

the two families, the scale that ranks them, and the salts their meeting produces

What makes an acid or a base

- an acid produces hydrogen ions when dissolved in water, and it tastes sour
- a base produces hydroxide ions in water, tastes bitter and feels soapy
- an alkali is a base that dissolves in water, so every alkali is a base but not every base is an alkali
- acids turn blue litmus red and bases turn red litmus blue
- strong acids and bases dissociate almost completely in water, weak ones only partly. Strength is not the same as concentration
- concentration is how much is dissolved, strength is how completely it dissociates, and a dilute solution of a strong acid is perfectly possible

The pH scale

- pH runs from 0 to 14 and measures the concentration of hydrogen ions
- below 7 is acidic, exactly 7 is neutral, above 7 is basic
- the lower the pH the more acidic, so pH 1 is a far stronger acid than pH 5
- the scale is logarithmic: each step of one unit is a tenfold change, so pH 3 is a hundred times more acidic than pH 5
- indicators change colour with pH: litmus, methyl orange, phenolphthalein, and universal indicator which gives a range of colours
- olfactory indicators such as onion and vanilla change smell rather than colour, and are used to test with the nose



five everyday substances pinned at their own places on the 0 to 14 band: the middle mark is neutral, everything to its left is acidic and everything to its right basic, and each step along the scale is a tenfold change

Why pH matters

- our body works in a narrow range, and blood is held close to pH 7.4
- tooth decay starts below pH 5.5, when bacteria in the mouth produce acid from sugar. Toothpaste is basic and neutralises it
- acidity in the stomach is treated with an antacid, a mild base such as magnesium hydroxide
- soil pH affects crops, and it is corrected with lime if too acidic or with organic matter if too basic
- acid rain has a pH below 5.6 and damages crops, buildings and aquatic life
- a bee sting is acidic and is treated with baking soda, while a wasp sting is basic and is treated with vinegar