

THERMOCHEMISTRY

1. Enthalpy of Chemical Reaction

$$H = E + PV$$

The change in Enthalpy:

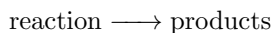
$$\Delta H = \Delta E + \Delta(PV)$$

If the pressure is held constant:

$$\Delta H = \Delta E + P\Delta V$$

Enthalpy of Reaction

- Because most reactions are constant-pressure process, we can equate the heat change in these cases to the change in enthalpy.

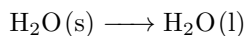


→ The change in enthalpy, called the **Enthalpy of Reaction**, ΔH .

$$\Delta H = H(\text{products}) - H(\text{reactants})$$

- $\Delta H > 0$, the reaction is an endothermic process.
- $\Delta H < 0$, the reaction is an exothermic process.

Thermochemical Equations



$$\Delta H = 6.01 \text{ kJ/mol.}$$

A comparison of ΔH and ΔE :

2. The change of internal energy:

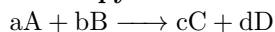
$$\Delta E = \Delta H - P\Delta V \tag{1}$$

$$\Delta E = \Delta H - \Delta(PV) \tag{2}$$

$$= \Delta H - \Delta(nRT) \tag{3}$$

$$= \Delta H - RT\Delta n \tag{4}$$

3. Enthalpy of Formation (ΔH°)



Hess's law

- When reaction are converted to products, the change in enthalpy is the **same** whether the reaction takes place in one step or in the series of steps. ΔH depends only on the initial and final state.
- We have a reaction:



$$\Delta H = -283.0 \text{ kJ/mol} \quad (6)$$

Then we inverse the equation: (7)



$$\Delta H = +283.0 \text{ kJ/mol}. \quad (9)$$