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67. $Hg^{2+} + 4I^- \leftrightharpoons HgI_4^{2-}$ $\quad K = 1.0 \times 10^{30}$

	Hg^{2+}	I^-	HgI_4^{2-}
I:	0.010 M	0.78 M	0
C:	−0.010	−0.010	+0.010
E:	0	0.74	0.010

← new initial

$Hg^{2+} + 4I^- \leftrightharpoons HgI_4^{2-}$

I	0	0.74 M	0.010 M
C	+x	+4x	−x
E	x	0.74 + 4x	0.010 − x

$$K = 1.0 \times 10^{30} = \frac{[HgI_4^{2-}]}{[Hg^{2+}][I^-]^4}$$

$$1.0 \times 10^{30} = \frac{(0.010 - x)}{(x)(.74 + 4x)^4}$$

assume:

$$1.0 \times 10^{30} = \frac{(0.010)}{x(.74)^4}$$

$$x = \boxed{3.3 \times 10^{-32}\ M = [Hg^{2+}]}$$

assumption is good.

69. Because the K values are much greater than 1, assume rxn goes to completion → CuX_3^{2-}

$Cu^+ + 3X^- \leftrightharpoons CuX_3^{2-}$ $\quad K = K_1 \times K_2 \times K_3 = 1.0 \times 10^9$

	Cu^+	X^-	CuX_3^{2-}
I	1.0×10^{-3} M	5.00 M	0
C	-10^{-3}	$-3(10^{-3})$	$+10^{-3}$
E	0	5.00	10^{-3}
E	x	5.00 + 3x	$10^{-3} - x$

reacts completely....

$$K = \frac{(10^{-3} - x)}{x(5.00 + 3x)^3} \approx \frac{10^{-3}}{x(5.00)^3} = 1.0 \times 10^9$$

$$x = \boxed{8.0 \times 10^{-15}\ M = [Cu^+]}$$

$[CuX_3^{2-}] = 1.0 \times 10^{-3} - (8.0 \times 10^{-15}) = \boxed{1.0 \times 10^{-3}\ \underline{M}}$

$$K_3 = \frac{[CuX_3^{2-}]}{[CuX_2^-][X^-]} = 1.0 \times 10^3 = \frac{(1.0 \times 10^{-3})}{[CuX_2^-](5.00)}$$

$\boxed{[CuX_2^-] = 2.0 \times 10^{-7}\ \underline{M}}$