Unit 4 – Equilibrium

1. K_{eq} = [products]^x/[reactants]^y … x and y represent the coefficients in the balanced chemical equation.
2. Only (aq) and (g) appear in an equilibrium expression. Use [ ] for Molarity and (P_{gas}) for atm.
3. A large K_{eq} means that there are more products at equilibrium. A small K_{eq} means there are more reactants at equilibrium.
4. Reversing a reaction? $1/K_{eq}$
   Doubling a reaction? $(K_{eq})^2$
   Adding reactions? Multiply the K's together
5. Le Chatelier's Principle: It's all about determining Q!!
   If Q >K_{eq} , then the reaction shifts to the left, towards the reactants.
6. Catalysts and inert gases DO NOT shift an equilibrium.
7. Changes in pressure (caused by changing the volume of a container) can shift an equilibrium ONLY IF the # of gas particles are different on each side...An increase in the pressure favors a shift in the equilibrium towards the side with LESS moles of gas. (Reminder: As V↓ , P↑)

Thou Shalt Not Forget Questions

Credit: Dan Reid

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1. Write the equilibrium expression for the following reaction: $2N_{2(g)} + 3H_{2(g)} \rightarrow 2NH_{3(g)}$
2. Write the K_c for this reaction in #1. Write the K_p for this reaction in #1
3. Does a large K_{eq} means that there are more products or reactants at equilibrium?
   Does a large K_{eq} means that there are more products or reactants at equilibrium?
4. What happens to K_{eq} when:
   Reversing a reaction? _____
   Doubling a reaction? _____
   Adding reactions? _____
5. If Q is larger than K_{eq}, then the reaction shifts which direction?
   If Q is smaller than K_{eq}, then the reaction shifts which direction?
6. a) Name 2 things that DO NOT shift a reaction's equilibrium position.
   b) Name 3 ways to increase the amount of products present at equilibrium in the following <u>endo/exo</u> reactions:
   ENDO: $2H_2S(g) + 3O_2(g) \rightarrow 2H_2O(g) + 2SO_2(g)$ **EXO**: $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$
7. a) When will a change in pressure (by changing the volume) NOT shift an equilibrium?
   b) Which direction will the equilibrium shift if the volume is decreased? $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$
   Which direction will the equilibrium shift if the volume is increased? $2H_2(g) + O_2(g) \rightarrow 2H_2O(g)$