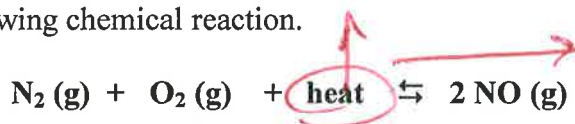


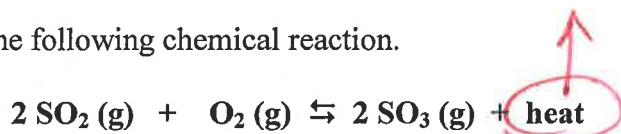
Equilibrium Worksheet #6: LeChatelier's Principle

1. Consider the following chemical reaction.



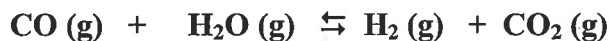
- (a) Will the equilibrium shift to the right or left when the temperature is increased?  $\longrightarrow$
- (b) What happens to the K value when the temperature is increased?

2. Consider the following chemical reaction.



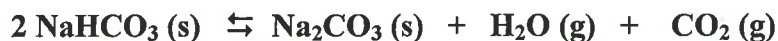
- (a) Will the equilibrium shift to the right or left when the temperature is increased?  $\longleftarrow$
- (b) What happens to the K value when the temperature is increased?

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



- (a) Gaseous carbon dioxide is removed.  $\longrightarrow$
- (b) Water vapor is added.  $\longrightarrow$
- (c) The pressure is increased by adding helium gas. NO EFFECT

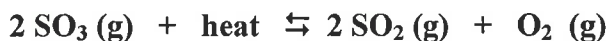
4. Heating solid sodium bicarbonate in a closed vessel establishes the following equilibrium:



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

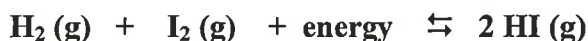
- (a) some of the  $\text{CO}_2$  were removed from the system?  $\longrightarrow$
- (b) some solid  $\text{Na}_2\text{CO}_3$  were added to the system? NO EFFECT
- (c) some of the solid  $\text{NaHCO}_3$  were removed from the system? NO EFFECT

5. What will happen to the number of moles of SO<sub>3</sub> in equilibrium in the following reaction:



- (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.



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

- (a) H<sub>2</sub> (g) is added. →
- (b) I<sub>2</sub> (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.



- (a) Addition of CO ←
- (b) Addition of C No Effect
- (c) Removal of some C No Effect
- (d) Addition of As<sub>4</sub>O<sub>6</sub> No Effect
- (e) Removal of gaseous arsenic (As<sub>4</sub>) →