5% ACIDITY?

5% OF THE TOTAL NUMBER OF ACID MOLECULES ARE DISSOCIATED.

$$HAc(aq) + H_2O(l) \rightleftharpoons H_3O^+(aq) + Ac^-(aq)$$

I	X	—	$10^{-7} \approx 0$	0
C	$-y$	—	y	y
E	$X-y$		y	y

$$K = \frac{y^2}{(x-y)}$$

$$\frac{y}{X} = 0.05 \quad \text{OR} \quad 20y = X$$

$$K = \frac{y^2}{20y-y} = \frac{y^2}{19y} = \frac{y}{19}$$

$$y = 19K$$

$$X = 380K$$

$$K = 1.76 \times 10^{-5}$$

$$x = 6.69 \times 10^{-3}$$

$$y = 3.34 \times 10^{-4} \quad << \quad 10^{-7}$$

$$[H_3O^+] = 3.34 \times 10^{-4} M$$

$$\boxed{pH = 3.476}$$ sig figs

In lab $[AcH] = 6.69 \times 10^{-3} M$

AT EQUILIBRIUM

$$a\,A(aq) + b\,B(g) + c\,C(s) \rightleftharpoons x\,X(aq) + y\,Y(g)$$

$$K = \frac{([X]^e)^x (P_Y^e)^y}{([A]^e)^a (P_B^e)^b} = \text{CONSTANT } (T, V)$$

(FOR ALL INITIAL CONDITIONS).

<u>DEFINITION</u> REACTION QUOTIENT, Q.

$$Q \equiv \frac{([X]^i)^x (P_Y^i)^y}{([A]^i)^a (P_B^i)^b}$$

FOR ANY INITIAL SET OF CONDITIONS

$$Q \longrightarrow K$$

$Q > K \Rightarrow Q \downarrow$ rxn $\longleftarrow$ Prod ↓ Reac ↑

$Q < K \Rightarrow Q \uparrow$ $\xrightarrow{\text{rxn}}$ Prod ↑ Reac ↓

Le Châtelier principle

$Q \longrightarrow K$

Ex. 9.13 and 9.14

NOTICE THAT ONLY PRODUCTS AND REACTANTS APPEAR IN Q AND K.
AT EQUILIBRIUM WE CAN SUDDENLY CHANGE

THE VOLUME, TEMPERATURE OR SOME OF

THE PARTIAL PRESSURES.

FROM THE VALUE OF Q, WE CAN PREDICT

THE DIRECTION OF THE RXN.

$$CH_4(g) + H_2O(g) \rightleftharpoons CO(g) + 3H_2(g)$$

AT 600 K

$$K = 1.8 \times 10^{-7}$$

	$CH_4(g)$	+ $H_2O(g)$	$\rightleftharpoons$ $CO(g)$	+ $3H_2(g)$
I	1.40	2.30	1.60	0
C	$-y$	$-y$	$+y$	$+3y$
E	$1.40-y$	$2.30-y$	$1.60+y$	$3y$

$$K = \frac{P_{CO}\,(P_{H_2})^3}{P_{CH_4}\,P_{H_2O}} = \frac{(1.60+y)(3y)^3}{(1.40-y)(2.30-y)} = 1.8\times10^{-7}$$

$K \ll 1 \Rightarrow y \ll 1$

$$K \simeq \frac{1.60 \cdot 9 \cdot y^3}{(1.40)(2.30)} \simeq 1.8 \times 10^{-7}$$

$$y^3 = 1.34 \times 10^{-8}$$

$$y = 2.38 \times 10^{-3}$$

$$P^{o}_{H_2} = 7.14 \times 10^{-3}\ atm$$