CHE 112 - Homework - Ch 13d

OER 16.4 **Nonstandard States or ΔG and $\mathbf{K}_c$** Score: _____/25

Name: _____ Date: _____

[5 pt] 1. Define the relationship between Gibbs Free Energy at standard state conditions and Gibbs Free Energy at nonstandard state conditions. Define each variable, and give the standard units for each

[6 pt] 2. Urea (NH_2CONH_2 is an important fertilizer and is produced industrially by reaction $2NH_3(g) + CO_2(g) \longrightarrow NH_2CONH_2(g) + H_2O(l)$. Given that ΔG° = - 13.6 kJ/mol, calculate ΔG at STP for the following sets of conditions:

(a) 10 atm NH_3, 10 atm CO_2 and 1.0 atm NH_2CONH_2 2(a) _____

(b) 0.10 atm NH_3, 0.10 atm CO_2 and 1.0 M NH_2CONH_2 2(b) _____

(c) Which set of reaction conditions lead to a spontaneous reaction (A or B)? 2(c) _____

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[5 pt] 3. Define the relationship between Gibbs Free Energy and the Equilibrium Constant. Define each variable, and give the standard units for each

[4 pt] 4. Calculate the equilibrium constant for the reaction in Question 2. 4. _____

[5 pt] 5. At 25 °C, the acid dissociation constant (K_c for aspirin ($C_9H_8O_4$) is 3.0×10^{-4}. 5. _____
Calculate ΔG° for the reaction: $C_9H_8O_4(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + C_9H_7O_4^-(aq)$