- An **acid** is a chemical substance that has a sour taste.
- Many food items such as lemons, curd, vinegar and orange taste sour because of the presence of acid in them.
- **Acidic Substances** are the substances that contain acid in them.
- **Natural Acids** are the acids that occur in nature, for example, acids found in fruits are natural acids.

Bases

- A **base** is a chemical substance that has a bitter taste and a soapy texture.
- Bases are found in different substances such as bleach, ammonia, washing powder and soap.
- Bases are also called **Alkaline**.

Basic Substances are the substances that contain a base in them.

Name of acid	Found in
Acetic acid	Vinegar
Formic acid	Citrus fruits such as oranges lemons etc.
Lactic acid	Curd
Oxalic acid	Spinach
Ascorbic acid (Vitamin C)	Amla, Citrus fruits
Tartaric acid	Tamarind, grapes, unripe magnoes, etc.
All the acids mentioned above occur in nature.	
Name of base	**Found in**
Calcium hydroxide	Lime water
Ammonium hydroxide	Window cleaner
Sodium hydroxide/Potassium hydroxide	Soap
Magnesium hydroxide	Milk of magnesia

Figure 1: Acids and Bases found in Nature

Neutral Substance is any substance which is neither acidic nor basic in nature.

Indicators

- We cannot taste every object and find its nature. Therefore, we use indicators.
- An indicator is a substance that can determine if another substance is acidic or basic in nature.
- The indicators indicate the presence of an acid or base in a substance by changing their colour. **For Example** Turmeric, China rose petals and Litmus are some natural indicators. Natural indicators the indicators that occur in nature.

Litmus

- Litmus is a natural indicator which is obtained from **Lichens**.

- Litmus is available in a solution form and paper strips (red litmus and blue litmus paper).

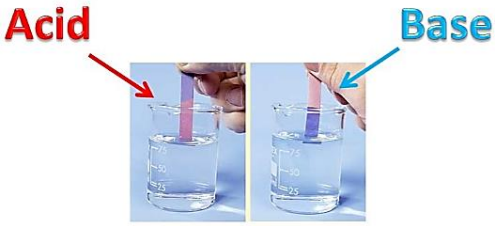

Figure 2: Litmus test

Testing Solutions with Litmus Paper

S.No.	Test solution	Effect on red litmus aper	Effect on blue litmus paper	Inference
1.	Tap water	No change	No change	Neutral
2.	Detergent Solution	Changes to blue	No change	Basic
3.	Aerated Drink	No change	Changes to red	Acidic
4.	Soap Solution	Changes to blue	No change	Basic
5.	Shampoo	No change	Changes to red	Acidic
6.	Common Salt solution	No change	No change	Neutral
7.	Sugar Solution	No change	No change	Neutral
8.	Vinegar	No change	Changes to red	Acidic
9.	Baking Soda Solution	Changes to blue	No change	Basic
10.	Milk of Magnesia	Changes to blue	No change	Basic
11.	Washing Soda Solution	Changes to blue	No change	Basic
12.	Lime Water	Changes to blue	No change	Basic

Turmeric as an indicator

- To use turmeric as an indicator it is generally mixed with water to form a paste which is then put on blotting paper and dried to form thin strips of turmeric paper.
- The turmeric paper is then put into the solutions in order to determine their acidity or alkaline nature.
- Sometimes turmeric solution is also used as an indicator.

Testing Substances with Turmeric Solution

S.No.	Test Solution	Effect on turmeric solution	Remarks
1.	Lemon juice	No change	Acidic or Neutral
2.	Orange juice	No change	Acidic or Neutral

3.	Vinegar	No change	Acidic or Neutral
4.	Milk of magnesia	Change to red	Basic
5.	Baking soda	Change to red	Basic
6.	Lime water	Change to red	Basic
7.	Sugar	No change	Acidic or Neutral
8.	Common salt	No change	Acidic or Neutral

China Rose

China Rose petals are kept in warm water and a coloured solution is obtained from that. This coloured solution is used as an indicator to test other substances.

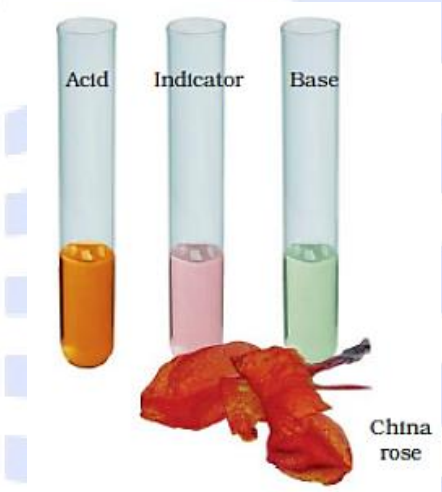

Figure 5: Using China rose as an Indicator

Testing solutions with China rose

S.No.	Test Solution	Initial colour	Final colour
1.	Shampoo (dilute solution)	Milky	Green
2.	Lemon juice	Dirty white	Magenta
3.	Soda water	Colorless	Green
4.	Sodium hydrogen carbonate solution	Colorless	Green
5.	Vinegar	Colorless	Magenta
6.	Sugar solution	Colorless	No change
7.	Common salt solution	Colorless	No change

S.No.	Name of Acid/Base	Effect on litus paper	Effect on tumeric paper	Effect on China rose solution
1.	Hydrochloric acid	Blue litmus paper turns red	No change	Turns dark pink
2.	Sulphuric acid	Blue litmus paper turns red	No change	Turns dark pink
3.	Nitric acid	Blue litmus paper turns red	No change	Turns dark pink
4.	Acetic acid	Blue litmus paper turns red	No change	Turns dark pink
5.	Sodium hydroxide	Red litmus paper turns blue	Turns red	Turns green
6.	Ammmonium hydroxide	Red litmus paper turns blue	Turns red	Turns red
7.	Calcium hydroxide	Red litmus paper turns blue	Turns red	Turns red

Acid Rain

- When the rainwater has increased amounts of acids in it, it is called **Acid Rain**.
- The acid rain is formed because of the presence of air pollutants such as Nitrogen dioxide, Carbon dioxide and Sulphur dioxide in the air.
- These pollutants mix with the rainwater and form acids such as Nitric acid, Sulphuric acid and Carbonic acid respectively.
- The acid rain in severely affect the vegetation, animal life and even buildings of the region where it falls.

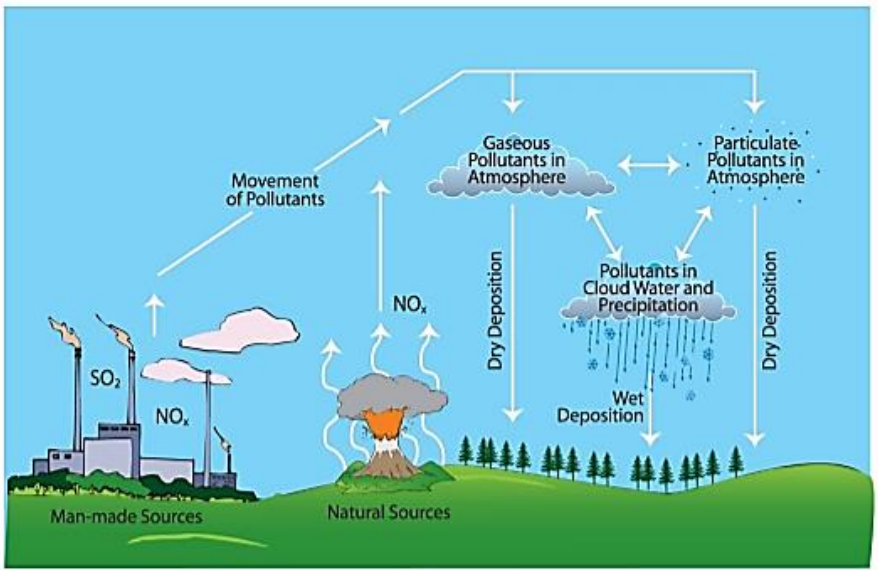

Figure 7: Acid Rain formation

pH scale

- The measure of acidity or basic nature of a substance can be determined by its pH value.
- The pH value range from 1 to 14 with 1 being the most acidic substance and 14 being the most basic substance while 7 is a neutral substance.

- The pH value is generally determined by using pH strips or solutions

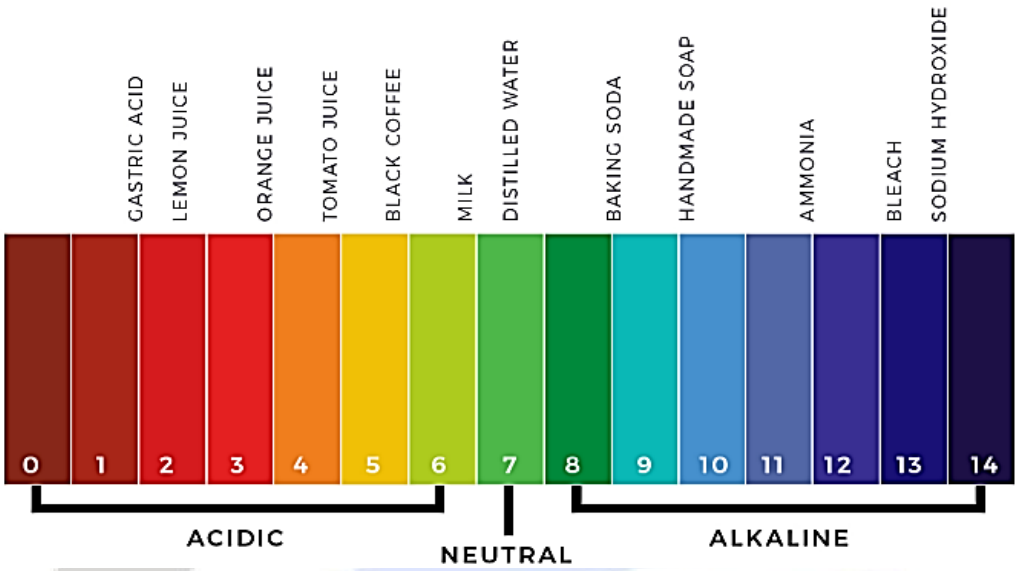

Figure 8: pH scale showing different colors

Acids are never stored in metal containers.

- They are rather stored in glass containers. This is so because acids are generally reactive in nature. If we keep them in metal containers they may react with the metal and erode them. Glass, on the other hand, does not react with acids at all.

Neutralization

- Neutralization is a process or a chemical reaction in which an acidic and basic substance is mixed with each other in order to neutralize their acidic and alkaline nature.
- The product that is formed after the neutralization process is called a **Salt**.
- The salt can have basic, acidic or neutral nature.
- The neutralization process results in the generation of heat which raises the temperature of the reacting mixture.
- A synthetic indicator often used for testing neutralization reactions is **Phenolphthalein** solution. It is pink in color.
- When an acid is added to Phenolphthalein solution, the solution turns colorless, indicating the presence of an acid.
- When a base is added to Phenolphthalein solution, the solution retains its pink color, indicating the presence of a base.

Figure 9: Neutalization using Phenolphthalein

Formation of Salt

$$\text{Acid} + \text{Base} \rightarrow H_2O + \text{Salt}$$

$$HCl + NaOH \rightarrow H_2O + NaCl$$

Figure 10: Formation of Salt

Neutralization in Everyday Life

1. Indigestion

- We know that our stomach produces hydrochloric acid which helps in the digestion of food.
- But sometimes the stomach releases too much of acid which leads to **indigestion** or sometimes hyperacidity.
- Hence, we need to neutralize this acid by taking substances that are basic in nature commonly known as antacids.
- For Example, milk of magnesia is a basic substance that can neutralize the acid of the stomach.

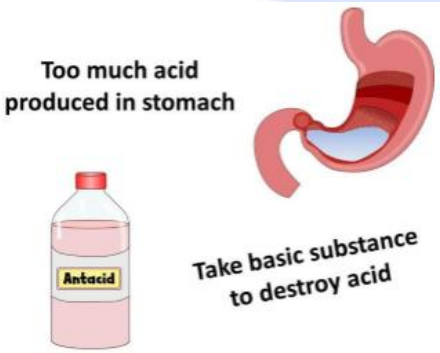

Figure 11: Indigestion caused in stomach

2. Ant Bite

- The irritation of the skin due to ant bite is caused because of the presence of formic acid that the ant injects into the skin while biting.
- Hence we use a basic substance to neutralize the effect.
- For Example, baking soda or hydrogen carbonate, calamine solution or zinc carbonate are generally used to treat ant bites

3. Soil Treatment

- Plants need a soil which is neutral in nature but using chemical fertilizers on soil can turn it into acidic.
- To treat acidic soil we use quicklime (calcium oxide) or slaked lime (calcium hydroxide).
- Basic soil can be treated by adding organic substances to it as they release acids while decomposing into the soil.

Figure 12: Soil treatment

4. Factory Wastes

- The factory waste is acidic in nature and cannot be directly dumped anywhere. Hence bases are added to it before it falls off into a river or stream so that the aquatic life does not get affected.