Dougherty Valley HS Chemistry - AP
Equilibrium – Chemical Equilibrium Problem Set 2

Worksheet #4

Name: **Period:** **Seat#:**

Directions: Show all work in a way that would earn you credit on the AP Test! This is always the rule! Some answers are provided at the end in italics and underlined. If you need more space, use binder paper and staple to your worksheet.

1) Consider the equilibrium: $2\ SO_2(g) + O_2(g) \leftrightarrow 2\ SO_3(g)$ $K_c = 4.36\ \underline{M}^{-1}$

a) Calculate the value of "Q" for a situation in which $[SO_2] = 2.00\ \underline{M}$, $[O_2] = 1.50\ \underline{M}$, and $[SO_3] = 1.25\ \underline{M}$.
0.260

b) Does this mixture shift toward the reactants or products to reach equilibrium? _____

2) Study the discussion in your textbook about converting K_c and K_p. Write the K_p expression for the reaction in question 1 and calculate its value at 0°C. Remember, R = 0.0821 L·atm/mol·K.

3) Consider the equilibrium $PCl_3(g) + Cl_2(g) \rightleftharpoons PCl_5(g)$.
How would the following changes affect the partial pressures of each gas at equilibrium?

	$PCl_3(g)$	$Cl_2(g)$	$PCl_5(g)$
a) Addition of PCl_3	_____	_____	_____
b) Removal of Cl_2	_____	_____	_____
c) Removal of PCl_5	_____	_____	_____
d) Decrease in the volume of the container	_____	_____	_____
e) Addition of He without change in volume	_____	_____	_____

4) How will each of the changes in question 3 affect the K_{eq}? (↑ = increase; ↓ = decrease; — = unchanged)

a _____ b _____ c _____ d _____ e _____

5) Indicate how each of the following changes affects the amount of each gas in the system below, for which $\Delta H_{reaction} = +9.9$ kcal.

	$H_2(g)$	$CO_2(g)$	$H_2O(g)$	$CO(g)$
a) Addition of CO_2	_____	_____	_____	_____
b) Addition of H_2O	_____	_____	_____	_____
c) Addition of a catalyst	_____	_____	_____	_____
d) Increase in temperature	_____	_____	_____	_____
e) Decrease in the volume of the container	_____	_____	_____	_____

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6) How will each of the changes in question 5 affect the equilibrium constant?

a _____ b _____ c _____ d _____ e _____

7) Consider the equilibrium: $2N_2O(g) + O_2(g) \rightleftharpoons 4NO(g)$
How will the amount of chemicals at equilibrium be affected by

	$2N_2O(g)$	$+ \; O_2(g) \rightleftharpoons$	$4NO(g)$
a) Adding N_2O	_____	_____	_____
b) Removing O_2	_____	_____	_____
c) Increasing the volume of the container	_____	_____	_____
d) Adding a catalyst	_____	_____	_____

8) For the reaction,
How will the concentration of each chemical be affected by

$$4NH_3(g) + 3O_2(g) \rightleftharpoons 2N_2(g) + 6H_2O(l)$$

a) adding O_2 to the system	_____	_____	_____	_____
b) adding N_2 to the system	_____	_____	_____	_____
c) removing H_2O from the system	_____	_____	_____	_____
d) decreasing the volume of the container	_____	_____	_____	_____

9) Consider the equilibrium: $2N_2O(g) + O_2(g) \rightleftharpoons 4NO(g)$
3.00 moles of NO(g) are introduced into a 1.00-Liter evacuated flask. When the system comes to equilibrium, 1.00 mole of $N_2O(g)$ has formed. Determine the equilibrium concentrations of each substance. Calculate the K_c for the reaction based on these data. *1.00, 0.500, 1.00*

	2 N_2O	**O_2**	**4 NO**
initial			
change			
equilibrium			

Remember: The "ice" box may be used with moles, molarity, or Liters (for gaseous equilibria)… never grams.