

## Quiz 15.3 - ICE Tables

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## Question 1

Consider the reaction:  $\text{C(s)} + \text{H}_2\text{O(g)} \rightleftharpoons \text{CO(g)} + \text{H}_2\text{(g)}$   $K_C = 5.63 \times 10^{-4}$ Give the equilibrium concentrations of all species if excess C(s) is placed in a chamber with  $[\text{H}_2\text{O(g)}] = 0.250 \text{ M}$ 

I	0.250 M	0	0
C	-x	+x	+x
E	0.250 - x	x	x

$$5.63 \cdot 10^{-4} = \frac{x^2}{0.250 - x}$$

assume x is small  
It is 4.76% of 0.250

$$0.250 \cdot 5.63 \cdot 10^{-4} = x^2 \rightarrow x = 0.0119$$

## Question 2

Consider the reaction:  $\text{PCl}_5\text{(g)} \rightleftharpoons \text{PCl}_3\text{(g)} + \text{Cl}_2\text{(g)}$   $K_C = 0.0160$ An amount of pure  $\text{PCl}_5\text{(g)}$  is placed in an empty chamber. After equilibrium is reached, the product concentrations are measured as:  $[\text{PCl}_3] = [\text{Cl}_2] = 0.0134 \text{ M}$ What are the initial and equilibrium concentrations of  $\text{PCl}_5$ ?

I	x	0	0
C	-0.0134	+0.0134	+0.0134
E	x - 0.0134	0.0134	0.0134

$$0.0160 = \frac{0.0134 \cdot 0.0134}{x - 0.0134}$$

$$0.0160 \cdot x - 2.14 \cdot 10^{-4} = 1.796 \cdot 10^{-4}$$

$$x = 0.0246$$

## Question 3

$$[\text{PCl}_5]_{\text{eq}} = 0.246 \text{ M} - 0.0134 \text{ M} = 0.0011 \text{ M}$$

Consider the reaction:  $\text{Cl}_2\text{(g)} + \text{Br}_2\text{(g)} \rightleftharpoons 2\text{BrCl(g)}$   $K_C = 7.20$ Find the equilibrium concentrations if a chamber is charged with 0.500 mol  $\text{Br}_2\text{(g)}$  and 0.0500 mol  $\text{BrCl}$  and the reaction is allowed to reach equilibrium

I	0	0.5	0.05
C	+x	+x	-2x
E	x	0.5 + x	0.05 - 2x

$$7.2 = \frac{(0.05 - 2x)^2}{x \cdot (0.5 + x)}$$

Assume x is small

$$7.2 = \frac{0.05^2}{x \cdot 0.5} \rightarrow x = 6.97 \cdot 10^{-4}$$

2x is only 2.8% of 0.05!

$$V \cdot [\text{Cl}_2] = 6.97 \cdot 10^{-4} \text{ moles}$$

$$V \cdot [\text{BrCl}] = 0.001394 \text{ moles}$$

$$V \cdot [\text{Br}_2] = 0.501 \text{ moles}$$