

Acid, Bases And Salts

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INTRODUCTION

Chemical compounds are divided into three categories acids, bases and salts. The word acid comes from the latin word adieus which means sour. Acid have sour taste. Curd, lemon juice, orange juice and vinegar taste sour because they have acids. Oranges and lemons have citric acid. It is a weak acid.

Some acids are very strong and dangerous to handle. They can burn skin. Sulphuric acid is important and strong acid which is used in manufacturing of fertilizers petroleum products. Other strong acids are hydrochloric acid in the stomach, which is helpful in digestion of food.

Substances which are bitter in taste and feel soapy on touching are called as bases. Bases can neutralize an acid's chemical properties. When we have problem in our stomach, we take an antacid. Antacids are bases they neutralize the acid in our stomach.

Test for Acids and Bases

An acid turns blue litmus red and a base turns red litmus blue. Substances such as litmus that change colour when treated with acidic or basic solutions are called indicators methyl orange and phenolphthalein are other indicators which are used to test acids and bases. Methyl orange turns red in acidic solutions and yellow in basic solutions. Phenolphthalein is colourless in acidic solutions and pink in basic solutions.

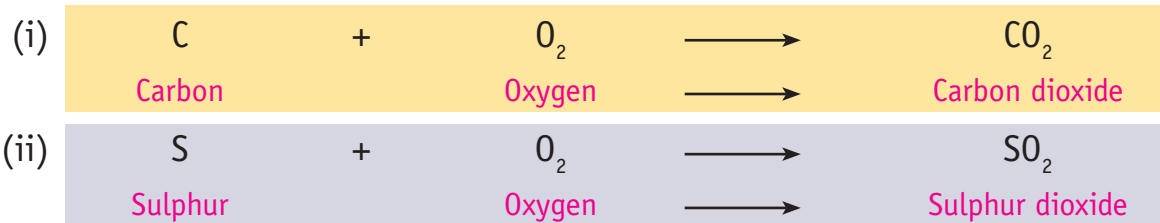
Sources of Acids and Bases

Name of Acid and Bases	Source (found in)
Acetic Acid	Vinegar
Citric Acid	oranges, lemons
Ascorbic Acid	Amla, citrus fruits
Lactic Acid	Curd
Formic Acid	Ant's sting
Tartaric Acid	Tamarind grapes-unripe
Tannic Acid	Tea
Sodium Hydroxide	Soap
Calcium Hydroxide	Lime water
Ammonium Hydroxide	Window cleaner
Magnesium Hydroxide	Milk of Magnesia

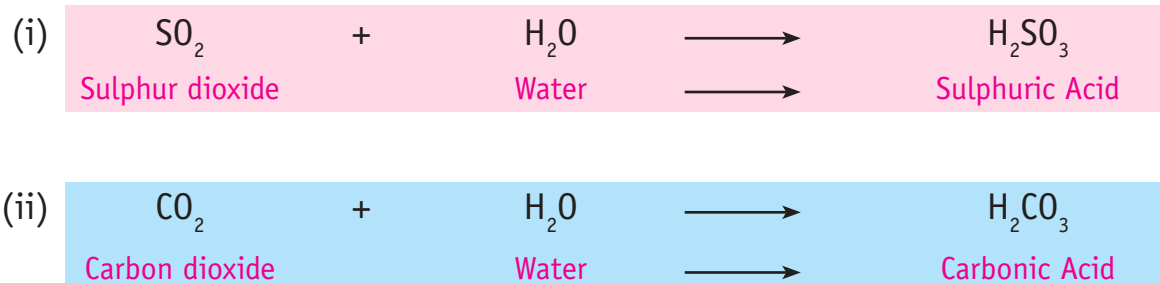
Preparation of Acids

Acids can be prepared from non metals by a two-stage process. Carbon, phosphorus, sulphur and nitrogen are some non metal. They are not hard and shiny like metals. They react with oxygen to form non-metallic oxides. They are acidic in nature. When they are dissolved in water they form acids.

Examples :



These oxides of non metals on dissolving in water form acids.



Some acid like hydrochloric acid, sulphuric acid and nitric acid are strong acids.

Citric acid is present in oranges, grapes and lemons, acetic acid is present in vinegar and lactic acid is present in milk and curd they all are weak acids.

Minerals and Organic Acids

Hydrochloric acid, sulphuric acid and nitric acid are known as mineral acids. The naturally occurring acids present in human and plant material such as acetic acid, lactic acid and citric acid are known as organic acids.

Concentrated and Dilute Acids

The acids which have small amount of water are called concentrated acid and when amount of water in acid is more then they are called dilute acids. Dilute acids have less strength due to presence of more water. So, an acid is concentrated or dilute, depending on the amount of water in it.

Physical Properties of Acids

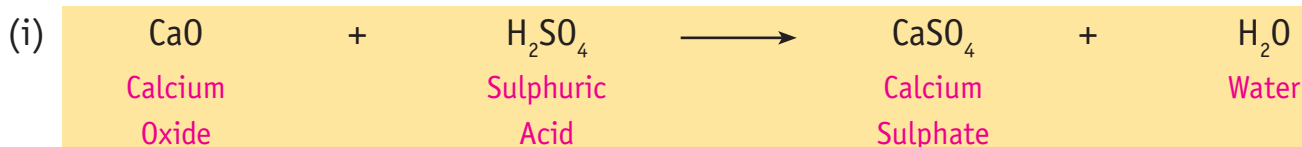
1. Acids have sour taste
2. Most of the acids are soluble in water
3. Acids turn blue litmus red
4. All acids solutions conduct electricity
5. Acids are dangerous, they cause burns on the skin, mainly concentrated acids

Do You Know ?

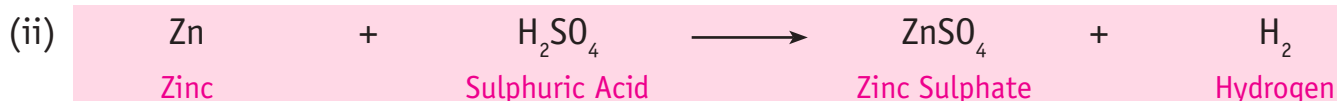
Hydrofluoric acid is the only such acid which attacks glass and is, therefore, stored in plastic bottles. Since it dissolves glass it is also used to etch glass. Hydrofluoric acid is highly toxic and can kill upon exposure.

Chemical Properties of Acids

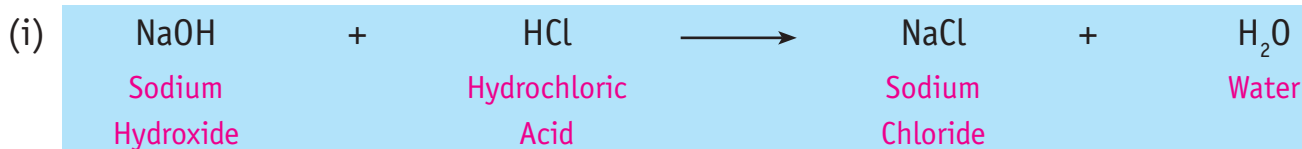
1. **Reaction with metallic oxides** : Acids react with Metallic oxides to give salt and water.

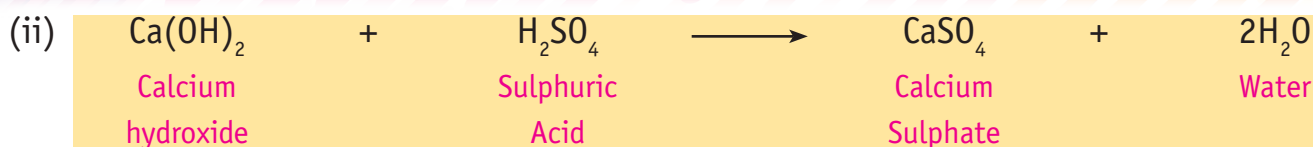


2. **Reaction with metals** : All acids react with metals to form salt and release hydrogen gas. The metal replace the hydrogen of acids to form salt.

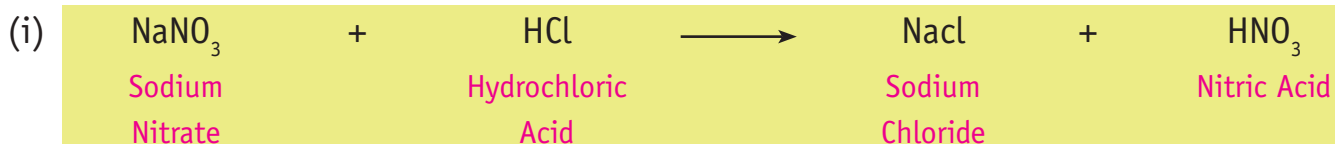


3. **Reaction with Hydroxide** : Acids react with hydroxides to form salt and water.





4. **Reaction with Metallic Nitrate** : Concentrated Sulphuric acid or Hydrochloric acid on heating react with all metallic nitrates and form salts and nitric acid with them.



5. **Reaction with Carbonates** : Acids react with carbonates to form salt, water and carbon dioxide.



This reaction is used to prepare carbon dioxide gas in laboratory.

Method of Preparation of Carbon Dioxide in Laboratory

Take some sodium carbonate in a test tube. Pour dilute sulphuric acid in it. Some bubbles are given off and effervescence takes place. Fix a one holed stopper with a delivery tube attached to it, to the test tube. Dip the other end of the tube in the lime water. This lime water turns milky due to carbon dioxide gas.



The sodium carbonate formed is white in colour and not very soluble in water. It forms a suspension in water and gives a milky appearance. This is used as a test for carbon dioxide.

Uses of Acids

Hydrochloric acid, nitric acid and sulphuric acid are the most commonly used acids in the laboratory as well as in several industries.

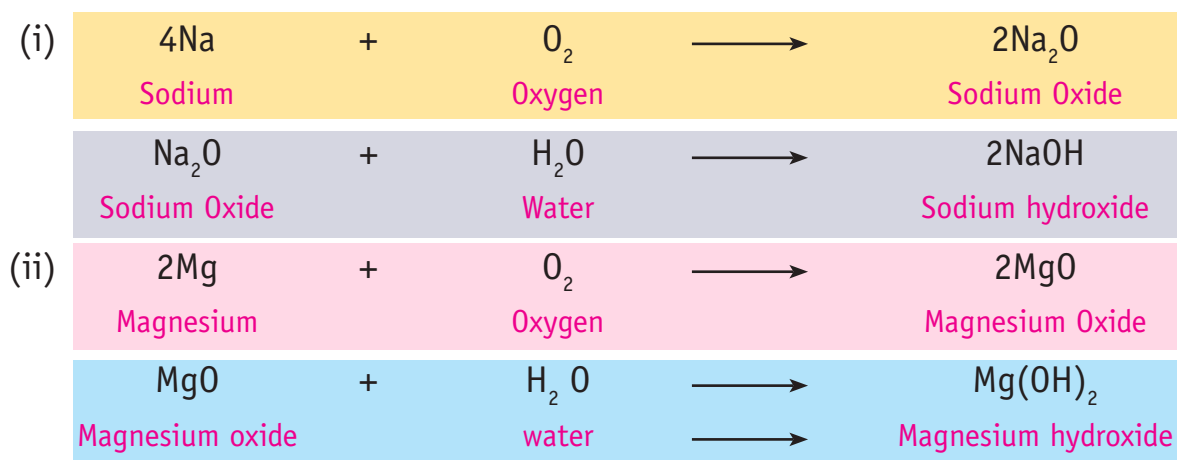
Nitric acid is used in the manufacture of fertilizers, explosives such as TNT, in the preparation of aqua regia, in the extraction of some metals from their ores etc.

Sulphuric acid is used in the manufacture of fertilizers, in automobile batteries, in the manufacture of detergents, drugs, plastic, paints and also in textile paper and other industries.

PREPARATION OF BASES

Bases can be prepared from metals in a two stage process. A metal is first burnt in the presence of oxygen to form a metal oxide. Metal oxides are basic in nature. When the metal oxide is dissolved in water, it forms a base.

For example :



Like acids, bases are also strong and weak. Sodium hydroxide and potassium hydroxide are strong bases, corrosive in nature and can burn the skin.

Magnesium hydroxide, copper hydroxide and ammonium hydroxide are weak bases. Stronger bases produce greater number of OH ions and weak bases produce less number of OH ions.

Physical Properties of Bases

1. All bases have a bitter taste
2. Bases are soapy and slippery to touch
3. Bases turn red litmus blue
4. They produce painful blisters in skin

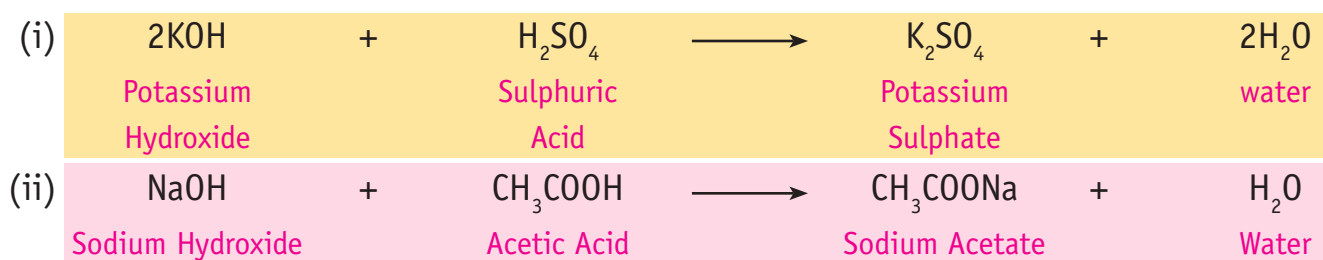
Do You Know?

Saliva in your mouth is also basic in nature. It breaks down food in your mouth and makes the digestion process in the stomach easier.

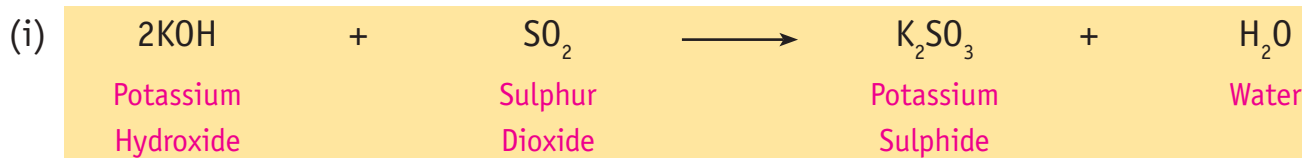
Chemical Properties of Bases

1. **Reaction with acids** : When any acid dissolves in alkaline solution, the solution obtained is neutral in nature.

It is neither acidic nor basic. The process of neutralizing bases by acids is called neutralization. All acids react with bases to make salt and water.



2. **Reaction with Acidic Oxides** : Some non-metallic oxides react with bases to give salt and water.



3. **Reaction with ammonium salt** : When a base is heated with an ammonium salt, ammonia gas is given off with pungent smell.



Uses of Bases

The most commonly used bases are sodium hydroxide (NaOH), calcium hydroxide [Ca(OH)₂] and ammonium hydroxide [NH₄OH].

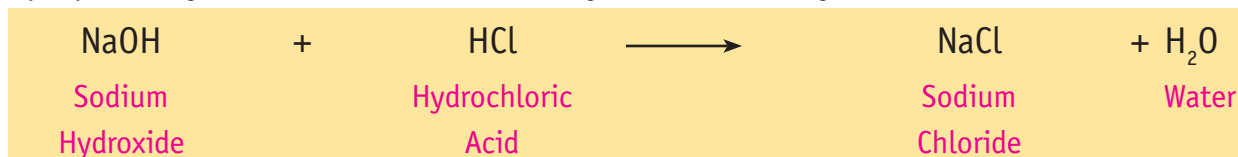
Sodium hydroxide (NaOH) is commonly known as caustic soda. It is used in manufacture of rayon, paper, soap, medicine etc.

Ammonium hydroxide is used in the manufacture of fertilizers, nylons, plastics, dyes or as ink remover to remove ink spots from clothes.

Sodium carbonate is used as washing soda and sodium hydrogen carbonate as baking soda. Magnesium hydroxide is used as an antacid to neutralize acidity in the stomach.

SALTS

The substance which is formed by the neutralization of acid and base, is called salt. Common salt can be prepared by the reaction of sodium hydroxide with hydrochloric acid.



Some Important Salts and their Uses

Common salt	Chemical Name	Formula	Use
Common salt	Sodium Chloride	NaCl	Used in food as a preservative in pickles, manufacture of washing soda, baking soda, caustic soda
Phitkari	Potash Alum	$K_2(SO_4)_2 \cdot Al_2(SO_4)_3 \cdot 24H_2O$	In the purification of water
Washing soda	Hydrated Sodium Carbonate	$Na_2CO_3 \cdot 10H_2O$	Used in washing clothes

Soaps which we use for cleaning are actually sodium salts of some acids. Soap can be prepared by boiling vegetable oil or animal fat with caustic soda (NaOH).



To separate the soap from the mixture, add a teaspoonful of salt to the container and stir. On cooling, solid separate out as a crust on top of the solution.

Properties of Salts

1. Most salts are solids with high melting and boiling points.
2. Most salts are soluble in water.
3. Salt solutions of water are good conductor of electricity.



Know the Keywords :

Acids : Substances whose molecules have one or more hydrogen atoms.

Bases : Substances whose molecules have hydroxide.

Salt : A substance formed by the neutralization reaction of an acid with a base.

Neutralization : The reaction of an acid with a base to form a salt and give out water.



Point to Remember

- Acid is a substance whose molecules have one or more hydrogen atoms. It has sour taste.
- Substances which are bitter in taste and feel soapy on touching are called as bases.
- The substance which is formed by the neutralization of acid and base, is called salt.

EXERCISE TIME

A. Answer the following questions :

1. How are acids prepared ? Write two physical properties of acids.
2. What are mineral and organic acids ?
3. How do we prepare bases ? Write any three uses of base.
4. Write any two chemical properties of bases.
5. What is the difference between strong and weak acids ? Write any two examples.

B. Short answers :

1. Which acid is present in lemon ?

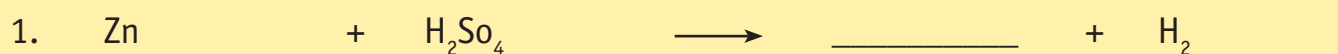
2. Which acid is used in the manufacture of the super phosphate fertilizers ?

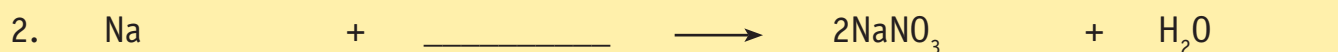
3. What is the use of methyl orange ?

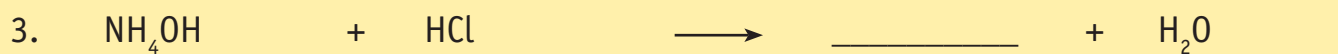
4. What is the chemical name of washing soda ?

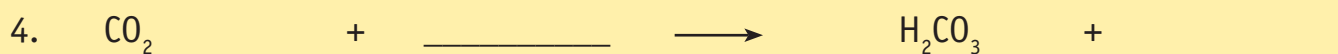
5. Name of base which is required to make soap.

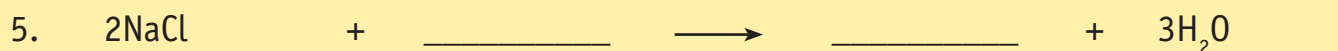
C. Complete the following chemical reactions and write the name of the chemical elements :

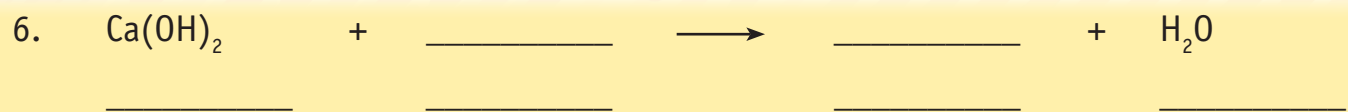












D. Tick (✓) the correct option :

1. An element common to all acids is :

- (i) sodium (ii) oxygen (iii) hydrogen

2. A base reacts with an acid to form :

- (i) water (ii) salt (iii) rust

3. A neutral salt is formed when strong acid reacts with a :

- (i) weak salt (ii) strong base (iii) weak base



Creative Work

- Tell the workers of factories about the uses of mineral acids.