

Chem 531: Problem Set #9

Due in class: Thursday, December 7th

(1) Consider the equilibrium $\text{C}_2\text{H}_6(\text{g}) \rightleftharpoons \text{C}_2\text{H}_4(\text{g}) + \text{H}_2(\text{g})$. At 1000 K and a constant total pressure of 1 bar, $\text{C}_2\text{H}_6(\text{g})$ is introduced into a reaction vessel. The total pressure is held constant at 1 bar and at equilibrium the composition of the mixture in mole percent is $\text{H}_2(\text{g})$: 26%, $\text{C}_2\text{H}_4(\text{g})$: 26%, and $\text{C}_2\text{H}_6(\text{g})$: 48%.

(a) Calculate K_P at 1000 K.

(b) If $\Delta H_r^\circ = 137.0 \text{ kJ/mol}$, estimate the value of K_P at 298.15 K.

(c) Calculate ΔG_r° for this reaction at 298.15 K.

(2) The following data apply to the reaction $\text{Br}_2(\text{g}) \rightleftharpoons 2\text{Br}(\text{g})$:

T (in K)	1123	1172	1223	1273
K_P	0.408×10^{-3}	1.42×10^{-3}	3.32×10^{-3}	7.2×10^{-3}

Determine by graphical means the reaction enthalpy at 1200 K.