

The pH scale, indicators, neutralisation and naming salts.

Learning objective: I can use the pH scale and explain what happens in neutralisation.

✓ I can use the pH scale ✓ I can identify acids and alkalis ✓ I can name salts

[illegible]

Use the pH to decide the universal indicator colour and whether each substance is an acid, neutral or an alkali.

Substance	pH	Indicator colour	Acid, neutral or alkali?
lemon juice	2		
vinegar	3		
pure water	7		
sea water	8		
soap solution	10		
oven cleaner	13		
stomach acid	1		

1 Which pH is the strongest acid?

- (A) pH 1 (B) pH 5 (C) pH 9

(A) any substance with pH 7 (B) a soluble base (C) a type of salt

(A) corrosive (B) flammable (C) toxic

1 Why must you wear eye protection when using even dilute alkalis? [2 marks]

Acids, Alkalis and pH

- 4 Neutralisation** An acid reacts with a base or alkali to make a salt and water. Name the missing product in each word equation.

- 1 hydrochloric acid + sodium hydroxide → _____ + water
- 2 sulfuric acid + potassium hydroxide → _____ + water
- 3 nitric acid + calcium hydroxide → _____ + water
- 4 hydrochloric acid + magnesium → magnesium chloride + _____
- 5 sulfuric acid + copper carbonate → copper sulfate + water + _____

Naming salts: hydrochloric acid makes **chlorides**, sulfuric acid makes **sulfates** and nitric acid makes **nitrates**. The first part of the name comes from the metal.

5 Explain it

- 1 A bee sting is acidic. Suggest a substance from the table on page 1 that could be used to treat it, and explain why. [2 marks]

- 2 Describe how you could show that a solution has been neutralised. [2 marks]

- 3 Farmers sometimes add lime (a base) to fields. Suggest why. [2 marks]

- 4 Why is universal indicator more useful than litmus paper? [2 marks]

6 Plan an investigation

Indigestion tablets contain a base that neutralises stomach acid. Plan a fair test to find out which of two brands of tablet neutralises the most acid. [4 marks]

Answer Key

Acids, Alkalis and pH

Question	Answers
1 Test the substances	lemon juice – Indicator colour: red , Acid, neutral or alkali?: acid vinegar – Indicator colour: orange , Acid, neutral or alkali?: acid pure water – Indicator colour: green , Acid, neutral or alkali?: neutral sea water – Indicator colour: blue , Acid, neutral or alkali?: alkali soap solution – Indicator colour: blue , Acid, neutral or alkali?: alkali oven cleaner – Indicator colour: purple , Acid, neutral or alkali?: alkali stomach acid – Indicator colour: red , Acid, neutral or alkali?: acid
2 Quick quiz	1 A (pH 1) – the lower the pH, the more acidic; 2 B (a soluble base); 3 A (corrosive)
3 Stay safe	1. Alkalis are corrosive/irritant and can damage the eyes quickly; even dilute solutions can cause harm if splashed.
4 Neutralisation	1 sodium chloride; 2 potassium sulfate; 3 calcium nitrate; 4 hydrogen; 5 carbon dioxide
5 Explain it	1. Soap solution (a weak alkali, pH 10) – it neutralises the acid. (Not oven cleaner – it is too strongly alkaline and would harm the skin.) 2. Add universal indicator and add the alkali a little at a time (or use a pH probe); when the indicator turns green / pH reaches 7, the solution is neutral. 3. To neutralise acidic soil, because many crops grow best at a pH close to neutral. 4. Litmus only shows acid or alkali (red or blue); universal indicator shows a range of colours, so it tells you the approximate pH (how strongly acidic or alkaline).
6 Plan an investigation	Look for: • Same volume and concentration of acid each time; same mass/number of tablets • Add indicator (or use a pH probe) and add crushed tablet until neutral (green, pH 7) • Measure how much acid one tablet neutralises; repeat and find a mean; wear eye protection

Teaching note: indicator colours vary slightly between brands; accept close colours (e.g. orange/yellow for pH 3–6, blue/purple for pH 8–14). UK schools now use the IUPAC spelling ‘sulfur’ and ‘sulfate’.