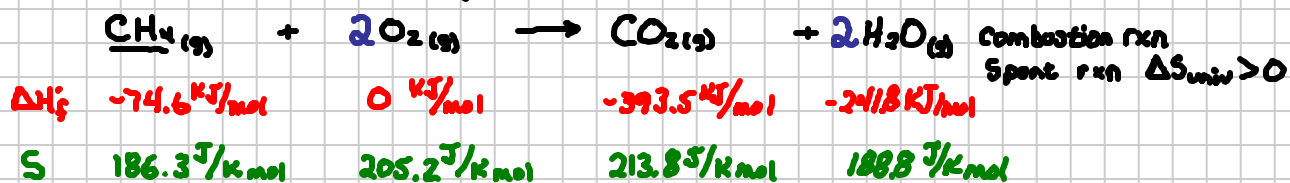


# Lecture 18.3 Reaction Spontaneity

Note Title

11/1/2011

Question. Is the following reaction spontaneous at 25 °C?



$$\Delta H_{\text{rxn}} = \sum n \Delta H_{\text{prod}} - \sum n \Delta H_{\text{react}} = (-393.5 + 2(-241.8)) - (-74.6 + 2(0)) = -802.5 \text{ kJ/mol} \quad \text{exo} \quad \text{☺}$$

$$\Delta S_{\text{rxn}} = \sum n S_{\text{prod}} - \sum n S_{\text{react}} = (213.8 + 2(188.8)) - (186.3 + 2(205.2)) = -53 \text{ J/K mol} \quad \text{☹}$$

$$\text{2nd Law: } \Delta S_{\text{univ}} = \Delta S_{\text{rxn}} - \frac{\Delta H_{\text{rxn}}}{T}$$

$$\Delta S_{\text{univ}} = -5.3 \text{ J/K mol} - \frac{-802.5 \text{ kJ/mol}}{298.15 \text{ K}}$$

$$\Delta S_{\text{univ}} = -5.3 \times 10^{-3} \frac{\text{kJ}}{\text{K mol}} + \frac{802.5 \text{ kJ/mol}}{298.15 \text{ K}} = +2.687 \text{ kJ/K mol}$$



pos...  $\Delta S_{\text{univ}}$  is pos.  
Spontaneous rxn  
at 25 °C