The Warwick School
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Homework Booklet

9A
Acids and Alkalis

Name: _____ Science set _____

Independent learning and useful websites

Independent research tasks:

- http://www.bing.com/videos/search?q=acid+and+alkali+videos&FORM=VIRE15#view=detail&mid=5910632987E79285F23E5910632987E79285F23E – Video clip all about acids and alkalis
- http://www.trans4mind.com/nutrition/pH.html - Find out what foods are acid or alkali – does it matter?
- https://www.burtongoldberg.com/page84.html - Acid/ - Alkali balance in the body
- http://www.proprofs.com/quiz-school/story.php?title=acids-and-alkalis-quiz – QUIZ!
- http://chemistry.about.com/od/acidsbase1/a/red-cabbage-ph-indicator.htm - Try this experiment at home (ask your parent or guardian first!)
- http://www.wikihow.com/Make-Homemade-pH-Paper-Test-Strips - make your own pH paper strips from different indicators (remember to ask an adult)
- http://www.fp.utm.my/projek/psm/webtlr/Neutralisation/learning2b.html - Use of neutralisation reactions in our everyday lives
- http://www.bgfl.org/bgfl/custom/resources_ftp/client_ftp/ks3/science/acids/ - Have a go at these interactive experiments

Revision:

http://www.bbc.co.uk/education/guides/zyn3b9q/revision - Acids and alkalis

http://www.bbc.co.uk/education/guides/z89jq6f/revision/1 - pH scale and neutralisation

http://www.neok12.com/Acids-and-Bases.htm - A series of well presented videos to help you revise

9A How do antacid tablets work?

Indigestion is caused by your stomach acid rising up your gullet, causing pain.
Antacid tablets are taken to relieve this pain.
The tablets contain alkalis such as calcium hydroxide.
Task: Describe how you think antacid tablets may work.

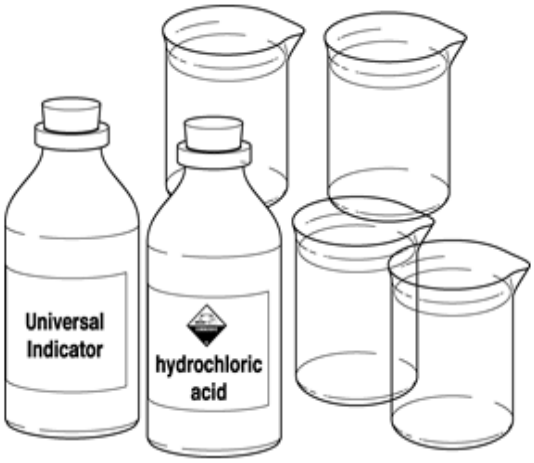
Key words:
acid, alkali, ions, dissolve, neutralisation, pH scale, reaction, salt, water

I am able to:	Peer Assessment
☐ Complete balanced symbol equations for the reaction between this antacid tablet and stomach acid ☐ Develop the ionic equation showing why water is produced in neutralisation	☐ ☐
☐ Attempt to represent the reaction as a symbol equation ☐ Explain accurately why mass is conserved in this reaction. ☐ Evaluate how effective antacids are, suggesting some limitations. ☐ Explore ways of measuring the pH of the solution to a higher resolution	☐ ☐ ☐ ☐
☐ Classify the difference between acids and alkalis in terms of their ions ☐ Apply my knowledge of neutralisation reactions by writing a word equation for the reaction between this antacid tablet and stomach acid ☐ Drawn accurate particle diagrams of the acid and alkali reacting and shown how the products are formed. ☐ Compare the name of the salts produced when he antacid tablet with different acids; give examples	☐ ☐ ☐ ☐
☐ Write the general word equation to describe the neutralisation reaction. ☐ Outline how an indicator which can be used to observe the effect of adding antacid tablets to an acid, include the measurements that are used. ☐ Explain the term neutralisation and why it occurs in simple terms ☐ Name the type of acid in the stomach and its strength ☐ Draw and use a simple particle diagram of acid and alkali particles reacting in the stomach.	☐ ☐ ☐ ☐ ☐
☐ Describe what would be observed when a named indicator is added to a solution of acid or alkali ☐ Describe simply why people take antacid tablets ☐ Identify the two chemicals that react together. ☐ Describe simply what a neutral solution is	☐ ☐ ☐ ☐
☐ Identify common everyday acids contained in our food or drink ☐ Describe the taste of foods that contain acids ☐ Recall the general term for a chemical opposite of an acid ☐ State the name of the chemical in the antacid tablet	☐ ☐ ☐ ☐

9A - HOW SCIENCE WORKS ASSESSMENT

How do indigestion powders work?

Joel wanted to find out how four different indigestion powders affected the pH of hydrochloric (stomach) acid. He used the equipment shown on the right:



1) First he poured hydrochloric acid into four beakers.
2) Then he added different indigestion powders to each beaker.
3) He measured the pH of the acid using universal indicator paper.

a) Name 2 variables that Joel would have to keep the same to make the investigation fair?

_____

_____ (2 marks)

b) What piece of equipment would you recommend that Joel uses for:

i measuring out the 20 cm^3 of acid _____

ii measuring out 5 g of the indigestion powders _____(2 marks)

Joel obtained the following results:

FizzAcid powder – pH 8
pH 6 – ClearTums
pH 7 – AcidGone powder
indiclear – pH 6

c) Design a table for these results. Remember to include all of the headings.

d) Joel looked at the results and decided that AcidGone was the best indigestion powder to neutralise stomach acid.

i) Is Joel's decision correct? Explain your answer.

_____(1 mark)

ii) Which indigestion powder do you think is best? _____

ii) Explain your answer to part (b).

_____

_____(2 marks)

Revision Guide

Bottles in the laboratory and tankers carrying chemicals on the road all have to carry hazard warning labels to show when there is a chemical hazard. Two common hazard warnings are:

irritant or harmful

corrosive

Acids and **alkalis** can be either **irritant** or **corrosive**. The hazard will depend on the type of acid and whether it is **concentrated** or **dilute**. In factories and in the laboratory at school we need to carry out **risk assessments**. This allows us to consider the level of risk and take action to reduce the chance of harm.

Common acids include vinegar and lemon juice. Fizzy drinks, pickles and spicy sauces also contain acids. Stronger acids, such as sulphuric and nitric acids, can be more dangerous. Often they are corrosive, which means they will attack your skin and seriously harm you. Alkalis can also be corrosive (e.g. oven cleaner). Common weak alkalis include soap and toothpaste.

Sulphuric acid is one of the most important chemicals that is manufactured. It has a wide range of uses, including making paints, dyes and fertilisers.

Indicators are coloured dyes that change colour when mixed with acids or alkalis. They often come from plants such as red cabbage and beetroot. **Litmus** is an indicator that turns red in acids and blue in alkalis.

The strengths of acids and alkalis can be measured on the **pH scale**, which runs from 1 to 14. pH numbers **1** to **6** are acids, **7** is **neutral**, and **8** to **14** are alkalis. You can find out the pH number using a **universal indicator**, or by using a pH meter.

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strong acid			weak acid			neutral	weak alkali			strong alkali			
1	2	3	4	5	6	7	8	9	10	11	12	13	14
stomach acid		vinegar		skin		pure water	indigestion powder		washing powder			oven cleaner	
	lemon juice		fizzy drinks		milk	blood		toothpaste					

Alkalis can cancel out acids, making them neutral. When this happens it is called **neutralisation**.

Neutralisation can be important:

- in gardening and agriculture, to make sure the soil is the correct pH
- when dealing with insect stings and bites
- to control indigestion caused by excess acid in the stomach

Metal oxides

Metal oxides act as bases. Here is the general word equation for what happens in their neutralisation reactions with acids:

metal oxide + acid → a salt + water

The salt made depends on the metal oxide and the acid used. For example, copper chloride is made if copper oxide and hydrochloric acid are used:

copper oxide + hydrochloric acid → copper chloride + water

$CuO + 2HCl \rightarrow CuCl_2 + H_2O$

Metal hydroxides

Metal hydroxides act as bases. Some of them dissolve in water, so they form alkaline solutions. Here is the general word equation for what happens in their neutralisation reactions with acids:

metal hydroxide + acid → a salt + water

As with metal oxides, the salt made depends on the metal hydroxide and the acid used. For example, sodium sulfate is made if sodium hydroxide and sulfuric acid are used:

sodium hydroxide + sulfuric acid → sodium sulfate + water

$2NaOH + H_2SO4 \rightarrow Na_2SO4 + 2H_2O$

Notice that a salt plus water are always produced when metal oxides or metal hydroxides react with acids.

Metal carbonates

Most carbonates are usually insoluble (they do not dissolve in water). They also neutralise acids, making a salt and water, but this time we get carbon dioxide gas too. Here is the general word equation for what happens:

metal carbonate + acid → a salt + water + carbon dioxide

The reaction fizzes as bubbles of carbon dioxide are given off. This is easy to remember because we see the word 'carbonate' in the chemical names. For example, copper carbonate reacts with nitric acid:

copper carbonate + nitric acid → copper nitrate + water + carbon dioxide

$CuCO_3 + 2HNO_3 \rightarrow Cu(NO_3)_2 + H_2O + CO_2$

Word Sheets

Word	Meaning
acid	A sustance that turns litmus red. It has a pH of less than 7.
concentrated	Something that has a large amount of the substance in it (and very little water or other impurities).
corrosive	Substances that attack metals, stonework and skin are called corrosive.
dilute	We dilute a solution by adding more water to it.
harmful	Something that causes harm, but less dangerous than a corrosive substance.
hazard	Something that could be a danger.
hydrochloric acid	A common acid that is found in your stomach.
irritant	Something that irritates the skin and eyes.
nitric acid	A common acid.
risk assessment	A way of estimating the amount of risk involved in an activity (and of taking steps to reduce the risk where necessary)
sulphuric acid	A common acid. Used in car batteries.

acetic acid	The old name for ethanoic acid. It is the acid in vinegar.
acid	A substance that turns litmus red. It has a pH of less than 7.
ascorbic acid	Chemical name for vitamin C.
citric acid	The acid in citrus fruits.
ethanoic acid	The acid in vinegar.
alkali	Substance that turns litmus blue. It has a pH of more than 7.
indicator	A dye that will change colour in acids and alkalis.
litmus	A simple kind of indicator. It turns red in acids and blue in alkalis.
neutral	Substance that is neither an acid nor an alkali. It has a pH of 7.

pH scale	A numbered scale from 1 to 14 showing the strengths of acids and alkalis. Numbers below 7 are acids. Numbers above 7 are alkalis. pH 7 is neutral.
universal indicator	A mixture of indicators giving a different colour depending on how weak or strong an acid or alkali is.

antacid	A medicine containing an alkali used to neutralise some of the acid in the stomach to treat heartburn.
chemical reaction	A reaction in which new substances are made.
neutralisation	When something is neutralised.
neutralise	When something is added to an acid or an alkali to make it more neutral – closer to pH7.