

Acids, Alkalies and Neutralisation

Answer the questions below.

1. State the chemical formula for hydrochloric acid.

HCl

2. State the general equation for the reaction between an acid and an alkali.

Acid + alkali → salt + water

3. Name the salt that would be produced from a reaction between calcium hydroxide and sulfuric acid.

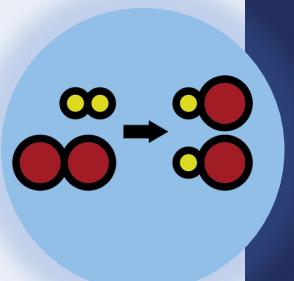
Calcium sulfate

4. Calculate the M_r of sodium hydroxide (NaOH). Na=23, O=16, H=1

23+16+1=40

5. Sodium hydroxide is an alkali. What colour would Universal Indicator turn when added to sodium hydroxide solution?

Purple/blue



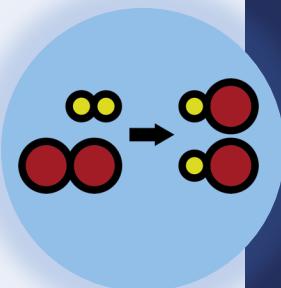
Acids, Alkali and Neutralisation

Do Now:

1. State the chemical formula for hydrochloric acid.
2. State the general equation for the reaction between an acid and an alkali.
3. Name the salt that would be produced from a reaction between calcium hydroxide and sulfuric acid.
4. Calculate the M_r of sodium hydroxide (NaOH). Na=23, O=16, H=1
5. Sodium hydroxide is an alkali. What colour would Universal Indicator turn when added to sodium hydroxide solution?

Drill:

1. State the pH of a neutral solution.
2. A substance has a pH of 4.7. It is an acid or a base?
3. Is a pH of 4.7 likely to be detected from Universal Indicator or a pH probe?

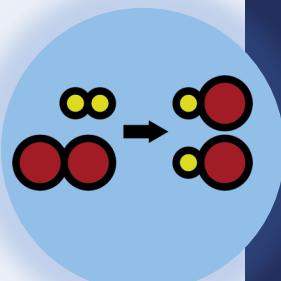


Acids, Alkalies and Neutralisation

Read Now:

The pH scale is a measure of the acidity or alkalinity of a solution. It measures from 0-14, where pH 7 is neutral, pH values lower than 7 are acidic and pH values greater than 7 are alkaline. The pH scale is an unusual scale in that a one point increase is equivalent to a ten-fold increase or decrease in acidity or alkalinity. For example, pH 2 is 10 times more acidic than pH 3. Litmus paper can be used to show whether a substance is acidic or alkaline but cannot give a pH value. pH values can be measured using Universal Indicator or a pH probe. Universal Indicator turns different colours in acidic and alkaline solutions which can be matched to a colour chart. A pH probe gives a more precise measurement, as it can give a value with a decimal place.

1. Explain what the pH scale measures.
2. Explain why the pH is an unusual scale.
3. State the pH of a neutral solution.
4. Describe two ways that pH can be measured.
5. Give an advantage of a pH probe over Universal Indicator.



Acids, Alkalies and Neutralisation

C4.3.10

Science
Mastery

C4.3.1 Prior Knowledge Review

C4.3.2 (HT) Introducing the Mole

C4.3.3 (HT) Mole Calculations

C4.3.4 PKR: Concentration

C4.3.5 TIF: Calculating Concentration

C4.3.6 TIF: Calculating an Unknown Concentration

C4.3.7 (HT) Amounts of Substances in Equations

C4.3.8 (HT) Limiting Reactants

C4.3.9 PKR: Reactions of Acids

➤ C4.3.10 Acids, Alkalies and Neutralisation

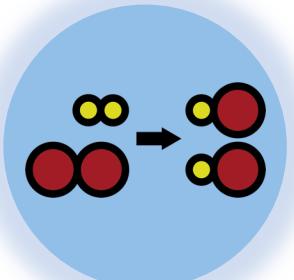
C4.3.11 TIF: Acid-Alkali Titration

C4.3.12 TIF: Acid-Alkali Titration Analysis

C4.3.13 TIF: Titration Calculations

C4.3.14 (HT) Strong and Weak Acids

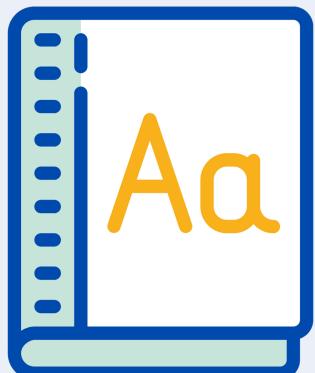
C4.3.15 TIF: Volumes of Gases



Following this lesson, students will be able to:

- Use the pH scale to identify acids and alkalis
- Identify ions produced by acids and alkalis in solution
- Describe what happens in a neutralisation reaction

Key Words:



acid alkali neutralisation
hydrogen ion hydroxide ion

This is the fix-it portion of the lesson

The **fix-it** is an opportunity to respond to gaps in knowledge, especially those identified by the **pre-unit quiz**.

- The teacher should customise this slide as needed, to facilitate
 - **reteach, explanation, demonstration or modelling** of ideas and concepts that students have not yet grasped or have misunderstood.
 - **practise** answering specific questions or of key skills.
 - **redrafting** or **improving** previous work.

Answer the questions below.

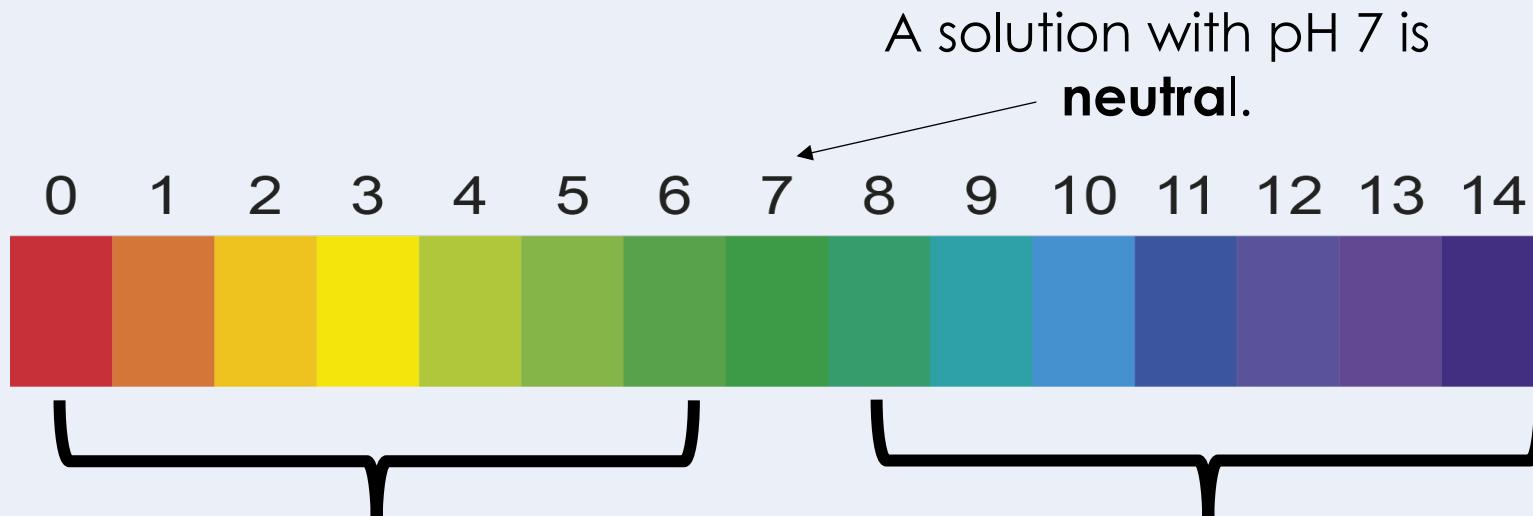
1. Name the salt that would be produced when hydrochloric acid reacted with potassium hydroxide.
 - A. Potassium hydride
 - B. Potassium chloride
 - C. Potassium chlorine
2. The products of which reaction would give a positive squeaky pop test?
 - A. Nitric acid + calcium oxide
 - B. Nitric acid + calcium carbonate
 - C. Nitric acid + calcium
3. Which of these is not a neutralisation reaction?
 - A. Acid + metal
 - B. Acid + metal hydroxide
 - C. Acid + metal carbonate

The pH Scale and indicators

The pH scale is a measure of the acidity or alkalinity of a solution.

pH can be measured using a **pH probe** or **Universal Indicator**.

Universal Indicator can give an **approximate** pH based on the **colour** it turns in different solutions.



Aqueous solutions of acids
have pH values of less than 7.

Aqueous solutions of alkalis
have pH values greater than 7.

The pH scale and indicators



pH probe

The **number** gives
indication of pH



Universal indicator

The **colour** gives an
indication of pH

What are Acids and Alkalis?

The tables below shows common acids and alkali that can be found in the laboratory.

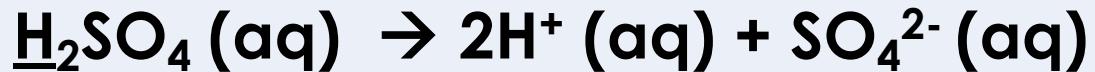
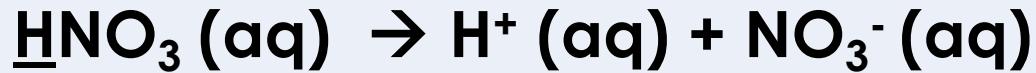
Common Acids	Chemical Formula
Hydrochloric Acid	HCl
Nitric Acid	HNO ₃
Sulfuric Acid	H ₂ SO ₄

Common Alkalis	Chemical Formula
Sodium Hydroxide	NaOH
Potassium Hydroxide	KOH
Calcium Hydroxide	Ca(OH) ₂

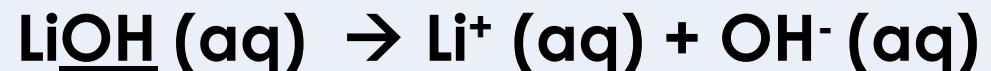
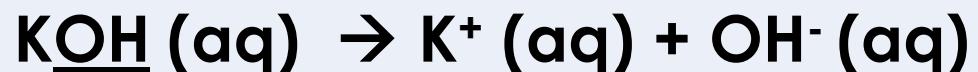
What similarities and differences can you see in the chemical formulae?

What are Acids and Alkalies?

Acids produce **hydrogen (H^+) ions** in aqueous solutions.



Alkalies produce **hydroxide (OH^-) ions** in aqueous solutions.



Acid and Alkali: Neutralisation

Acid + alkali → *salt* + water

This is a neutralisation reaction:



Salts

Acid + alkali → **salt** + water

What salt would be formed from a reaction between **calcium hydroxide** and **hydrochloric acid**?

Calcium chloride

Using the list of ions, determine the formula of this salt.

CaCl₂

What salt would be formed from a reaction between **potassium hydroxide** and **sulfuric acid**?

Potassium sulfate

Using the list of ions, determine the formula of this salt.

K₂SO₄

Hydrochloric acid makes **chloride** salts.

Sulfuric acid makes **sulfate** salts.

Nitric acid makes **nitrate** salts.

Positive ions		Negative ions	
Name	Formula	Name	Formula
Hydrogen	H ⁺	Chloride	Cl ⁻
Sodium	Na ⁺	Bromide	Br ⁻
Silver	Ag ⁺	Fluoride	F ⁻
Potassium	K ⁺	Iodide	I ⁻
Lithium	Li ⁺	Hydroxide	OH ⁻
Ammonium	NH ₄ ⁺	Nitrate	NO ₃ ⁻
Barium	Ba ²⁺	Oxide	O ²⁻
Calcium	Ca ²⁺	Sulfide	S ²⁻
Copper(II)	Cu ²⁺	Sulfate	SO ₄ ²⁻
Magnesium	Mg ²⁺	Carbonate	CO ₃ ²⁻
Zinc	Zn ²⁺		
Lead	Pb ²⁺		
Iron(II)	Fe ²⁺		
Iron(III)	Fe ³⁺		
Aluminium	Al ³⁺		

Which statements do you agree with?

A neutralisation reaction always produces a salt

The higher the pH, the more acidic a solution

Neutralisation is when an acid is broken down

Acids reacting with metals are an example of neutralisation

Is this statement correct?

Neutralisation is a redox reaction

Name the salts that would be produced from the following pairs of reactants:

1. Sodium hydroxide + hydrochloric acid → **sodium chloride** NaCl
2. Potassium hydroxide + nitric acid → **potassium nitrate** KNO_3
3. Lithium hydroxide + sulfuric acid → **lithium sulfate** Li_2SO_4
4. Barium hydroxide + hydrochloric acid → **barium chloride** BaCl_2
5. Sodium hydroxide + sulfuric acid → **sodium sulfate** Na_2SO_4
6. Lithium hydroxide + nitric acid → **lithium nitrate** LiNO_3

Stretch: determine their formulae

What would the other product be in each of these reactions? **Water**

Drill

1. State the pH of neutral solutions.
2. State the pH of acidic solutions.
3. State the pH of alkaline solutions.
4. Describe two ways of measuring pH.
5. Name the ion that acids produce in aqueous solutions.
6. Name the ion that alkalis produce in aqueous solutions.
7. State the general equation for the reaction between an acid and an alkali.
8. Name the type of salts formed from hydrochloric acid.
9. Name the type of salts formed from sulfuric acid.
10. Name the type of salts formed from nitric acid.

Drill answers

1. 7
2. Less than 7 (0-6)
3. Greater than 7 (8-14)
4. Universal Indicator or a pH probe
5. H⁺
6. OH⁻
7. Acid + alkali → salt + water
8. Chlorides
9. Sulfates
10. Nitrates

Check for understanding

Answer the questions below.

1. Identify the ion that is produced by acids in aqueous solutions.
 A. H^+
 B. OH^-
 C. H_2O

2. Name the salt that would be produced when sulfuric acid reacts with lithium hydroxide?
 A. Lithium hydride
 B. Lithium sulfide
 C. Lithium sulfate

3. What is the correct ionic equation when an acid is neutralised by an alkali?
 A. $\text{H}_2\text{O} \rightarrow \text{H}^+ + \text{OH}^-$
 B. $\text{H} + \text{OH} \rightarrow \text{H}_2\text{O}$
 C. $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$

Lesson C4.3.10

What was good about this lesson?

What can we do to improve this lesson?

[Send us your feedback by clicking this link](#)
or by emailing sciencemastery@arkonline.org
Thank you!