

18.2 Notes: REVERSIBLE REACTIONS AND EQUILIBRIUM Name _____

Demo: Reactant and product water in beakers.

Equilibrium is:

Your book gave an example of equilibrium, shoppers on an escalator. If the rate at which shoppers move from the first floor to the second is equal to the rate at which shoppers move from the second to the first floor, then the number of shoppers on each floor is constant.

A reversible chemical reaction is:

Theoretically, are all chemical reactions reversible?

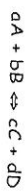
When substances enter into a chemical reaction, the concentration of the reactants _____ and the concentration of the products _____

CHEMICAL EQUILIBRIUM is:

Is chemical equilibrium static or dynamic?

The correct way to denote the concentration of substance A is:

For a reaction below what is its equilibrium expression?



Describe the Law of Chemical Equilibrium.

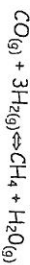
What is meant by equilibrium position?

Sample problems

Write the equilibrium expression for the reaction



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The equilibrium constant is a measure of the extent to which a _____

An equilibrium constant that is much greater than 1 is symbolized by _____

Are reactants or products favored if K_{eq} is much greater than 1?

If equilibrium "lies to the left", which is favored, reactants or products?

Reaction Quotient is used to determine if

Consider the following reaction of synthesizing ammonia from nitrogen and hydrogen: $N_2(g) + 3H_2(g) \rightleftharpoons 2NH_3(g)$

The equilibrium constant for this reaction at 472°C is 0.105. If $Q = 1.1 \times 10^4$, is the reaction at equilibrium? If not, which way will it proceed, to the right or to the left?

Indicate the direction that the reaction will proceed for each situation below. *Make sure you understand why.*

1. $Q < K_{eq}$
2. $Q > K_{eq}$
3. $Q = K_{eq}$

Sample problems

1. Determine whether the following reaction is in equilibrium or not. If not, determine which direction the reaction will proceed.

$COCl_2(g) \rightleftharpoons CO(g) + Cl_2(g)$ $K_{eq} = 170$. CO & Cl_2 are each 0.15M and $COCl_2$ concentration is $1.1 \times 10^{-3}M$.

2. A vial contains 0.150M NO_2 and 0.300M N_2O_4 . Calculate the reaction quotient for the reaction $2NO_2(g) \rightleftharpoons N_2O_4(g)$

3. At 448°C, $K_{eq} = 50.5$ for the reaction $H_2(g) + I_2(g) \rightleftharpoons 2HI(g)$. Find Q and predict how the reaction proceeds if $[H_2] = 0.150M$, $[I_2] = 0.175M$, and $[HI] = 0.950M$.

LE CHATELIER'S PRINCIPLE:

Car exhaust/ air pollution problem: $2NO_2 \rightleftharpoons N_2O_4$

*If more NO_2 is added to the system, what will happen? Why?

*If more N_2O_4 is added to the system, what will happen? Why?

Adding a substance to a system at equilibrium drives the system to _____ that substance.

Removing a substance from a system at equilibrium drives the system to _____ that substance.

Pressure changes affect which substances only?

How do increases in pressure affect the system? Why?

If the pressure in this reaction is increased in the following reactions, in which direction will the reaction shift?

