**Unit 8 Notes**

**Equilibrium**

**Reversible Reactions –**occur at the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ in both directions

Example: 2SO2 + O2 2SO3

**Equilibrium -**  reached when the \_\_\_\_\_\_\_\_\_\_\_\_ of the forward reaction \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the rate of the reverse reaction

Equilibrium does not mean that the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of reactants and products are the same

The \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of reactants and products are used to determine when a system reaches equilibrium

When concentrations of reactants and products remain \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ it means the forward rate of reaction equals the backwards rate of reaction

**LeChatelier’s Principle –** if \_\_\_\_\_\_\_\_\_\_\_\_\_\_ is applied to a system in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the system will respond (shift) in a way to relieve the stress and return the system to equilibrium

Factors that cause a system in equilibrium to shift:

1. Addition or removal of reactants or products

2. Addition or removal of heat

3. Increasing/decreasing pressure

\*\*Adding a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ does not cause a system in equilibrium to \_\_\_\_\_\_\_\_\_\_\_ but helps the system to reach equilibrium faster by lowering the activation energy

**Addition/Removal of Reactant/Products**

2SO2(g) + O2(g) 🡨🡪 2 SO3(g) + heat

In the equation above if the system is at equilibrium adding more of any reactant or

product will cause the system to shift \_\_\_\_\_\_\_\_\_\_\_\_ from whatever is added

Removal of a reactant or product causes a shift \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the removal

If SO2 or O2 is added or SO3 is removed, the equilibrium shifts to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If SO3 is added or SO2 or O2 is removed, equilibrium shifts to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Addition/Removal of Heat**

2SO2(g) + O2(g) 🡨🡪 2 SO3(g) + heat

When heat is written like a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_, treat it like any other reactant or product. Adding more will cause a shift away from it, removing it will cause a shift towards the heat

In the above reaction the addition of heat would cause a shift to the \_\_\_\_\_\_\_\_\_\_\_\_\_

Removing heat would cause a shift to the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Remember that heat can either be a reactant or product depending on whether the

reaction is \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ or \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Increasing/Decreasing Pressure**

2SO2(g) + O2(g) 🡨🡪 2 SO3(g) + heat

Increasing the \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ of a system causes an equilibrium shift away from the side with the most moles of gas.

Decreasing the pressure causes a shift \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ the side with the most moles of gas

If pressure was increased in the above reaction the equilibrium would shift to the

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

If pressure was decreased in the above reaction the equilibrium would shift to the

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_