

4	Σ_1	0.443	0.115	0.0144	0.0621
	stress				-y
	I	0.443	0.115	0.0144	0.0621-y
	C	-x	-6x	+2x	+8x
	Σ_2	0.443-x	0.115-6x	0.0144+2x = 0.0160	0.0621-y+8x

$$a) [\text{NO}_2]_{\text{eq'm}_2} = 0.0160 \text{ mol/L}$$

$$0.0144 + 2x = 0.0160$$

$$2x = 0.0016$$

$$x = 8 \times 10^{-4}$$

$$\begin{aligned} [\text{N}_2\text{H}_4]_{\text{eq'm}_2} &= 0.443 - x \\ &= 0.443 - 0.0008 \\ &= 0.4422 \text{ mol/L} \end{aligned}$$

$$\begin{aligned} [\text{H}_2\text{O}_2]_{\text{eq'm}_2} &= 0.115 - 6x \\ &= 0.115 - 6(8 \times 10^{-4}) \\ &= 0.1102 \text{ mol/L} \end{aligned}$$

$$\begin{aligned} [\text{H}_2\text{O}]_{\text{eq'm}_2} &= 0.0621 - y + 8x \\ &= 0.0621 - y + 8(8 \times 10^{-4}) \\ &= 0.0685 - y \end{aligned}$$

$$K_c = \frac{[\text{NO}_2]^2 [\text{H}_2\text{O}]^8}{[\text{N}_2\text{H}_4] [\text{H}_2\text{O}_2]^6}$$

$$\frac{(0.0144)^2 (0.0621)^8}{(0.443) (0.115)^6} = \frac{(0.0160)^2 (0.0685 - y)^8}{(0.4422) (0.1102)^6}$$

$$4.47 \times 10^{-8} = 3.232 \times 10^{-2} (0.0655 - y)^8$$

$$1.38 \times 10^{-10} = (0.0655 - y)^8$$

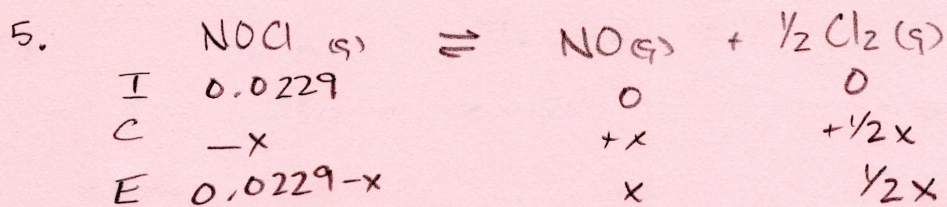
$$0.0655 - y = 0.05859$$

$$y = 0.00694$$

$$\text{remove } 0.00694 \frac{\text{mol}}{\text{L}}$$

$$\begin{aligned} n &= [\text{H}_2\text{O}]_{\text{stress}} \times V \\ &= 0.00694 \frac{\text{mol}}{\text{L}} \times 6.00 \text{ L} \end{aligned}$$

$$n = 0.0416 \text{ mol H}_2\text{O}$$



a)

$$[\text{NOCl}]_I = \frac{m}{MV}$$

$$= 1.50 \text{ g NOCl} \times \frac{1 \text{ mol NOCl}}{65.36 \text{ g NOCl}} \times \frac{1}{1 \text{ L}}$$

$$= 0.0229 \frac{\text{mol}}{\text{L}}$$

57.2% dissociation
42.8% of initial remains

$$[\text{NOCl}]_{\text{eq'm}} = 0.428 [\text{NOCl}]_I$$

$$= 0.00980 \frac{\text{mol}}{\text{L}}$$

$$0.0229 - x = 0.00980$$

$$x = 0.0131 \frac{\text{mol}}{\text{L}}$$

$$[\text{NO}]_{\text{eq'm}} = 0.0131 \text{ mol/L}$$

$$[\text{Cl}_2]_{\text{eq'm}} = \frac{1}{2} x$$

$$= 0.00655 \frac{\text{mol}}{\text{L}}$$

$$K_c = \frac{[\text{NO}] [\text{Cl}_2]^{1/2}}{[\text{NOCl}]}$$

$$= \frac{(0.0131)(0.00655)^{1/2}}{0.0229}$$

$$K_c = 0.0463$$



stress

I	9.8×10^{-3}		1.31×10^{-2}		$6.55 \times 10^{-3} - y$
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C	-x		+x		+1/2 x
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Σ_2	$9.8 \times 10^{-3} - x$		$1.31 \times 10^{-2} + x$		$6.55 \times 10^{-3} - y + 1/2 x$
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$$[\text{NO}]_{\text{Eq'm 2}} = 2 [\text{NO}]_{\text{eq'm 1}}$$

$$= 2 (1.31 \times 10^{-2})$$

$$= 2.62 \times 10^{-2} = 1.31 \times 10^{-2} + x$$

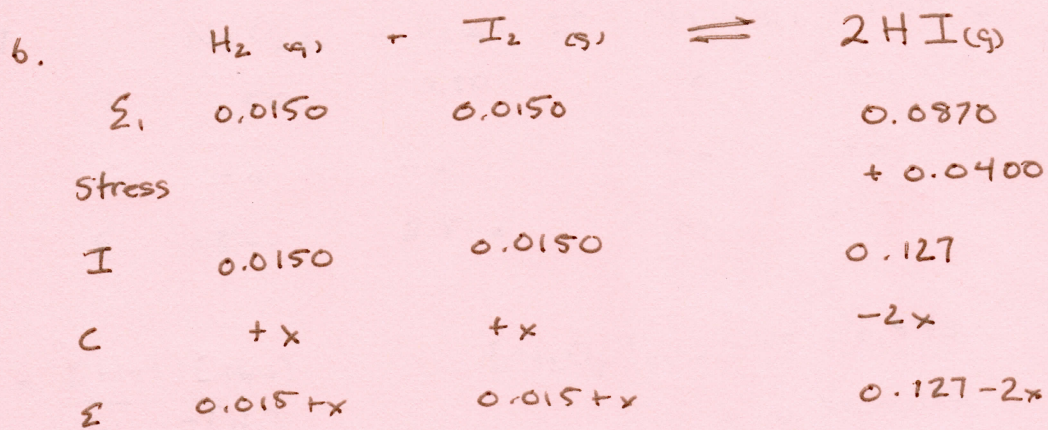
$$x = 1.31 \times 10^{-2}$$

$$[\text{NOCl}] = 9.8 \times 10^{-3} - x$$

$$= 9.8 \times 10^{-3} - 1.31 \times 10^{-2}$$

$$= -3.3 \times 10^{-4}$$

∴ you cannot double
[NO] bc there
is not enough NOCl



$$K_c = \frac{[HI]^2}{[H_2][I_2]}$$

$$= \frac{(0.087)^2}{(0.015)(0.015)}$$

$$= 33.64$$

$$[H_2]_{eq} = [I_2]_{eq}$$

$$= 0.015 + 0.00513$$

$$= 0.0201 \text{ mol/L}$$

$$[HI] = 0.127 - 2(0.00513)$$

$$= 0.117 \text{ mol/L}$$

$$K_c = \frac{[HI]^2}{[H_2][I_2]}$$

$$33.64 = \frac{(0.127-2x)^2}{(0.015+x)(0.015+x)}$$

$$\sqrt{33.64} = \frac{0.127-2x}{0.015+x}$$

$$5.8(0.015+x) = 0.127-2x$$

$$0.087 + 5.8x = 0.127 - 2x$$

$$7.8x = 0.04$$

$$x = 0.00513$$

7. $N_2O_2(g) + H_2(g) \rightleftharpoons N_2O(g) + H_2O(g)$

	N_2O_2	H_2	N_2O	H_2O
I	1.50	2.50	0	0
C	-x	-x	+x	+x
Σ	1.5-x	2.5-x	x	x

$$K_c = \frac{[N_2O][H_2O]}{[N_2O_2][H_2]}$$

$$[N_2O_2]_{eq'm} = 1.5 - 0.938 = 0.56 \text{ mol/L}$$

$$1 = \frac{(x)(x)}{(1.5-x)(2.5-x)}$$

$$[H_2]_{eq'm} = 2.5 - 0.938 = 1.56 \text{ mol/L}$$

$$1 = \frac{x^2}{3.75 - 4x + x^2}$$

$$[N_2O]_{eq'm} = 0.938 \text{ mol/L}$$

$$[H_2O]_{eq'm} = 0.938 \text{ mol/L}$$

$$x^2 - 4x + 3.75 = x^2$$

$$-4x + 3.75 = 0$$

$$3.75 = 4x$$

$$x = 0.938$$

b) $N_2O_2(g) + H_2(g) \rightleftharpoons N_2O(g) + H_2O(g)$

	N_2O_2	H_2	N_2O	H_2O
Σ_1	0.56	1.56	0.938	0.938

stress	-y		0.938	0.938
I	0.56-y	1.56	-x	-x
C	+x	+x		0.938-x
Σ_2	0.56-y+x	1.56+x	0.938-x	

$$K_c = \frac{[N_2O][H_2O]}{[N_2O_2][H_2]}$$

$$[N_2O]_{eq'm_2} = 0.75 \text{ mol/L} = 0.938 - x$$

$$x = 0.188$$

$$1 = \frac{(0.75)(0.75)}{(0.75-y)(1.75)}$$

$$[H_2O]_{eq'm_2} = 0.938 - x = 0.75 \text{ mol/L}$$

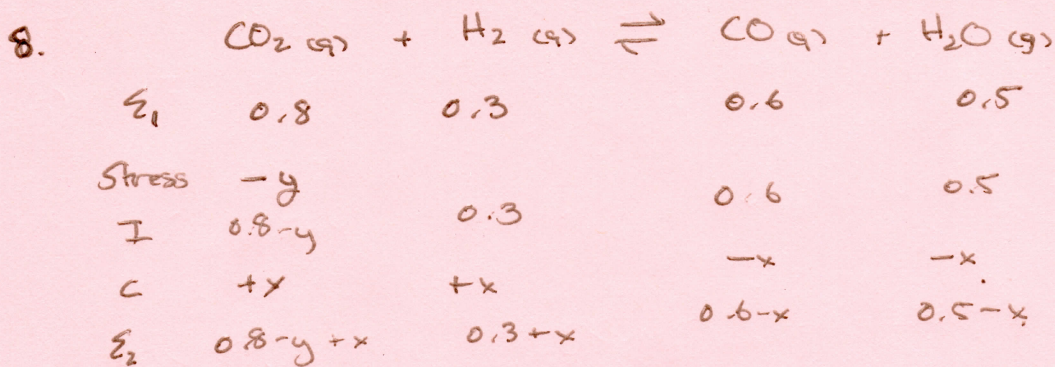
$$0.75 - y = 0.32$$

$$[N_2O_2]_{eq'm_2} = 0.56 - y + x = 0.75 - y$$

$$y = 0.43$$

$$[H_2]_{eq'm_2} = 1.75$$

$[N_2O_2]_{stress} = 0.43 \frac{\text{mol}}{L}$



$$[\text{CO}]_{\text{eq'm}_2} = 0.5 \frac{\text{mol}}{\text{L}}$$

$$0.5 = 0.6 - x$$

$$x = 0.1$$

$$[\text{H}_2]_{\text{eq'm}_2} = 0.3 + x = 0.4 \frac{\text{mol}}{\text{L}}$$

$$[\text{H}_2\text{O}]_{\text{eq'm}_2} = 0.5 - x = 0.4 \text{ mol/L}$$

$$[\text{CO}_2]_{\text{eq'm}_2} = 0.8 - y + x = 0.9 - y$$

$$K_c = \frac{[\text{CO}][\text{H}_2\text{O}]}{[\text{CO}_2][\text{H}_2]}$$

$$= \frac{(0.6)(0.5)}{(0.8)(0.3)}$$

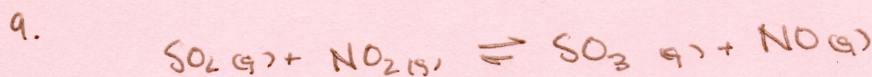
$$= 1.25$$

$$K_c = \frac{(0.5)(0.4)}{(0.4)(0.9-y)} = 1.25$$

$$0.9 - y = 0.4$$

$$y = 0.5$$

$$\begin{aligned} n_{\text{CO}_2 \text{ removed}} &= [\text{CO}_2]_{\text{Stress}} \times V \\ &= 0.5 \text{ mol/L} \times 5 \text{ L} \\ &= 2.5 \text{ mol CO}_2 \end{aligned}$$



Σ_1	1.0	4.0	4.0	4.0
Stress	+3.0		4.0	4.0
I	4.0	4.0		
C	-x	-x	+x	+x
Σ_2	4-x	4-x	4+x	4+x

$$K_c = \frac{[\text{SO}_3][\text{NO}]}{[\text{SO}_2][\text{NO}_2]}$$

$$= \frac{(4)(4)}{(1)(4)}$$

$$= 4$$

$$K_c = \frac{[\text{SO}_3][\text{NO}]}{[\text{SO}_2][\text{NO}_2]}$$

$$4 = \frac{(4+x)(4+x)}{(4-x)(4-x)}$$

$$2 = \frac{4+x}{4-x}$$

$$2(4-x) = 4+x$$

$$8-2x = 4+x$$

$$4 = 3x$$

$$x = 1.3$$

$$[\text{NO}]_{\text{eq'm}_2} = [\text{SO}_3]_{\text{eq'm}_2} = 4 + 1.3$$

$$= 5.3 \frac{\text{mol}}{\text{L}}$$

$$[\text{SO}_2]_{\text{eq'm}_2} = [\text{NO}_2]_{\text{eq'm}_2} = 4 - 1.3$$

$$= 2.7 \frac{\text{mol}}{\text{L}}$$