Chemical Thermodynamics

$\Delta_r \bar{H}^0_T$

- $\Delta_r \bar{H}^0_T$ can be measured from calorimetry.
- However, isn't always possible to isolate the reaction of interest and study it cleanly.
- Consider the creation of $CO_2(g)$

Hess's Law

- Calculate $\Delta_r \bar{H}^0_T$ using a fictitious chemical path.

Enthalpies of formation

- In practice, enthalpies are tabulated as enthalpies of formation, $\Delta_f \bar{H}^0_T$.

- Two cautions

$\Delta_r \bar{H}^0_T$

- For a generic chemical reaction, $\Delta_r \bar{H}^0_T$.

- Value is for chemical reaction as written

$\Delta_r \overline{S}^0_T$

- For a generic chemical reaction, $\Delta_r \overline{S}^0_T$.

- Only technically correct at 298K and 1 bar pressure.

$\Delta_r \bar{G}^0_T$

- $\Delta_r \bar{G}^0_T$ has a direct temperature dependence

- Often assume enthalpy and entropy are not temperature dependent.

Example

- How much heat is evolved when 50 g of $CH_4(g)$ is burned at 298 K?

Example

- How much heat is evolved when 50 g of $CH_4(g)$ is burned at 2000 K?

Example

- How much heat is evolved when 50 g of $CH_4(g)$ is burned at 2000 K?
- Consider the temperature dependence of the heat capacities.

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- Consider the temperature dependence of the heat capacities.

Species	a (J/Kmol)	b (J/K^{2}mol)	c (J/K^{3}mol)	ν
$CO_2(g)$				
$H_2O(g)$				
$O_2(g)$				
$CH_4(g)$				
Δ				

Example

- How much heat is evolved when 50 g of $CH_4(g)$ is burned at 2000 K?
- Continuing…