

4/ The text

Chemical changes

In a physical change, the appearance of a substance is altered, but not its composition. When liquid water becomes a gas, or freezes to a solid, it is still water.

In a chemical change, the reacting substances change into new substances that have different formulas and different properties.

A chemical reaction always involves chemical change because atoms of the reacting substances form new combinations with new properties.

A chemical equation uses symbols and formulas to represent a chemical reaction.

The substances on the left side of the equation are called reactants and those on the right side products.

The four types of chemical reactions and their general equations are :-



Or



An equilibrium reaction is a dynamic state in which the rate of the forward reaction is equal to the rate of the reverse reaction.

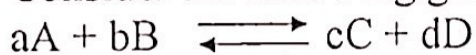
Lechatelier's principle states that , if a stress is applied to a reaction at equilibrium , the equilibrium will be displaced in such a direction as to relieve that stress.

The speed of a chemical reaction depends upon the nature of the reacting substances , upon the temperature, upon the concentration of the reacting substances, upon the presence of a catalyst and upon the surface area of the reacting substances.

Law of mass action:- the rate of a chemical reaction is proportional to the concentration of the reacting substance.

Equilibrium constant:-

Consider the following general equilibrium reaction.



rate $\propto [A]^a [B]^b$ k_1 = proportionality constant

$S_1 = k_1 [A]^a [B]^b$ $[]$ = concentration mol/L

The rate of the reverse reaction

$$S_2 = K_2 [C]^c [D]^d$$

At equilibrium , the rate of the forward reaction is equal to the rate of the reverse reaction so

$$K_1 \times [A]^a [B]^b = k_2 \times [C]^c [D]^d$$

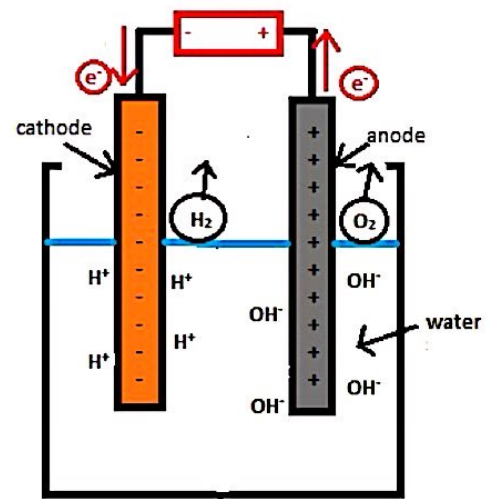
$$\frac{K_1}{K_2} = k_{eq} = \frac{[\text{product}]}{[\text{reactants}]}$$

Catalyst:- Any substance that increases the speed of a reaction with out it self being changed chemically is called a catalyst.

Solubility and solubility product:-

The solubility of a salt is the quantity present in a unit amount of a saturated solution, expressed in a unit amount of a saturated solution , expressed in moles per liter , grams per 100ml or other units'.

Solubility product is an equilibrium constant k_{sp} .



Ionization:-

Substances whose water solution conduct electricity are called electrolytes. Soluble acid, bases and salt are electrolytes.

Electrolytes have an effect on the boiling and freezing point of a solution. This effect is due to the presence of ions.

Ionization (The formation of ions) accounts for the electrical conductivity of a solution. When a substance ionizes, the sum of the positive charges equals the sum of the negative charges. The positive ions, cations, are attracted toward the cathode (negative electrode) whereas the negative ions, the anions, are attracted toward the anode (positive electrode) where as the negative ions, the anions, are attracted toward the anode anode (positive electrode).

The modern theory of ionization considers that ions are already present in a crystalline salt and that these ions are released to move about when that substance is placed in solution. Most salts are strong electrolytes because they completely (strongly) ionized.

Acids and bases that are strong electrolytes are highly ionized. Acids and bases that are poor electrolytes are weakly ionized. The presence of ions is of great importance in the body in the maintenance of the electrolyte balance of the body fluids.

5/ post test :-

Q1/ What are the types of chemical reaction and the factors affecting on speed of chemical reaction.

Q2/ Define equilibrium. What does Le Chatelier's principle state?

Note:- check your answer in key answer page at the end of the lecture.

5 degree for each