5. WORKING WITH K VALUES

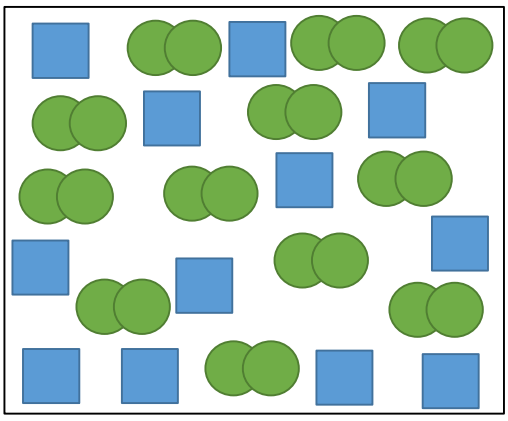
UNIT 4 – CHEMICAL EQUILIBRIUM

CH40S *MR. WIEBE*

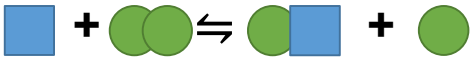
1

WORKING WITH K VALUES

INITIAL CONCENTRATIONS



K = 25 @ this temp.

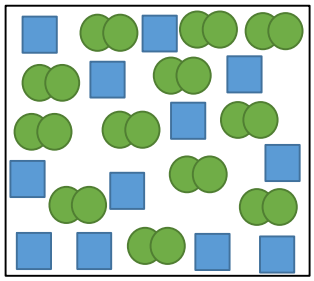


1. What will the concentration of be at equilibrium?
2. How can we determine this?

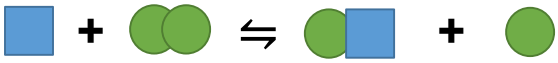
2

GUESS & CHECK…?

INITIAL [REACTANTS]



K = 25 @ this temp.

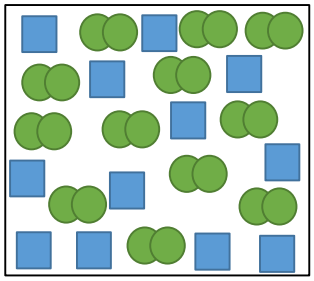


I				
C				
E				

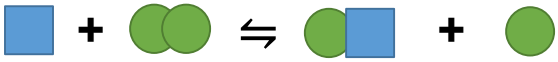
3

A MORE EFFICIENT METHOD!

INITIAL [REACTANTS]



K = 25 @ this temp.



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4

EXAMPLE PART 1 – THE CHEMISTRY…

0.80 moles of H_2 and Cl_2 are initially put in a 4.0 L flask and allowed to reach equilibrium according to the reaction below. Calculate the $[H_2]$ at equilibrium if the equilibrium constant for this reaction at this temperature is 14.

$$H_{2(g)} + Cl_{2(g)} \rightleftarrows 2\ HCl_{(g)} \qquad K = 14$$

5

EXAMPLE PART 2 – THE MATH…

6

EXAMPLE PART 3 – THE ANSWER!

7

AN ASSUMPTION THAT IS WORTH MAKING!

THE "100 RULE"

If the [initial] of your starting substances is at least **100x bigger than the K value** for the reaction, you can **ignore "-x" in your ICE table to make the math easier**!

If it isn't, then congratulations! You get to use the **quadratic equation!**

8

EXAMPLE PART 1 – THE CHEMISTRY

Carbon monoxide gas is a primary starting material in the synthesis of many organic compounds. At 2000°C, $K = 6.40 \times 10^{-7}$ for the decomposition of CO_2. Calculate the equilibrium concentrations of all entities if 0.250 mol of CO_2 is initially placed in a 1.000 L closed container at 2000°C.

$$2CO_2(g) \rightleftarrows 2CO(g) + O_2(g)$$

9

EXAMPLE PART 2 – THE MATH

$$2CO_2(g) \rightleftarrows 2CO(g) + O_2(g)$$

10