

# Acids and Alkalis Knowledge Organiser

## Topic Overview

### Acids

- **Acids** are a group of chemicals with similar *properties*. For example, they all taste sour.
- Lemon juice, vinegar and milk are all acids.
- Common laboratory acids include hydrochloric acid (HCl), sulfuric acid, (H<sub>2</sub>SO<sub>4</sub>), nitric acid (HNO<sub>3</sub>).

### Alkalis

- **Bases** are chemically opposite to acids. When a base is dissolved in water, we call it an **alkali**.
- Alkalis all have similar *properties*, for example they feel soapy.
- Baking powder, soap and bleach are all alkalis.
- Common laboratory alkalis include sodium hydroxide (NaOH), potassium hydroxide (KOH) and ammonium hydroxide (NH<sub>4</sub>OH).

### Neutral substances

- Substances which are neither an acid nor an alkali are **neutral**.
- Water is an example of a neutral substance.

### Concentration

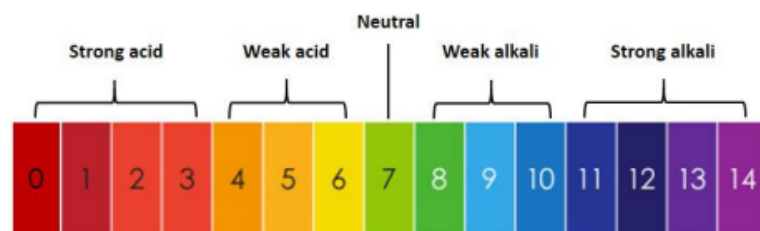
- Acids and alkalis come in different concentrations e.g. 1M or 0.1M. The higher the number, the stronger the substance.
- The concentration of something tells you how many particles are dissolved in one litre of water, in this case acid or alkali particles.
- When there are lots of particles dissolved, we say the liquid is **concentrated**. We can make it less concentrated, or **dilute**, by adding water.
- Concentrated solutions will be labelled with a **corrosive** hazard label – telling you to wear goggles when using them.

### Indicators

- An **indicator** is a chemical which can be used to identify whether a substance is acidic or alkaline because it changes colour. For example, red cabbage water, litmus or Universal Indicator.

### Universal indicator and the pH scale

- The pH scale uses Universal Indicator to show how acidic or alkaline a solution is:

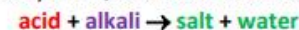


- A solution which is neither acidic nor alkaline is described as being **neutral** and has a pH of 7. Neutral substances turn Universal Indicator green.
- **Acids** have a pH of less than 7 and **alkalis** have a pH of more than 7.
  - Substances with a pH of 0-3 are classified as **strong acids**. They turn Universal Indicator **red**. **Weak acids** have a pH of 4-6, they turn Universal Indicator **orange or yellow**.
  - Substances with a pH of 11-14 are classified as **strong alkalis**, they turn Universal Indicator **purple**. **Weak alkalis** have a pH of 8-10, they turn Universal Indicator **dark green or blue**.

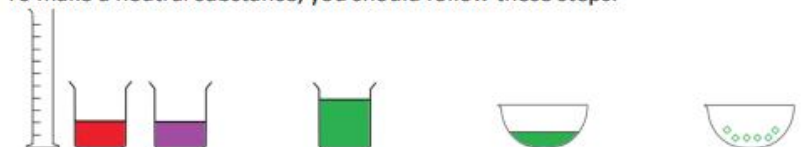
### Neutralisation reactions

- A chemical reaction happens if you mix together an acid and an alkali. The reaction is called **neutralisation**. A neutral solution is made if you add just the right amount of acid and alkali together.

- When an acid is neutralised by alkali, a salt and water are produced:

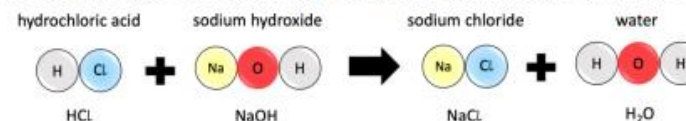


- To make a neutral substance, you should follow these steps:



1. Mix identical volumes of acid and alkali at the same concentration.
2. Check that the solution is neutral using universal indicator.
3. Leave the solution to evaporate.
4. When the water has evaporated salt crystals are left behind.

- The name of the salt is determined by the type of acid and metal used, for example:



- **Hydrochloric acid** makes a **chloride**:  
e.g. hydrochloric acid + ammonium hydroxide → ammonium chloride + water
- Nitric acid makes a **nitrate**  
e.g. nitric acid + potassium hydroxide → potassium nitrate + water
- Sulfuric acid makes a **sulfate**  
e.g. sulfuric acid + sodium hydroxide → sodium sulfate + water

### Uses of neutralisation

- Remember: **acid + alkali = neutral**

Bee sting = pH 2



A bee sting hurts because it is an **acid**, we can **neutralise** it using an **alkali** like baking powder.

Wasp sting = pH 10



A wasp sting hurts because it is an **alkali**, we can **neutralise** it using an **acid** like vinegar.