Equilibrium 2

$$2\,HF_{(g)} \rightleftarrows H_{2(g)} + F_{2(g)}$$

1) A 7.57 gram sample of HF liquid is placed in a sealed 2.50L container. The container is heated to 350K and the liquid first boils and then begins to break down according to the equation given above.

a) If no decomposition had occurred what would be the pressure of the HF gas?

$$7.57g\ HF \cdot \frac{1\ mol}{20.01g} = 0.378\ mol\ HF$$

$$P = \frac{0.378\ mol \cdot 0.0821\frac{atm\cdot L}{mol\cdot K} \cdot 350K}{2.50L} = 4.35\ atm$$

b) The equilibrium constant for the decomposition at 350K, K_p, is $4.85 \cdot 10^{-3}$. Write the equilibrium expression for the reaction.

$$K_p = \frac{P_{H_2} \cdot P_{F_2}}{P_{HF}^2}$$

c) Once the system reaches equilibrium what will be the partial pressure of HF remaking in the container?

	2HF	$\rightleftarrows$	H_2	F_2
I	4.35		0	0
C	$-2x$		$+x$	$+x$
E	$4.35-2x$		x	x

$$\boxed{P_{HF} = 3.818\ atm}$$

$$4.85 \cdot 10^{-3} = \frac{(x)(x)}{(4.35-2x)^2} = \frac{x^2}{(4.35-2x)^2}$$

$$6.96 \cdot 10^{-2} = \frac{x}{4.35-2x}$$

$$6.96 \cdot 10^{-2}(4.35-2x) = x$$

$$0.30276 - 0.1392x = x$$

$$0.30276 = 1.1392x$$

$$x = 0.266\ atm$$

d) What will be the total pressure in the container at equilibrium?

$$P_{Total} = P_{H_2} + P_{F_2} + P_{HF}$$

$$= 0.266\ atm + 0.266\ atm + 3.818$$

$$P_{Total} = 4.35$$