

5) a) reaction must proceed to right since there are no products initially



$$K = \frac{[\text{NO}]^2 [\text{Cl}_2]}{[\text{NOCl}]^2} = 1.6 \times 10^{-5}$$

	NOCl	NO	Cl ₂
I	$\frac{2.0 \text{ mol}}{2.0 \text{ L}} = 1.0 \text{ M}$	0	0
C	- 2x	+ 2x	+ x
E	1.0 - 2x	2x	x

$$\frac{(2x)^2 (x)}{(1.0 - x)^2} = 1.6 \times 10^{-5}$$

assume insignificant

$$\frac{4x^3}{(1.0)^2} = 1.6 \times 10^{-5} \quad x = 1.6 \times 10^{-2}$$

$$\% \text{ error} = \frac{2(0.016)}{1.0} \times 100 = 3.2 \% \checkmark$$

$$[\text{NO}] : 2x = 0.032 \text{ M} \quad [\text{Cl}_2] = 0.016 \text{ M}$$

$$[\text{NOCl}] = 1.0 \text{ M}$$

b)

	NOCl	NO	Cl ₂
I	1.0M	1.0M	0
C	- 2x	+ 2x	x
E	1.0 - 2x	1.0 + 2x	x

$$1.6 \times 10^{-5} = \frac{(1.0 + 2x)^2 (x)}{(1.0 - 2x)^2}$$

assume insignificant

$$1.6 \times 10^{-5} = \frac{(1.0)^2 (x)}{(1.0)^2}$$

$$x = 1.6 \times 10^{-5}$$

$$\% \text{NO} = \frac{2(1.6 \times 10^{-5})}{1.0} \times 100 = 3.2 \times 10^{-3} \% \quad \checkmark$$

$$[\text{NOCl}] = [\text{NO}] = 1.0 \text{ M} \quad [\text{Cl}_2] = 1.6 \times 10^{-5} \text{ M}$$

	NOCl	NO	Cl_2
I	2.0	0	1.0
C	-2x	+2x	+x
E	2.0-2x	2x	1.0+x

$$1.6 \times 10^{-5} = \frac{(2x)^2 (1.0 + x)}{(2.0 - 2x)^2}$$

assume insignificant

$$1.6 \times 10^{-5} = \frac{(2x)^2 (1.0)}{(2.0)^2} \quad x = 4.0 \times 10^{-3}$$

$$\% \text{NO} = \frac{2(4.0 \times 10^{-3})}{2.0} \times 100 = 0.4\%$$

$$\frac{4.0 \times 10^{-3}}{1.0} \times 100 = 0.4\%$$

$$[\text{Cl}_2] = 1.0 \text{ M} \quad [\text{NO}] = 2(4 \times 10^{-3}) = 8.0 \times 10^{-3} \text{ M}$$

$$[\text{NOCl}] = 2.0 \text{ M}$$



$$K = \frac{[\text{CO}]^2 [\text{O}_2]}{[\text{CO}_2]^2} ; 2.0 \times 10^{-6}$$

	CO ₂	CO	O ₂
1	$\frac{2.0 \text{ mol}}{5.0 \text{ L}} = 0.4 \text{ M}$	0	0
2	-2x	+2x	+x
3	0.40 - 2x	2x	x

$$2.0 \times 10^{-6} = \frac{(2x)^2 (x)}{(0.40 - 2x)^2}$$

assume insignificant

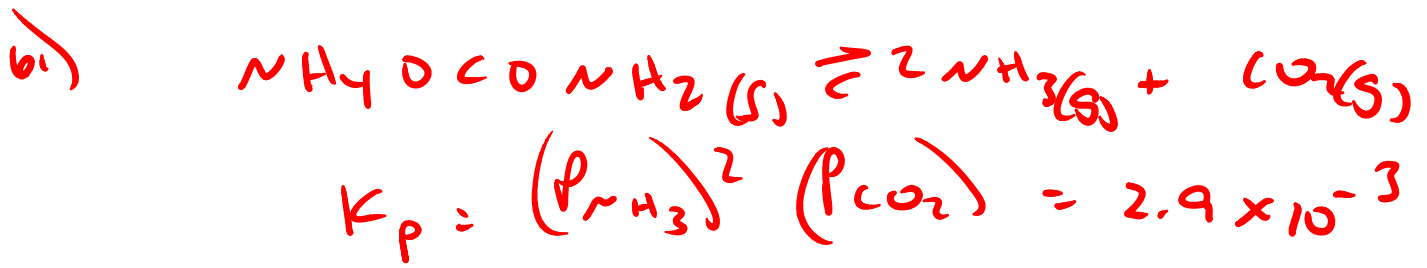
$$2.0 \times 10^{-6} = \frac{4x^3}{0.16} \quad x = 4.3 \times 10^{-3}$$

$$\% \text{CO} = \frac{2(4.3 \times 10^{-3})}{0.40} \times 100 = 2.2\% \quad \checkmark$$

$$[\text{CO}_2] = 0.40$$

$$[\text{CO}] = 8.6 \times 10^{-3} \text{ M}$$

$$[\text{O}_2] = 4.3 \times 10^{-3} \text{ M}$$



	$\text{NH}_4\text{OCN}(\text{s})$	NH_3	CO_2
I		0	0
C		+2x	+x
E		2x	x

$$2.9 \times 10^{-3} = (2x)^2 (x) = 4x^3$$

$$x = 9.0 \times 10^{-2} \text{ atm}$$

$$P_{\text{NH}_3} = 2(9.0 \times 10^{-2}) = 0.18 \text{ M}$$

$$P_{\text{CO}_2} = 9.0 \times 10^{-2} \text{ M}$$

$$P_{\text{total}} = P_{\text{NH}_3} + P_{\text{CO}_2} = 0.18 + 0.090 = 0.27 \text{ atm}$$