**Dougherty Valley HS AP Chemistry**

**WORKSHEET #4**

**Equilibrium – Chemical Equilibrium**

Problem Set 2

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

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| 1. Consider the equilibrium: 2 SO2(g) + O2(g)  2 SO3(g) Kc = 4.36 M-1  Calculate the value of “Q” for a situation in which the concentrations are [SO2] = 2.00 M, [O2] = 1.50 M, and [SO3] = 1.25 M. |
| Does this mixture shift toward the reactants or products to reach equilibrium? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ |

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| 2. Study the discussion in your textbook about converting Kc and Kp. Write the Kp 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 PCl3(g) + Cl2(g)  PCl5(g).

How would the following changes affect the partial pressures of each gas at equilibrium?

PCl3(g) + Cl2(g)  PCl5(g)

a) addition of PCl3 \_\_\_\_ \_\_\_\_ \_\_\_\_

b) removal of Cl2 \_\_\_\_ \_\_\_\_ \_\_\_\_

c) removal of PCl5 \_\_\_\_ \_\_\_\_ \_\_\_\_

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 Keq? (↑=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 ΔHreaction = +9.9 kcal.

H2(g) + CO2(g)  H2O(g) + CO(g)

a) addition of CO2 \_\_\_ \_\_\_ \_\_\_ \_\_\_

b) addition of H2O \_\_\_ \_\_\_ \_\_\_ \_\_\_

c) addition of a catalyst \_\_\_ \_\_\_ \_\_\_ \_\_\_

d) increase in temperature \_\_\_ \_\_\_ \_\_\_ \_\_\_

e) decrease in the volume of the container \_\_\_ \_\_\_ \_\_\_ \_\_\_

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

a \_\_\_ b \_\_\_ c \_\_\_ d \_\_\_ e \_\_\_

7. Consider the equilibrium: 2N2O(g) + O2(g)  4NO(g)

How will the amount of chemicals at equilibrium be affected by

2N2O(g) + O2(g)  4NO(g)

a) adding N2O \_\_\_ \_\_\_ \_\_\_

b) removing O2 \_\_\_ \_\_\_ \_\_\_

c) increasing the volume of the container \_\_\_ \_\_\_ \_\_\_

d) adding a catalyst \_\_\_ \_\_\_ \_\_\_

8. For the reaction, 4NH3(g) + 3O2(g)  2N2(g) + 6H2O(l)

How will the concentration of each chemical be affected by

a) adding O2 to the system \_\_\_ \_\_\_ \_\_\_ \_\_\_

b) adding N2 to the system \_\_\_ \_\_\_ \_\_\_ \_\_\_

c) removing H2O from the system \_\_\_ \_\_\_ \_\_\_ \_\_\_

d) decreasing the volume of the container \_\_\_ \_\_\_ \_\_\_ \_\_\_

9. Consider the equilibrium: 2N2O(g) + O2(g)  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 N2O(g) has formed. Determine the equilibrium concentrations of each substance. Calculate the Kc for the reaction based on these data.

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|  | 2 N2O | O2 | 4 NO |
| initial |  |  |  |
| change |  |  |  |
| equilibrium |  |  |  |

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