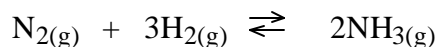


Chemistry 12
Tutorial 6
Questions and Self-Test Only

1. The equilibrium equation for the formation of *ammonia* is:



In an **equilibrium mixture** at 200 °C, the concentrations were found to be as follows:

$$[\text{N}_2] = 2.12\text{M}, \quad [\text{H}_2] = 1.75\text{M} \quad \text{and} \quad [\text{NH}_3] = 84.3\text{M}$$

Notice the 3 SD's in all your data

Calculate the value of the Equilibrium Constant for this reaction at 200°C.

Answer: $K_{\text{eq}} =$ _____

Check your answer on page 1 of Tutorial 6 – Solutions

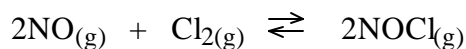
2. At 200°C, the K_{eq} for the reaction: $\text{N}_{2(\text{g})} + 3\text{H}_{2(\text{g})} \rightleftharpoons 2\text{NH}_{3(\text{g})}$ is **625**

If the $[\text{H}_2] = 0.430 \text{ M}$, and the $[\text{NH}_3] = 0.10 \text{ M}$, at equilibrium, calculate the equilibrium $[\text{N}_2]$.

Answer: Equilibrium $[\text{N}_2] =$ _____

Check your answer on pages 1 & 2 of Tutorial 6 – Solutions

3. Consider the following equilibrium system:



0.80 moles of NO and 0.60 moles of Cl₂ are placed into a 1.0 L container and allowed to establish equilibrium. At equilibrium [NOCl] = 0.56 M.

- Calculate the equilibrium [NO]
- Calculate the equilibrium [Cl₂]
- Determine the value of K_{eq} at this temperature

NOTE: In a 1.0 Litre container, concentration is moles/ 1.0 litre, so concentration is the same as the moles. In other words, if 0.80 moles of NO are placed in a 1.0 L container, the ***initial concentration of NO*** = 0.80 M

(Usually, you will have to construct your own "ICE" table but here's one you can use this time).

Write the balanced equation here

[I]			
[C]			
[E]			

- The equilibrium [NO] = _____M
- The equilibrium [Cl₂] = _____M
- The value of K_{eq} = _____

Check the answer on page 3 of Tutorial 6 – Solutions

4. Given the equilibrium equation:



When 2.0 moles of A and 4.0 moles of B are added to a 10.0 L container, an equilibrium established in which 1.4 moles of C are found.

Find the equilibrium concentrations of A, B and C.

(Notice that you do NOT have a 1.0 L container! Also notice that the amount of C found at equilibrium is given in **moles**, not in concentration. Any moles you are given in the question **must be changed into concentration**. And this time, you can make your **own ICE table!**)

The equilibrium[A] = _____

The equilibrium[B] = _____

The equilibrium[C] = _____

Check page 4 of Tutorial 6 - Solutions for the answer.

5. The equilibrium equation: $PCl_5(g) \rightleftharpoons PCl_3(g) + Cl_2(g)$ has a $K_{eq} = 0.50$ at $25^\circ C$. If 0.60 moles of PCl_3 , 0.45 moles of Cl_2 and 0.26 moles of PCl_5 are all placed in a 1.0 L container, will the reaction move to the left, right or not at all in order to reach equilibrium?

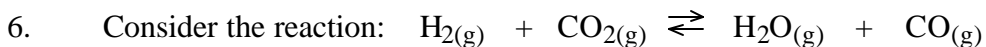
Trial $K_{eq} =$ _____ Actual $K_{eq} =$ _____. Reaction will _____

As equilibrium is approached, what will happen to the $[PCl_5]$? _____

As equilibrium is approached, what will happen to the $[PCl_3]$? _____

As equilibrium is approached, what will happen to the $[Cl_2]$? _____

Check the answer on page 8 of Tutorial 6 – Solutions



At a certain temperature the K_{eq} for this reaction = 1.50

If the initial concentration of all four species = 0.500 M, calculate the equilibrium concentration of CO_2 and CO.

Remember to determine which way the reaction has to shift in order to reach equilibrium using a Trial Keq (Sometimes this can be done in your head)
(Look at the example given before this to help you find this out.)

Answer [CO] = _____M

[CO₂] = _____M

Check page 4 of Tutorial 6 - Solutions for the answer.

Self-Test on Tutorial 6

1. Given the equilibrium: $3A_{(g)} + B_{(g)} \rightleftharpoons 2C_{(g)}$

If 4.0 moles of A and 2.0 moles of B are added to a 2.0 L container, an equilibrium is established in which the $[C] = 0.40 \text{ M}$.

- a) Calculate the equilibrium $[A]$ and $[B]$

Equilibrium $[A] =$ _____

Equilibrium $[B] =$ _____

- b) Calculate the value of K_{eq} at the temperature at which this was carried out.

$K_{eq} =$ _____

2. Given the equilibrium equation: $A_{(g)} + B_{(g)} \rightleftharpoons C_{(g)} + D_{(g)}$

The value of K_{eq} for this reaction at 25°C is **34.6**

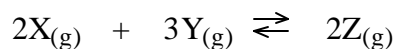
0.200 moles of A, B, C & D are all added to a 1.0 L container.

Calculate the $[B]$ at equilibrium.

HINT: The reaction will have to shift to the _____ in order to reach equilibrium.

Equilibrium $[B] =$ _____M

3. Consider the equation:



An equilibrium mixture is analyzed and [X] is 0.030M, [Y] = 0.500M and [Z] = 0.600M

Calculate the value of K_{eq} for this reaction.

$K_{eq} =$ _____

4. The K_{eq} for the reaction: $A_{(g)} + B_{(g)} \rightleftharpoons 2C_{(g)}$ is **1.20**

A mixture of A, B and C is analyzed and found to contain 3.0 M A, 0.40 M B and 2.50 M C.

This reaction will shift which way (left, right or not at all) in order to reach equilibrium?

Trial $K_{eq} =$ _____

The reaction will shift to the _____

As equilibrium is approached, the [A] will _____, [B] will _____

and the [C] will _____

Check the answers to the Self-Test starting on page 8 of Tutorial 6 - Solutions.

This is the end of Tutorial 6