



KPI 7CC 1: Identify substances as acid, alkali or neutral based on observations with indicators and the pH scale

Universal pH scale

Universal indicator is supplied as a solution or as universal indicator paper. It is a mixture of several different indicators. Unlike litmus, universal indicator can show us how strongly acidic or alkaline a solution is, not just that the solution is acidic or alkaline. This is measured using the pH scale, which runs from pH 0 to pH 14.

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.

These are the important points about the pH scale:

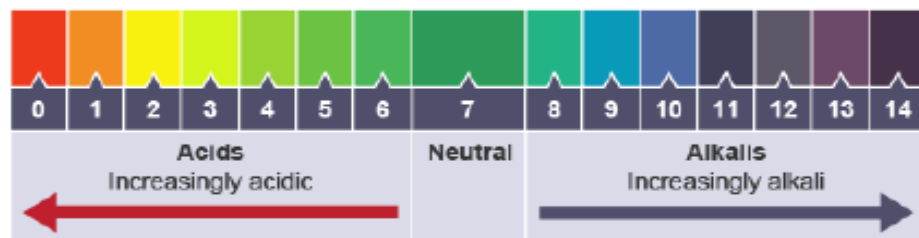
neutral solutions are pH 7 exactly

acidic solutions have pH values less than 7

alkaline solutions have pH values more than 7

the closer to pH 0 you go, the more strongly acidic a solution is

the closer to pH 14 you go, the more strongly alkaline a solution is



Indicators and the pH scale

Solutions can be acidic, alkaline or neutral:

we get an acidic solution when an acid is dissolved in water

we get an alkaline solution when an alkali is dissolved in water

solutions that are neither acidic nor alkaline are neutral

Pure water is neutral, and so is petrol.

An indicator is a substance that changes colour when it is added to acidic or alkaline solutions. You can prepare homemade indicators from red cabbage or beetroot juice - these will help you see if a solution is acidic or alkaline.

Litmus and universal indicator are two indicators that are commonly used in the laboratory.

Litmus indicator

Litmus indicator solution turns red in acidic solutions and blue in alkaline solutions. It turns purple in neutral solutions.

Litmus paper is usually more reliable, and comes as red litmus paper and blue litmus paper. The table shows the colour changes it can make.

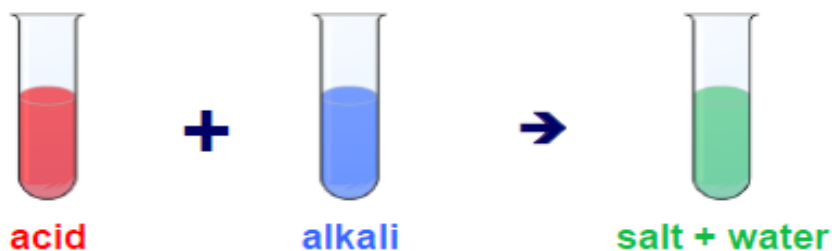
	Red litmus	Blue litmus
Acidic solution	Stays red	Turns red
Neutral solution	Stays red	Stays blue
Alkaline solution	Turns blue	Stays blue

KPI 7CC 2: Describe neutralisation in terms of acids and alkalis reacting

Neutralisation

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 base together. The products formed are salt and water.

- When an alkali reacts with **hydrochloric acid**, the salt produced is a **chloride**.
- When an alkali reacts with **sulphuric acid**, the salt produced is a **sulphate**.
- When an alkali reacts with **nitric acid**, the salt produced is a **nitrate**.



E.g:



Other ways to neutralise

metal oxide + acid → salt + water

metal hydroxide + acid → salt + water

metal carbonate + acid → salt + water + carbon dioxide

Notice they all produce a salt and water...

Word and symbol equations

sodium hydroxide + hydrochloric acid → sodium chloride + water
 $\text{NaOH} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2\text{O}$

copper oxide + sulphuric acid → copper sulphate + water
 $\text{CuO} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O}$

sodium hydroxide + sulphuric acid → sodium sulphate + water
 $2\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$

copper carbonate + sulphuric acid → copper sulphate + water + carbon dioxide
 $\text{CuCO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O} + \text{CO}_2$

Highlight all acids in red and all salts in green.