SCH4U	# ICE Practice Problems
Chemical Systems and Equilibrium	

#1 – Relatively easy, no ICE table required because eq'm concentrations are given
For the reaction $CH_{4(g)} + H_2O_{(g)} \leftrightarrow CO_{(g)} + 3H_{2\ (g)}$ @ 1500° C an equilibrium mixture of these gases was found to have the following concentrations [CO] = 0.300M, $[H_2]$ = 0.800M and $[CH_4]$ = 0.400M. K_c @ 1500° C = 5.67. Determine the equilibrium concentration of H_2O in this mixture.

#2 – Requires an ICE table because you do not know the equilibrium concentrations– no product is yet formed
For the reaction $CO_{(g)} + H_2O_{(g)} \leftrightarrow CO_{2(g)} + H_{2(g)}$ calculate the equilibrium concentrations of all species if 1.000 mol of **each reactant** is mixed in a 1.000L flask. Kc = 5.10 at the temperature of this reaction.

		$CO_{(g)}$	+	$H_2O_{(g)}$	$\leftrightarrow$	$CO_{2(g)}$	+	$H_{2(g)}$
[Initial]	I	1.000		1.000		0		0
[Change in]	C							
[Equilibrium]	E							

#3 – Requires an ICE table because you do not know the equilibrium concentrations. The initial concentrations must be calculated– no product is yet formed
For the reaction $H_{2(g)} + F_{2(g)} \leftrightarrow 2HF_{(g)}$ calculate the equilibrium concentrations of all species if 3.000 mol of **each reactant** was added 1.500L flask. K_c at the temperature of the reaction is 1.15×10^2.

		$H_{2(g)}$	+	$F_2(g)$	$\leftrightarrow$	$2HF_{(g)}$
[Initial]	I	2.00		2.00		0
[Change in]	C					
[Equilibrium]	E					

#4 – Requires an ICE table because you do not know the equilibrium concentrations. Initial concentrations of reactants are given.

0.200mol of H_2, 0.200mol of I_2, and 0.200mol of HI were placed in a 1.00 L flask and allowed to come to equilibrium. The K_c value of the reaction at this temperature is 49.5. Determine the equilibrium concentrations of all species.

		$H_{2(g)}$	+	$I_{2(g)}$	$\leftrightarrow$	$2HI_{(g)}$
[Initial]	I					
[Change in]	C					
[Equilibrium]	E					

#5 – Requires an ICE table because you do not know the equilibrium concentrations. Initial concentrations of reactants must be calculated and no product is yet formed

For the reaction $H_{2(g)} + F_{2(g)} \rightarrow 2HF_{(g)}$ calculate the equilibrium concentrations of each species if 3.000 mol of H_2 and 6.000mol of F_2 are mixed in a 3.000L flask. K_c at this temperature is 1.15×10^2.

		$H_{2(g)}$	+	$F_{2(g)}$	$\leftrightarrow$	$HF_{(g)}$
[Initial]	I					
[Change in]	C					
[Equilibrium]	E					

SCH4U	# Equilibrium Assignment /10
Chemical Systems and Equilibrium	

Complete the following questions. Full solutions are required for full marks. Good luck!

#1 A sample of HI (9.30×10^{-3} mol) was placed in an empty 2.00 L container at 1000K. After equilibrium was reached, the concentration of I_2 was 6.29×10^{-4} M. Calculate the value of Kc at 1000K for the reaction: $H_{2(g)} + I_{2(g)} \Leftrightarrow 2\,HI_{(g)}$

#2 When wine spoils, ethanol is oxidized to acetic acid as O_2 from the air dissolves in the wine: $C_2H_5OH_{(aq)} + O_{2(aq)} \Leftrightarrow CH_3COOH_{(aq)} + H_2O_{(l)}$ The value of Kc for this reaction at 25°C is 1.2×10^{82}. Will much ethanol remain when the reaction has reached equilibrium? Explain.

#3 An equilibrium mixture of O_2, SO_2 and SO_3 contains equal concentrations of SO_2 and SO_3. Calculate the concentration of O_2 if Kc = 270 for the reaction: $2\,SO_{2(g)} + O_{2(g)} \Leftrightarrow 2\,SO_{3(g)}$

#4 A 5.00 L reaction vessel is filled with 1.00 mol of H_2, 1.00 mol of I_2 and 2.50 mol of HI. Kc (at 500K) is 129. Calculate the equilibrium concentrations of H_2, I_2 and HI at 500K. given the reaction: $H_{2(g)} + I_{2(g)} \Leftrightarrow 2HI_{(g)}$

#5 The value of Kc for the equilibrium $N_2O_4 \Leftrightarrow 2NO_{2(g)}$ is 4.64×10^{-3} at 25°C. If the initial concentrations of N_2O_4 is 0.0367M and the initial concentration of NO_2 is zero, what will be the concentration of both gases at equilibrium ?