

## 16 • Chemical Equilibria

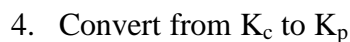
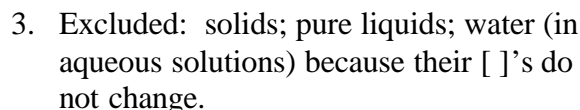
## BLUFFER'S GUIDE



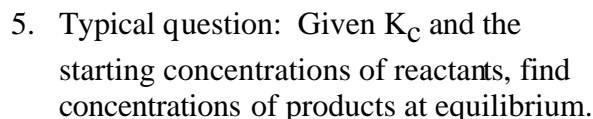
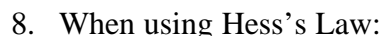
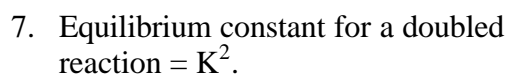
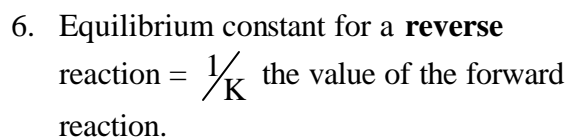
$$K_c = \frac{[R]^r [S]^s \dots}{[A]^a [B]^b \dots}$$

and for gases:

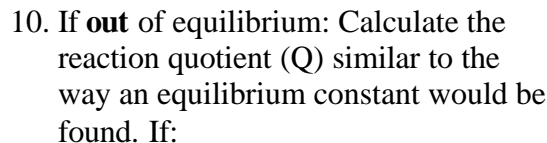
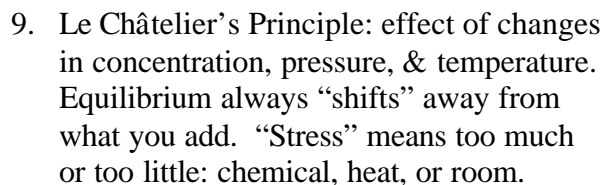
$$K_p = \frac{(P_R)^r (P_S)^s}{(P_A)^a (P_B)^b}$$

 $K < 1$  **reactants** favored

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

where  $\Delta n$  = moles of gaseous product – moles of gaseous reactant.Example:  $K_c$  for acetic acid =  $1.8 \times 10^{-5}$ .What is the equilibrium concentration of  $[H^+]$  in a 0.100 M solution of the acid?

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

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

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



	A	B	C
initial	5.0 M	0 M	0 M
<b>D</b>			
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.



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

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  $[H_2] = [I_2] = 0.10 M$