Answer on Question #60316, Chemistry / General Chemistry

1. Solve the following problem. Your solution must apply the ICE method and your final answer must include the units and the appropriate number of significant figures. For the reaction H2 (g) + I2 (g) = 2HI (g) at equilibrium, the 5.0 L container comprises 2.0 moles of H2 (g), 4.0 moles of I2 (g) and 3.0 moles of HI (g). How many moles of H2 (g) must be added to bring the concentration of HI (g) 0.84 mol/L.

Solution:

At equilibrium the concentrations of reactants and products is still changing, however,

the rate of the forward reaction (kf) is equal to the rate of the reverse reaction (kr) in

what is described as a dynamic equilibrium such that no change in their concentrations is observed. Thus, for equilibrium to occur, neither reactants nor products can escape from the system.
The law of mass action states the ratio of forward and reverse processes is described by the equilibrium constant KC which can be calculated using a knowledge of the equilibrium concentrations of reactants and products.

From the chemical reaction we have the K:

$K=[HI]^2/([H_2][I_2])$, hereof $K=0.6^2/(0.4*0.8)=1.875$[n/a]

	H_2 (g)	+	I_2 (g)	=	2HI (g)
1. the **I**nitial concentrations of reactants and products	0.4 mol/l		0.8mol/l		0.6mol/l
2. The **C**hange in concentration due to reaction using the given reaction stoichiometric coefficients:	-X		-X		+2X
3. The reactant and product concentrations at new **e**quilibrium	-Y		0.8mol/l		0.84mol/l

From the chemical reaction we have :

$K=[HI]^2/([Y][I_2])$, hereof $Y=[HI]^2/([K][I_2]) \Rightarrow 0.84^2/(1.875*0.8)=0.47$[mol]
The initial concentration of H_2 was 0.4mol/l hereof we need to add 0.47-0.4=0.07[mol]

Answer: We need to add 0.07mol of H_2.