Answer on Question #83619 - Chemistry - Physical Chemistry

Question:

The value of Kc is 4.24 at 800 Kelvin temperature for the reaction --> $CO(g) + H20(g) \text{-----}> CO2(g) + H2(g)$. If initial concentration is 0.10 M . Find the concentration of each components.

Solution:

$CO(g)$	+	$H_2O(g)$	=	$CO_2(g)$	+	$H_2(g)$
0.1M		0.1M		0		0
-x		-x		x		x
0.1-x		0.1-x		x		x

$Kc = x^2 /(0.1-x)^2;$

$4.24 = x^2 /(0.1-x)^2;$

$x^2 = 4.24(0.01 + x^2 -0.2x);$

$x^2 = 0.0424 + 4.24x^2 - 0.848x ;$

$3.24x^2 – 0.848x + 0.0424 = 0 ;$

$x1 = 0.067$ $x2 = 0.194;$

$x2 = 0.194$ – no!

So, $[CO2] = [H2] = x1 = 0.067$ M ;

$[CO2] = [H2] = x = 0.067$ M;

$[CO] = [H2O] = 0.1 - x = 0.1 - 0.067 =0.033$ M.

Answer: $[CO2] = [H2] =0.067$ M and $[CO] = [H2O] = 0.033$ M.