

**MINISTRY OF EDUCATION**  
**SECONDARY ENGAGEMENT PROGRAMME**  
**GRADE 10**  
**CHEMISTRY**

**WEEK 11**

**LESSON 2**

**Topic:** Acids, Bases and Salts

**Sub-topic:** Reactions of Acids and Bases

**Objectives:** Given the information, students will:

- write chemical equations for the reactions of acids.
- correctly state all the physical properties of bases

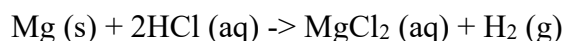
**Content**

**Reactions of Acids**

**Acid + metal**       $\longrightarrow$       **Salt + Hydrogen gas**

The reaction of **magnesium with hydrochloric acid** produces magnesium chloride (a salt) and hydrogen gas.

The balanced equation is as follows:

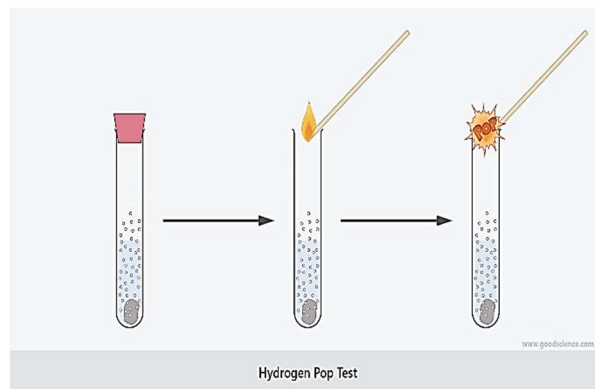


When this reaction takes place, the hydrogen gas causes bubbles and the reaction creates heat.

This reaction is known as a single displacement reaction because the magnesium displaces (and replaces) another element (hydrogen).

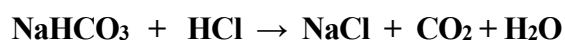
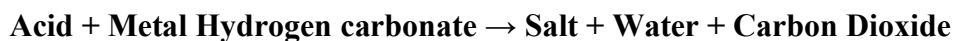
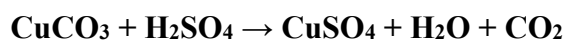
**Test for Hydrogen Gas**

A simple **test** for the presence of **hydrogen gas** is to light a splint and put it in the smoke present. If it makes a squeaky pop sound, then **hydrogen gas** is present.



## Acids and Carbonates/Hydrogencarbonates

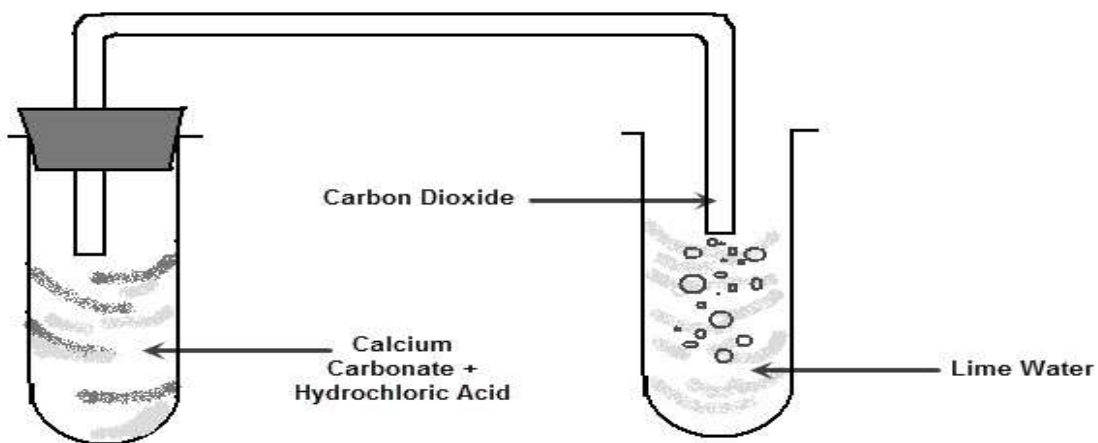
A **carbonate** is negatively charged and contains carbon bonded to three oxygen atoms. The general reaction results in salt, carbon dioxide gas, and water.



The reactions between carbonates and acids are called **neutralization reactions** because the acid is neutralized the pH gets close to 7.

### Test for Carbon Dioxide

Carbon dioxide reacts with limewater (a solution of calcium hydroxide,  $\text{Ca}(\text{OH})_2$ ), to form a white precipitate (appears milky) of calcium carbonate,  $\text{CaCO}_3$ .



**Apparatus to Test for Carbon Dioxide**

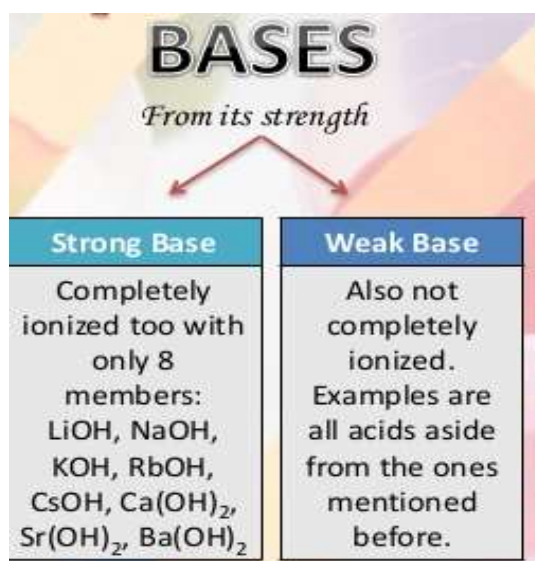
## Bases

Bases are substances made of hydroxide  $\text{OH}^-$  ions and a metal. A base is a molecule or ion able to accept a hydrogen ion from an acid. Bases can be made of:

- Metal hydroxide (metal ion &  $\text{OH}^-$  ion)
- Metal oxides
- Metal carbonates (metal ion &  $\text{CO}_3^{2-}$ )
- Metal hydrogen carbonate (Bicarbonate)
- Ammonium hydroxide ( $\text{NH}_4\text{OH}$ )
- Ammonium Carbonate ( $(\text{NH}_4)_2\text{CO}_3$ )

### Classification of Bases

Some bases are water-soluble and some bases are water-insoluble. Water-soluble bases are also called alkalis. Like acids, alkalis' strength is determined by its ability to be ionized into metal and hydroxide  $\text{OH}^-$  ions. Completely ionized alkalis are the strongest and partially ionized alkalis are the weakest. Ammonium hydroxide is one of the strongest alkalis while weak alkalis include the hydroxides of sodium, potassium, and magnesium.



### Properties of Bases

- They are found to have a soapy texture when touched.
- These substances release hydroxide ions ( $\text{OH}^-$  ions) when dissolved in water.
- In their aqueous solutions, bases act as good conductors of electricity.
- The pH values corresponding to bases are always greater than 7.
- Bases are bitter-tasting substances that can turn red litmus paper blue.
- Examples: Sodium hydroxide [ $\text{NaOH}$ ], milk of magnesia [ $\text{Mg}(\text{OH})_2$ ], calcium hydroxide [ $\text{Ca}(\text{OH})_2$ ]

## Uses of bases

- The manufacturing of soap and paper involves the use of sodium hydroxide. NaOH is also used in the manufacture of rayon.
- $\text{Ca(OH)}_2$ , also known as slaked lime or calcium hydroxide, is used to manufacture bleaching powder.
- Dry mixes used in painting or decoration are made with the help of calcium hydroxide.
- Magnesium hydroxide, also known as milk of magnesia, is commonly used as a laxative. It also reduces any excess acidity in the human stomach and is, therefore, used as an antacid.
- Ammonium hydroxide is a very important reagent used in laboratories.
- Any excess acidity in soils can be neutralized by employing slaked lime.

### Difference between Acids and Bases

Acids	Bases
Acid gives off hydrogen ions when dissolved in water.	Bases give off hydroxyl ion when dissolved in water.
It turns blue litmus paper red.	It turns red litmus paper blue.
It has a sour taste.	It has a bitter taste and soapy to touch.
Its pH value ranges from 1 to 7.	Its pH value ranges from 7 to 14.
Example: HCl, $\text{H}_2\text{SO}_4$ , etc.	Example: NaOH, KOH, etc.

## References

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3. <https://slideplayer.com/slide/2560137/>
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