

Chapter 4: Acids and Alkalis

Lesson Aims-

- Understand what acids and alkalis are, and where they are found.
- Test a range of household products with litmus indicator to see whether they are acidic or alkaline.



Found in citrus
fruit like lemons

These feel soapy

If it is concentrated it can be
corrosive (dissolve things)

Acid or Alkali?

Foods that contain
this taste sour

Can cut through
grease - used as
oven cleaner

Found in your
stomach

What are substances called that
Give some examples of neutral
substances

Examples of household acids & alkalis

Foods -

Berries and citrus fruits are acidic. They contain **Citric acid**.

Bicarbonate of soda and chocolate are alkaline.

In the body-

Stomach juices are acidic. They contain **Hydrochloric acid**.

Pancreatic juices are alkaline.

Cleaning products-

Products containing ammonia are alkaline

Products containing vinegar are acidic. They contain **Ethanoic acid**.



WHAT ARE ACIDS?

- Acids are chemical compounds that can react with metals and other substances to **'eat them away'** or damage them.
- Mild acids that are dissolved in water have a sour taste.
 - A common example of such an acid is carbonic acid (HCO_3) used in carbonated drinks.
 - Lemon juice is also acidic and contains citric acid.



- You should never try to taste stronger, **CONCENTRATED** acids, because they could harm you.
- Even trying to smell an acid is not a good idea, because the fumes can burn your nostrils.
- If you add water to concentrated acids, they become weaker, and we then call them **DILUTE**.
- Even after diluting a strong acid like sulfuric acid, you must still use caution.



THE CHEMICAL FORMULA

- In general, acids can be chemically identified by the hydrogen term in front of its chemical formula.
 - Ex: The formula for hydrochloric acid is **HCl**
 - Ex: The formula for sulfuric acids is **H₂SO₄**



WHAT ARE BASES AND ALKALIS?

- Alkalis and bases are chemical compounds that have caustic action on plant and animal tissue.
- They feel slippery to the skin, as can be experienced with soap.
- Diluted bases have a bitter taste.



- You should use caution when tasting or touching any chemical, especially one that is caustic to your skin.
- A base is the opposite to an acid because it cancels out its acidity.
- An alkalis is a base which is soluble in water.



THE CHEMICAL FORMULA

- Alkalis can often be identified by the OH term at the end of their chemical formula.
 - Ex: Sodium Hydroxide → NaOH
 - Ex: Potassium Hydroxide → KOH



HOW CAN I IDENTIFY AN ACID?

- Sometimes, one can tell whether a substance is an acid simply by tasting it.
 - **Acids are sour.**
- By now, you should know that it is not always possible to taste a chemical to find out if it is an acid or not.
- A better way to find out is to determine the pH value using **specific indicators.**



HOW CAN I IDENTIFY AN BASE OR AN ALKALI?

- Bases are soapy to the skin.
- By now, you should know that it is not always possible to touch a chemical to find out if it is acidic or alkaline.
- A better way to find out is to determine the pH value using **specific indicators**.



WHAT ARE INDICATORS?

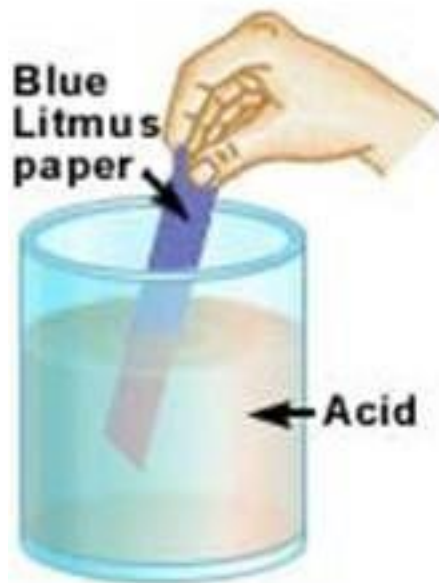
- An indicator can be described in a very simple way:

It is a chemical that changes colour when it is added to an acid (or an alkali). The colour depends on how strong the acid or alkali is.



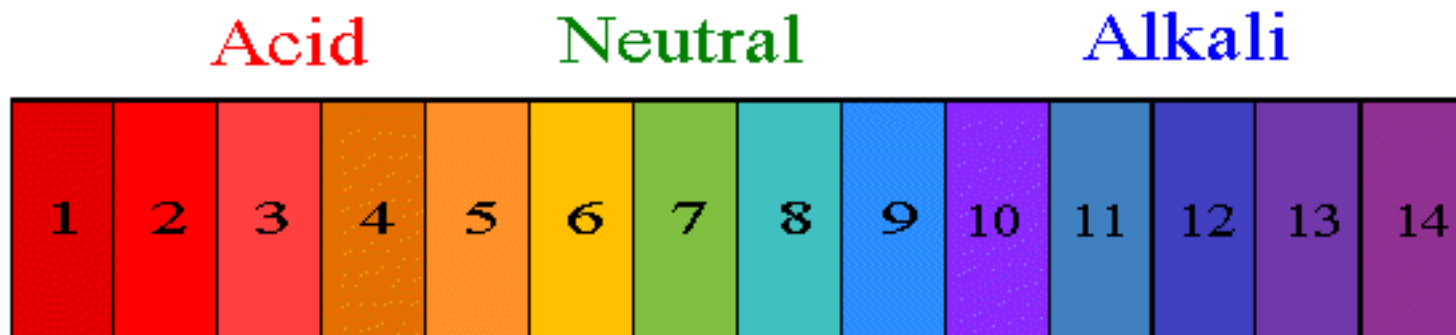
LITMUS PAPER

- A paper containing dyes which change colour when exposed to acids or bases.
- **Acids** turn litmus pink or **red**. **Bases** turn litmus paper **blue**.
- Litmus paper can tell us whether a substance is an **acid or a base**, but it cannot tell how strong it is.



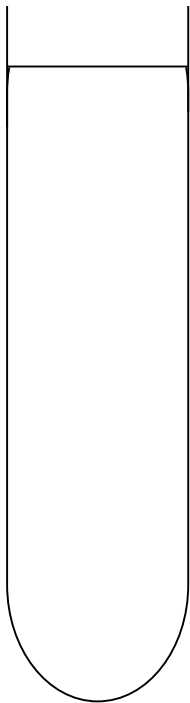
UNIVERSAL INDICATOR

- Universal indicator is a solution which changes colour depending on the strength of acids or alkalis added to it.
- The colours range from red (acids) to deep purple (alkalis).
- The depth of colour depends on how strong the acid or alkali is.

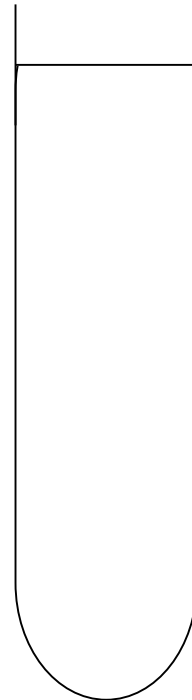


INDICATORS

- Click on the test tubes to find out how LITMUS indicator works



ACID



ALKALI



INDICATORS

Litmus indicator turns alkalis blue
and acids red .

Universal indicator tells us how strong or weak an acid or
alkali is.

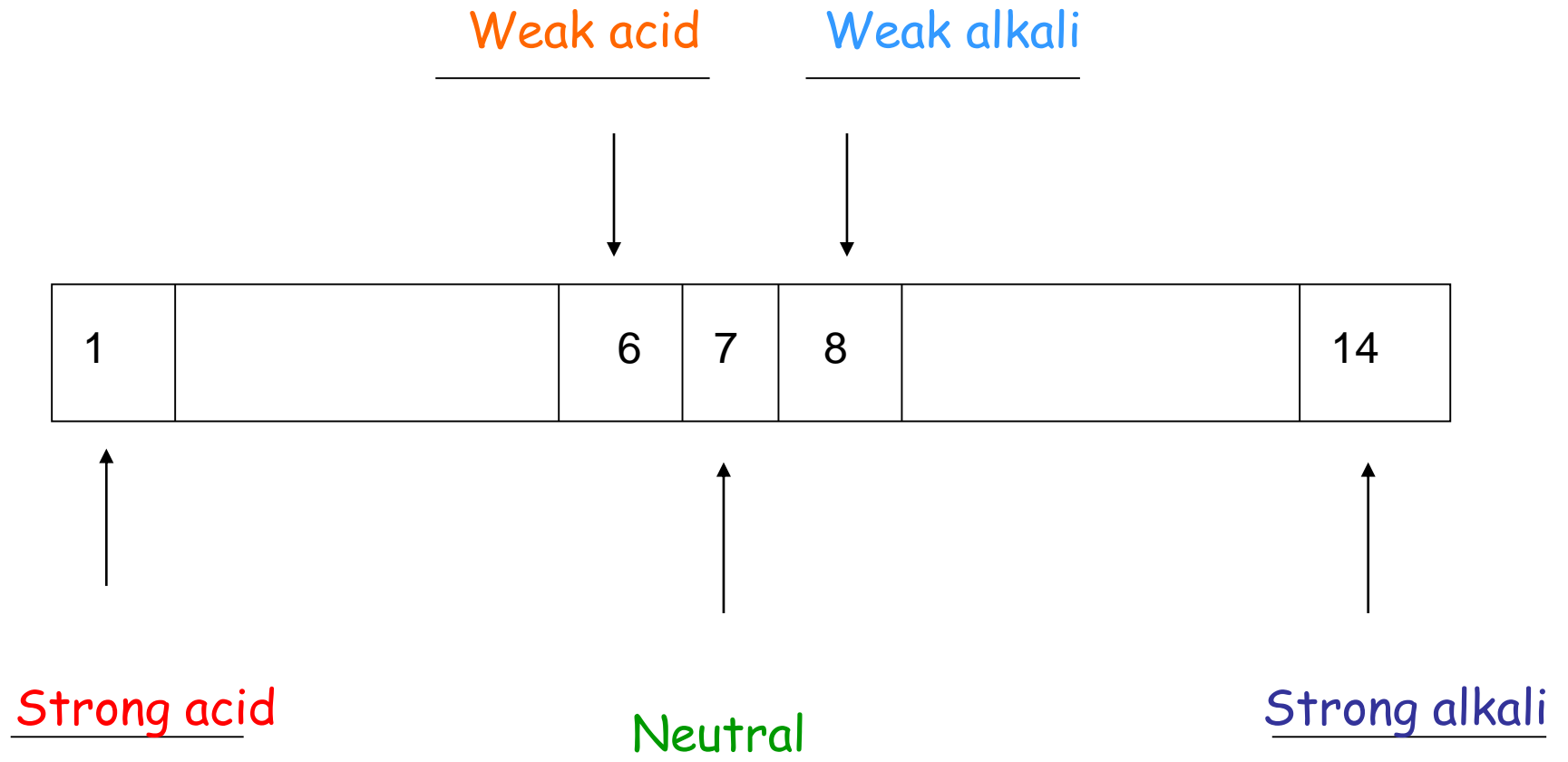


THE PH SCALE

- The pH scale is a measurement of the strength of an acid or a base.
- An **acid** is a solution with a **pH less than 7**, whereas a **base or an alkali** has a **pH of more than 7**.
- Litmus paper is often used to give a **rough estimate of the pH**. When the litmus paper turns **red**, the material is **acidic**, and when the litmus paper turns **blue**, it contains a **base**.



THE PH SCALE



USES FOR ACIDS

- **Car batteries**
 - Car batteries use sulfuric acid to help create and store electricity.
 - Sulfuric acid is such a strong acid that it will eat a hole in a piece of iron, as well as eat through your clothes and skin.
 - You should always use extreme caution when handling a car battery.



- **Stomach acids**

- Your stomach has acids that help break down and digest food you have eaten. Concentrated stomach acid can irritate your stomach lining and even eat a hole through it.

- **Antacids**

- If the body has secreted excess acid, because it is having trouble digesting the food you have eaten, you can get a burning pain in your stomach area.
- If you take an antacid, it will buffer the stomach acid.
- Some antacids contain a base-type chemical compound. Adding a base to an acid neutralizes the acid and produces water and salt.



- **Aspirin**

- Aspirin is an acid that can irritate you if taken on an empty stomach.
- Buffered aspirin has a small amount of antacid to neutralize the acidic effect on you.

- Acids are also used in industry both to dissolve materials and to create new compounds. We drink very mild acids in our carbonated and fruit drinks.



FINAL NOTE ON ACIDS

- Acids usually must be mixed with water to dilute them and make them more usable. Although they dissolve in water, they also can react and bubble when mixed with water.
- Care must be taken when mixing strong acids and water, because if the mixture explodes, the acid can be sprayed all over.
- An acid can eat through materials and has a formula that usually begins with an H (hydrogen).



USES FOR BASES AND ALKALIS

- A major use for bases is in cleaning. Soaps and detergents are bases or alkalis.
- They can also be used to neutralize solutions that are too acidic. Industrial uses for alkalis include making new materials.
- A common base is sodium hydroxide (NaOH). It is also called lye and is the grease-cutting material in early forms of soap.



- If a gardener finds that the soil is too acidic to grow certain plants, the gardener will add lime (calcium oxide) to make the soil neutral or alkaline, depending on how much is used. Lime is a similar compound to chalk.



NEUTRALIZATION

- When acids and alkalis are mixed, they **react** and produce water and a salt which is **neutral**.
- This reaction is called neutralization.
- Example:

Hydrochloric acid + Sodium Hydroxide → Sodium Chloride + Water



NEUTRALISATION

