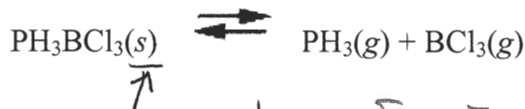


****SHOW ALL WORK TO RECEIVE CREDIT****

1. (3 Pts) Write the expressions for both K_c and K_p for the reaction



$$K_c = [\text{PH}_3][\text{BCl}_3] \quad K_p = P_{\text{PH}_3} P_{\text{BCl}_3}$$

2. (6 Pts) At a high temperature, the following reaction has an equilibrium constant of 1.0×10^2 .



If 1.00 mol of each of H_2 and F_2 are allowed to come to equilibrium in a 10.0 L vessel, calculate the equilibrium concentration of H_2 and HF and then determine how many moles of each element or compound are present at equilibrium.

$$K_c = \frac{[\text{HF}]^2}{[\text{H}_2][\text{F}_2]}$$

$$1.0 \times 10^2 = \frac{(2x)^2}{(0.100 - x)(0.100 - x)}$$

	$\text{H}_2(g)$	$+$	$\text{F}_2(g)$	\rightleftharpoons	$2\text{HF}(g)$
I.	0.100		0.100		0
C.	-x		-x		+2x
E	0.100 - x		0.100 - x		2x

$\sqrt{\text{gives: } 10 = \frac{2x}{0.100 - x}}$

$x = 0.0833$

$[\text{H}_2] = 0.100 - 0.0833 = 0.0167 = [\text{F}_2]$

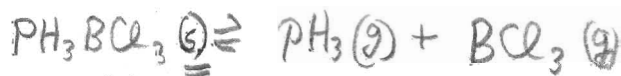
$[\text{HF}] = 0.167$

for moles use 10.0L volume
 moles $\text{H}_2 = \text{mole } \text{F}_2 = 0.167$
 mol $\text{HF} = 1.67$

3. (6 Pts) When 0.152 mol of solid PH_3BCl_3 is introduced into a 3.0 L container at a certain temperature, 8.44×10^{-3} mol of PH_3 is present at equilibrium:



Construct a reaction table (I.C.E.) for the process, and use it to calculate K_c at this temperature.



I.	NA	0	0
C.		+x	+x
E.		x	x

$$K_c = [\text{PH}_3][\text{BCl}_3]$$

$$K_c = \left(\frac{8.44 \times 10^{-3}}{3.0} \right)^2$$

$$x = \frac{8.44 \times 10^{-3} \text{ mol}}{3.0 \text{ L}}$$

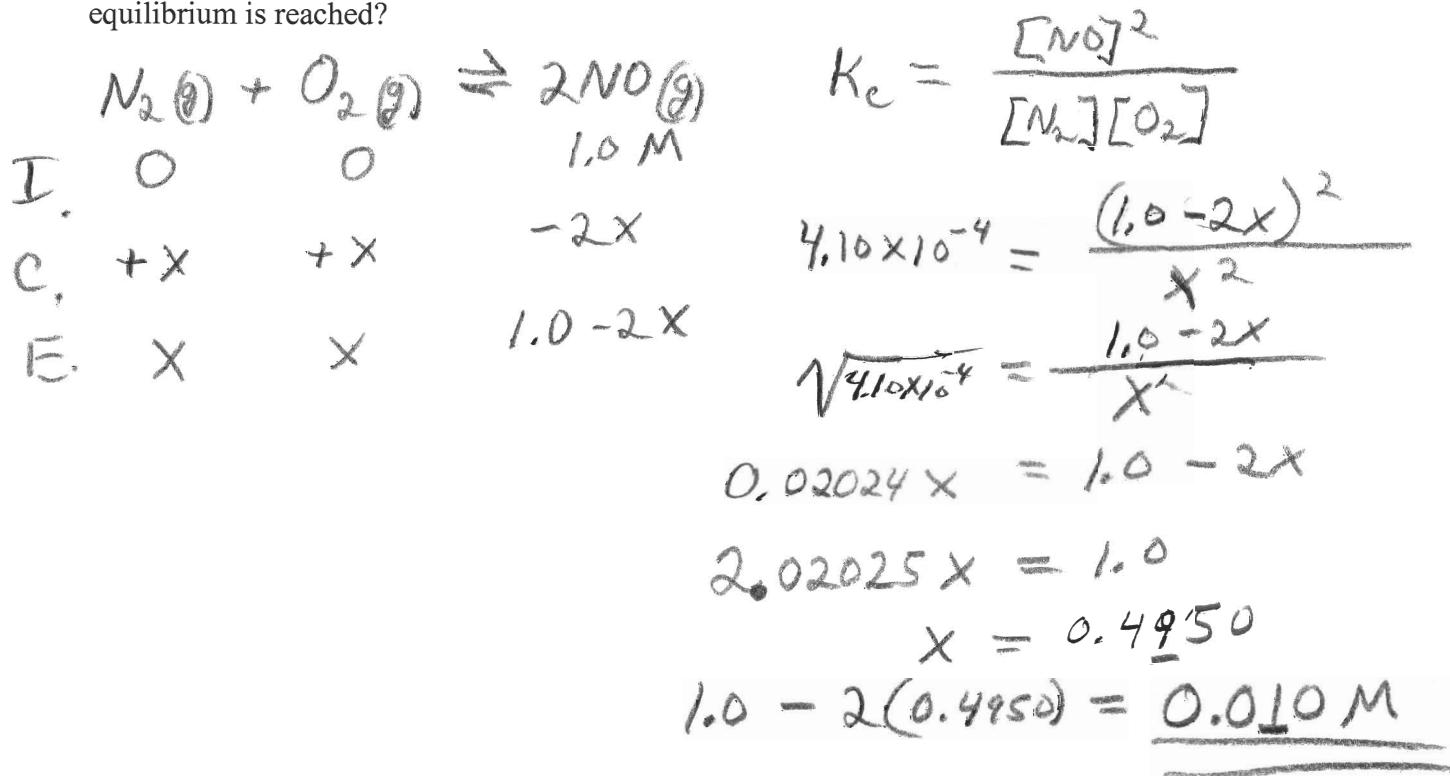
$$K_c = 7.91 \times 10^{-6}$$

Key

4. (6 Pts) Consider the following gas-phase equilibrium reaction:



If 1.0 mol of NO is introduced into a 1.0 L container at 2000°C, what is the concentration of NO when equilibrium is reached?



5. (4 Pts) Consider the equilibrium: $\text{A}(\text{s}) \rightleftharpoons \text{B}(\text{s}) + \text{C}(\text{g}); \Delta H^\circ_{\text{rxn}} > 0$ $\Delta H = (+)$

Predict and explain how or whether the following actions would affect this equilibrium.

a. adding more solid A

no effect (solids do not effect E_g)

b. lowering the temperature

more A (since rxn is endothermic, heat is a reactant)

c. increasing the pressure on the system by reducing its volume

more A (since conc. of $\text{C}(\text{g})$ is increased)

d. adding helium gas to increase the total pressure

no effect (the partial pressure of $\text{C}(\text{g})$ does not change)