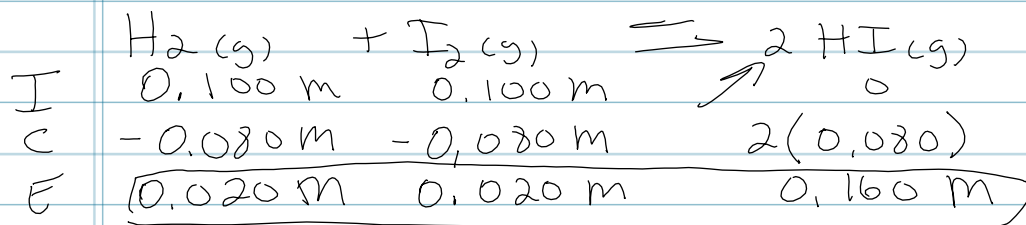


Chapter 14

1. Place 0.200 mol H_2 + 0.200 mol I_2 into a 2 L flask.

At equil $[I_2] = 0.020 M$ What is K_c at 298K

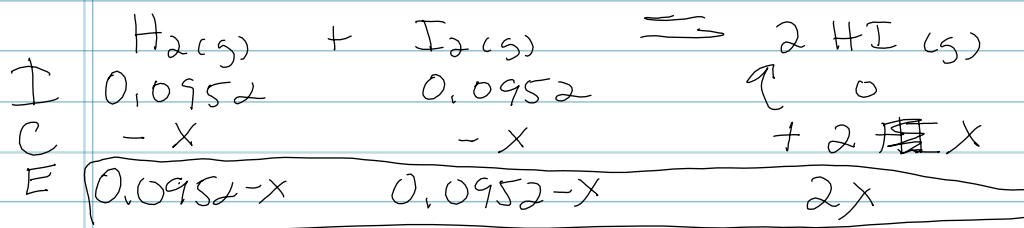


$$K_c = \frac{[HI]^2}{[I_2][H_2]} = \frac{(0.160)^2}{(0.020)(0.020)} = 64$$

$$K_c = 64$$

2. 0.500 mol I_2 + 0.500 mol H_2 in a 5.25 L at 698K
 How many mols of each gas will be present at equil? $K_c = 54.3$ at 698K

$$[I_2] = [H_2] = \frac{0.500 \text{ mol}}{5.25 L} = 0.0952 M$$



$$K_c = \frac{[HI]^2}{[I_2][H_2]} = 54.3 \Rightarrow \frac{(2x)^2}{(0.0952-x)(0.0952-x)} = 54.3$$

$$\sqrt{\frac{(2x)^2}{(0.0952-x)^2}} = \sqrt{54.3} \Rightarrow \frac{2x}{0.0952-x} = 7.37$$

$$\frac{2x}{0.0952-x} = 7.37$$

Solve for x

$$2x = 7.37(0.0952-x)$$

$$2x = 0.7015 - 7.369x$$

$$9.369x = 0.7015$$

$$x = 0.0749$$

$$[H_2]_{eq} = [I_2]_{eq} = 0.0952 - x = 0.0952 - 0.0749 = 0.0203 \text{ M}$$

$$\# \text{ mols } H_2 + I_2 = 0.0203 \text{ M} \times 5.25 \text{ L} = 0.106 \text{ mols}$$

$$[HI]_{eq} = 2x = 2(0.0749) = 0.150 \text{ M}$$

$$0.150 \text{ M} \times 5.25 \text{ L} = 0.788 \text{ mol}$$

$$K_c = \frac{(0.150)^2}{(0.0203)(0.0203)} = 54.6$$

3. Calculate the equil conc. of all 3 species
 if starting conc. are as follows.

$$[H_2]_0 = 0.00623 \text{ M} \quad [I_2]_0 = 0.00414 \text{ M}$$

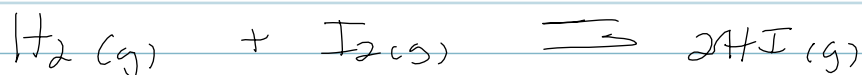
$$[HI]_0 = 0.0424 \text{ M}$$

$$K_c = 54.3 \text{ at } 698 \text{ K}$$

Q & compare to K

$$Q_c = \frac{[HI]^2}{[I_2][H_2]} = \frac{(0.0424)^2}{(0.00414)(0.00623)} = 69.7$$

$Q_c > K$, $\therefore$ rxn will have to proceed to
 the left to establish equil.



I	0.00623	0.00414	0.0424
C	+x	+x	-2x
E	0.00623 + x	0.00414 + x	0.0424 - 2x

$$K_c = \frac{(0.0424 - x)^2}{(0.00623 + x)(0.00414 + x)} = 54.3$$

~~$$54.3(2.58 \times 10^{-4})$$~~

$$50.3x^2 + 0.73x - 4.00 \times 10^{-4} = 0$$

$a \quad x^2 \quad + \quad b \quad x \quad + \quad c$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$a = 50.3 \quad b = 0.73 \quad c = -4.00 \times 10^{-4}$$

$$x = \frac{-0.735 \pm \sqrt{(0.735)^2 - 4(50.3)(-4.00 \times 10^{-4})}}{2(50.3)}$$

$$x = 5.25 \times 10^{-4}$$

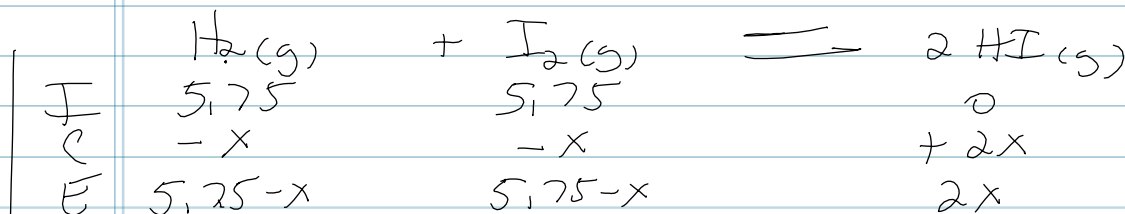
$$\text{or } x = -0.0151$$

$$[H_2]_{eq} = (0.00623 + 5.25 \times 10^{-4}) = 0.00676 \text{ M}$$

$$[I_2]_{eq} = (0.00414 + x) \text{ M} = 0.00467 \text{ M}$$

$$[HI]_{eq} = (0.0424 - x) = 0.0414 \text{ M}$$

4. 5.75 atm of H_2 and 5.75 atm of I_2
 in a 1.0 L vessel at 698 K $K_p = 54.3$
 $K_p = K_c = 54.3$



$$K_p = 54.3 = \frac{(2x)^2}{(5.75-x)^2}$$

$$7.369 = \frac{2x}{5.75-x}$$

Solve for x

$$x = 4.52$$

$$P_{H_2} = P_{I_2} = 5.75 - 4.52 = 1.23 \text{ atm}$$

$$P_{HI} = 2(4.52) = 9.04 \text{ atm}$$