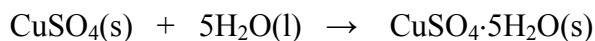


- Anhydrous copper(II) sulfate is a white powder that reacts with water to give the familiar light blue crystals of copper(II) sulfate-5-water.

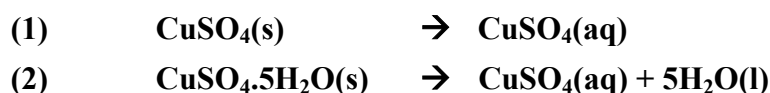


Calculate the standard enthalpy change for this reaction from the heats of solution.

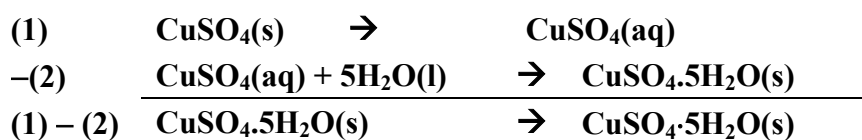
Compound	$\Delta H^\circ_{\text{solution}} / \text{kJ mol}^{-1}$
$\text{CuSO}_4(\text{s})$	-66.5
$\text{CuSO}_4 \cdot 5\text{H}_2\text{O}(\text{s})$	+11.7

Marks
2

The heats of solution correspond to the reactions:



The reaction $\text{CuSO}_4(\text{s}) + 5\text{H}_2\text{O}(\text{l}) \rightarrow \text{CuSO}_4 \cdot 5\text{H}_2\text{O}(\text{s})$ therefore corresponds to (1) – (2):

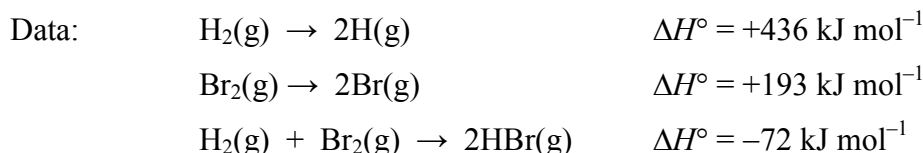


Therefore,

$$\Delta_{\text{rxn}}H^\circ = \Delta_{\text{solution}}H^\circ (1) - \Delta_{\text{solution}}H^\circ (2) = (-66.5) - (+11.7) = -78.2 \text{ kJ mol}^{-1}$$

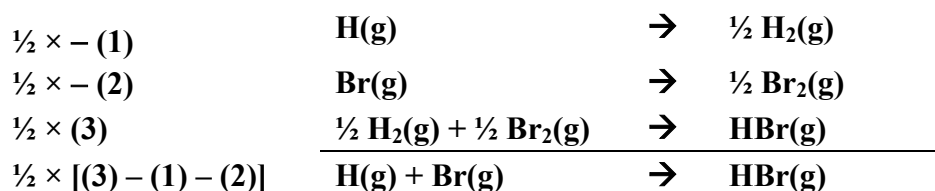
Answer: $-78.2 \text{ kJ mol}^{-1}$

- Using the given data, calculate ΔH° for the reaction: $\text{H}(\text{g}) + \text{Br}(\text{g}) \rightarrow \text{HBr}(\text{g})$



3

The reaction involves the formation of $\text{HBr}(\text{g})$ from $\text{H}(\text{g})$ and $\text{Br}(\text{g})$ and so involves the combination:



Therefore,

$$\Delta_{\text{rxn}}H^\circ = \frac{1}{2} [\Delta H^\circ(3) - \Delta H^\circ(1) - \Delta H^\circ(2)] = \frac{1}{2} [(-72) - (436) - (193)] = -351 \text{ kJ mol}^{-1}$$

Answer: -351 kJ mol^{-1}

