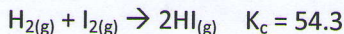


Name Mr. Shank

Class AP 2, 2, 3

Equilibrium IV

1. Hydrogen iodide can be produced from hydrogen gas and iodine gas at 430 C according to the following reaction



If a chemist initially fills a 2.4 L reaction vessel with 0.714 moles of H₂, 0.984 moles of I₂, and 0.886 moles of HI, what will be the equilibrium concentrations of each of the gases in the vessel?

R	H ₂	+ I ₂	⇌	2HI
I	.714	.984		.886
C	+x	+x		-2x
E	.714+x	.984+x		.886-2x

$$K_c = \frac{(0.886-2x)^2}{\left(\frac{.714+x}{2.4}\right)\left(\frac{.984+x}{2.4}\right)} = 54.3$$

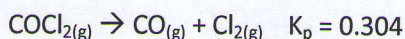
~~x = 1.855~~
or
x = -0.548

0.069 M
" "
[H₂]_{eq} $\frac{0.166 \text{ M}}{2.4}$

0.182 M
" "
[I₂]_{eq} $\frac{0.436 \text{ M}}{2.4}$

0.826 M
" "
[HI]_{eq} $\frac{1.982 \text{ M}}{2.4}$

2. The equilibrium constant for the decomposition of phosgene, COCl₂, is 0.304 at 527 C.



If the initial reaction vessel contains 0.760 atm of pure phosgene, calculate the equilibrium partial pressures of all three gases.

R	COCl ₂	⇌	CO	+ Cl ₂
I	.76		0	0
C	-x		+x	+x
E	.76-x		x	x

$$K_p = \frac{x^2}{.76-x} = 0.304$$

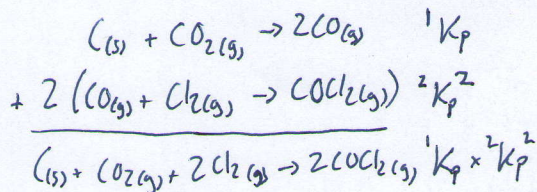
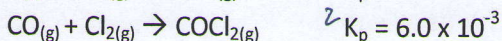
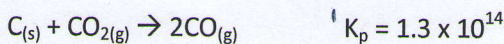
~~x = 0.656~~ or x = 0.352

p_{COCl₂,eq} 0.408 atm

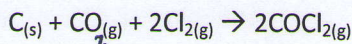
p_{CO,eq} 0.352 atm

p_{Cl₂,eq} 0.352 atm

3. The following equilibrium constants were determined at 1123 K:



Write K_p and calculate its value at 1123 K for the following reaction



$$K_p = (1.3 \times 10^{14})(6.0 \times 10^{-3})^2 = 4.68 \times 10^9$$

K_p 4.68 × 10⁹