



Litmus  
Litmus paper can be red or blue.

acid      neutral      alkali

Red litmus **stays** red in acid;  
Blue litmus **turns** red in acid.

Acids to know  
HCl – hydrochloric acid; make salts called chlorides  
HNO<sub>3</sub> – nitric acid; make salts called nitrates  
H<sub>2</sub>SO<sub>4</sub> – sulfuric acid; make salts called sulfates

**Universal Indicator (paper or solution)**

red – orange – yellow – green – green blue – blue – purple

acidic		neutral			alkaline	
red	orange	yellow	green	green-blue	blue	purple
0-2	3-4	5-6	7	8-9	10-11	12-14
[H <sup>+</sup> ] >>> [OH <sup>-</sup> ]		[H <sup>+</sup> ] > [OH <sup>-</sup> ]	[H <sup>+</sup> ] = [OH <sup>-</sup> ]	[OH <sup>-</sup> ] > [H <sup>+</sup> ]	[OH <sup>-</sup> ] >>> [H <sup>+</sup> ]	

An **acid** is a compound that produces hydrogen ions (H<sup>+</sup>) when dissolved in water.  
An **alkali** is a compound that produces hydroxide ions (OH<sup>-</sup>) when dissolved in water, or reacts with water to produce hydroxide ions.

**LEARN THESE 3 GENERAL EQUATIONS**

- Metal + acid → salt + hydrogen
- Base + acid → salt + water
- Carbonate + acid → salt + water + carbon dioxide

A salt is the chemical made when metal (or ammonium) ion replaces the “H” of an acid e.g. acid, sulfuric acid H<sub>2</sub>SO<sub>4</sub> : salt, sodium sulfate Na<sub>2</sub>SO<sub>4</sub>.  
Acid, nitric acid HNO<sub>3</sub> : salt, zinc nitrate Zn(NO<sub>3</sub>)<sub>2</sub>

A solution is **acidic** if the concentration of H<sup>+</sup> ions > OH<sup>-</sup> ions  
A solution is **neutral** if the concentration of H<sup>+</sup> ions = OH<sup>-</sup> ions  
A solution is **alkaline** if the concentration of H<sup>+</sup> ions < OH<sup>-</sup> ions

The colour of an indicator depends on the ratio of H<sup>+</sup> to OH<sup>-</sup> ions.

Bases to know  
NaOH sodium hydroxide  
Ca(OH)<sub>2</sub> calcium hydroxide  
NH<sub>3</sub> ammonia  
NaHCO<sub>3</sub> sodium hydrogen carbonate  
Na<sub>2</sub>CO<sub>3</sub> sodium carbonate

- **BASES** are metal oxides or metal hydroxides e.g. CuO and NaOH
- **ALKALIS** are bases *that are soluble in water* e.g. NaOH
- **Yes! All alkalis are bases but not all bases are alkalis!**

