Acids, Alkalis, Neutralisation and the pH Scale

Acids and alkalis can be thought of as chemical opposites. If the right amount of acid and alkali are mixed together their chemical properties cancel each other out, we call this **neutralisation**. Acids and alkalis are both corrosive, this means that they can damage your skin and attack metals.

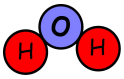
Acids

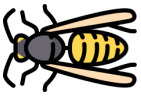
Hydrochloric acid, HCl, and **sulphuric acid, H_2SO_4**, are the most commonly used acids in schools. People often think acids are dangerous, this is only true if they are concentrated or 'strong'. Acids are extremely useful and we use them all the time. Vinegar (acetic acid), is an acid we put on our chips. Citrus fruits (oranges, lemons and limes) contain citric acid which makes them sour. Vitamin C (ascorbic acid), is essential for healthy skin. Our fizzy drinks are also acidic due to the carbonic acid from dissolved carbon dioxide. Hydrochloric acid in our stomachs is essential for killing bacteria and making our enzymes (biological catalysts) work properly. Car batteries rely on very strong sulphuric acid to work. It is known that the sting from a **bee** is acidic and has something to do with the pain we experience.

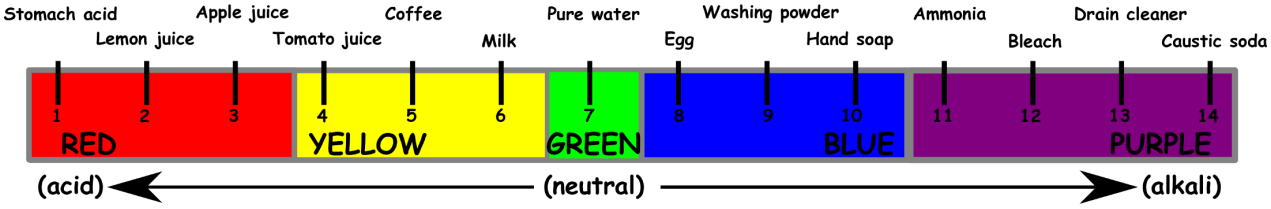
Alkalis

Sodium hydroxide, NaOH, is the most commonly used alkali in schools (also called caustic soda). Like acids, alkalis are only really harmful if they are concentrated or 'strong'. Household products such as drain cleaner or bleach, however, are strong so care must be taken when using them. Sodium hydroxide is used in making soap, this leaves it alkaline. Soap helps water to penetrate dirt better and clean our skin. Washing up liquid is alkaline and is great for penetrating grease, washing powder too. Baking powder is an alkali that releases carbon dioxide when baking to make cakes rise. If you have an upset stomach, you can take an alkaline indigestion tablet to help calm your stomach. It neutralises excess (too much) acid. It is known that the sting from a **wasp** is alkaline and has something to do with the pain we experience.

Indicators and the pH scale.







In chemistry we use indicators to tell us if a solution (substances dissolved in liquids), is acidic or alkaline. The pH scale is a number scale from 1 to 14 that tells us how strong an acidic or alkaline solution is. **One** on the scale is strongly acidic, **seven** is neutral (neither acidic nor alkaline), and **fourteen** is strongly alkaline. To know the pH of a solution we often use universal indicator, it is brilliant! If we add a few drops to a solution it changes to a colour that matches a number on the pH scale. If universal indicator turns more towards **yellow/red,** then what we are testing is an **acid**. If it turns more towards **blue/purple** then it is **alkaline**. If it stays **green**, it is **neutral**. Another common indicator is 'litmus'. This is usually a strip of paper that 'only' changes to red if acidic or blue if alkaline. It doesn't tell us the pH because there are no 'in-between' colours. It is less useful than the brilliant universal indicator which is actually a mixture of indicators.

WHAT?

Fluoroantimonic acid is the strongest acid and explodes on contact with water! It can dissolve glass. pH stands for potential of hydrogen.

Questions on Acids, Alkalis, Neutralisation and the pH Scale

Comprehension

1. How can acids and alkalis be thought of?
2. If we mix the right amount of acid and alkali what can happen?
3. What do we call this?
4. What are the two most commonly used acids in schools?
5. When is it true that acids are dangerous?
6. Why is the hydrochloric acid, HCl, in our stomachs essential?
7. What might have something to do with the pain we experience from bee stings?
8. What is the most commonly used alkali in schools?
9. How does the sodium hydroxide used in making soap leave it?
10. How do indigestion tablets help calm your stomach?
11. What might have something to do with the pain we experience from wasp stings?
12. What do we use indicators for in chemistry?
13. What is the pH scale and what does it tell us?
14. What do we often use to know the pH of a solution?
15. What colour is neutral on the pH scale?
16. Why can't litmus indicator tell us the pH?

Additional tasks

1. Complete the jumbled pH table below using the examples given on the opposite page.

pH	Example	Acid or alkali?
4		
8		
10		
6		
11		
5		
1		
12		
2		
9		
3		
14		
7		
13		

2. Complete the gap filling exercise below. Choose from the following words.

acid particles, corrosive, skin, test tubes, acidic, Sulphuric acid, soaps, concentrated, 12, Hydrochloric acid, acetic acid, sodium hydroxide, washing powders, volume, strong, neutralise, stomachs, alkaline, neutral, red, metals, blue, bleach

Acids are only dangerous if they are _____ or _____. Concentration is how many _____ _____ are in a certain _____. Acids and alkalis can be _____. This means they can damage your _____ or attack _____. The hazard symbol for corrosive has a picture of two _____ _____in it. _____ _____, H_2SO_4 is used in car batteries. _____ _____ helps our digestive system to work properly. Another name for vinegar is _____ _____.

Alkalis like _____ _____ are commonly used in schools. _____ is alkaline and has a pH of about ___. So are _____ and _____ _____. Alkalis _____ acids so can be used to treat upset _____. pH stands for potential of hydrogen. On the pH scale, pH-1 is strongly _____, pH-14 is strongly _____ and pH-7 is _____. pH-7 is green, becoming more acidic the colour changes to yellow then ____, becoming more alkaline the colour changes to more _____ then purple.

3. Design your own leaflet explaining the benefits and uses of acids and alkalis (A4 paper folded in half).

   Or design your own hazard symbol, warning of the dangers of strong acids and alkalis.