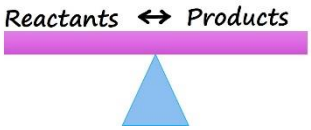
Le Chatelier's Principle Notes



A. What is Le Chatelier's Principle?

- *"If a system in equilibrium is subjected to a _____, the equilibrium will shift in the direction which tends to _____ that stress"*

B. Restoring Balance

- *Think of it as a lever that must constantly be in _____ (equilibrium)*
- *A shift always occurs to make it _____*

C. Shifts in Equilibrium

1. Changes in Concentration (must be _____ or _____)

- *If you **add** something, the equilibrium will shift in order to get rid of whatever you add and restore balance. (**A**dd = shifts **A**_____)*
- *If you **remove** something, the reaction will shift to _____ what was lost*
- *The reaction will shift in the forward direction if…*
  - *More reactant is _____ **OR** Product is _____*
- *The reaction will shift in the reverse direction if…*
  - *More product is _____ **OR** Reactant is _____*

Example 1: $2NO_2\ (g) \leftrightarrow N_2O_4\ (g) + Heat$

For the reaction above, which direction will equilibrium shift if…,

NO_2 (g) is added?_____NO_2 (g) is removed?_____

2. Changes in Pressure (Only affects _____)

- *Increase in pressure (decrease in _____) will shift the reaction in the direction producing _____ molecules of gas*
- *_____ in pressure (increase in volume) will shift reaction to the direction with _____ molecules of gas*
- *Count the molecules that are gas on each side of the reaction arrow!*

Example 2: $N_2\ (g) + 3H_2\ (g) \leftrightarrow 2NH_3\ (g) + Heat$

For the reaction above, which direction will equilibrium shift if…,

Increase in Pressure? _____Decrease in Pressure? _____

3. Changes in Temperature

- *Heat is treated like a change in _____*
- *Endothermic reaction – Heat is a _____*
- *Exothermic reaction – Heat is a _____*
- *Change in temperature (& temperature only) changes the value of _____!*

Example 3: $2NO_2\ (g) \leftrightarrow N_2O_4\ (g) + Heat$

For the reaction above, which direction will equilibrium shift if…,

Increase in Temp? _____Decrease in Temp? _____

D. What happens to Keq when temperature changes?

Keq=

- *If reaction shifts right, _____ gets bigger, and Keq _____*
- *If reaction shifts left, _____ gets bigger, and Keq _____*

E. What happens after the reaction shifts?

- *If the equilibrium shifts right, every thing on the _____ side of the equation increases and the other side decreases*
- *If the equilibrium shifts left, every thing on the _____ side of the equation increases and the other side decreases*

Example 4: $2H_2O\ (g) + 572\ kJ \leftrightarrow O_2\ (g) + 2H_2\ (g)$

Stress	Equilibrium Shift	$[H_2O]$	$[O_2]$	$[H_2]$	Value of Keq
add O_2			---		
add H_2O		---			
remove H_2				---	
increase pressure					
decrease temperature					

Example 5: $H_2\ (g) + Br_2\ (l) \leftrightarrow 2HBr\ (g)$

- *What happens to the amount of H_2 if Br_2 is added?*

- *What happens to the amount of H_2 as pressure increases?*

Example 6: $N_2\ (g) + 3H_2\ (g) \leftrightarrow 2NH_3\ (g) + Heat$

- *List five possible ways in which you can maximize the production of ammonia?*