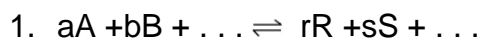


Dougherty Valley HS • AP Chemistry
 Chemical Equilibria
 Bluffer's Guide

[Keep for Reference]



$$K_c = \frac{[R]^r [S]^s \dots}{[A]^a [B]^b \dots}$$

and for gases:

$$K_p = \frac{(P_R)^r (P_S)^s}{(P_A)^a (P_B)^b}$$

2. $K > 1$ **products** favored
 $K < 1$ **reactants** favored

3. Excluded: solids; pure liquids; water (in aqueous solutions) because their []'s do not change.

4. Convert from K_c to K_p

$$K_p = K_c (RT)^{\Delta n}$$

where Δn = moles of gaseous product – moles of gaseous reactant.

5. Typical question: Given K_c and the starting concentrations of reactants, find concentrations of products at equilibrium.

Example: K_c for acetic acid = 1.8×10^{-5} .

What is the equilibrium concentration of $[H^+]$ in a 0.100 M solution of the acid?

6. Equilibrium constant for a **reverse** reaction = $\frac{1}{K}$ the value of the forward reaction.

7. Equilibrium constant for a doubled reaction = K^2 .

8. When using Hess's Law:

$$K_{\text{overall}} = K_1 \times K_2$$

9. Le Châtelier's Principle: effect of changes in concentration, pressure, & temperature. Equilibrium always "shifts" away from what you add. "Stress" means too much or too little: chemical, heat, or room.

10. If **out** of equilibrium: Calculate the reaction quotient (Q) similar to the way an equilibrium constant would be found. If:

$Q < K$ **forward** reaction occurs to reach equilibrium

$Q > K$ **reverse** reaction occurs to reach equilibrium

11. Problem solving:

- Set up problems using the "magic box" (or ICE box) C = "change" or Δ .

Example: $A \rightleftharpoons B + C$

	A	B	C
initial	5.0 M	0 M	0 M
Δ			
equilibrium			

" Δ " row **only** follows the stoichiometry of the equation.

- Learn when to make an approximation (needed for multiple choice questions!) 5% rule usually works when value of K is 10^3 smaller than value of known concentrations.

Example: $A \rightleftharpoons B + C$

$$K = 3.0 \times 10^{-6}$$

if $[A] = 5.0M$ initially; find $[C]$ at equilibrium.

- If greater than 5% use the quadratic equation: (not usual on the AP exam)

$$ax^2 + bx + c = 0$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- Another easy to solve situation is the perfect squares situation.
 Example: $H_2 + I_2 \rightleftharpoons 2HI$ $K = 3.5 \times 10^2$
 Calculate $[HI]$ when $[H_2] = [I_2] = 0.10 M$