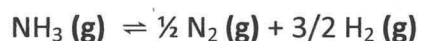


Helpful: Once you are *sure* that you can solve quadratic equations by hand with your calculator (as you will need to do on exams), you can save time on future PLI and Sapling problems by typing your equation into wolframalpha.com, which will solve it for you.

1. (Similar to in class problem, but at different temperature) - Consider the chemical equation and equilibrium constant for the synthesis of ammonia at 25 °C:

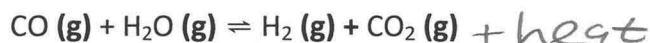


What is the equilibrium constant, K_{c2} , for the following reaction at 25 °C?



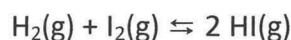
original equation was flipped and multiplied by $\frac{1}{2}$. so $K_{c2} = \left(\frac{1}{K_{c1}}\right)^{\frac{1}{2}} = \left(\frac{1}{(3.7 \times 10^8)}\right)^{\frac{1}{2}} = \boxed{5.2 \times 10^{-5}}$

2. An important exothermic reaction in the commercial production of hydrogen is:



At equilibrium, how will the system shift (left, right, or no shift) in the five following cases?

- Gaseous carbon dioxide is removed: *right*
 - Water vapor is added: *right*
 - The temperature is increased: *left*
 - The pressure is increased by decreasing the volume of the reaction container:
no change - there are equal amount of gas moles on both sides.
3. The reaction of hydrogen and iodine to give hydrogen iodide has an equilibrium constant, K_c , of 56 at 435 °C. What is the value of K_p ?



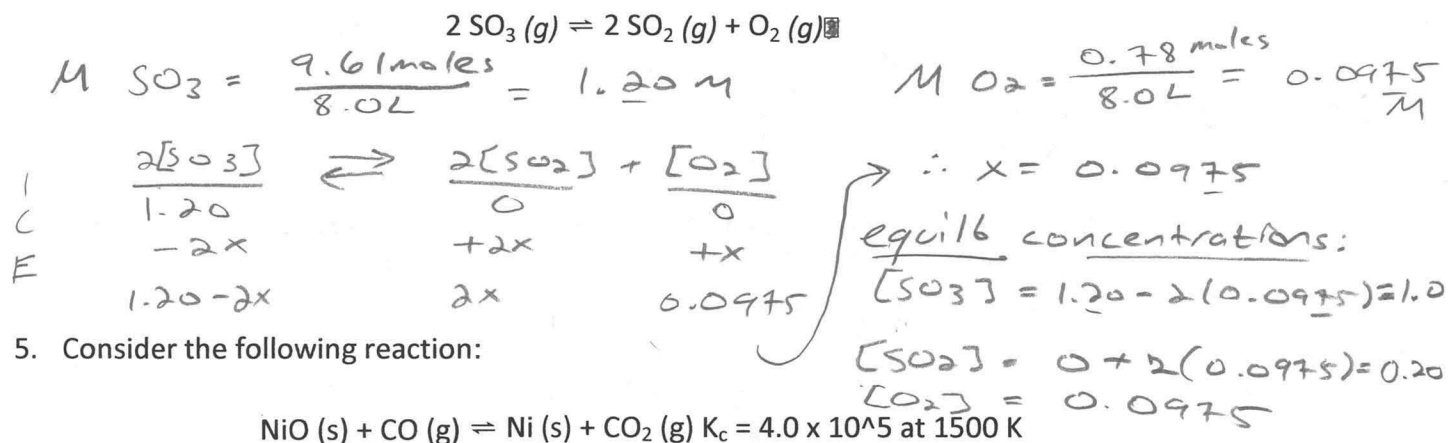
$$K_p = K_c \times (RT)^{\Delta n}$$

$\Delta n = \text{moles gas products} - \text{moles gas reactants}$

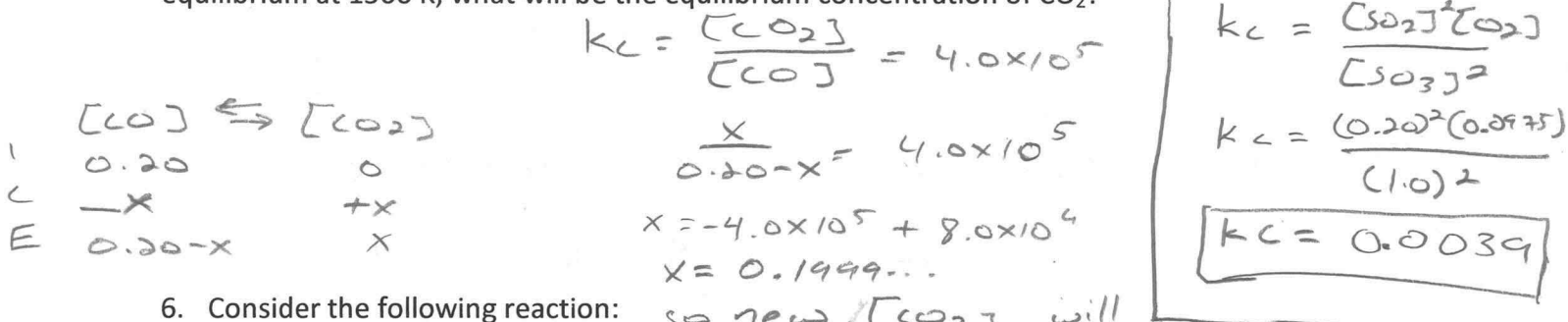
$$\Delta n = 2 - (1+1) = 0$$

$$K_p = K_c \times (RT)^0 = K_c \times 1 = \boxed{56}$$

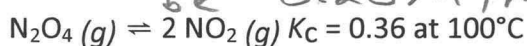
4. You place 9.61 mol of pure SO_3 in an 8.0 L flask at 1000 K. At equilibrium, 0.78 mol of O_2 has been formed. Calculate K_c for the reaction at 1000 K:



If a mixture of solid nickel(II) oxide and 0.20 M carbon monoxide is allowed to come to equilibrium at 1500 K, what will be the equilibrium concentration of CO_2 ?



6. Consider the following reaction:



A reaction mixture at 100°C initially contains $[\text{NO}_2] = 0.100 \text{ M}$. Find the equilibrium concentrations of NO_2 and N_2O_4 at this temperature:

