CH 223
Sample Quiz #1 Name: ______________________________ Lab Section: _______
Answers

1. For the reaction: $\mathbf{CH_4(g) + 2\ O_2(g) \rightleftharpoons CO_2(g) + 2\ H_2O(g)}$, $\mathbf{K_c = 1.15*10^7}$ (430. K), held within a 2.00 L flask (10 points)

   Write the equilibrium constant expression for K_c. $\mathbf{K_c = [H_2O]^2[CO_2]/[CH_4][O_2]^2 = 1.15 \times 10^7}$

   Is the reaction at equilibrium if $[CO_2] = [H_2O] = 0.00350$ M, $[O_2] = 3.31*10^{-6}$ M and $[CH_4] = 3.31*10^{-6}$ M? If not, indicate the direction that the reaction must proceed to achieve equilibrium.

   Q = 1.18 x 10^{9}
   Q > K, will shift left (to reactant side)

   What is the value of the equilibrium constant if the reaction is $2\ CH_4(g) + 4\ O_2(g) \rightleftharpoons 2\ CO_2(g) + 4\ H_2O(g)$ at 430. K?

   $\mathbf{K_{new} = 1.32 \times 10^{14}}$

   What is the value of K_c at 430. K for the reaction: $CO_2(g) + 2\ H_2O(g) \rightleftharpoons CH_4(g) + 2\ O_2(g)$

   $\mathbf{K_{new} = 8.70 \times 10^{-8}}$

2. For the reaction: $\mathbf{Cl_2(g) + Br_2(g) \rightleftharpoons 2\ BrCl(g)}$, $\mathbf{K_c = 10.3}$ (150 °C) (4 points)

   Is this reaction product-favored or reactant-favored? **product favored ($\mathbf{K_c > 1}$)**

   If 0.500 mol BrCl in a 1.00 L flask is allowed to reach equilibrium, what are the equilibrium concentrations of Cl_2, Br_2 and BrCl?

   $\mathbf{[Cl_2] = [Br_2] = 0.0960\ M}$
   [BrCl] = 0.308 M

3. For the reaction: $\mathbf{RX(s) \rightleftharpoons R(g) + X(g)}$, $\mathbf{K_c = 1.11*10^{-7}}$ (200. K) (6 points)

   Write the equilibrium constant expression. $\mathbf{K_c = [R][X] = 1.11 \times 10^{-7}}$

   Calculate the equilibrium concentrations of R and X if a solid sample of RX is placed in a closed vessel and decomposes until equilibrium is established.

   $\mathbf{[R] = [X] = 3.33 \times 10^{-4}\ M}$

   What is the value of $\mathbf{K_p}$ at 200. K?

   $\mathbf{K_p = 2.99 \times 10^{-5}}$