Name _____ AP Chemistry

HW 1: Due 3/12/20. Complete all free response and multiple choice questions. One question will be graded. Show all work. Box and clearly label all final free response answers.

Substance	Standard Entropy Joule °C^{-1} mole^{-1}
$N_2(g)$	192
$H_2(g)$	130
$NH_3(g)$	192

Ammonia can be produced by the following reaction: $N_2(g) + 3\ H_2(g) \Longleftrightarrow 2\ NH_3(g)$

The Gibbs free energy of formation $\Delta G_f°$ of $NH_3(g)$ is -16.5 kilojoules per mole.

(a) Calculate the value for $\Delta H°$ for the reaction above at 298 K.

(b) Can the yield of ammonia be increased by raising the temperature? Explain.

(c) What is the equilibrium constant for the reaction above at 298 K?

(d) If 235 milliliters of H_2 gas measured at 25°C and 570 millimeters Hg were completely converted to ammonia and the ammonia were dissolved in sufficient water to make 0.500 liter of solution, what would be the molarity of the resulting solution?

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Compound	$\Delta H°_f$ (kilocalories/ mole)	S° (calories/mole K)
H_2O (l)	-68.3	16.7
CO_2 (g)	-94.1	51.1
O_2 (g)	0.0	49.0
C_3H_8 (g)	?	64.5

When 1.000 gram of propane gas, C_3H_8, is burned at 25°C and 1.00 atmosphere, H_2O(l) and CO_2(g) are formed with the evolution of 50.33 kilojoules.

(a) Write a balanced equation for the combustion reaction.

(b) Calculate the molar enthalpy of combustion, $\Delta H°_{comb}$, of propane.

(c) Calculate the standard molar enthalpy of formation, $\Delta H°_f$, of propane gas.

(d) Calculate the entropy change, $\Delta S°_{comb}$, for the combustion reaction and account of the sign of $\Delta S°_{comb}$.

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