Worksheet 19 - Le Chatelier's Principle

Le Chatelier's Principle states that if a **stress** is applied to a system at equilibrium, the system will adjust, to partially offset the stress and will reach a new state of equilibrium.

The "stresses" that can be applied to the system include changes in **concentration**, **pressure**, **volume** and **temperature**.

- Changes in concentration of either reactants or products will change the value of **Q**, the reaction quotient.

> Adding more reactant will drive the forward reaction.
> Adding more product will drive the reverse reaction.
>
> Removal of reactants or products will shift the equilibrium in the direction needed to produce more of the substance that was removed.

Solids and pure **liquids** can **not** change concentration. Changing the amount of these present in the system will have no effect on equilibrium, unless they are removed entirely.

Catalysts are species that speed up the rate of a reaction. However, they speed up both the forward and reverse reactions, leaving ***K*** unchanged.

- Changes in pressure and **volume** will affect the equilibrium of reactions involving gases. In the previous worksheet, you calculated the effect of pressure on gaseous systems.

> **Increasing** the **volume** of the system (**lowering** the **pressure**) drives the equilibrium toward the state with the **larger** number of **moles** of **gas**.
>
> **Increasing** the **pressure** of the system by adding an **inert gas** has **no effect** on the equilibrium of the system.

- Changes in temperature change the **value** of the equilibrium constant, ***K***. This is a fairly complex process, but can be thought of in simple terms, using Le Chatelier's Principle.

> **Heat** can be treated as a **product** in **exothermic** reactions ($\Delta H < 0$) and as a **reactant** in **endothermic** reactions ($\Delta H > 0$).
>
> Raising the temperature of a reaction can be thought of as adding heat. In endothermic reactions (heat = reactant) this will drive the forward reaction. In exothermic reactions (heat = product) and raising the temperature will drive the reverse reaction.