Summary Sheet Year 8 Acids and Alkalis:

Acids and Alkalis

An **acid** is a substance that has a pH lower than 7.
For example, hydrochloric acid (HCl), sulfuric acid (H_2SO_4), citric acid, ethanoic acid (vinegar).

A **base** is a substance that neutralises an acid – those that dissolve in water are called alkalis.
An **alkali** is a soluble substance with a pH higher than 7.
For example, sodium hydroxide (NaOH), potassium hydroxide (KOH), oven cleaner, toothpaste, shampoo.

Hazard symbols

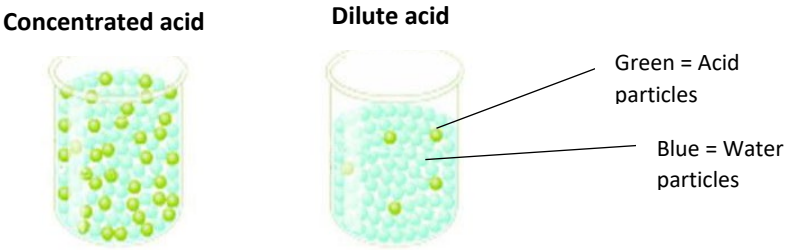
Acids and alkalis are useful, but they can also be dangerous. A **hazard** is something that can cause harm. A **hazard symbol** is used to show the level and type of danger.

Corrosive
(can attack metals, stonework and skin)

Toxic
(poisonous)

Irritant
(not corrosive but may cause reddening or itching of skin)

Concentration is a measure of the number of particles in a given volume.



Strong acids can be very concentrated (lots of particles in the same volume) and can be very dangerous (**corrosive**). They can be **diluted** with water to make them less dangerous (**irritant**). This means they have less acid particles in the same volume.

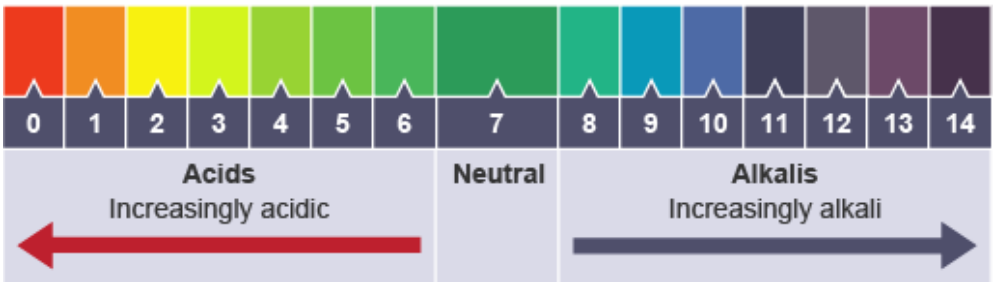
The pH Scale

The pH of a solution depends on the strength of the acid: **strong acids** have **lower pH** values (pH 0-3) than weak acids (pH 4-6). **Neutral** solutions have a pH of 7. For example, pure water. **Strong alkalis** have **higher pH** values (pH 11-14) than weak alkalis (pH 8-10).

Indicators

We can use **indicators** to test the pH of a substance. An indicator is a substance that changes colour when it is added to **acidic** or **alkaline** solutions.

Universal indicator (paper or liquid): Universal indicator has many different colour changes, from **red** for strongly acidic solutions to **dark purple** for strongly alkaline solutions. In the middle, neutral pH 7 is indicated by **green**.



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Litmus (paper or liquid): Litmus indicator solution turns **red** in acidic solutions and **blue** in alkaline solutions.

	Red litmus	Blue litmus
Acidic solution	**Stays red**	**Turns red**
Neutral solution	Stays red	Stays blue
Alkaline solution	**Turns blue**	**Stays blue**

Neutralisation

When an alkali and acid are mixed, a **chemical reaction** occurs and a new substances are formed. If exactly the right amounts of acid and alkali are mixed, you will end up with a neutral solution (pH 7). This is called a **neutralisation reaction**.

We can describe neutralisation using an equation: acid + alkali (or base) → salt + water

The name of the salt depends on the acid used

- Sulfuric acid makes a salt called a metal sulfate
- Nitric acid make a metal nitrate
- Hydrochloric acid makes a metal chloride

eg1 copper oxide + sulfuric acid → copper sulfate + water
eg2 potassium hydroxide + nitric acid → potassium nitrate + water
eg3 sodium hydroxide + hydrochloric acid → sodium chloride + water

If you produce too much acid during digestion, you may suffer from **indigestion** or heart burn. Remedies such as **antacids** contain alkalis to help increase the pH back up towards pH 7 and restore the correct balance.

Bee and wasp stings are treated with neutralisation reactions.

Toothpaste is a weak alkali to neutralise the acids that cause holes in the enamel on your teeth.

Making Salts – eg. Making Copper Sulfate

1 Reacting the metal oxide with the acid

Excess copper oxide (more than is really needed) is added to the sulfuric acid to make sure the acid is **fully neutralised**. The mixture is **stirred** and **warmed** to ensure that it fully reacts

2 Filtering to remove any excess solid

When no more copper oxide will react, the excess solid is **filtered** off to leave a solution of copper sulfate.

3 Evaporating some of the water to leave crystals

The solution is **heated** in an **evaporating basin** to **remove some of the water**.

The rest of the water is left to evaporate slowly at room temperature over a day or two to get larger crystals.