Mr. Bracken
AP Chemistry

Name BRACKEN KEY
Period ____

Equilibrium Worksheet #6: LeChatelier's Principle

1. Consider the following chemical reaction.

$$N_2\,(g) + O_2\,(g) + \text{heat} \leftrightarrows 2\,NO\,(g)$$

(a) Will the equilibrium shift to the right or left when the temperature is increased? →

(b) What happens to the K value when the temperature is increased?

2. Consider the following chemical reaction.

$$2\,SO_2\,(g) + O_2\,(g) \leftrightarrows 2\,SO_3\,(g) + \text{heat}$$

(a) Will the equilibrium shift to the right or left when the temperature is increased? ←

(b) What happens to the K value when the temperature is increased?

3. How will this system at equilibrium shift in each of the following cases?

$$CO\,(g) + H_2O\,(g) \leftrightarrows H_2\,(g) + CO_2\,(g)$$

(a) Gaseous carbon dioxide is removed. →

(b) Water vapor is added. →

(c) The pressure is increased by adding helium gas. No Effect

4. Heating solid sodium bicarbonate in a closed vessel establishes the following equilibrium:

$$2\,NaHCO_3\,(s) \leftrightarrows Na_2CO_3\,(s) + H_2O\,(g) + CO_2\,(g)$$

What would happen to the equilibrium position if… *(assume the temperature remains constant)*

(a) some of the CO_2 were removed from the system? →

(b) some solid Na_2CO_3 were added to the system? No Effect

(c) some of the solid $NaHCO_3$ were removed from the system? No Effect

5. What will happen to the number of moles of SO_3 in equilibrium in the following reaction:

$$\mathbf{2\ SO_3\ (g)\ +\ heat\ \leftrightarrows\ 2\ SO_2\ (g)\ +\ O_2\ (g)}$$

(a) Oxygen gas is added. ← increase

(b) The pressure is increased by decreasing the volume. ← increase

(c) The pressure is increased by adding argon gas. No Effect

(d) The temperature is decreased. ← increase

(e) A catalyst is added. No Effect

(f) Gaseous sulfur dioxide is removed. → decrease

6. Consider the following chemical equation.

$$\mathbf{H_2\ (g)\ +\ I_2\ (g)\ +\ energy\ \leftrightarrows\ 2\ HI\ (g)}$$

In which direction will the position of the equilibrium be shifted for each of these changes?

(a) H_2 (g) is added. →

(b) I_2 (g) is removed. ←

(c) HI (g) is removed. →

(d) Some Ar (g) is added. No Effect

(e) The volume of the container is doubled. No Effect

(f) The temperature is increased. →

7. Predict the direction of the shift in the equilibrium position in response to each of these changes.

$$\mathbf{As_4O_6\ (s)\ +\ 6\ C\ (s)\ \leftrightarrows\ As_4\ (g)\ +\ 6\ CO\ (g)}$$

(a) Addition of CO ←

(b) Addition of C No Effect

(c) Removal of some C No Effect

(d) Addition of As_4O_6 No Effect

(e) Removal of gaseous arsenic (As_4) →