

Lecture 19.1 Gibbs Free Energy

Note Title

3/16/2012

Review: 2nd Law

$\Delta S_{\text{univ}} > 0$... for spontaneous change

$$\left(\Delta S_{\text{univ}} = -\frac{\Delta H_{\text{rxn}}}{T} + \Delta S_{\text{rxn}} \right) \cdot \leftrightarrow T$$

$$-\overline{T\Delta S_{\text{univ}}} = \Delta H_{\text{rxn}} - T\Delta S_{\text{rxn}}$$

$$\Delta G_{\text{rxn}} = -T\Delta S_{\text{univ}}$$

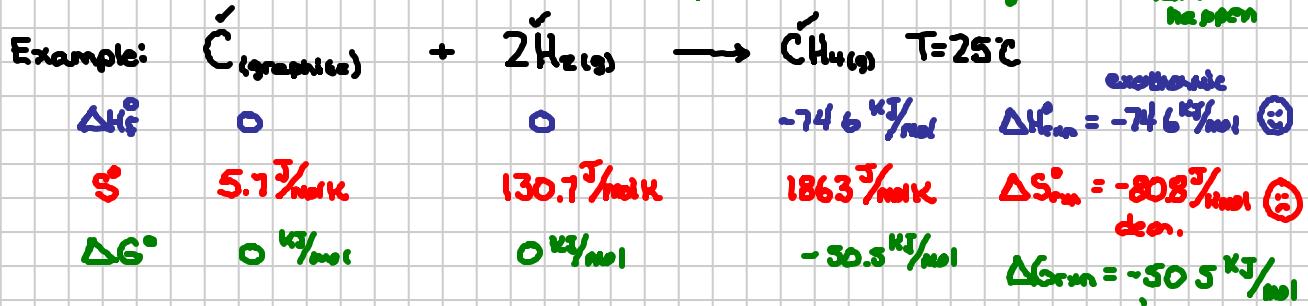
Flags: $\Delta G_{\text{rxn}} = \Delta H_{\text{rxn}} - T\Delta S_{\text{rxn}}$

goldfish are horrible % tarter sever

$\Delta G_{\text{rxn}} < 0$ spontaneous ... $\Delta G_{\text{rxn}} = \text{max avail. work}$

$\Delta G_{\text{rxn}} = 0$ equilibrium

$\Delta G_{\text{rxn}} > 0$ non-spont. ΔG_{rxn} work required to make rxn happen



$$\Delta G_{\text{rxn}} = \Delta H_{\text{rxn}}^\circ - T\Delta S_{\text{rxn}}^\circ$$

$$\Delta G_{\text{rxn}} = -74.6 \text{ kJ/mol} - (298.15 \text{ K})(-0.0008 \text{ kJ/moleK}) = \underline{-50.5 \text{ kJ/mol}}$$

neg \leftrightarrow spontaneous
max work

Two ways to calc. ΔG

- i) Tabulated ΔH & S, $\Delta G = \Delta H - T\Delta S$
- ii) Tabulated ΔG° , prod - react.

Last Note.

$$\Delta H_{\text{rxn}}^\circ = -74.6 \text{ kJ/mol}$$

exothermic rxn... heat released

$$- \Delta G_{\text{rxn}}^\circ = -50.5 \text{ kJ/mol}$$

mod. amt. work!

heat lost -24.1 kJ/mol heat released but unavailable for work
 required for spontaneous.

required to increase entropy surroundings