Name: Key
Blk: _____ Date: _____

Chemistry 12
EQUILIBRIUM Lesson #7
**LE CHATELIER'S PRINCIPLE AND $K_{eq}$**

When the concentration, pressure or surface area is changed, the reaction tends to counteract these changes, and equilibrium is re-established
The re-established equilibrium has the SAME **$K_{eq}$ value**.

The only change imposed on a system at equilibrium that will result in a change in the **$K_{eq}$ value** is a TEMPERATURE change!!!!

**THE MEANING OF THE NUMERICAL VALUE FOR $K_{eq}$ :**

Recall that **$K_{eq}$** = [Products] / [Reactants]

This is simply a fraction. For any fraction if the number is LARGE it means that the value in the NUMERATOR is greater, or in this case the PRODUCTS is larger. If the number is SMALL it meansthat the value in the DENOMINATOR is greater, or in this case the REACTANTS is larger.

IN OTHER WORDS
**$K_{eq}$** = 1 both reactants and products are equally favoured at equilibrium
**$K_{eq}$** > 1 the PRODUCTS are favoured at equilibrium. (large)
**$K_{eq}$** < 1 the REACTANTS are favoured at equilibrium. (small)

**SEAT WORK/ HOMEWORK**: EXERCISES 36 - 46 pgs 62 - 63
**PLO's: F3 + F4**

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Chemistry 12
EQUILIBRIUM Lesson #8
**EQUILIBRIUM CALCULATIONS**

**EXAMPLE A**
**A 2.0 L bulb contains 6.00 mol of $NO_2(g)$, 3.0 mol of NO(g) and 0.20 mol of $O_2(g)$ at equilibrium. What is $K_{EQ}$ for:**

**$2\ NO(g) + O_2(g) \rightleftharpoons 2\ NO_2(g)$ ?**

1. Write out keq expression

$$K_{eq} = \frac{[NO_2]^2}{[NO]^2[O_2]}$$

2. Notice values given in moles @ equilibrium
Calculate [ ] (mol/L)

$[NO_2] = \frac{6.00 mol}{2.0 L} = 3.0\ M$ ; $[NO] = \frac{3.0 mol}{2.0 L} = 1.5\ M$ ; $[O_2] = \frac{0.20 mol}{2.0 L} = 0.10\ M$

3. Plug values @ equilibrium into keq and solve

$$K_{eq} = \frac{[3.0]^2}{[1.5]^2[0.10]} = \boxed{4.0 \times 10^1}$$

(sig figs)

**EXAMPLE B**
**Into a 2.00 L bulb was introduced 4.00 mol of $NO_2(g)$. After a while equilibrium was attained according to the equation:**

**$2\ NO(g) + O_2(g) \rightleftharpoons 2\ NO_2(g)$ .**

**At equilibrium, 0.500 mol of NO(g) was found. What is the value of $K_{EQ}$?**

1. Write keq expression → $K_{eq} = \frac{[NO_2]^2}{[NO]^2[O_2]}$

2. B/c there is a sense of TIME PASSING you need an ICE TABLE. where I = initial [ ]
C = change [ ]
E = equilibrium [ ]
↳ Represents the SHIFTS & follows the RULES of STOICHIOMETRY

| | $2NO$ | $+1O_2$ | $\rightleftharpoons 2NO_2$ |
|---|---|---|---|
| I | Ø | Ø | 2.00 |
| C | +0.250 | +0.125 | −0.250 |
| E | 0.250 | 0.125 | 1.75 |

2 : 1 ⇌ 2
0.250 0.125 0.250