

S2 Acids & Bases - Knowledge Organiser



Key Word	Definition
acid	substance with pH 1-6
base	reacts with acids
alkali	substance with pH 8-14
neutral	solution with pH 7
solution	a substance dissolved in water
universal indicator	shows the pH of a substance
pH paper	shows the pH of a substance
dilution	addition of water
acid rain	rain water that is more acidic than normal
salts	A substance formed when an acid and base/alkali react together
neutralisation	reaction when an acid reacts with a base/alkali
element	substance made from one type of atom
compound	two or more elements joined together
fertiliser	Substance added to plants to make them grow faster and bigger.

Types of Solution

Solutions can be classified as “acidic”, “alkaline” or “neutral”. Solutions can be classified as acidic, alkaline or neutral using:

- universal indicator,
- pH paper

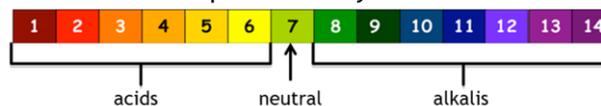
The colour universal indicator (or pH paper) changes to when added to a solution can be compared against a pH chart and used to classify a solution as an acid, alkali or neutral.

Universal indicator is a mixture of different indicators.

Acids are solutions with a pH less than 7. The lower the pH, the more acidic the solution is.

Alkalis are solutions with a pH of more than 7. The higher the pH, the more alkaline the solution is.

Neutral solutions have a pH of exactly 7. Pure water has a pH of exactly 7.



Diluting with water:

- Moves the pH of an acid up towards 7.
- Moves the pH of an alkali down towards 7.

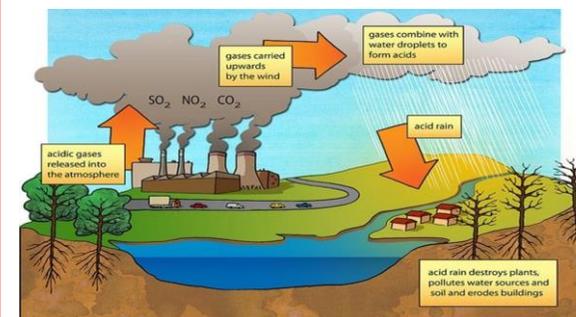
Making Acids and Alkalis

Metal oxides that dissolve in water produce alkalis. Non-metal oxides that dissolve in water produce acids. Insoluble oxides will have no effect on the pH of water (neutral).

Acid Rain

Normal rainfall is slightly acidic due to dissolved atmospheric carbon dioxide.

'Acid rain' is rainwater that is more acidic than normal. Acid rain is caused when sulphur dioxide and nitrogen dioxide dissolve in rainwater.



Causes of Acid Rain

Sulphur dioxide is produced by burning sulphur containing fossil fuels, such as coal.

Nitrogen oxides are produced when nitrogen and oxygen react together due to the energy produced by the spark plug in a petrol engine.

Further Reading

<https://www.bbc.co.uk/bitesize/guides/z89jq6f/revision/1>

https://www.youtube.com/watch?v=d_QLsUlmqdM

<https://www.bbc.co.uk/bitesize/guides/zsmgpbk/revision/1>

<https://www.bbc.co.uk/teach/class-clips-video/chemistry-ks3-gcse-acids-and-alkalis/zfrqpg8>

<https://www.bbc.co.uk/bitesize/guides/z9tvw6f/revision/2>

Common Acids

Lab acids include:

- hydrochloric acid
- nitric acid
- sulphuric acid

Common Alkalis

Lab alkalis include:

- sodium hydroxide
- potassium hydroxide
- calcium hydroxide

Household acids include:

- vinegar
- lemon juice
- fizzy drinks

Household alkalis include:

- toothpaste
- baking soda
- bleach

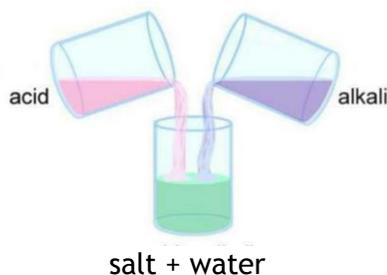




Reactions of Acids and Alkalis

The reaction of an acid with base to form a salt and water is called neutralisation. Neutralisation reactions move the pH of a solution to 7.

The general word equation is:
 $\text{acid} + \text{alkali} \rightarrow \text{salt} + \text{water}$



Bases

A base is a substance that reacts with an acid to produce salt and water.

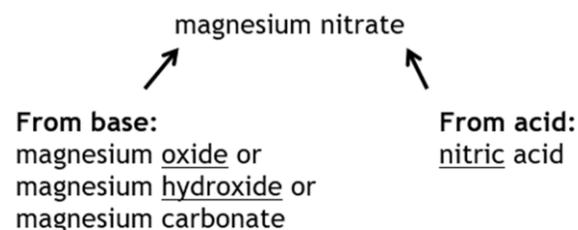
The three types of base are:

- metal oxides
- metal hydroxides
- metal carbonates

An alkali is a solution made by dissolving a base in water.

Salts

The specific type of salt produced in a reaction will depend on both the metal and the type of acid used:



Hydrochloric acid produces metal chloride salts
 Nitric acid produces metal nitrate salts
 Sulphuric acid produces metal sulphate salts

Purpose of Fertilisers

Fertilisers are necessary to replace the nutrients removed from the soil when crops are harvested.



Fertilisers are also necessary to ensure speedy crop growth to feed the ever increasing world population.

Properties of Fertilisers

Fertilisers are soluble in water.
 Many fertilisers make the soil acidic

Problems with Fertilisers

Very soluble fertilisers are washed out of the soil and into rivers and streams where they poison aquatic life.



Some fertilisers can make the soil too acidic for growing certain crops.

Sources of Fertilisers

Natural fertilisers are made from the remains of crops or animal waste

- manure
- compost
- seaweed

Man-made fertilisers are salts made by neutralisation reactions.

For example:



Neutralisation

Everyday examples include:

- neutralising plaque acid with toothpaste.
- neutralising stomach acid with indigestion tablets.
- adding lime to reduce the acidity of soil/lochs.
- using baking powder (acid + carbonate) to produce bubbles in cakes.
- removing limescale using vinegar.



Healthy Plants

The three elements necessary for healthy plant growth are:

- Nitrogen
- phosphorus
- potassium



Fertilisers

Fertilisers are chemicals which are used to make crops grow larger and faster. Fertilisers contain compounds with the elements nitrogen, phosphorus and potassium.

