Answer to Question #50811, Chemistry, Physical Chemistry
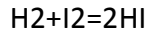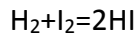
at 425 degree centigrade temperature the equilibrium constant of this reaction is 52.5.if at initial,1 mol H_2 and 0.75 mol I_2 reacts, then how much HI will be found in equilibrium at mole unit. the ans is 0.0911 mol. but i cant get the solution. please help. the reaction is

H2+I2=2HI

Solution:
Chemical reaction is
$H_2+I_2=2HI$
So equilibrium constant is described as:
$$K = \frac{[HI]^2}{[H_2][I_2]}$$
If in equilibrium will be found **x** mol of HI so **2x** mol of H_2 and I_2 was converted, than in equilibrium will be **1-x** of H_2 and **0.75-x** of I_2. So we have:
$$K = \frac{4x^2}{(1-x)(0.75-x)} = 52.5$$
$$4x^2 = 52.5(1-x)(0.75-x)$$
$$4x^2 = 39.375 - 52.5x - 39.375x + 52.5x^2$$
$$52.5x^2 - 4x^2 - 91.875x + 39.375 = 0$$
$$48.5x^2 - 91.875x + 39.375 = 0$$
This equation has two possible solutions:
$$x = 1.239$$
$$x = 0.655$$

Solved for x = 0.655
So, maybe there is mistake in Question, because
n(HI) = 0.655/2 = 0.3275 mol

Answer:
0.3275 mol