The Causes of stress

- **CHANGES IN CONCENTRATION:** Changing the amount of any reactant or product in a system at equilibrium disturbs the equilibrium.
- **Adding** a chemical pushes the equilibrium position toward the opposite side of the arrow.

- **Removing** a chemical pulls the equilibrium position toward the same side of the arrow.

- **CHANGES IN TEMPERATURE:**
- **$2\ SO_2(g) + O_2(g) \leftrightarrow 2\ SO_3(g) +$ heat**

- **Adding** the temperature causes the equilibrium position of a reaction to shift in the direction away from the heat term

- **Removing** the temperature causes the equilibrium position of a reaction to shift in the direction toward the heat term.

- **DEMONSTRATION: In this demonstration you will look at the following equation:**
- **$Co(H_2O)_6$ + 2 Cl ←→ $Co(H_2O)_4Cl_2$**
- **Pink** **Blue**

- **CHANGES IN PRESSURE:** Pressure will only affect an equilibrium with an unequal number of moles of reactants and products. For example
- **3 H2 (g) + N2 (g) ⇔ 2 NH3 (g)**

- An **Increase** in pressure will shift the equilibrium to the side with the **Least** number of moles

- A **decrease** in pressure will shift the equilibrium to the side with the **greater** number of moles

- **Demonstration In this experiment you will look at the following equation:**
- **$2\ NO_2 \leftrightarrow N_2O_4$**
- **Colorless Brown**

Lets summarize:

- All reversible reactions in a **closed** system (e.g. container) will come to a state of equilibrium.

- If stress is applied to a system at equilibrium, the system readjusts so that the stress is **Reduced**. This is Le Chatelier's principle.

- The stress may be a change in temperature or concentration. If a **Gas** is present in the reaction, another possible stress is a change in pressure.

F.Y.I.

- Gases fill large volumes with **VERY** few particles. The **KINETIC** Theory explains how they can do this.

- Think of a balloon, how does the balloon **INFLATE** with only a relatively few air particles inside it?

- According to the Kinetic Theory, these few, but **FAST** moving particles **COLLIDE** into the sides of the balloon at a very fast rate (an O2 molecule at room temperature may be moving at 600 mph) causing the sides of the balloon to expand.

- The frequency and force that these molecular "bangings" happen at determines the **PRESSURE** exerted by a gas.