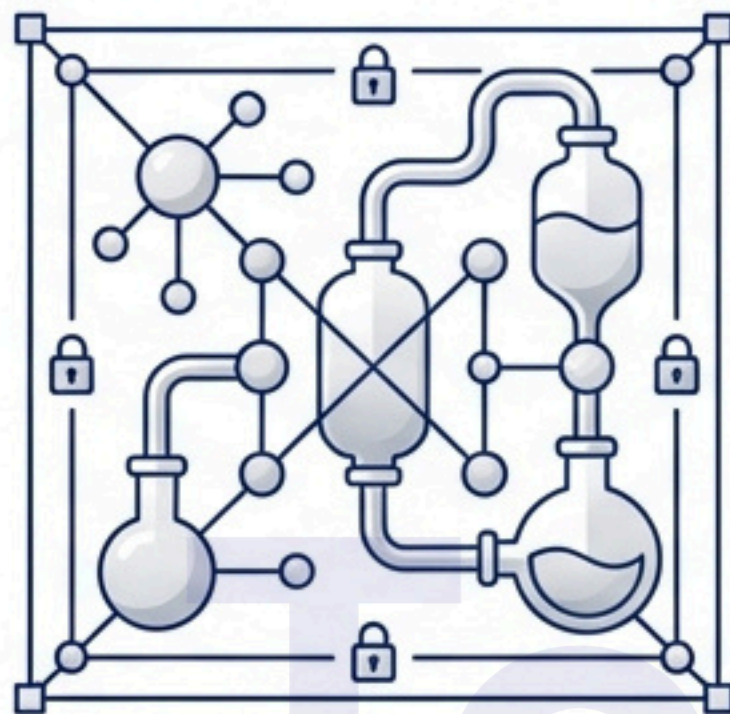




Chapter 5: Thermodynamics

Standard Enthalpy of Reactions

Defining the universal baseline for thermodynamic measurements.

Section 5.4 (a)

The Problem with Unstandardized Enthalpy



Enthalpy changes (ΔH) depend entirely on the physical conditions under which a reaction occurs.

Without a baseline, comparing ΔH values across different labs or reactions is impossible.



Standardization provides a universal reference point.

Allows chemists to accurately tabulate, calculate, and compare thermodynamic data worldwide.

It is strictly necessary to specify standard conditions to make make enthalpy data meaningful.

Defining the Standard State

Standard State = Pure Substance + 1 bar Pressure



Liquid Ethanol @ 298 K

Pure liquid ethanol exactly
at 1 bar of pressure.



Solid Iron @ 500 K

Pure solid iron exactly
at 1 bar of pressure.

*Notice that the standard state requires a specified temperature,
but the temperature itself can vary.*



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$$E=mc^2$$



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The Temperature Convention



298 K

The Default Baseline

By convention, thermodynamic tables and data are usually taken at 298 K (approx. 25°C).

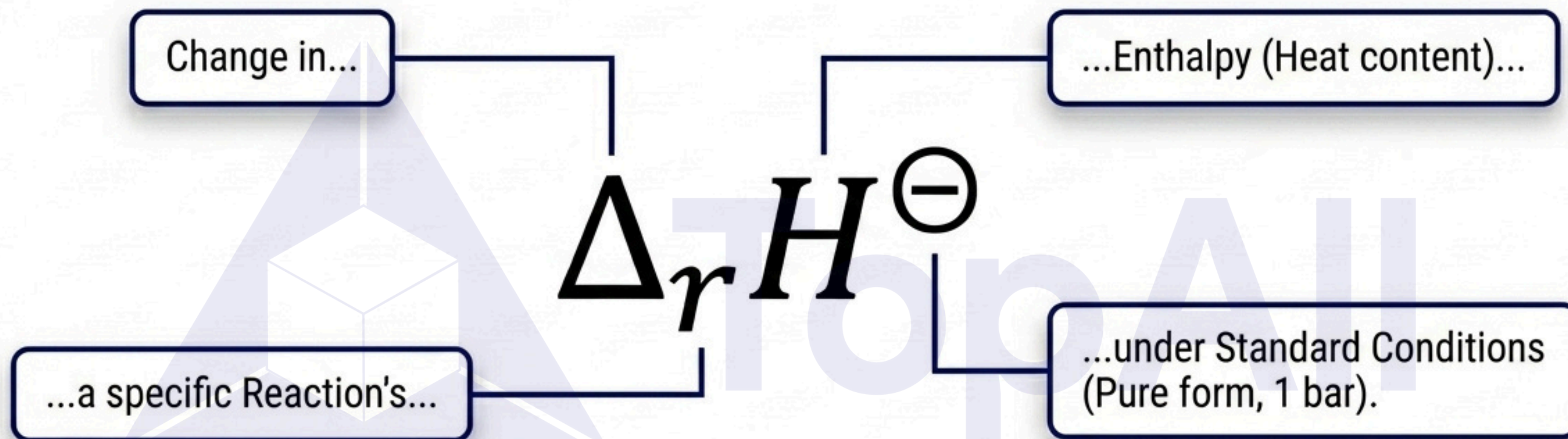
MYTH

Standard state means a reaction ~~must happen at a single standard temperature.~~

FACT

Standard state must specify a temperature, but temperature itself is not fixed by the standard definition.

Decoding the Standard Enthalpy Notation



Standard Enthalpy of Reaction ($\Delta_r H^\ominus$) is the measured enthalpy change when all participating reactants and products are completely in their standard states.



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