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ANSWERS

1.

	$I_2(g)$	+	$Cl_2(g)$	$\rightleftharpoons$	$2 ICl(g)$
I	0.066		0.066		0
C	-x		-x		+ 2x
E	0.066-x		0.066-x		2x

$$K = \frac{[ICl(g)]^2}{[I_2(g)] [Cl_2(g)]}$$

$$82 = \frac{(2x)^2}{(0.066-x)(0.066-x)}$$

$$82 = \frac{(2x)^2}{(0.066-x)^2}$$

$$\pm 9.0553... = \frac{2x}{0.066-x}$$

(square-root both sides)

POSITIVE ROOT

$$9.0553...(0.066-x) = 2x$$

$$0.59765... - 9.0553... x = 2x$$

$$0.59765... = 11.0553... x$$

$$\frac{0.59765...}{11.0553...} = x$$

$$0.054060... = x \quad \checkmark$$

NEGATIVE ROOT

$$-9.0553...(0.066-x) = 2x$$

$$-0.59765... + 9.0553... x = 2x$$

$$-0.59765... = -7.0553... x$$

$$\frac{-0.59765...}{-7.0553...} = x$$

$$0.084709... = x \quad \times$$

$$\begin{aligned} [I_2(g)]_{eq} &= (0.066-x) \text{ mol/L} \\ &= (0.066-0.054060...) \text{ mol/L} \\ &= 0.012 \text{ mol/L} \end{aligned}$$

$$\begin{aligned} [Cl_2(g)]_{eq} &= (0.066-x) \text{ mol/L} \\ &= (0.066-0.054060...) \text{ mol/L} \\ &= 0.012 \text{ mol/L} \end{aligned}$$

$$\begin{aligned} [ICl(g)]_{eq} &= 2x \text{ mol/L} \\ &= 2 (0.054060...) \text{ mol/L} \\ &= 0.11 \text{ mol/L} \end{aligned}$$

2.

	$\text{PCl}_3(\text{g})$	+	$\text{NO}_2(\text{g})$	$\rightleftharpoons$	$\text{POCl}_3(\text{g})$	+	$\text{NO}(\text{g})$
I	1.2		1.2		0		0
C	-x		-x		+x		+x
E	1.2-x		1.2-x		x		x

$$K = \frac{[\text{POCl}_3(\text{g})][\text{NO}(\text{g})]}{[\text{PCl}_3(\text{g})][\text{NO}_2(\text{g})]}$$

$$3.77 = \frac{(x)(x)}{(1.2-x)(1.2-x)}$$

$$3.77 = \frac{x^2}{(1.2-x)^2}$$

$$\pm 1.9416... = \frac{x}{1.2-x} \quad (\text{square-root both sides})$$

POSITIVE ROOT

$$1.9416...(1.2-x) = x$$

$$2.3299... - 1.9416... x = x$$

$$2.3299... = 2.9416... x$$

$$\frac{2.3299...}{2.9416...} = x$$

$$0.79206... = x \quad \checkmark$$

NEGATIVE ROOT

$$-1.9416...(1.2-x) = x$$

$$-2.3299... + 1.9416... x = x$$

$$-2.3299... = -0.9416... x$$

$$\frac{-2.3299...}{-0.9416...} = x$$

$$2.4743... = x \quad \times$$

$$\begin{aligned} [\text{PCl}_3(\text{g})]_{\text{eq}} &= (1.2-x) \text{ mol/L} \\ &= (1.2-0.79206...) \text{ mol/L} \\ &= 0.4 \text{ mol/L} \end{aligned}$$

$$\begin{aligned} [\text{NO}_2(\text{g})]_{\text{eq}} &= (1.2-x) \text{ mol/L} \\ &= (1.2-0.79206...) \text{ mol/L} \\ &= 0.4 \text{ mol/L} \end{aligned}$$

$$\begin{aligned} [\text{POCl}_3(\text{g})]_{\text{eq}} &= x \text{ mol/L} \\ &= 0.79 \text{ mol/L} \end{aligned}$$

$$\begin{aligned} [\text{NO}(\text{g})]_{\text{eq}} &= x \text{ mol/L} \\ &= 0.79 \text{ mol/L} \end{aligned}$$