Chemistry 102 Name:_____

FREE ENERGY CHANGE & SPONTANEITY

Exit Ticket

1. Given the following data:

$2\ H_2\ (g) + C\ (s) \rightarrow CH_4\ (g)$	$\Delta G° = -51$ kJ
$2\ H_2(g) + O_2\ (g) \rightarrow 2\ H_2O\ (l)$	$\Delta G° = -474$ kJ
$C\ (s) + O_2\ (g) \rightarrow CO_2\ (g)$	$\Delta G° = -394$ kJ

Calculate $\Delta G°$ for the following reaction:

$$CH_4\ (g) + 2\ O_2\ (g) \rightarrow CO_2\ (g) + 2\ H_2O\ (l)$$

2. Consider the following reaction:

$$2\ NO_2\ (g) \rightleftharpoons N_2O_4\ (g)$$

For each of the following mixture of reactants and products at 25°C, predict the direction in which the reaction will shift to reach equilibrium:

a) $P_{NO2} = P_{N2O4} = 1.0$ atm

b) $P_{NO2} = 0.29$ atm $P_{N2O4} = 1.6$ atm

3. The value of $\Delta G°$ for the reaction shown below is –5490 kJ. Use this value and other data from appendix II in your textbook to calculate $\Delta H°_f$ for C_4H_{10} (g).

$$2\ C_4H_{10}\ (g)\ +\ 13\ O_2\ (g)\ \rightarrow\ 8\ CO_2\ (g) + 10\ H_2O\ (l)$$

4. Calculate $\Delta G°$ for $H_2O\ (g) + ½\ O_2\ (g) \rightleftharpoons H_2O_2\ (g)$ at 600 K from the following data:

$H_2\ (g) + O_2\ (g) \rightleftharpoons H_2O_2\ (g)$ $\qquad$ $K = 2.3 \times 10^6$ at 600 K

$2\ H_2\ (g) + O_2\ (g) \rightleftharpoons 2\ H_2O\ (g)$ $\qquad$ $K = 1.8 \times 10^{37}$ at 600 K

5. Using the following data, calculate the value of K_{sp} for $Ba(NO_3)_2$, one of the least soluble of the common nitrate salts.

Species	$\Delta G°_f$
Ba^{2+} (aq)	-561 kJ/mol
NO_3^-	-109 kJ/mol
$Ba(NO_3)_2$ (s)	-797 kJ/mol