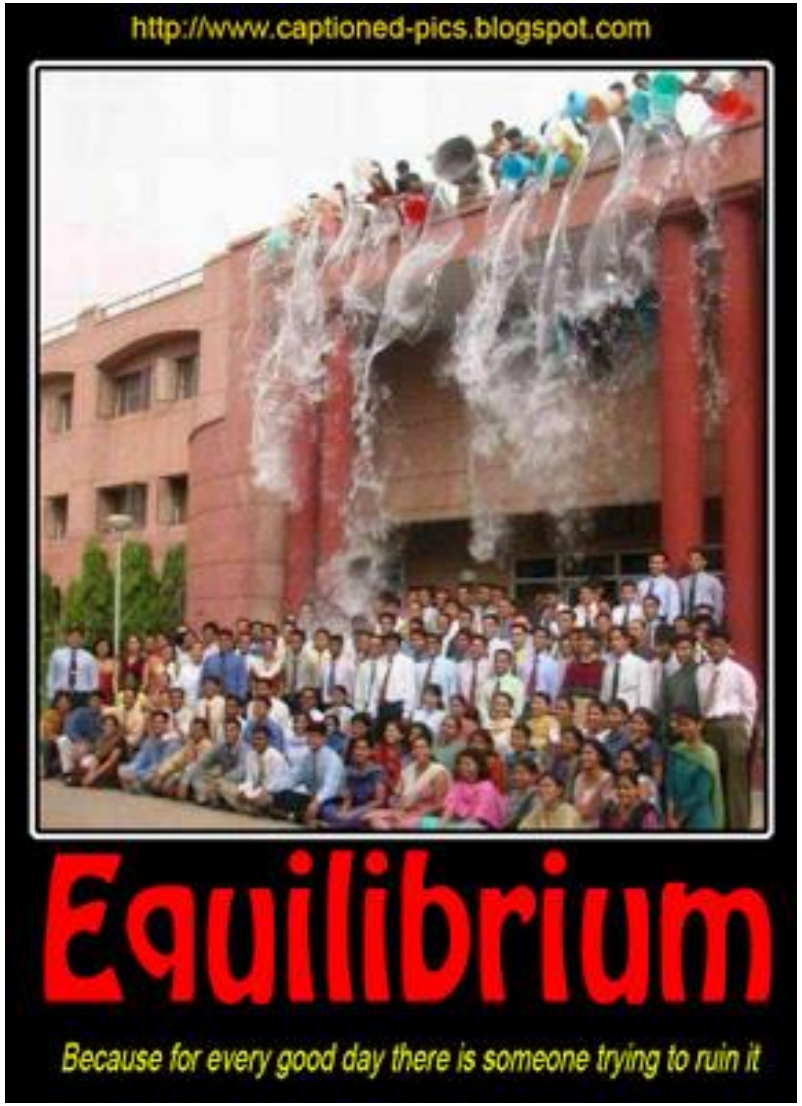
Calculating Keq



Outcome:

Solve problems involving equilibrium constants.

Calculating Keq:

We can calculate the value of K_c, if we are given the **CONCENTRATIONS** of **REACTANTS** and **PRODUCTS** at **EQUILIBRIUM**. We simply **SUBSTITUTE** these values into the equilibrium law.

Example:

For the reaction:

$$N_{2(g)} + 3H_{2(g)} \leftrightarrows 2NH_{3(g)}$$

At 225°C, a 2.0L container holds 0.40 moles of N_2, 0.15 moles of H_2, and 0.50 moles of NH_3. If the system is at equilibrium, find K_c.

Calculating Keq:

If the equilibrium constant is given, the **CONCENTRATION** a **SPECIES** can be calculated…

Example 2:

For the following reaction at 210°C, $K_c = 64.0$

$$N_{2(g)} + O_{2(g)} \leftrightarrows 2NO_{(g)}$$

The equilibrium concentrations of N_2 and O_2 are 0.40M and 0.60M. Find the equilibrium concentration of NO.

What is the meaning of Keq

It is important to note that, like the rate constant, **K_{eq}** is only affected by **TEMPERATURE**.

Since K_{eq} is the **RATIO** of product **CONCENTRATIONS** to reactant **CONCENTRATIONS**, we can predict the **DIRECTION** a reaction will **FAVOUR**. Three scenarios are possible:

1. **$K_{eq} > 1$**
   - The system at equilibrium will consist mostly of **PRODUCTS**. (i.e. the **PRODUCT** side of the reaction is **FAVOURED**.)
   - Reactions of this kind or said to be '**COMPLETE'** or '**GO TO COMPLETION'**.

$$Keq = \frac{[products]}{[reactants]}$$

What is the meaning of Keq

2. **$K_{eq} < 1$**
   - The system at equilibrium will consist of mostly **REACTANTS**. (i.e. the **REACTANT** side of the reaction is **FAVOURED**)
   - Reactions of this kind do **NOT OCCUR** to any significant **EXTENT** and are said to be '**INCOMPLETE'**.

$$Keq = \frac{[Products]}{[Reactants]}$$

3. **$K_{eq} = 1$**
   - **NEITHER PRODUCTS** nor **REACTANTS** are **FAVOURED**.
   - **CONCENTRATIONS** of reactants and products are **EQUAL**.

$$Keq = \frac{[Products]}{[Reactants]}$$