Acids, Bases and Salts

Classify Acids and Bases from their taste

The word 'Acid' comes from a Latin word acre which means sour. Hence Acidic substances are usually identified by their sour taste. Examples would be Orange juice, Lemon juice, Curd etc. all of which have a characteristic sour taste due to presence of acid in them.

Some substances however, carry a particular bitter taste instead. This characteristic bitter taste is due to presence of base in them. So Bases are the substances which have a bitter taste and feel slippery.

Examples of bases include Soap, Baking Soda etc.

Definition

Neutralization reaction

Neutralization is a type of chemical reaction in which a strong acid and strong base react with each other to form water and salt.

$NaOH+HCl \square NaCl+H2O$

Salt is produced when an acid and base react.

Definition

Reactivity of bases with metals

When alkali (base) reacts with metal, it produces salt and hydrogen gas.

Alkali + Metal $\square$ Salt + Hydrogen.

Example:

$2NaOH+Zn \square Na2ZnO2+H2$

Definition

Reactivity of acids with metals

Acids react with metals to form metal salts. In this reaction, hydrogen gas is liberated.

Example: In the reaction of hydrochloric acid reacts with zinc produces hydrogen gas and zinc ch

$2HCl+Zn \square ZnCl2+H2$

Example

Chemical properties of Acids

When it comes to the Chemical properties of Acids, there are three common reactions of Acids.

$Acids+Metals \rightarrow Salt+Hydrogen\ Gas$

$Acids+Bases \rightarrow Salt+Water$

$Acids+Carbonates \rightarrow Salt+Water+Carbon\ dioxide$

1. Reaction of Acids with Metals:

Many acids react with reactive metals to liberate hydrogen gas. For ex.

$2HCl(aq)+Mg(s) \rightarrow MgCl2(aq)+H2(g)$

2. Reaction of Acids with Bases:

Acids react with bases to form salt and water only. No other products are formed.

$NaOH(aq)+HI \rightarrow NaI(aq)+H2O(l)$

3. Reaction of Acids with Carbonates:

Acids react with carbonate or hydrogen carbonate to form a salt, water and carbon dioxide gas.

$MgCO3+2HCl \rightarrow MgCl2+CO2+H2O$

$NaHCO3+HCl \rightarrow NaCl+CO2+H2O$

Chemical properties of Bases

When it comes to the Chemical properties of Bases, there are three common reactions of Bases.

$Bases + Metals \rightarrow Salt + Hydrogen\ Gas$

$Bases + Acids \rightarrow Salt + Water$

$Bases + Non-metal\ Oxide \rightarrow Salt + Water$

1. Reaction of Bases with Metals:

Many bases react with reactive metals to liberate hydrogen gas. For ex.

$2NaOH + Zn \rightarrow Na_2ZnO_2 + H_2$

2. Reaction of Acids with Bases:

Bases react with acids to form salt and water.

$NaOH + HI \rightarrow NaI + H_2O$

3. Reaction of Bases with oxides of non-metals:

Bases react with non-metal oxides to form salt and water.

$2NaOH + CO_2 \rightarrow Na_2CO_3 + H_2O$

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$

Olfactory Indicators

A substance whose smell varies depending on whether it is mixed with an acidic or basic solution is known as an 'Olfactory indicator'. Such substances can be used in the laboratory to test whether a solution is a base or an acid, and this process is called olfactory Titration. Onion, Vanilla extract are common examples of Olfactory Indicators.

1.Onion:- Paste or juice of onion loses its smell when added with base. It does not change its smell with acid.

2.Vanilla:- The smell of vanilla vanishes with base, but its smell does not vanish with acid.

Definition

Natural Indicators

Indicators obtained from natural sources are called 'Natural Indicators'. The colour of a natural acid-base indicator depends on pH. One of the most well-known effects of natural indicators in plants occurs in the hydrangea or snowball plant. Hydrangea flowers are blue when grown in acidic soils and pink or red in basic soils.

Other common examples of Natural indicators include Turmeric, Beetroot juice etc.

Synthetic indicators

Indicators that are synthesized in laboratory are known as synthetic indicators.

For example: phenolphthalein, methyl orange, etc.

Definition

Importance of pH

Our body works within the pH range of 7.0 to 7.8. Living organisms can survive only in a narrow range of pH change. When pH of rain-water is less than 5.6, it is called acid rain. When acid rain flows into the rivers, it lowers the pH of the river water. The survival of aquatic life in such rivers becomes difficult.

pH scale

Acidity and alkalinity are measured with a logarithmic scale called pH.
The pH scale measures how acidic or basic a substance is.
The pH scale ranges from 0 to 14.
A pH of 7 is neutral. A pH less than 7 is acidic. A pH greater than 7 is basic.

Family of Salts

Salts are formed by the reaction of acids and base. And a salt contains positive as well as negative ions. Depending on the positive and negative ions, salts can be categorized into family. If two salts have same positive or same negative radicals, they are called to be of same family. In other words, if salts are formed by the reaction of same acid with different bases, then all salts so formed belong to the same family. On the other hand if salts formed by the reaction of same base with different acids, then all salts so formed have same negative ions, and all such salts belong to the same family.
In Sodium chloride (NaCl) and sodium sulphate(Na2SO4, sodium which is a positive ion is same in both of the salts. Thus, sodium chloride and sodium sulphate belongs to the sodium family. Similarly, in sodium chloride (NaCl) and potassium chloride (KCl), chloride which is negative ion is same. Thus, sodium chloride and potassium chloride both belong to chloride family.

Normal Salt

A Normal salt is formed when all the hydrogen ions(H+) of an acid, have been replaced by metal ions. In other words, no replaceable hydrogens are present in Normal Salt.
Common examples include Sodium Carbonate (Na2CO3), Potassium Chloride (KCl), Sodium Chloride (NaCl)
Definition
Properties and uses of sodium chloride
Sodium chloride melts at 1801 K. It has a solubility of 36.09 in 100g water at 273 K. When heated with sulphuric acid and manganese dioxide, it liberates chlorine. It is used as a common salt or table salt, preservatives and also used in process of soap production.

Water of cystallization

The water of crystallization is water that occurs in crystals. Water is often necessary for the formation of crystals.
Example in copper(II) sulfate: [Cu(H2O)4]SO4H2O
Cobalt(II) chloride hexahydrate : CoCl26H2O

Salt

Salts are ionic compounds that result from the neutralization reaction of an acid and a base. They are composed of equal number of cations and anions so that the salt is electrically neutral. These component ions can be inorganic, such as chloride (Cl^-), or organic, such as acetate (CH_3COO^-); and can be monoatomic, such as Fluoride (F^-), or polyatomic, such as Sulfate (SO

There are several varieties of salts. Types of salts include acidic salts, basic salts, neutral salts, hydrated salts etc.

pH of aqueous solution of acidic salts will be less than 7. For aqueous solution of basic salt, $pH>7$ and for neutral salts, $pH=7$.