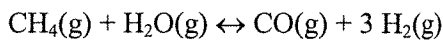


Equilibrium Part 1 Practice Quiz

Key

1. Write the mass action expression and calculate the K_{eq} value for the following equation with the listed concentrations.

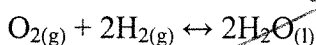


$$[\text{CH}_4] = 2 \times 10^{-3} \text{ M} \quad [\text{H}_2\text{O}] = 7 \times 10^{-3} \text{ M}$$

$$[\text{CO}] = 5 \times 10^{-3} \text{ M} \quad [\text{H}_2] = 3 \times 10^{-3} \text{ M}$$

$$K_{eq} = \frac{[\text{CO}][\text{H}_2]^3}{[\text{CH}_4][\text{H}_2\text{O}]} = \frac{(5 \times 10^{-3})(3 \times 10^{-3})^3}{(2 \times 10^{-3})(7 \times 10^{-3})} = 9.64 \times 10^{-6}$$

2. What is the concentration of O_2 if $K_{eq} = 6.5 \times 10^{-8}$ and the concentrations of H_2 and H_2O are both 0.7M?



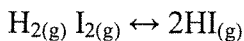
$$K_{eq} = \frac{1}{[\text{O}_2][\text{H}_2]^2}$$

$$6.5 \times 10^{-8} = \frac{1}{[\text{O}_2](0.7)^2}$$

$$[\text{O}_2] = \frac{1}{(6.5 \times 10^{-8})(0.7)^2}$$

$$[\text{O}_2] = 3.14 \times 10^7 \text{ M}$$

3. What is the concentration of HI if $K_{eq} = 4.0 \times 10^3$ and the concentrations of H_2 and I_2 are 0.25M and 1.0M respectively?

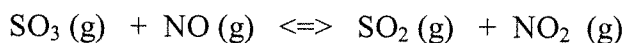


$$K_{eq} = \frac{[\text{HI}]^2}{[\text{H}_2][\text{I}_2]}$$

$$4.0 \times 10^3 = \frac{[\text{HI}]^2}{(0.25)(1.0)} \quad [\text{HI}]^2 = 1000$$

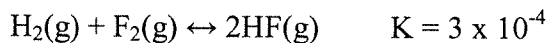
$$[\text{HI}] = 31.62 \text{ M}$$

4. An equilibrium system was kept at constant temperature and pressure in a **five litre** container. It contained 0.15 mole of SO_2 , 0.25 mole of NO_2 , 0.40 mole of NO , and 0.50 mole of SO_3 . What is the equilibrium constant for the following reaction?



$$K_{eq} = \frac{[\text{SO}_2][\text{NO}_2]}{[\text{SO}_3][\text{NO}]} = \frac{(0.03)(0.05)}{(0.1)(0.08)} = 0.1875$$

5. For the reaction:



Find the equilibrium concentration of HF in a 1.00 L container if initially there were 0.200 moles of H_2 added to 0.200 moles of F_2 .

	H_2	F_2	$\leftrightarrow 2\text{HF}$
I	0.200	0.200	0
C	-x	-x	+2x
E	0.200-x	0.200-x	2x

$$K_{eq} = 3 \times 10^{-4}$$

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

$$3.0 \times 10^{-4} = \frac{(2x)^2}{(0.200-x)^2}$$

$$0.0173 = \frac{2x}{0.200-x}$$

$$[\text{HF}] = 3.43 \times 10^{-3} \text{ M}$$

$$[\text{H}_2] + [\text{F}_2] = 0.1983 \text{ M}$$

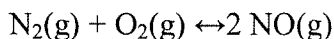
$$0.0173 (0.200-x) = 2x$$

$$3.46 \times 10^{-3} - 0.0173x = 2x$$

$$3.4 \times 10^{-3} = 2.0173x$$

$$x = 1.7151 \times 10^{-3}$$

6. Initially the concentrations of N_2 and O_2 are 1.4 mol/L each and there is 0.1 mol/L of NO . If at equilibrium the $[\text{NO}]$ is 2.0 mol/L, find K.



	N_2	O_2	$\leftrightarrow 2\text{NO}$
I	1.4M	1.4M	0.1M
C	-x	-x	+2x
E	0.45M	0.45M	2.0M

$$1.9 = 2x$$

$$0.95 = x$$

$$K_{eq} = \frac{[\text{NO}]^2}{[\text{N}_2][\text{O}_2]}$$

$$K_{eq} = \frac{(2.0)^2}{(0.45)(0.45)}$$

$$K_{eq} = 19.75$$