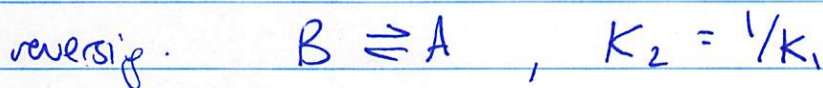
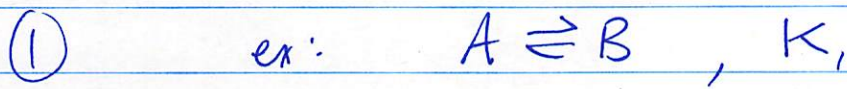
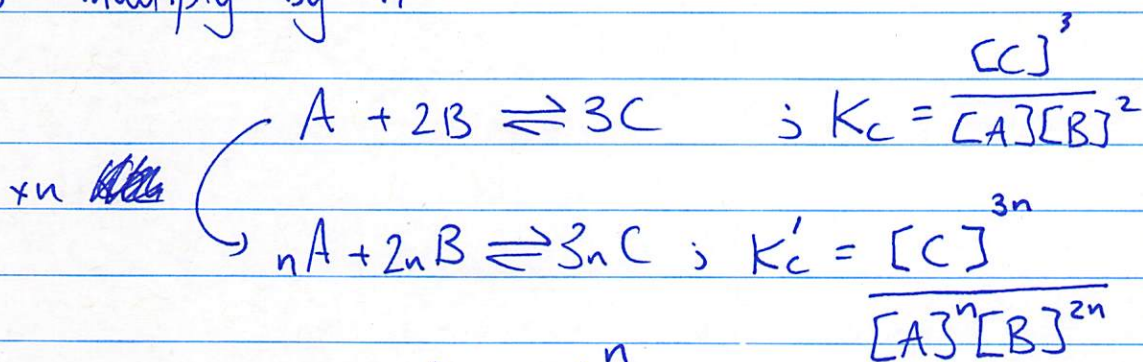


3/6/2019

Writing the chem eq affects K !



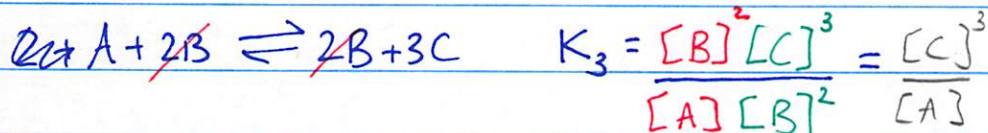
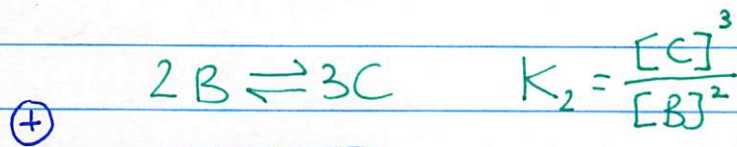
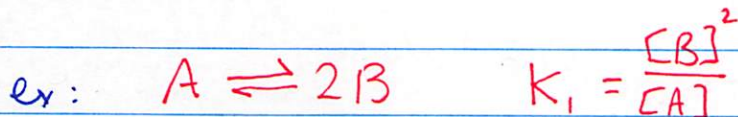
(2) multiply by 'n'



$$K'_c = \left(\frac{[C]^3}{[A][B]^2} \right)^n = K_c^n$$

\times chem eq. by n , $K \rightarrow K^n$

(3) Adding chem eqs:



*WHEN ADDING CHEM EQ'S, WE MULTIPLY EQ. CONSTS.

Other eq. constants.

$$K_c \sim \frac{[P]}{[R]}, \quad \text{let's meet } K_p$$

↑
molar
concs

↑
(partial) pressures.



$$K_c = \frac{[\text{SO}_2]^2 [\text{O}_2]}{[\text{SO}_3]^2}, \quad K_p = \frac{(P_{\text{SO}_2})^2 (P_{\text{O}_2})}{(P_{\text{SO}_3})^2}$$

(@ eq)

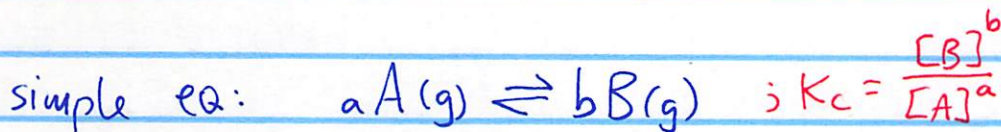
Relating K_c and K_p

$[A] \neq P_A$, so in general $K_c \neq K_p$

$$[A] = \frac{n_A}{V}, \quad \text{and using ideal gas eq: } pV = nRT$$

$$\Rightarrow P_A V = n_A \cdot RT, \quad \Rightarrow \boxed{\frac{n_A}{V} = \frac{P_A}{RT}}$$

or: $[A] = \frac{P_A}{RT}$ or: $P_A = [A] \cdot RT$



$$\frac{x^a}{x^b} = x^{a-b}$$

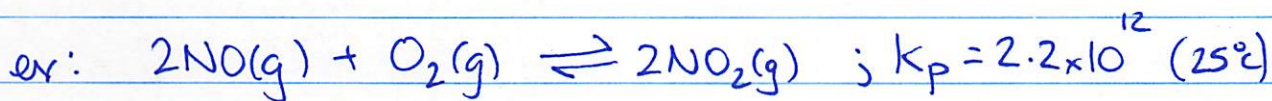
$$K_p = \frac{(P_B)^b}{(P_A)^a} = \frac{([B] \cdot RT)^b}{([A] \cdot RT)^a} = \frac{[B]^b (RT)^b}{[A]^a (RT)^a} = K_c \cdot (RT)^{b-a}$$

$(b-a) = \Delta n_{\text{gas}}$
(change in # mol gas)

$\Rightarrow \boxed{K_p = K_c (RT)^{\Delta n_{\text{gas}}}}$

Note: if $\Delta n_{\text{gas}} = 0$, then $K_c = K_p$

(otherwise, $K_c \neq K_p$!)



What is K_c ?

$$K_p = K_c (RT)^{\Delta n_{\text{gas}}}$$

$$\Delta n_{\text{gas}} = (2) - (3) = -1 \quad K_c = K_p$$

$$(RT)^{\Delta n_{\text{gas}}}$$

$$25 + 273.15 = 298.15 \text{ K}$$
$$8.3145 \frac{\text{J}}{\text{mol} \cdot \text{K}} \quad // \quad 0.08206 \frac{\text{atm} \cdot \text{L}}{\text{mol} \cdot \text{K}}$$

$$K_c = \frac{2.2 \times 10^{12}}{(0.08206 \times 298)^{-1}} = 5.4 \times 10^{13}$$

Units of K_c, K_p

- actually just use #, not units when [] and P

$$[A] = 2.0 \text{ M}$$

$$P_A = 0.10 \text{ atm}$$

Reality

$$\frac{[A]}{c^\ominus}$$

std. state
conc (1M)

$$\frac{P_A}{p^\ominus}$$

std. state
pressure (1atm)

ex: if $[A] = 2.0M$

$$\frac{[A]}{c^\ominus} = \frac{2.0M}{1M} = 2.0 \text{ (pure \#)}$$

$$\frac{P_A}{P^\ominus} = \frac{3.0 \text{ atm}}{1 \text{ atm}} = 3.0 \text{ (pure \#)}$$