Acids and Alkalis

Content

Subject Knowledge Objective	Use all or some of the following activities to cover this objective	Working scientifically	Vocabulary
Share biggerpicture and links to concepts	See resource folder	Asking relevant questions: Students can ask questions related to the properties of different substances, the use of indicators, and the effects of acids and alkalis. Setting up simple practical inquiries: Students will set up practical inquiries to investigate the properties of substances, test indicators, and explore the effects of acids and alkalis. Recognising with guidance whether a test is fair: With guidance, students will learn to recognize and understand the importance of fair testing when conducting experiments involving indicators, pH testing, and neutralization. Taking accurate measurements: Students will take accurate measurements, such as pH values, during experiments using indicators and other testing methods. Presenting data in a variety of simple ways: Students will present data in tables, charts, and diagrams, showcasing their findings from experiments with substances, indicators, and pH testing. Reporting on findings from inquiries: Students will report on their findings through written or oral presentations, describing the outcomes of experiments and the properties of substances. Using results to draw simple conclusions: Based on their observations and data, students will draw simple conclusions about the properties of substances, the effectiveness of indicators, and the impact of acids and alkalis. Identifying differences, similarities, or changes related to simple scientific ideas:	Chemical Substances: Refers to different types of matter with distinct chemical compositions. Hazard Symbols: Symbols used to indicate the potential dangers or hazards associated with certain substances. Acids: Substances that have a pH less than 7. Alkalis: Substances that have a pH greater than 7. Indicators: Substances that change color in the presence of acids or alkalis, helping to identify their pH. pH Scale: A scale ranging from 0 to 14 that measures the acidity or alkalinity of a solution, with 7 being neutral. Neutralization: A chemical reaction between an acid and an alkali, resulting in the formation of water and a salt. Universal Indicator: A substance that changes color across a range of pH values, providing a broader indication of acidity or alkalinity.
To recognise that there are chemical substances all aroud us.	Use Active Teach 7FA (Chemisty in the home) pg 87. Use 4 4. hazardous_or_safe. Pupils match the warning hazard sign to the substance found in the home.		
To recognise common hazard symbols. To explain why hazard symbols are necessary To recognise some common acids.	Use Active Teach 7Fa Hazards pg 88 - 89. Read throupugh identify the dangers of some acids and notice that some are not hazardous and are, as an example, used in our food. Watch the linked videos and discuss.		
To know that we can use indicators to classify solutions.	Use Active Teach 7Fb Indicators pg 92 - 93 Use 5. Litmus paper indicators_acids_alkalis. Test the substances at the bottom of the sheet using litmus paper and classify as an acid or an alkali.Please reference the CLEAPPS safety guide for when handling acids: CLEAPPS sss020-hydrochloric-acid (resource folder)		
To know some indicators made from plants.	Use Active Teach 7Fb Indicators pg 92 Use 6. Preparing Red Cabbage Indicator (resource folder) Lesson 2. Use 8. pH Investigation Red Cabbage Indicator Home Learning - Pupil test a arnge of materials using their red cabbage indicator strip as a guide for judging the acidity and alkalinity of a range of substances.		
To be able to name common exampes of acids and alkalis To describe the ph scale and how it is useful. To describe how Ph can be measured To understand that unlike litmus universal indicator shows us how acidic or alkaline a substance is.	Use Active Teach 7Fc Acidity and Alkalinity pg 94 -95. Complete 9. Indicator_rainbow. Provide three unknown substances for pupils to test for part B of the worksheet. Students use thr inofrmaton that have read on the Active teach page to help them join the lines to the correct substance on the bottom part of the sheet. Lesson 2. Use 10. _ph_testing to test a range of substances using universal indicator can show us how strongly acidic or alkaline a solution is Lesson 3 12. _a_day_of_ph (resource folder) encouage students to use the pH scale to find colours. Ask them to use language such as more or less acidic and more or less alkaline.		
To know how universal indicator can be useful in real life.	Use 11. ph_applications (resource folder) read as a class an highlight times when knowledge of the pH scale can be applied to real life situations.		
To know what happens during neutralisation	Use Active Teach 7Fd Neutralisation pg 98-99. Use 13. acids_and_alkalis to neutralise the acid - recording the change of colour as neutralisation slowly occures.		
To know an acid and alkali reaction form a salt.	Use Active Teach 7Fd Neutralisation pg -99. https://www.bbc.co.uk/bitesize/topics/zn6hvcw/articles/z9gnn9q Watch Naming the salt.		
Ito be able to describe and explain some everyday exampels of neutralisation reactions	Use active teach 7Fe Neutralisation in daily life pg 100 - 101. Use 14. _using_acids_and_bases (resource folder) Match the problem to the image and then match the solution where neutralisation helps to limit the damage caused.		

Adapted 2

Subject Knowledge Objective	Use all or some of the following activities to cover this objective	Working Scientifically	Vocabulary
Share biggerpicture and links to concepts	See resource folder	Asking simple questions and recognising that they can be answered in different ways: Students can ask questions about the properties of different substances, the role of indicators, or the effects of acids and alkalis. Encourage students to think about various ways to answer these questions, fostering curiosity and critical thinking. Observing closely, using simple equipment: Students will use hazard symbols and indicators, requiring close observation. They may use simple equipment like litmus paper, test tubes, and pH indicators to closely observe changes during experiments. Performing simple tests: Through activities like testing substances with litmus paper or creating their own indicators, students will perform simple tests to identify acids, bases, and neutral substances. Identifying and classifying: Students will identify hazard symbols and classify substances based on their properties, such as acidity or alkalinity. Indicators made from plants can be classified based on their color changes. Using their observations and ideas to suggest answers to questions: After observing the effects of acids and alkalis, students can use their findings to suggest answers to questions about the strength of substances and their impact. Gathering and recording data to help in answering questions: Students will record data from experiments, such as pH values or color changes during neutralization, to support their conclusions. Data can be gathered through activities like pH testing and recorded for analysis.	Chemical Substances: Refers to different types of matter with distinct chemical compositions. Hazard Symbols: Symbols used to indicate the potential dangers or hazards associated with certain substances. Acids: Substances that have a pH less than 7. Alkalis: Substances that have a pH greater than 7. Indicators: Substances that change color in the presence of acids or alkalis, helping to identify their pH. pH Scale: A scale ranging from 0 to 14 that measures the acidity or alkalinity of a solution, with 7 being neutral. Neutralization: A chemical reaction between an acid and an alkali, resulting in the formation of water and a salt. Universal Indicator: A substance that changes color across a range of pH values, providing a broader indication of acidity or alkalinity.
To recognise that there are chemical substances all aroud us.	Use 14 acids in the home and Use Active Teach 7FA (Chemisty in the home) pg 87.		
To recognise common hazard symbols	Look for examples of the hazard warning signs on the back of everyday products such as bleach and cleaning products. Show pupils the symbols and ask them to make an educated guess at to what they symbol might mean Use 4 4. hazardous_or_safe.Read the description of the product and the hazard and then match to the correct symbol.		
To know that we can use indicators to classify solutions.	Read the first three paragraphs of 16 Then look at the digram on the ajoining page ehich shows the colour chart for litmus paper. Use 15 In the red . Fill the three test tubes as indicated on the diagram and allow pupils to test them using litmus paper		
To know we can make our own indicstors using plants	Use a variety of the tasks listed in 7. Using indicator teacher guide. (respurce folder) Make indicators using plants and ask pupils to test the listed items. Photograph for books.		
To know the pH scale tells us about the strength of an acid or alkali	Show pupil the pH scale and explain that it provides more information about how acidic or alkali a substance is. Use 17 to encourage discussion and debate about what a substance might be on the pH scale. Use . 10. _ph_testing (resource folder) to test a range of substances using universal indicator can show us how strongly acidic or alkaline a solution is Lesson 2. Use knowledge from pH testing to complete 18. Ph Scale cut and stick (resource foplder)		
To know how universal indicator can be useful in real life.	Use 11. ph_applications (resource folder) read as a class an highlight times when knowledge of the pH scale can be applied to real life situations.		
To know what happens during neutralisation	Explain a neutral substance is fromed when an acid and an alkali are mixed together. Show image 19. Establish that the man has indigestion casued by stomach acid. Discuss how this could be cured using neutralisation. Use 14. _using_acids_and_bases (resource folder) Match the problem to the image and then match the solution where neutralisation helps to limit the damage		

Adapted 3

Subject Knowledge Objective	Use all or some of the following activities to cover this objective	Working Scientifically	Vocabulary
Share biggerpicture and links to concepts	See resource folder	Asking simple questions: Students can ask questions such as: "What happens when we mix different substances together?" "How can we tell if something is an acid or an alkali?" "Why does litmus paper change color?" Observing Closely: Throughout the unit, students will closely observe changes in: The color of litmus paper when exposed to acids and alkalis. Reactions between different substances, such as baking soda and vinegar. Hazard symbols and their meanings. Performing Simple Tests: Students will perform simple tests using: Litmus paper to identify acids and alkalis. Universal indicator to determine the pH level of substances. Everyday materials to explore their acidity or alkalinity. Identifying: Students will identify: Acids and alkalis in common foods by reading food labels. Hazard symbols associated with different substances. The color changes on litmus paper to classify substances. Using Their Observations and Ideas to Suggest Answers to Questions: Students will: Use observations of litmus paper color changes to identify acids and alkalis. Suggest answers to questions like, "Why does the color of litmus paper change?" Discuss and propose explanations based on their observations. Gathering and Recording Data: Students will: Record data from experiments, such as the pH values of substances. Document their observations of	Acid: A substance that has a sour taste, can turn blue litmus paper red, and has a pH value below 7. Acids release hydrogen ions (H^+) in water. Alkali: A substance that has a bitter taste, feels slippery, can turn red litmus paper blue, and has a pH value above 7. Alkalis release hydroxide ions (OH^-) in water. Litmus Paper: Special paper treated with a natural dye that changes color in the presence of acidic or alkaline substances. Blue litmus paper turns red in acids, and red litmus paper turns blue in alkalis. pH Scale: A scale used to measure the acidity or alkalinity of a substance. It ranges from 0 to 14, where 7 is neutral, values below 7 are acidic, and values above 7 are alkaline. Universal Indicator: A chemical solution or paper that changes color across a range of pH values. It is used to determine the acidity or alkalinity of a substance more precisely than litmus paper. Neutral: A substance that is neither acidic nor alkaline. On the pH scale, a neutral substance has a pH of 7. Water is a common example of a neutral substance.
To know three common chemical hazard symbols To know acids and alkalis can be found in common everyday foods.	Match the card to the meaning. Introduce safe and mild substances like lemon juice, sour sweets (acid) and discuss the taste. Look at food labels to find the acids eg. phosphoric acid in cola..Explain that not all acids and alkalis are denagerous to us. Make sure that students understand that some acids can be dangerous.		
To know that we can use litmus paper to find out whether something is an acid or an alkali.	Use blue litmus paper to test for an acid. 19. large litmus paper (resource folder). Colour the paper in to show how it would look when it has been dipped in an acid. (red top, the dipped area would go blue). Pupils them dip the litmus paper in a range of acid and lakaline substances.Provide a list of substances, pupils can tick or cross to show wether it looks like there coloured example, indicating it is an acid.		
To know that we can use litmus paper to find out whether something is an acid or an alkali.	As for yesterday but use red litmus paper to test foralkalis. 19. large litmus paper (resource folder) . Colour the paper in to show how it would look when it has been dipped in an acid. (blue top, the dipped area would go red). Pupils them dip the litmus paper in a range of acid and lakaline substances.Provide a list of substances, pupils can tick or cross to show wether it looks like there coloured		
To know that water is neutral.	Ask pupils to make predictions as to whether they believe water will be an acid or an alkali. Test with both pieces of litmus paper (red & blue) ask pupils to notice what happens. There shoud be no colour change. Ask pupil to discuss why this might be. Explain to pupils that water in neither an acid or an alkali, we say it is neutral. Pupils stickl the litmus paper in books and write simple sentneces to expain what has happeded - including the word neutral.		
To identify some everyday acids and alkalis.	Based on the testing that pupils have completed over the last two lessons. They sort the cards to show that they can remember some everyday acids and alkalis. 20. Acids and Alkalis Card Sort (resource folder)		
To know we can use universal indicator to tell how acidic or alkaline something is.	Use 21. Ph Matching (resource folder) Pupils to use the colour to match the object to the correct place on the pH chart. In a table, pupils write or stick the substance, then write the matching pH number and whether or not it is a stong or weakacid or alkali or neutral		
To be able to test a range of everyday substances to tell whether they are a strong or weak acid using universal indicator			

Knowledge

I know chemical substances exist all around us.
I know common hazard symbols.
I know why hazard symbols are necessary.
I know some common acids.
I know indicators can be used to classify solutions.
I know some indicators are made from plants.
I know common examples of acids and alkalis.
I know the pH scale and how it is useful.
I know how to describe and measure pH.
I know universal indicator shows acidity or alkalinity.
I know how universal indicator is useful in real life.
I know what happens during neutralization.
I know examples examples of neutralisation reactions

I know that there are chemical substances all around us.
I know common hazard symbols and can match them to everyday products.
I know some common acids.
I know how to use indicators to classify solutions.
I know some indicators are made from plants.
I know that we can make our own indicators using plants.
I know the pH scale tells us about the strength of an acid or alkali.
I know how universal indicator can be useful in real life.
I know what happens during neutralization, where an acid and an alkali are mixed together.

I knowsome of the more common chemical hazard symbols.
I know which acids are found in some everyday foods
I know how to use blue litmus paper to test for acids
I know how to use red litmus paper to test for alkalis
I understand that water is neutral.
I know how to use universal indicator to determine if a substance is acidic or alkaline.
I know how to test with universal indicator

Common Misconcpetions

Misconception: All chemical substances are harmful.

Explanation: Not all chemicals are harmful; many substances we encounter daily are chemicals. Understanding the properties of different chemicals helps students distinguish between harmful and safe substances.
Misconception: All acids are dangerous and should be avoided.

Explanation: While some acids can be corrosive, others are common in daily life and even found in foods. Teaching about the various types of acids helps dispel the notion that all acids are harmful.
Misconception: Universal indicator always changes color immediately.

Explanation: Universal indicator may take some time to show a change in color, and the intensity of the color can vary. Patience and careful observation are essential for accurate readings.
Misconception: The pH scale is too complicated for everyday use.

Explanation: The pH scale is a simple tool that can be applied to understand acidity and alkalinity in various situations. Relating it to common scenarios helps students see its practicality.
Misconception: Neutralization is only relevant in a laboratory setting.

Explanation: Neutralization reactions occur in everyday life, such as in antacid tablets or when neutralizing acidic spills. Real-life examples help students recognize the importance of neutralization.
Misconception: Indicators can only be synthetic chemicals.

Explanation: Many indicators, like litmus paper or red cabbage juice, are derived from natural sources. Introducing natural indicators dispels the misconception that indicators are all artificial.
Misconception: Alkalis are always harmful to the skin.

Explanation: While some alkalis can be caustic, others, like soap, are safe for use on the skin. Understanding the diverse nature of alkalis helps students appreciate their different applications.
Misconception: The pH scale only measures the strength of acids.

Explanation: The pH scale measures both acidity and alkalinity. Teaching that the scale ranges from acidic to alkaline helps students grasp the full spectrum of pH levels.

Misconception: All chemical substances are harmful or dangerous.

Explanation: Not all chemical substances are harmful; many are essential for everyday life. This unit aims to clarify the difference between hazardous and non-hazardous substances.
Misconception: All acids are harmful or corrosive.

Explanation: While some acids can be corrosive, not all acids are harmful. Many foods contain weak acids, and understanding their properties is essential for a balanced perspective.
Misconception: The pH scale is only relevant to laboratory settings.

Explanation: The pH scale is a practical tool applicable to real-life situations. This unit aims to demonstrate how understanding acidity and alkalinity can be useful in various contexts.
Misconception: Neutralization is only relevant in science experiments.

Explanation: Neutralization has practical applications, such as in antacid medications. The unit emphasizes real-world scenarios where neutralization reactions can occur.
Misconception: Hazard symbols are only found in laboratories.

Explanation: Hazard symbols are used in everyday products. Recognizing these symbols helps individuals make informed decisions about the products they use.
Misconception: All plant-based substances are safe.

Explanation: While many plant-based substances are safe, some can be harmful. The unit addresses this by discussing the use of plants in making indicators and emphasizing responsible experimentation.
Addressing these misconceptions during the unit wil

All Sour Substances are Acids:

Misconception: Students may think that any substance with a sour taste is an acid. While many acids are sour, not all sour substances are acids (e.g., lemons, sour candies).
All Bitter Substances are Alkalis:

Misconception: Students might believe that any bitter-tasting substance is an alkali. In reality, not all bitter substances are alkalis (e.g., black coffee).
Color of Litmus Paper Determines Strength:

Misconception: Students may think that the intensity of the color change on litmus paper indicates the strength of the acid or alkali. The color change primarily signifies acidity or alkalinity, not necessarily the concentration or strength.
All Chemicals with Hazard Symbols are Dangerous Acids:

Misconception: Students might associate hazard symbols with extreme danger and think that all substances marked with such symbols are strong acids. Hazard symbols indicate potential hazards, but not all substances are equally dangerous or acidic.
Everyday Water is Always Neutral:

Misconception: Students may assume that all water is neutral. However, some natural waters can have a slightly acidic or alkaline pH due to dissolved minerals.
Universal Indicator Shows Only Acidic or Alkaline:

Misconception: Students might think that universal indicator only indicates whether a substance is acidic or alkaline without providing information about the degree of acidity or alkalinity. In reality, universal indicator provides a range of pH values.
Everyday Foods Always Have Obvious Acids or Alkalis:

Misconception: Students may believe that everyday foods containing acids or alkalis always have a distinct taste or smell. In reality, some substances are not easily detectable

Strand	Unit: Science - Acids and alkalis
Social	In exploring chemical substances and their effects, students develop social awareness by understanding the importance of using chemicals responsibly and recognizing the potential hazards. Discussions about safety symbols and responsible chemical use contribute to creating a safer and more informed community.
Moral	The unit incorporates moral considerations by highlighting the ethical use of chemicals. Emphasizing the responsible and ethical handling of substances, especially when dealing with hazards, encourages students to make morally sound decisions regarding their actions and choices in the context of chemical use.
Spiritual	teachers can foster a sense of awe and wonder about the complexity and beauty of the natural world, encouraging students to appreciate the intricacies of chemical reactions as part of the broader wonders of creation.
Cultural	
British Values	The exploration of chemical substances aligns with British values by promoting a commitment to the rule of law and individual liberty. Understanding hazard symbols and the responsible use of chemicals reinforces the importance of adhering to safety regulations, promoting a sense of responsibility for one's actions. Additionally, the unit encourages mutual respect and tolerance, fostering an inclusive learning environment where students appreciate diverse perspectives on chemical usage and safety. Through these discussions, students develop an awareness of the democratic principles of respect for others, individual freedoms, and the significance of safety in both personal and community contexts.