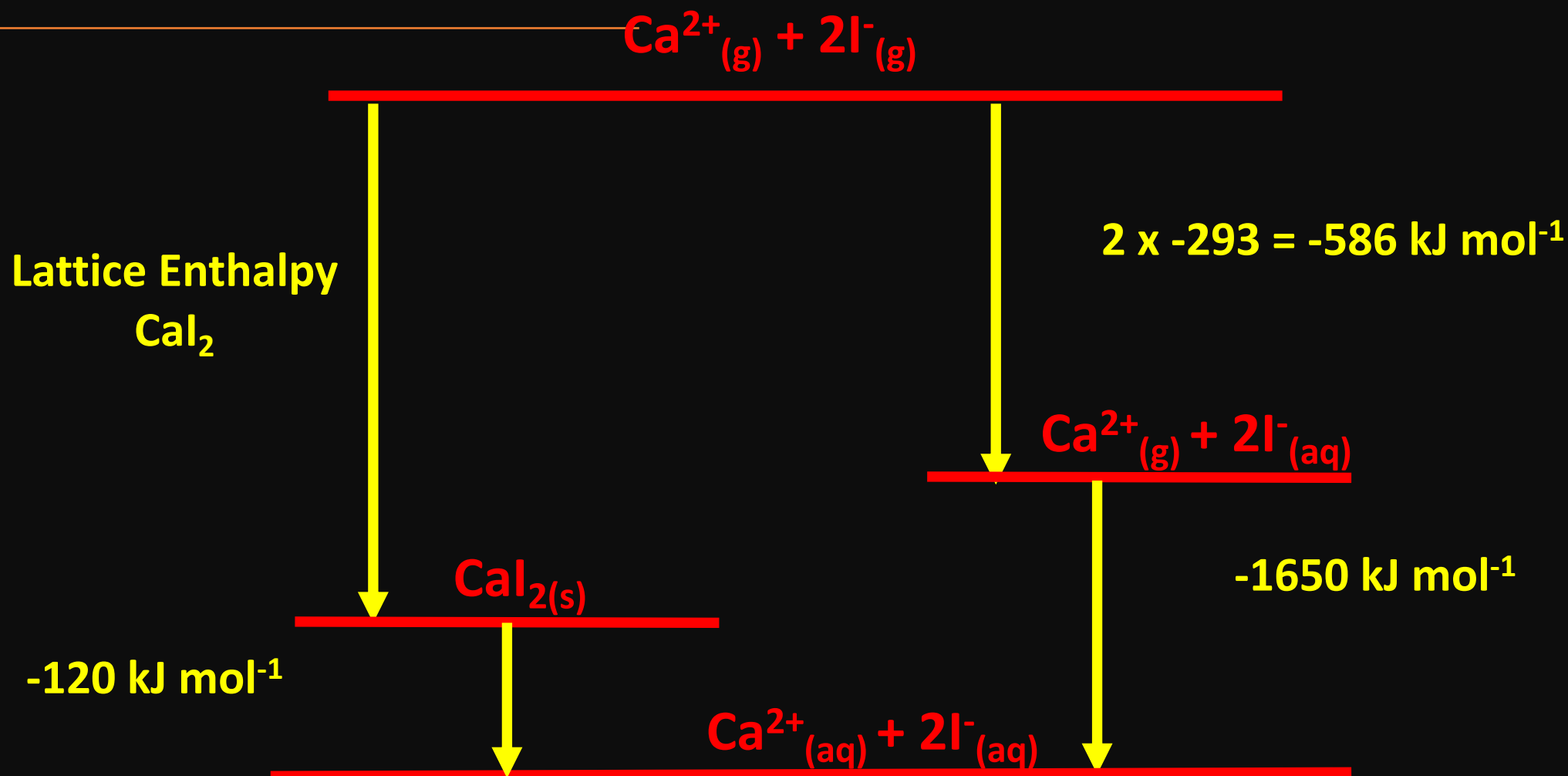
Enthalpy of Solution = Hydration Enthalpies - Lattice Enthalpy

$$2116 = - \text{Lattice Enthalpy}$$



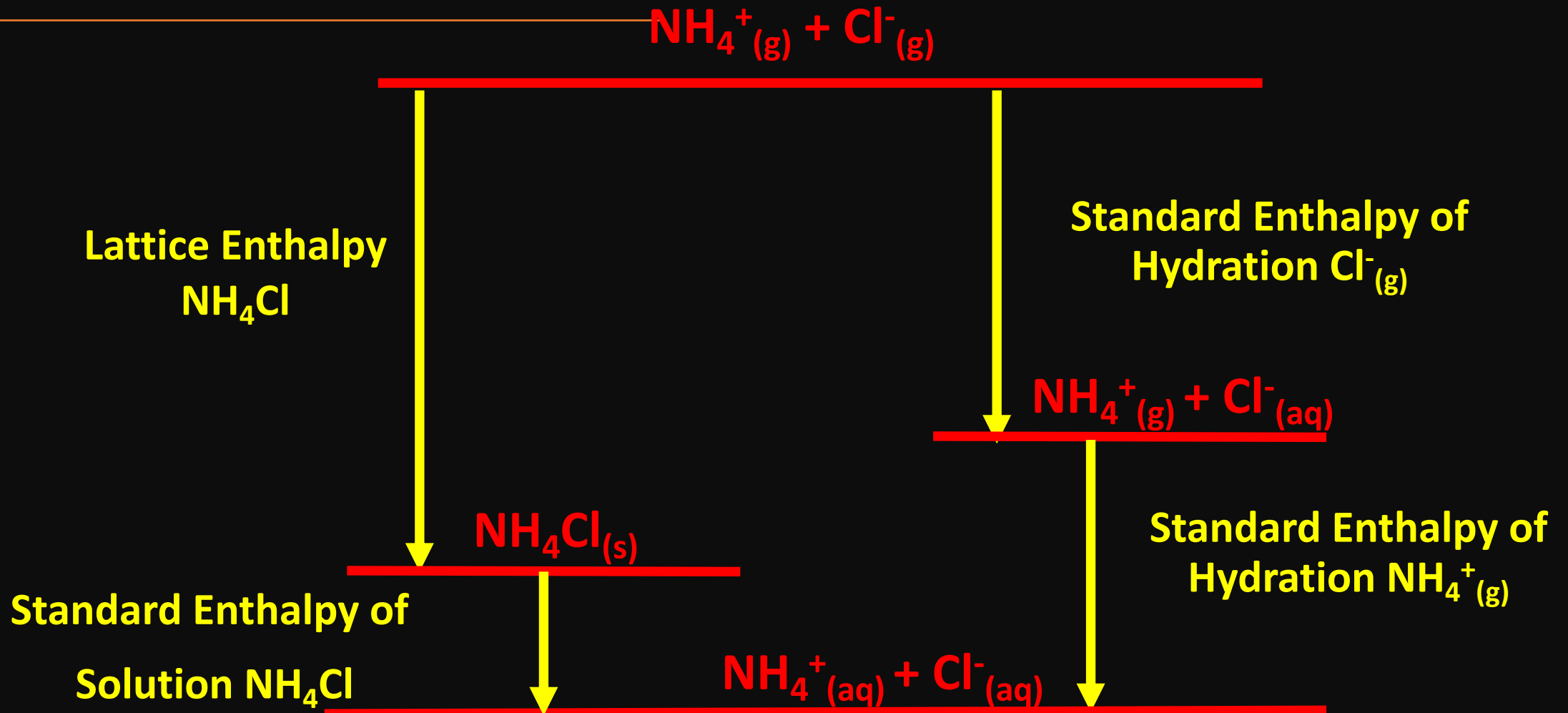
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$-2116 \text{ kJ mol}^{-1} = \text{Lattice Enthalpy}$

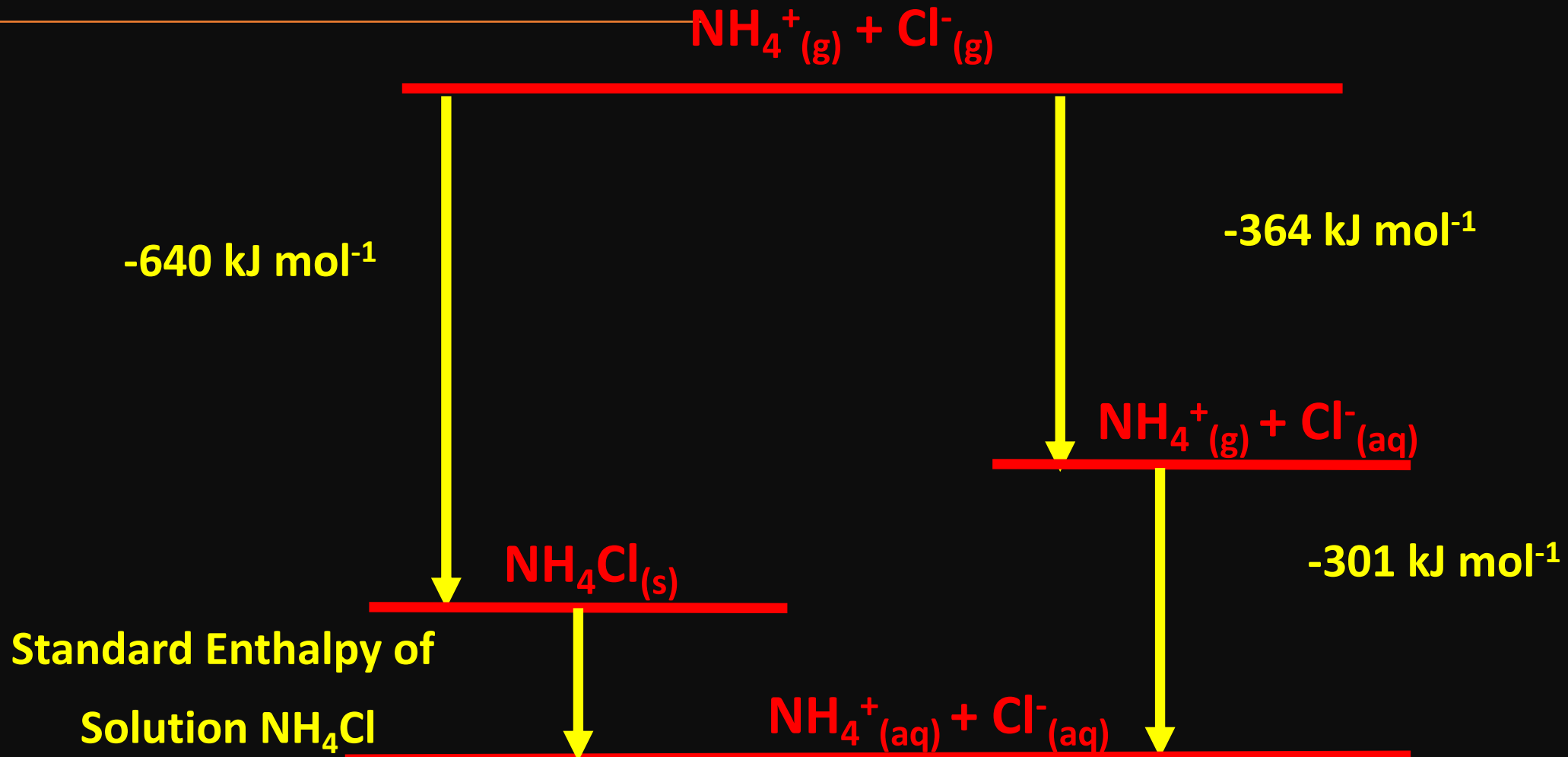


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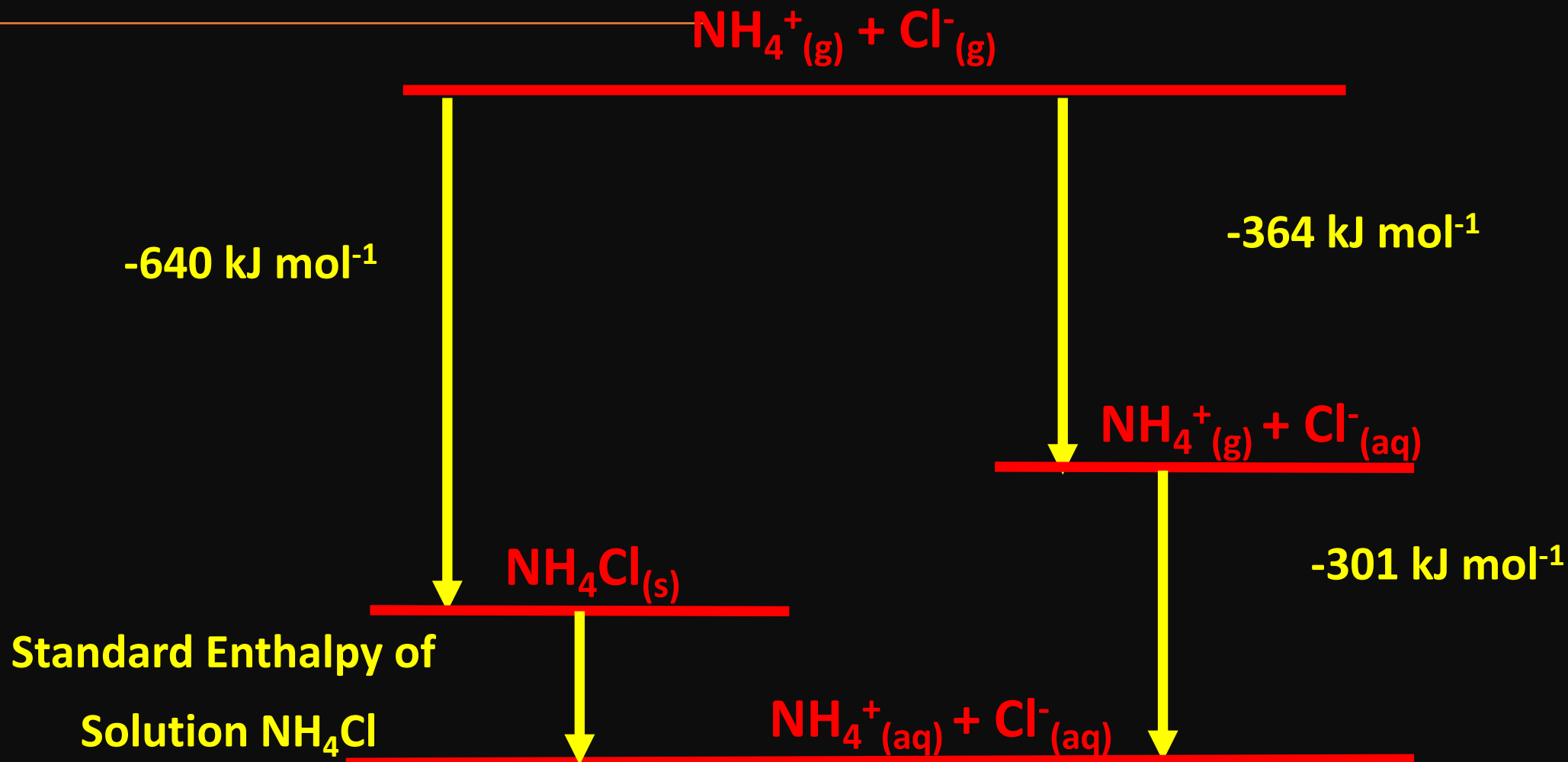
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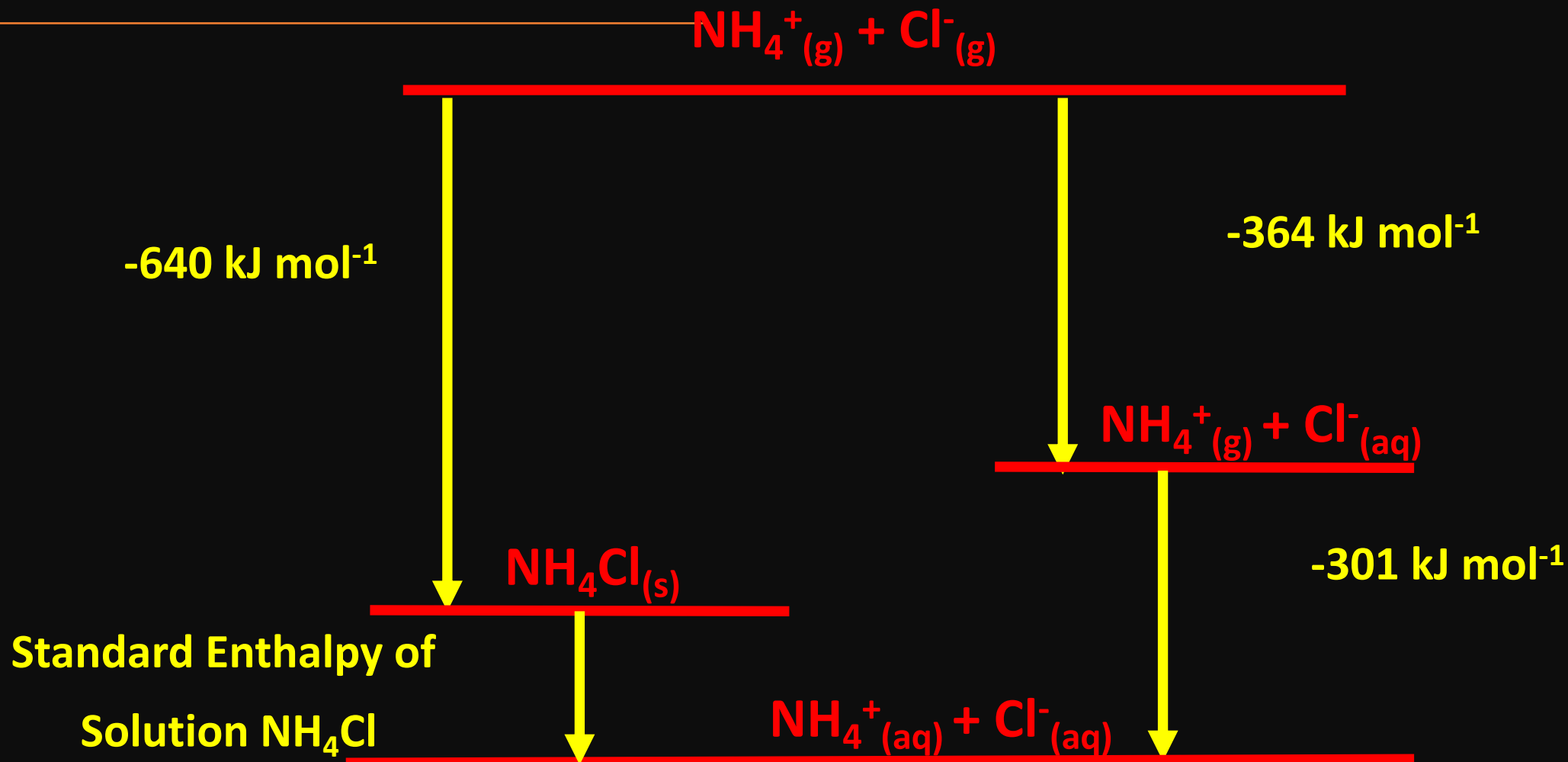


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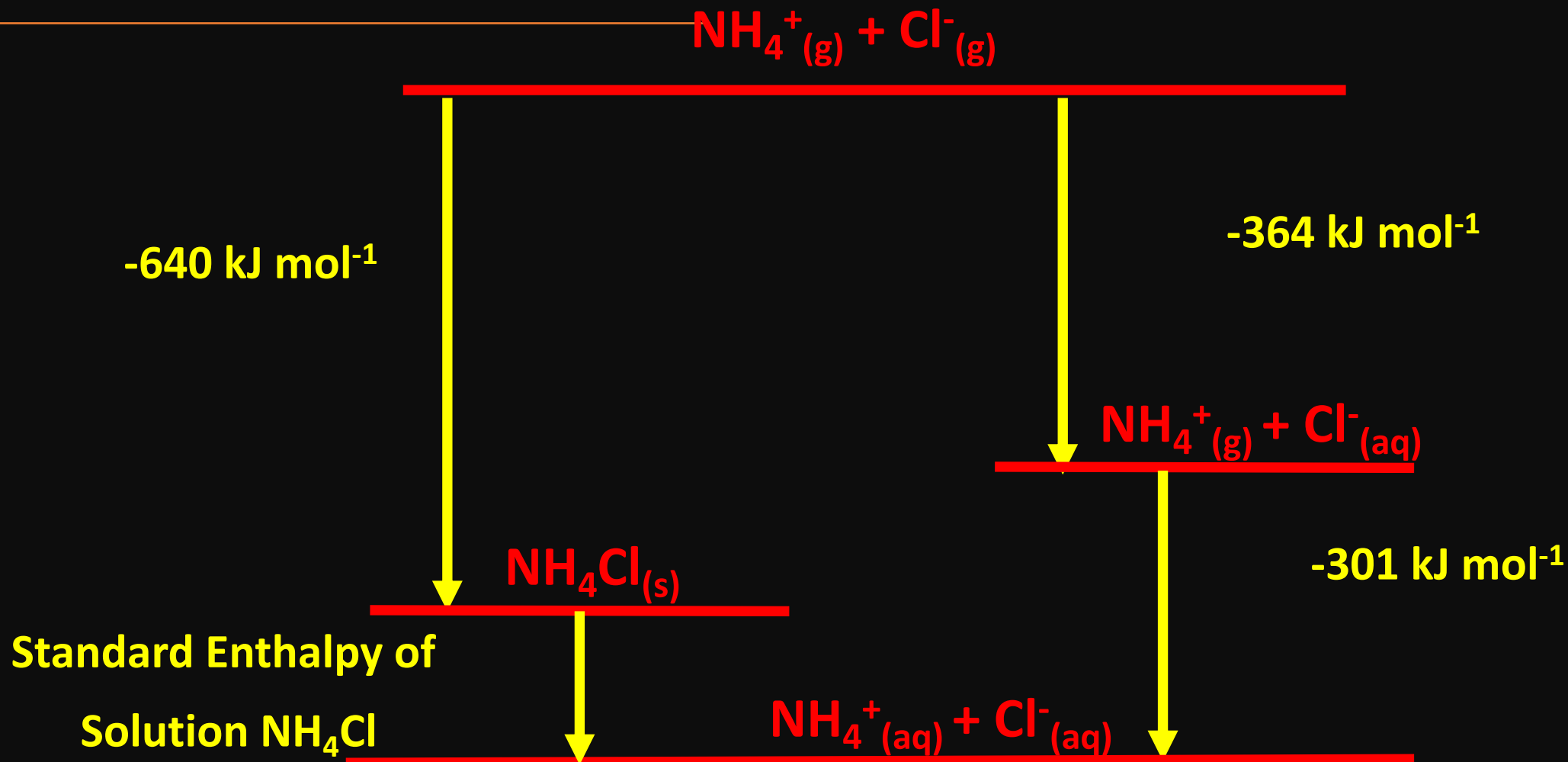
Enthalpy of Solution = Hydration Enthalpies - Lattice Enthalpy

$$\text{Enthalpy of Solution} = -364 - 301 - (-640)$$



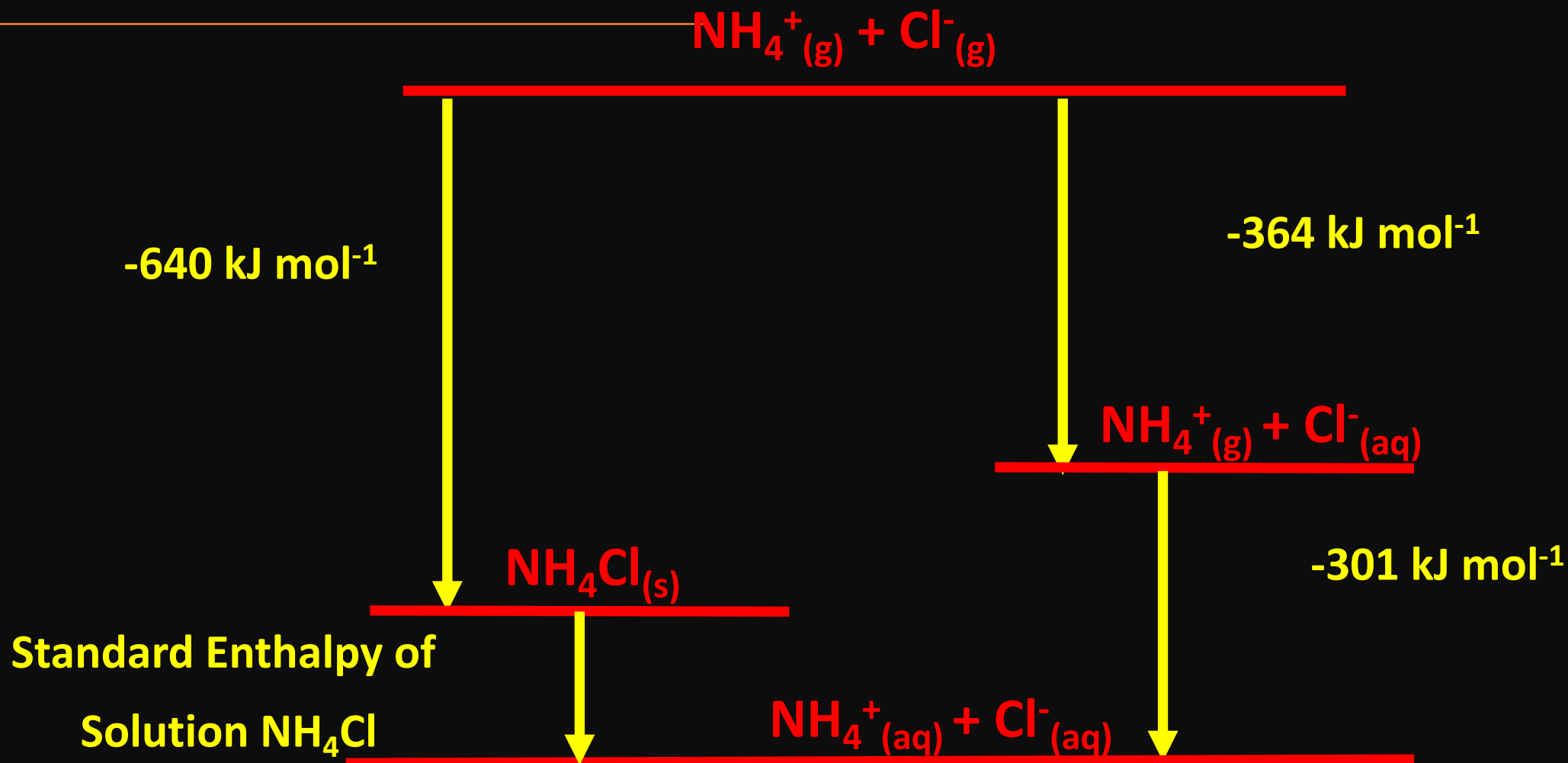
Enthalpy of Solution = Hydration Enthalpies - Lattice Enthalpy

$$\text{Enthalpy of Solution} = -364 - 301 + 640$$



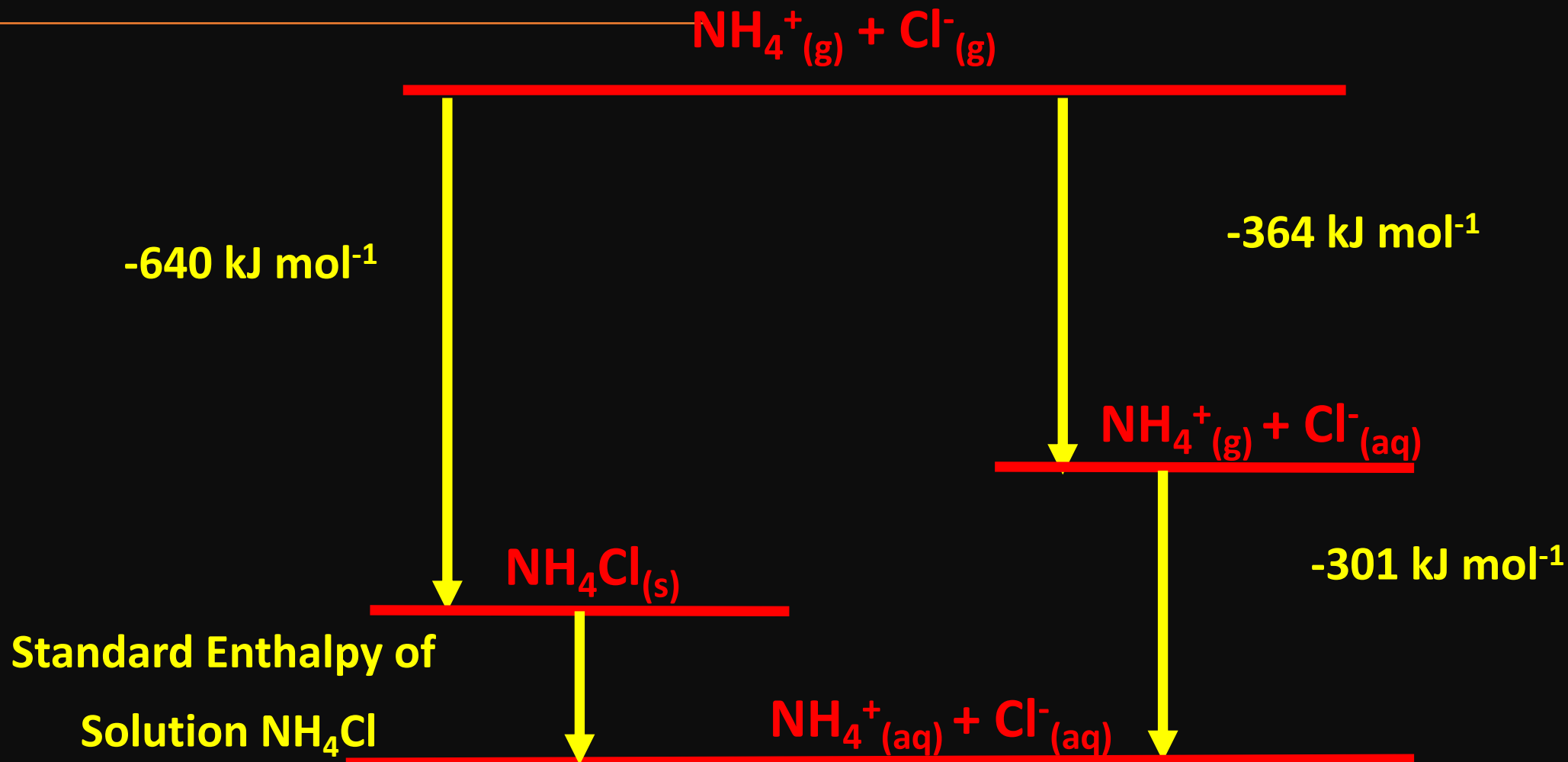
Enthalpy of Solution = Hydration Enthalpies - Lattice Enthalpy

$$\text{Enthalpy of Solution} = -665 + 640$$



Enthalpy of Solution = Hydration Enthalpies - Lattice Enthalpy

$$\text{Enthalpy of Solution} = -25 \text{ kJ mol}^{-1}$$





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