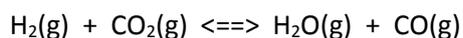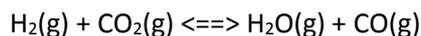Hydrogen and carbon dioxide gases are mixed in equal molar amounts at 800 K. A reversible reaction takes place. At equilibrium, the partial pressures of H_2 and CO_2 are both 10.0 kPa. Kp is 0.288 at 800 K.

What is the partial pressure of CO in the equilibrium mixture?

the equation is $H_2(g) + CO_2(g) = H_2O(g) + CO(g)$ the reaction is reversible.

Answer:

$H_2(g) + CO_2(g) <==> H_2O(g) + CO(g)$

$H_2(g) + CO_2(g) <==> H_2O(g) + CO(g)$
y mol ... y mol ....0 ....0 .... initial
-x .... -x .... +x .... +x .... change
y-x .... y-x .... x .... x .... equilibrium

$Kp = P(H_2O)\, P(CO) / (P(H_2)\, P(CO_2))$
$Kp = x^2 / (y-x)^2$
$\sqrt{(Kp)} = x / (y-x)$
$0.288 = x^2 / (10-x)$ $x^2 = 0.288 \cdot (10-x)$ $x^2 = 2.88 - 0.288\, x$ $x^2 + 0.288x - 2.88 = 0$ $x = 1.56$
Therefore, the partial pressure of CO in the equilibrium mixture is 1.56 kPa.