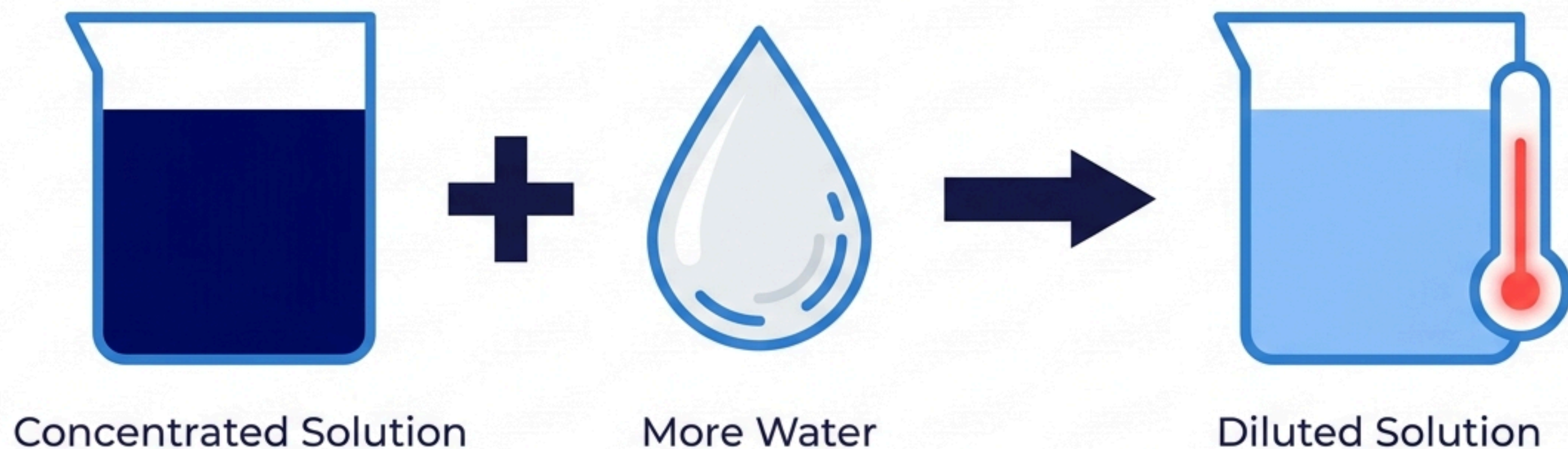


Enthalpy of Dilution | Thermodynamics



**THE SOLUTE IS ALREADY DISSOLVED —
SO WHY DOES THE HEAT CHANGE?**

What is Enthalpy of Dilution?

Enthalpy of Dilution is the heat withdrawn from (or released to) the surroundings when additional solvent is added to an existing solution.

- ✓ **Depends on two factors:**
 1. The **original concentration** of the solution.
 2. The **amount of solvent** added.
- ✓ **Conditions:** Measured at constant temperature and pressure.



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$$E=mc^2$$



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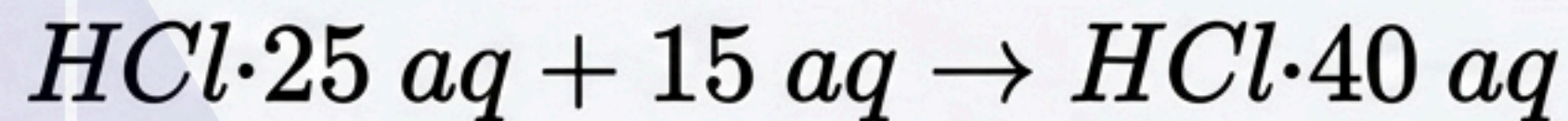
The Concentration Dependence (HCl Example)

As more solvent is added, the enthalpy of solution approaches a **limiting value** (infinite dilution).



Calculating Enthalpy of Dilution

We want to find the heat change when diluting from 25 aq to 40 aq.
Subtract Equation 1 from Equation 2:



$$\Delta H = -72.79 - (-72.03)$$

$$\Delta H_{\text{dilution}} = -0.76 \text{ kJ mol}^{-1}$$

This $-0.76 \text{ kJ mol}^{-1}$ is the **Enthalpy of Dilution** for this specific step.

Solution vs. Dilution

Enthalpy of Solution



- Breaking the solid crystal lattice & initial hydration of ions.
- Generally larger magnitude.

Enthalpy of Dilution



- Ions moving further apart & forming extended hydration spheres. *No lattice to break!*
- Generally smaller magnitude.

! JEE Trap: Do not confuse $\Delta_{\text{sol}} H$ with $\Delta_{\text{dil}} H$. Dilution starts with an *already dissolved* solute. The heat change comes entirely from changes in ion-ion and ion-solvent interactions!

Revision Summary

Key Takeaways: Enthalpy of Dilution

- **Definition:** Heat change when additional solvent is added to an existing solution.
- **Variables:** Depends heavily on the *initial concentration* and the *amount of solvent* added.
- **Limiting Value:** As infinite solvent is added, the enthalpy change approaches a constant limiting value (infinite dilution).
- **Calculation:** Easily calculated using Hess's Law by subtracting enthalpies of solution for different concentrations.



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