

Chapter 14 Multiple Choice Numerical Solutions

3. $R_{xN_2} = 2(R_{xN_1})$

$$K_{c,2} = (K_{c,1})^2 = (4.4 \times 10^9)^2 = 1.9 \times 10^{19}$$

6. $[N_2O_4]_0 = \frac{0.625 M}{5.00 L} = 0.125 M$

Since $[N_2O_4]_{eq} = 0.075 M$, let $x = 0.125 M - 0.075 M = 0.050 M$ and $2x = 0.10 M$

Thus, $[NO_2]_{eq} = 2 \times 0.050 M = 0.10 M$

Using ICE:

	$2 NO_2 (g)$	\rightleftharpoons	$N_2O_4 (g)$
Initial (M)	0		0.125
Change (M)	+0.10		-0.050
Equilibrium (M)	0.10		0.075

$$K_C = \frac{0.075}{0.10^2} = 7.5$$

7. Set up ICE:

	$2NO_2 (g)$	\rightleftharpoons	$2NO (g)$	+	$O_2 (g)$
Initial (atm)	0.500		0		0
Change (atm)	-2x		+2x		+x
Equilibrium (atm)	$0.500 - 2x$		$2x$		x

So the $P_{Total} = (0.500 - 2x) + 2x + x = 0.674 \text{ atm}$

$x = 0.174 \text{ atm}$

$P_{NO_2} = 0.500 \text{ atm} - 2 \times 0.174 \text{ atm} = 0.152 \text{ atm}$

9. The desired rxn = $\frac{1}{2} rxn_2 - \frac{1}{2} rxn_1$, so

$$K_C = (K_{C,2})^{\frac{1}{2}} (K_{C,1})^{-\frac{1}{2}} = \left(\frac{1.4 \times 10^{-3}}{2.3 \times 10^{-7}} \right)^{\frac{1}{2}} = \sqrt{6100} = 78$$

10. Solve Q_C :

$$Q_C = \frac{[SO_3]^2}{[SO_2]^2 [O_2]} = \frac{(0.10)^2}{(10.)^2 (0.1)} = \frac{10^{-2}}{10^1} = 10^{-3}$$

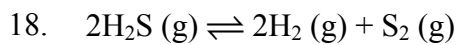
So, $Q_C < K_C$ and the equilibrium will shift to the right

16. Set up ICE:

	$2NOCl (g)$	\rightleftharpoons	$2NO (g)$	+	$Cl_2 (g)$
Initial (M)	y		0		0
Change (M)	-2x		+2x		+x
Equilibrium (M)	1.00		2x		x

$$K_C = \frac{[2x]^2 [x]}{[1.00]^2} = 8.0 \text{ so } 4x^3 = 8.0 \text{ and } x = \sqrt[3]{2.0} = 1.26$$

$[NOCl]_0 = y = 1.00 M + 2x = 1.00 M + 2 \times 1.26 M = 3.52 M$



$$P_{\text{S}_2} = \frac{1}{2}P_{\text{H}_2} = \frac{1}{2}(0.300 \text{ atm}) = 0.150 \text{ atm}$$

$$K_p = \frac{P_{\text{H}_2}^2 P_{\text{S}_2}}{P_{\text{H}_2\text{S}}^2} = 0.0120; P_{\text{H}_2\text{S}} = \sqrt{\frac{P_{\text{H}_2}^2 P_{\text{S}_2}}{0.0120}} = \sqrt{\frac{(0.300)^2 (0.150)}{0.0120}} = 1.06 \text{ atm}$$

$$P_{\text{Total}} = 1.06 \text{ atm} + 0.300 \text{ atm} + 0.150 \text{ atm} = 1.51 \text{ atm}$$