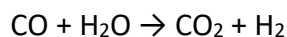


## Answer on the Question #65310, Chemistry / General chemistry

If 250 mol of CO and 125 ml of H<sub>2</sub>O gases are placed in 125 ml flask at 900 K, what is the concentration of each component at equilibrium? K<sub>c</sub>=1.56

### Solution:

Reaction between CO and H<sub>2</sub>O at 900 K:



Initial concentration of the reactants can be calculated by the following manner:

$$c_{\text{reactant}} = \frac{n_{\text{reactant}}}{V_{\text{flask}}}$$

Results are present below:

Component	CO	H <sub>2</sub> O	CO <sub>2</sub>	H <sub>2</sub>
Initial concentration, mol/l	2·10 <sup>3</sup>	1·10 <sup>3</sup>	0	0
Intermediate concentration, mol/l	-x	-x	+x	+x
Equilibrium concentration, mol/l	2·10 <sup>3</sup> -x	1·10 <sup>3</sup> -x	x	x

Equilibrium constant of the reaction is a ratio between the composition of equilibrium concentrations of products and reactants. It is equal to:

$$K_c = \frac{[\text{CO}_2] \cdot [\text{H}_2]}{[\text{CO}] \cdot [\text{H}_2\text{O}]} = \frac{x \cdot x}{(2 \cdot 10^3 - x) \cdot (1 \cdot 10^3 - x)} = 1.56$$

$$0.56x^2 - 4.7 \cdot 10^3x + 3.1 \cdot 10^6 = 0$$

$$x_{1,2} = \frac{-b \pm \sqrt{D}}{2a}$$

$$x_1 = 0.73 \cdot 10^3$$

$$x_2 = 7.6 \cdot 10^3$$

Solution of quadratic equation gives 2 positive answers. But x<sub>2</sub> can't be an adequate solution, because its value much more than initial concentration of reactants.

### Answer:

Component	CO	H <sub>2</sub> O	CO <sub>2</sub>	H <sub>2</sub>
Equilibrium concentration, mol/l	1.27·10 <sup>3</sup>	0.27·10 <sup>3</sup>	0.73·10 <sup>3</sup>	0.73·10 <sup>3</sup>