Name: Form:

MYP 1
Year 7
Chemical Reactions

Statement of Inquiry:	Observing chemical reactions gives **evidence** to help understand **patterns** and **relationships** in the world around us.
Key Concept:	Relationships
Related Concepts:	Patterns and Evidence

7C MYP Command Terms

Term	Definition
Analyse	Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions.
Apply	Use knowledge and understanding in response to a given situation or real circumstances
Describe	Give a detailed account or picture of a situation, event, pattern or process
Design	Produce a plan, simulation or model
Discuss	Offer a considered and balanced review that includes a range of arguments, factors or hypotheses. Opinions or conclusions should be presented clearly and supported by appropriate evidence
Document	Credit sources of information used by referencing (or citing), following one recognized referencing system. References should be included in the text and also at the end of the piece of work in a reference list or bibliography
Evaluate	Make an appraisal by weighing up the strengths and limitations
Explain	Give a detailed account
Formulate	Express precisely and systematically the relevant concept(s) or argument(s)
Interpret	Use knowledge and understanding to recognize trends and draw conclusions from given information
Outline	Give a brief account
Present	Offer for display, observation, examination or consideration
Recall	Remember or recognize from prior learning experiences
Select	Choose from a list or group
Solve	Obtain the answer(s) using appropriate methods
State	Give a specific name, value or other brief answer without explanation or calculation
Suggest	Propose a solution, hypothesis or other possible answer
Summarize	Abstract a general theme or major point(s)

Glossary: Chemical Reactions

Word	*Meaning*
Chemical reaction	A change where new chemicals are formed
Irreversible change	A change in which what you have made cannot be turned straight back into what you started with
Physical change	A change where no new chemical is formed
Reversible change	A change where what you have made is easily turned back into what you started with
Reactant	Chemicals that join together to make a new chemical
Product	A new chemical formed in a chemical reaction
Observation	Something you see or smell when doing a reaction
Hydrogen	A flammable gas that can be made by chemical reactions
Corrosive	Chemicals that attack other chemicals and skin causing damage
Carbon Dioxide	A gas that puts out fires and can be made by chemical reactions
Limewater	A chemical that is used to test whether a gas is carbon dioxide
Fuel	A chemical that can release energy when it is reacting
Hydrocarbon	A chemical that only contains hydrogen and carbon
Flammable	Can catch fire and burn easily
Combustion	The chemical reaction when we burn a fuel

Acid	A chemical that turns litmus red. It has a pH of less than 7
Alkali	A chemical that turns litmus blue. It has a pH of more than 7
Hazardous	A chemical that can cause damage
Precaution	Something we do to protect ourselves from hazards in an experiment (like wearing goggles)
Corrosive	Chemicals that attack metals, rocks and skin very quickly
Irritant	Chemicals that make the skin and eyes itchy

Neutral	Chemicals that are not acids or alkalis. They have a pH of 7
Litmus	A simple indicator. It goes red in acids, blue in alkalis and purple in neutrals

Indictor	A chemical that changes colour when it is in an acid and alkali
Extract	To remove a chemical from a plant so it can be used

pH Scale	A measurement from 1 - 14 that shows how strong acids and alkalis are.
Universal Indicator	A mixture of indicators that gives a range of colours showing how strong or weak acids and alkalis are

Neutralisation	A reaction adding acid to an alkali to form a neutral chemical
Solution	A mixture of water and another chemical that is dissolved into it

7C 1a Is there a physical change or chemical change?

Apparatus

- **Bunsen burner, Goggles, Heatproof mat, Spatula, Test tubes, Test tube holder, Tripod, Test tube rack, Chemicals**

Safety

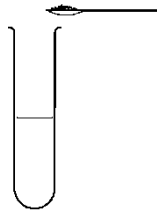
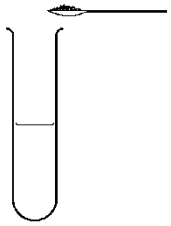
Wear goggles. Treat all chemicals as irritants. Be careful when heating chemicals. Your teacher will show you how to safety heat experiment 4 and 6.

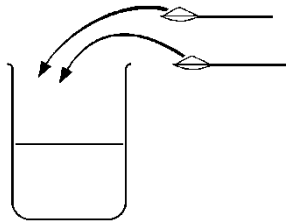
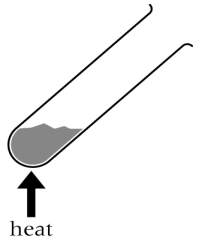
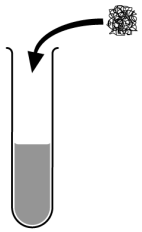
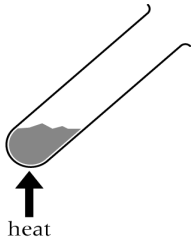
Method

1 Carry out the experiments described in the table, and look carefully at what happens.

2 Write your observations in the table. Use the 'What happened?' column.

3 In the right column of the table say if you think a physical or chemical change has taken place.

Experiment	What to do	Diagram	What happened?	Is it a physical or chemical change?
1	• Half fill a test tube with lemon juice. • Add a spatula of bicarbonate of soda. • Watch what happens. • Feel the tube.			
2	• Half fill a small test tube with water. • Add a spatula of baking powder. • Watch what happens. • Feel the tube.			

3	• Put 20cm^3 of water into a small beaker with water. • Add two spatulas of salt. • Stir the mixture thoroughly. • Heat the beaker over a Bunsen until the water has all boiled away.			
4	• Put two spatulas of zinc oxide in a test tube. • Heat the tube. Watch what happens. • Leave the hot tube in a rack to cool down.			
5	• Half fill a test tube with copper sulphate solution. • Put a little iron wool into the copper sulphate solution. • Watch what happens.			
6	• Put a few pieces of wax onto a test tube • Heat the test tube with a Bunsen flame. • Allow to cool back down and write down what you see.			

Conclusion

How can you tell from these observations if a chemical or physical change is taking place?

Can you give some examples of things to look for to tell if a chemical change is taking place?

7C 1b Reactant or Product

Look at the following examples, so of which you completed in the practical (sheet 1a) try to put these chemicals into the correct group - were they a reactant or product?

E.g. Iron wool + copper sulfate ⟶ iron sulfate + copper

Citric acid + Bicarbonate of soda ⟶ sodium carbonate + carbon dioxide + water

Magnesium + Oxygen ⟶ Magnesium oxide

Reactant	Product

Conclusion

What do you think we mean by a 'reactant' or 'product' in a chemical reaction?

Do both chemical changes and physical changes have reactant and products?

What do you think the arrow means in a chemical reaction? Reactant ⟶ Product

Extension

Research and try to find the chemical formulas for some of your reactants and products

7C 1c Chemical or Physical Change

1 Define a physical change – (use the keyword: reversible)

2 Define a chemical change – (use the keywords: permanent irreversible)

3 Give three examples of how you know a chemical change has taken place – use the

2 Identify whether the example is a chemical or physical change.

a If you put some water into a freezer, it turns to ice.

b Bananas turn black if you leave them in a warm cupboard for a week.

c Some white powder from your kitchen fizzes when you put it into vinegar.

d When you boil water in a kettle, some of it turns to steam.

e When you fry an egg it turns white and goes solid.

Extension: For one chemical change and one physical change above (Q2), can you explain why you made your decision.

7C 2a Types of Chemical Reactions – Making Hydrogen

How can you collect the gas given off in an experiment?

Apparatus

- **Goggles**
- **Test tubes x 3 and stoppers**
- **Small Conical flask (use instead of a boiling tube shown in the diagram)**
- **Washing up bowl**
- **Bung and delivery tube**
- **3 pieces of magnesium (1cm long each)**
- **Measuring cylinder**
- **Dilute hydrochloric acid**
- **Bunsen burner**
- **Splints**

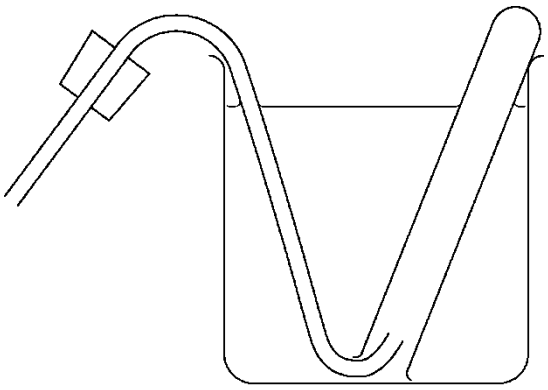
Safety:
Hydrogen is an explosive gas.
Only produce small amounts to be tested in a test tube.
Pack away the equipment **before** testing the H_2.
Hydrochloric acid is an irritant.

Wear eye protection.

Method

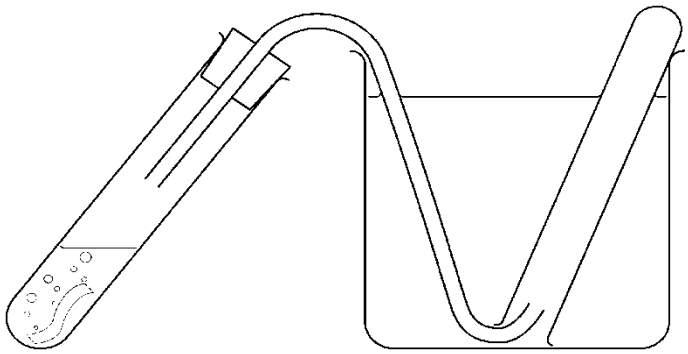
1 Fill the 3 test tubes and the washing up bowl with water. Put your thumb over the end of the test tube, and put it into the washing up bowl upside down.

2 Put the end of the delivery tube into the upside down test tube, without letting any of the water out.



3 Measure 25 cm^3 of hydrochloric acid (using a measuring cylinder) and put it into a small conical flask.

4 Drop 3 pieces of magnesium into the acid, and put the bung into the top of the flask. It is better to use a small conical flask rather than the boiling tube shown in the following diagram.

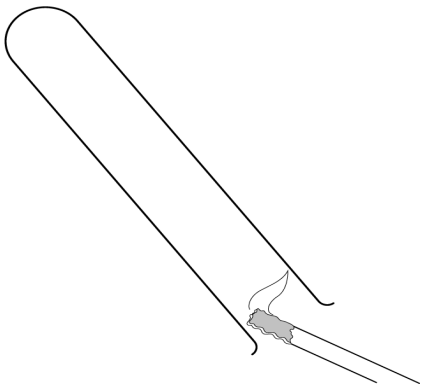


5 Watch what happens to the magnesium and the acid.

6 When the first test tube is filled, shake any water out and put a stopper in, try and collect 3 test tubes full of gas.

7 When the reaction has finished, pack away your equipment **before** you test your gas.

8 Carefully test the gas in the upside down tube using a lighted splint. Your teacher will show you how to do this safely. Point the test tube away from yourself and others.



Considering your results/conclusions

1 What are the names of the two reactants in this experiment?

2 What did you see happening when you put the magnesium into the acid?

3 How could you tell that one of the products of this reaction is a gas?

4 What happened when you tested the gas in the test tube?

5 What does this tell you about the gas?

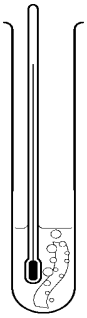
Extension:

Find out the chemical formula of hydrogen gas. What is the product when it reacts with oxygen during this test?

7C 2b Reactions of Metals with Acids

1 How can you tell from the diagram that a reaction is happening in the test tube?

_____



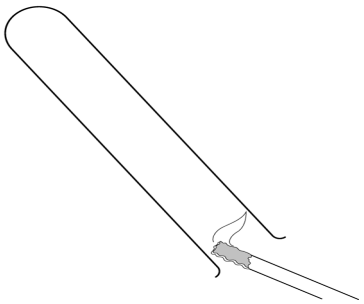
If you looked at the thermometer while the reaction was happening, what would you expect to see?

_____

What safety precautions should you take if you did this experiment?

_____

2 Describe how you would test a gas to see if it is hydrogen.



_____

_____

If the gas *is* hydrogen, what would you see? _____

Extension:

1. Rainwater is a weak acid.

a) What can rainwater do to metals like iron?

b) What types of things are made out of metals like iron?

c) Why do you think that it is a disadvantage to make things out of iron?

d) What other materials can be used instead?

2. a) Why do some metals, such as gold not react with acids? Can you think of any other metals that may not react? You may need to research this.

b) How does the reactivity of the metal affect what we use it for? E.g. Why do we use gold for jewelry?

c) Can you find the chemical equation that describes when a metal such as zinc reacts with hydrochloric acid.

E.g. Zinc + Hydrochloric acid $\longrightarrow$

Zn + 2 HCl

7C 3a Making Carbon Dioxide

How can we find out which materials contain carbonates?
Carbon dioxide is formed when an acid is added to a carbonate. Carbon dioxide is a gas. You can see that a gas is being made because bubbles are produced and the gas produced puts out a lit splint

Apparatus

- **Goggles**
- **Boiling tubes and a delivery tube**
- **Test tube rack**
- **Hydrochloric acid**
- **Materials to test**

Wear eye protection.

Method

1 Collect the materials you are going to test and write their names in the table.

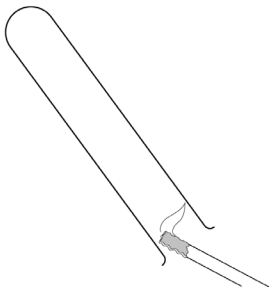
2 Add about 1 cm depth of acid to the boiling tube.

3 Put half a spatula of a material into the tube.

4 Watch carefully and write your observations in the table.

5 If a gas is given off, collect some of the gas by connecting a delivery tube and a test tube. Your teacher will show you how to do this.

6 Put a **lit splint** into the test tube, write down what you observe.



6 Repeat steps 2 to 5 for your other materials.

Recording your results

Material	Observation	What happened to the lit splint?	Is the material a carbonate?
Marble Chips	There was a steady stream of small bubbles released.		

Your teacher will demonstrate how to test the gas formed to prove it is carbon dioxide using limewater.

Draw a labelled diagram of the equipment your teacher used to test the gas.

You can now test one of your materials in the same way using limewater.

If the gas made is carbon dioxide what did you observe?

Considering your results/conclusion

How did you know which materials contained carbonates?

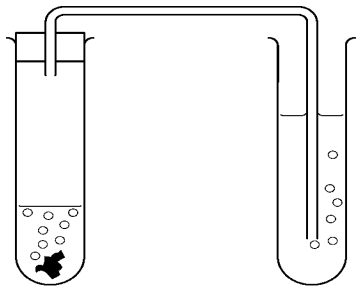
How could you prove that the gas produced was carbon dioxide rather than another gas?

Is carbon dioxide heavier or lighter than air? How can you tell?

What is the chemical formula of carbon dioxide? What does this formula tell you about the elements that it contains?

Extension:
Research some more things about carbon dioxide gas, for example, how is it related to combustion or respiration? Why is it used to make carbonated (fizzy) drinks or in fire extinguishers?

7C 3b Properties of Carbon Dioxide and Hydrogen Gas



1 Describe how you would test a gas to see if it is carbon dioxide.

If the gas *is* carbon dioxide, what would you see?

2 Which gas would you get if you carried out these reactions?

hydrochloric acid + magnesium produces …….. gas

nitric acid + calcium carbonate produces …….. gas

hydrochloric acid + magnesium carbonate produces …….. gas

sulphuric acid + magnesium produces …….. gas

3 Think about the tests you have completed for hydrogen and carbon dioxide gas. List the similarities in tests and difference in the tests.

Similarities between tests	Differences between tests

Extension:
Hydrogen can be used as fuel. Explain the advantages and disadvantages of this.
Research how carbon dioxide fire extinguishers work.

7C 3c Gases in Air – Extension Activity

1. The names of some gases found in the air are listed below. Write the names of the gas in the left-hand column of the table next to the correct set of properties. You may need to look up the gases in a science text book or on the internet.

argon carbon dioxide helium methane nitrogen
nitrogen dioxide oxygen

Gas	Properties
	This gas is in the air we breathe out. It puts flames out. It turns limewater milky.
	This is the gas we need to stay alive. It is also needed for burning. A burning splint will burn brightly in this gas.
	This is a brown gas with a strong smell. It is poisonous. It can cause acid rain.
	This gas makes up most of the air on Earth. It does not react very much.
	This is the gas in the gas taps. It burns with a blue flame if there is plenty of air.
	This gas does not react at all. It is used in light bulbs so that the metal in the light bulb can get very hot without burning.
	This gas is very light, so we use it in balloons. It does not react at all, and will put out a flame. Divers use this gas.

2 The next table shows how much of each gas there is in the air.

Gas	Amount in the air
nitrogen	78%
oxygen	21%
argon	0.9%
other gases (including helium, methane and carbon dioxide)	0.1%

Draw a pie chart to show the composition of the air. You can draw it by hand using a compass and protractor, or you can use a computer program to plot the pie chart for you. Colour in the sections on your pie chart and provide a key.

7C 4a Types of Chemical Reaction - Burning Metals

Copper is a metal which reacts with the oxygen in the air when it is heated strongly.

Prediction

I think that if I weigh some copper powder and then heat it strongly in the air, the mass of the

metal will _____ (stay the same/go up/go down).

I think this because_____

_____

_____

_____.

Apparatus

- **Bunsen burner and tripod.**
- **Heat-proof mat**
- **Crucible and pipe triangle.**
- **Copper powder**
- **Goggles and tongs.**

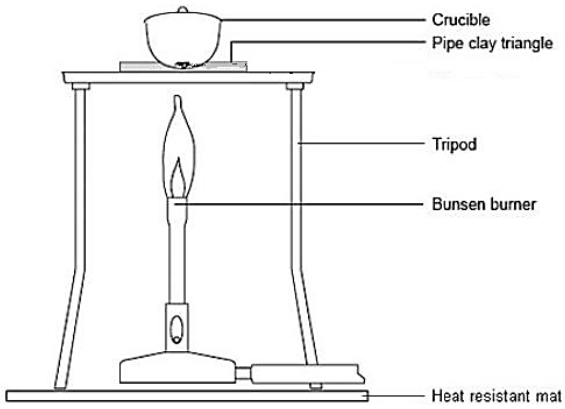
Wear eye protection. Be careful with hot apparatus

Method

1 Zero the balance then add a spatula of copper powder to a crucible and weigh them accurately. Record the mass in the table.

2 Look carefully at the surface of the copper and write down what it looks like in the table.

3 Put your crucible on a tripod using a pipe triangle like the diagram.



4 Heat the crucible strongly in the flame of a Bunsen burner for about 3 minutes. Write down your observations in the table. Is this a chemical or a physical change?

5 After 3 minutes, turn off the Bunsen and let the crucible **cool down for at least 5 minutes.** Write down what the reacted copper powder looks like after heating.

6 When it is cool, use the tongs to carefully lift the crucible onto the heat proof mat. Your teacher will show you how to do this. Take the mat and the crucible over to the balance and record the mass of the crucible. Write this in your table.

Recording your results
Complete the table to show your results.

	Mass shown on balance (g)	**Observation**
Copper powder and crucible before heating		
Copper powder and crucible during heating		
Reacted Copper powder and crucible after heating		

Calculation: How can you work out if the copper has gained or lost mass during heating?

Write down your working and your answer in the space below.

Considering your results/conclusion

From my results I can see that after I had heated the copper metal the mass had

_____ (gone up/stayed the same/gone down).

I think this happened because: (Hint: What does the copper react with when it burns?)

_____

_____

_____

Complete the word equation: Copper + _____ ⟶ _____

Extension→

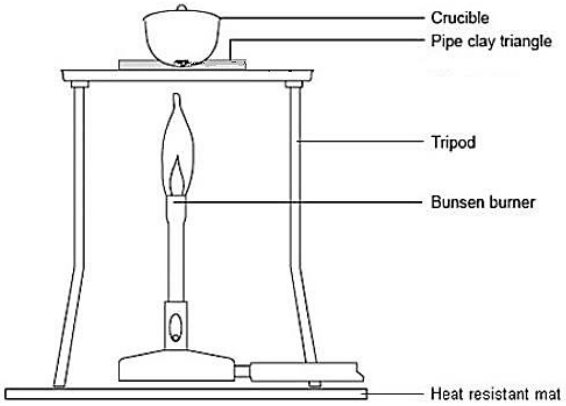
Complete the symbol equation: 2 Cu + _____ ⟶ 2 CuO

If 2.5g of copper is heated with 0.5g of oxygen, how much copper oxide would you expect to get?

What do you think conservation of mass means?

7C 4b Word Equations – Burning Metals

1 When metal burns, a chemical reaction happens.



Fill in the boxes and the gaps in the sentences, using words from the list.

Metal, products, combustion, air, reactants, fuel, irreversible, oxygen, metal oxide

[ ] + [ ] → [ ]

R _____ P _____

This type of reaction is called a _____ reaction. It is i_____.

The metal is the _____ and oxygen comes from the _____ .

2 Now complete these word equations for the combustion of different materials.

a copper + [ ] → [ ]

b oxygen + [ ] → Iron oxide

c Magnesium + [ ] → [ ]

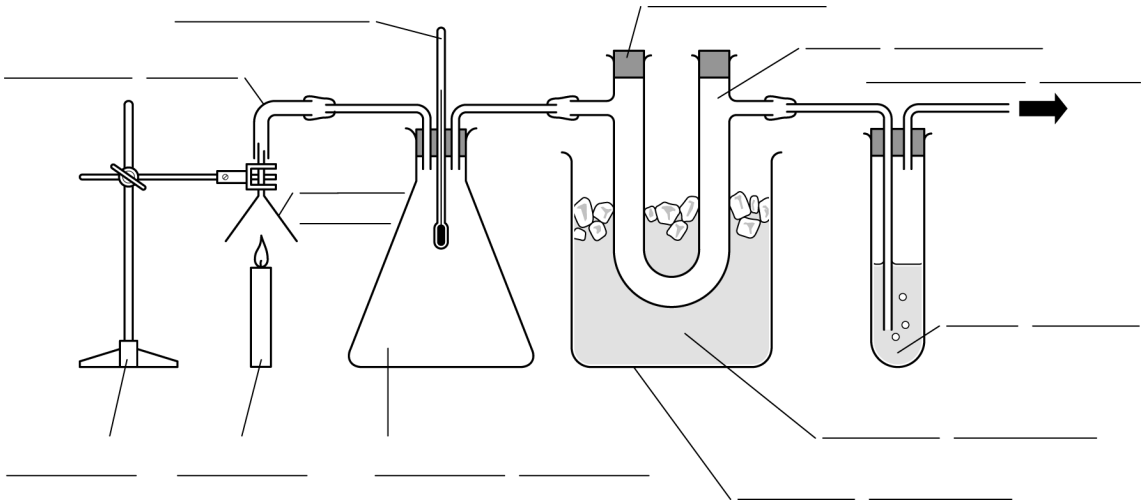
Extension: When a metal reacts to form a metal oxide, the mass increases. Why?

7C 5a Types of Chemical Reaction - Combustion of Fuels

What happens when fuels burn?

Your teacher will demonstrate the combustion of a fuel. Label the diagram using words from the list below.

delivery tube bung funnel stand
U-tube large beaker iced water boiling tube
limewater thermometer candle conical flask



Recording your results

Now write the results from the demonstration in the table below:

Observation	Before experiment	After experiment
Appearance of fuel		
Appearance of limewater		
Appearance of U-tube		
Temperature shown on thermometer (°C)		

How do you know that a chemical change has taken place?

Write the word equation for the reaction:

7C 5b Types of Chemical Reaction - Combustion of Fuels - 2

Prediction

I think that if I weigh a candle and then burn it in the air, the mass of the candle will

_____ (stay the same/go up/go down).

I think this because_____

_____

_____

_____

Apparatus

- **Lighter**
- **Heat-proof mat**
- **Candle**
- **Goggles and tongs.**

Wear eye protection. Be careful with hot apparatus

Method

1 Zero the balance then weigh you candle accurately (to all three decimal places). Record the mass in the table.

2 Look carefully at the candle and write down what it looks like in the table.

3 Put your candle on a heatproof mat and ensure it will not fall over.

4 Light the candle and leave it burning for about 3 minutes. Write down your observations in the table. Is this a chemical or a physical change?

5 After 3 minutes, blow the candle out carefully**. Wait for the wax on the top to cool down and become solid again.** Write down what the candle looks like after burning.

6 When it is cool, take the mat and the candle over to the balance and record the mass of the candle. Write this in your table.

Recording your results
Complete the table to show your results.

	Mass shown on balance (g)	Observation
Candle before combustion		
Candle during combustion		
Candle after combustion		

Calculation:
How can you work out if the candle has gained or lost mass during heating?

Write down your working and your answer in the space below.

Considering your results/conclusion

From my results I can see that after I had burnt the candle the mass had_____

I think this happened because: (Hint: What does the candle produce when it burns?)

_____

_____

_____

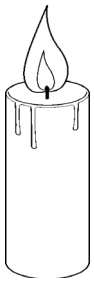
Complete the word equation:

Candle wax + _____ ⟶ _____ + _____ _____

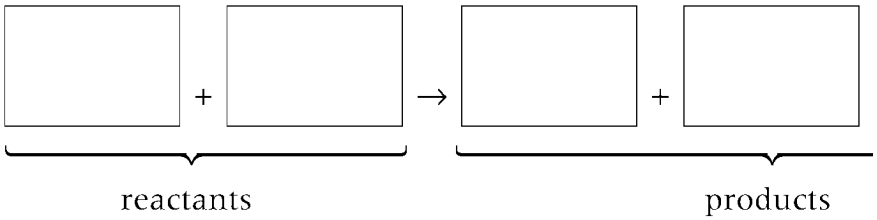
Extension:
Find out what 'phlogiston' is and how this influenced our understanding of the conservation of mass and burning.

7C 5c Chemistry of a Candle Burning

1. When a candle burns, a chemical reaction happens.



Fill in the boxes using words from the list.



candle wax carbon dioxide oxygen water

2. Write a description of what is happening as the candle is burning. Try and use as many of the words below as possible

Reactants combustion fuel irreversible air oxygen products water carbon dioxide energy

.

3. Now complete these word equations for the combustion of different materials.

a wood + ☐ → ☐ + ☐

b natural gas (methane) + ☐ → ☐ + ☐

c ethanol + ☐ → ☐ + ☐

7C 6a What Hazard?

Match the warning symbol to the hazard, and find the correct example.

Colour in or number them or draw lines to match them up.

	Hazard: flammable	Example: concentrated sulphuric acid
	Example: dilute sulphuric acid	Hazard: irritant
Hazard: toxic		Example: petrol
Example: mercury	Hazard: corrosive	

Extension:
Find out what other hazard symbols there are that are not included here.

Find out some examples of chemicals that would need to be labeled with these symbols.

Why is it important to have hazard symbols in Chemistry?

7C 6b IDENTIFYING HAZARDOUS ACIDS

In this experiment you will be comparing three different acids. You will find out which is the most hazardous.

Apparatus

- **Test tube rack**
- **Test tubes**
- **Acids A, B and C**
- **3 pieces of magnesium strip**
- **3 marble chips**
- **Thermometer**
- **Eye protection**

Eye protection should be worn.

Method

1 Fill a test tube about one third full of acid A, as shown in the diagram. Take the temperature of the acid and record it in the table.

2 Put **one** piece of magnesium into the tube.

3 Watch what happens. Write the results in the table.

4 When the fizzing stops, measure the temperature of the solution again.

5 Repeat steps **1-4** with acids B and C.

9 When the tests are finished, pour all the liquid away.

10 Refill the three tubes with fresh acid: A, B and C.

11 Do steps **1-4** again but using a marble chip instead of the magnesium.

Recording your results

Acid	Solid	Temperature at the beginning of the experiment (°C)	Observation	Temperature at the end of the experiment (°C)
A	magnesium			
B	magnesium			
C	magnesium			
Acid	**Solid**	**Temperature at the beginning (°C)**	**Observation**	**Temperature at the end of the experiment (°C)**
A	marble chip			
B	marble chip			
C	marble chip			

Considering your results

I think the most hazardous acid and the strongest acid was

The least hazardous acid and the weakest acid was

I could tell this because

Suggest if the marble chips or the magnesium give us the most accurate way to tell which acid was the most hazardous or strongest acid? Explain why.

Extension
Was this a fair test? Explain.

How could you make this practical fairer or more accurate?

What do we mean by ‘strong’ acid?

7C 7a Identifying Acids and Alkalis

Introduction: Litmus is a type of indicator. It goes red in acid, blue in alkali and stays purple in neutral substances.

Materials required
Sulfuric acid, toothpaste, vinegar, soap, salt, baking soda, sugar, lemon juice, sodium hydroxide, hydrochloric acid, milk, alcohol, dropping pipettes, dimple trays, litmus, phenolphthalein indicator.

Method:

1. Set up a dimple tray.
2. Add a small amount of one of the substances into one of the dimples using a spatula or a plastic dropper pipette.
3. Add 1 drop of litmus indicator. Observe the colour and record this in your table.
4. Repeat for the other substances.

Substance	Colour in Litmus	Acid, alkali or neutral?

Safety.
Wear goggles.
Treat all chemicals as corrosive and hazardous.
Wash your hands at the end of the practical.

Analysis/Conclusion :

1 Which of the chemicals are acids?

2 Which of the chemicals are alkalis?

3 Which of the chemicals are neutral?

Extension
Does litmus indicator tell us anything about how strong or weak our acids and alkalis are?

If you have time, try the same test with another indicator, such as phenolphthalein. What colour does this change in acid compared to alkali?

7C 7b Acids Bingo - Review

Choose one of the words below to write into each box; make sure you put them in randomly.

Your teacher will read out a definition and you must cross out the matching word.

Try to be the first to get a) diagonal line, b) vertical line or c) horizontal line completed

Shout out 'bingo' when you do.

These are the words you need to write into the boxes:

litmus	alkali	vinegar	hydrochloric acid
acid	neutral	corrosive	hazardous
sodium hydroxide	soap	litmus	irritant

MYP 1: Year 7 Science

Criterion D Assessment

Reflecting the Impacts of Science

UNIT:	Chemical Reactions
ASSESSMENT TITLE:	**Acids and Alkalis in the Home**
Statement of Inquiry:	Observing chemical reactions gives **evidence** to help understand **patterns and relationships** in the world around us.
Key Concept:	Relationships
Related Concepts:	Patterns and Evidence
ATL Focus:	Communication Skills
Key Scientific Vocabulary:	Hydrogen, Hydroxide, Corrosive, Irritant, Concentration, Neutralisation, pH Scale, Indicator, Dissociation, Salt, Solution, Solvent, Structure, Properties

GRASPS - ACIDS AND BASES IN THE HOME

There are many common acids and alkalis found in the home, examples include acids such as vinegar, fruit juice, lemonade, cola, ketchup, car batteries and alkalis such as soap, toothpaste, washing powder, oven cleaner and antacids.

How are we able to use the properties of specific acids and alkalis in our everyday lives? What are the implications in terms of safety compared to how useful they are?

For this assignment, the setting is as follows…

Goal – your goal is to raise awareness of acids and bases in the home to make people realize that Chemistry is all around them.

Role – You work for the Royal Society of Chemistry, publicity division.

Audience – Youth and young adults, be sure to only use words that laymen (everyday people) would understand. Be sure to use correct scientific terminology when required.

Situation – You need to make a product that will encourage young people to take an interest in chemistry, while informing them of the science behind acids and bases and the prevalence of them in everyday lives.

Product – Make a leaflet or poster that will capture both minds and imaginations and encourage chemical thought! The product has to be informative, well researched and eye catching.

Illustrate and present your project using **media literacy (ICT).**

Be sure to correctly use and reference a multitude of sources. Pictures also need to be referenced too. You will be assessed on using correct scientific terminology when required. Make sure you address your leaflet/poster to the target audience! Be as creative as you can but don't compromise on scientific

Other Information:

- Due Date – this will be set by your teacher and must be adhered to

Success Criteria for Assessment	For top marks, students must include: A leaflet/poster that has been created using ICT. At least 2 correctly referenced diagrams. At least 1 chemical equation showing how acids and bases interact with water. 2 properties each of an acid and an alkali and an explanation of how these can be identified. Specific examples (along the chemical formula) of 2 acids and 2 bases used in the home along with their purpose. A description of how the specific properties of both an acid and alkali help them with their function in the home. *"i.e. Sodium hydroxide is present in oven cleaner because…"* A summary of the health and safety implications and a discussion regarding the advantages and disadvantages of using these chemicals in the home. A clear and concise bibliography, with at least 5 different sources used.

Level Descriptors and Task Specific Clarifications for Criterion D:

	Level Descriptor	Task Specific Clarification
0	The student does not reach a standard described by any of the descriptors below.	No task specific clarifications addressed.
1-2	The student is able to, **with limited success**: i. **state** the ways in which science is used to address a specific problem or issue ii. **state** the implications of using science to solve a specific problem or issue, interacting with a factor iii. **apply** scientific language to communicate understanding iv. document sources.	i. **State** where acids and bases are found the home. ii. **State,** briefly, the health precautions one should take when using acids and bases, with some inaccuracies. iii. Language used is casual or unclear throughout; points not made clearly. iv. Limited sources used and cited.
3-4	The student is able to: i. **Outline** the ways in which science is used to address a specific problem or issue ii. **Outline** the implications of using science to solve a specific problem or issue, interacting with a factor iii. **sometimes apply** scientific language to communicate understanding iv. **sometimes** document sources correctly.	i. **State,** briefly, the basic properties of Acids and Bases. ii. **State** where acids and bases are found in the home and the safety precautions one should take when handling them. iii. Language used is sometimes clear; scientific terms sometimes applied. iv. Some sources used and cited.
5-6	The student is able to: i. **Summarize** the ways in which science is used to address a specific problem or issue ii. **Describe** the implications of using science to solve a specific problem or issue, interacting with a factor iii. **usually apply** scientific language to communicate understanding **clearly and precisely** document sources correctly.	i. **Outline** how the properties of acids and bases help them to be used for certain purposes around the home. ii. **Outline** the advantages and disadvantages of using acids and bases in the home and the precautions one should take when handling them. iii. Language used is usually clear; scientific terms generally used correctly. iv. Adequate sources used and cited; sources generally reliable.
7-8	The student is able to: i. **Describe** the ways in which science is applied and used to address a specific problem or issue ii. **Describe and summarize** the implications of using science and its application to solve a specific problem or issue, interacting with a factor iii. **consistently apply** scientific language to communicate understanding **clearly and precisely** iv. document sources **completely**	i. **Describe** how the properties of acids and bases help them to be used for certain purposes around the home, with specific examples of the chemical(s) used. ii. **Describe and summarise** the advantages and disadvantages of using acids and bases in the home; give reasoning to support the conclusion on whether acids/bases should be used. iii. Language used is usually clear; scientific terms generally used correctly. *iv.* Numerous reliable sources used and cited.

Student Task Planning Notes:

7C 10a Investigating Red Cabbage Indicator 1

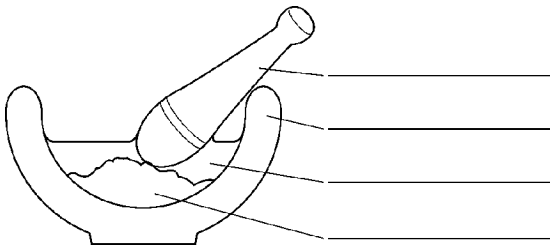
Materials required
Red cabbage leaves, Pestle and mortar, Sand, Filter paper and funnels, Conical flasks & beakers
0.1M HCl, 0.1 M NaOH, Water bottles, Unknown substances A & B

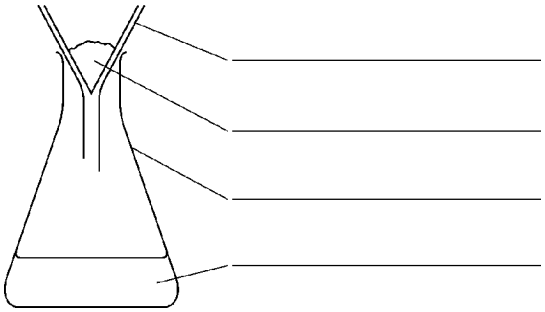
Safety. Wear goggles.**,** Acids and alkalis are irritants/corrosive. Treat unknown substances as irritants.

Method/Diagram:

Your teacher will explain what to do:

To make sure you understand, before you start the experiment, label the following diagrams and fill in the missing words on the method below.





In this experiment the _____ is the solvent.

Some of the red colour _____ in the water.

The rest of the cabbage leaves do not dissolve. They are_____ .

The cabbage juice is separated from the leaves by _____

Dissolves, filtering, insoluble, water

Results :

Name of Substance	Colour of Red Cabbage Juice
Acid (Hydrochloric)	
Neutral (Water)	
Alkali (Sodium Hydroxide)	
Unknown solution A	
Unknown solution B	

Analysis/Conclusion

The red cabbage juice changed _____ in acid, _____ in neutral and _____ in alkali.

What type of substances were the unknown solutions A and B?

A = _____ B = _____

Describe in your own words what you think and indicator is:

Explain why you think scientists may find indicators useful:

Evaluation

Why did you need to crush the red cabbage up before mixing it with water?

How could you change your method to make your red cabbage indicator better?

Do you think red cabbage is a good indicator compared to litmus or others? Why?

Extension
Different indicators change different colours. Find out the name of another indicator and what colour it is in acid, alkali and neutral conditions.

Find out how indicators work. What causes them to change colour?

7C 11a The pH Scale

Safety. Wear googles.
Treat all chemicals as irritants.

Chemicals/Equipment
UI paper, glass rods, white tiles, several household substances .

Method:
Pick up a sample of one of the household substances. They may be in a beaker. Take this to your work bench. Write the name of the substance in the table.

2 Get some pieces of universal indicator (UI) paper and put these on a white tile.

3 Use a glass rod to get a drop of the household substance and put this onto the UI paper on the tile.

4 Write the colour into the table.

5 Look up the pH number using the colour chart. Write it into the table.

6 Do this again with another substance. Make sure you put the beakers of the substances back so that others can use them.

Results:

Name of substance	Colour of universal indicator	pH number	Type of substance

Considering your results/conclusion

Try to work out from the pH number if each of the substances you have tested is:

- a strong acid
- a weak acid
- neutral
- a weak alkali
- a strong alkali.

Write your answer in the column of the table marked 'Type of substance'.

Why do you think knowing the pH is useful?

Extension: Why can universal indicator change so many colours?

Can you find other examples of strong acids or alkalis that are commonly found in the home? Predict their pH number.

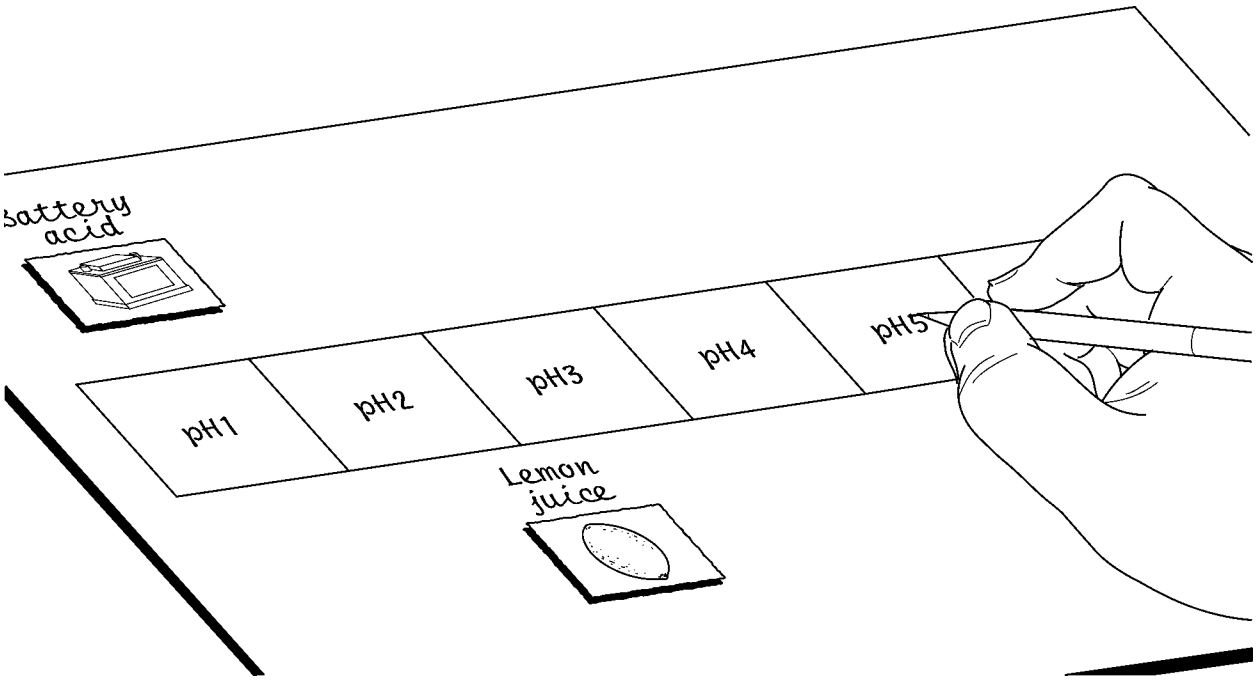
7C 11b Making a pH Scale

Use the blank sheet on the next page to draw the pH scale running from 1 to 14.

Add the colours to show how universal indicator would change colour.

Label the chart by drawing arrows from each substance to the correct pH number. You may be able to draw pictures or find photos photos that you could cut out and stick onto your chart.

Substance	pH	Substance	pH
battery acid	1.0	mineral water	8.0
bee sting	3.5	oven cleaner	13.0
blood	7.5	skin	5.5
distilled water	6.0	tap water	7.0
egg white	9.0	toothpaste	9.5
fizzy drinks	4.5	vinegar	3.0
indigestion powder	8.5	washing up liquid	5.0
kitchen surface cleaner	11.0	washing powder	10.5
lemon juice	2.5	washing soda	11.5
milk	6.5	wasp sting	10.0



Extenison: Find out what 'pH' actually stands for.

How is it calculated?

What role do hydrogen ions play in pH?

pH Scale

7C 12a Changing Colours of Indicators 1

Aim: MAKING A RAINBOW BY NEUTRALISATION

Safety. Treat all chemicals as irritants at these concentrations, wear goggles and wash hands.

Chemicals/Equipment
Test tube rack containing six test tubes, 0.5M ethanoic acid, 0.5M NaOH, UI solution, measuring cylinders

Aim: In this activity you will also need to follow instructions carefully and also make precise observations. If you are careful, you should be able to produce a rainbow effect in the tubes.

Method:

1 Line the 6 test tubes up in the test tube rack.

2 Add about 5cm^3 of ethanoic acid to each using a measuring cylinder or syringe.

3 Carefully smell the contents of the test tubes by wafting them. Your teacher will explain how to do this safely.

4 Write your observations in the results section.

5 Add approx 3-4 drops of universal indicator to each of the test tubes. Carefully shake by tapping them gently with 2 fingers. Your teacher will show you how to mix chemicals safely.

6 What do they look like? What does this tell us? Write your observations in the results table.

7 Half fill a small beaker with the sodium hydroxide alkali solution (NaOH).

8 Leave the first test tube. Add nothing to this one.

9 Use a dropper pipette to add 5 drops of the NaOH alkali to the second test tube.

10 Gently tap the tube to shake it. Continue adding 5 drops of NaOH until the colour turns **orange**.

11 Write down the number of drops of NaOH added and the pH in the results table.

12 Do the same thing to test tube 3 until this one turns **yellow**.

13 In test tube 4 continuing adding 5 drops of NaOH until the test tube turns **green**. Feel the test tube.

14 Test tube 5 should turn **blue**.

15 Test tube 6 should turn **purple**.

16 Make sure you fill in your results and observations in the table

Results:

Boiling Tube	Colour in Universal	pH	Number of drops of NaOH (alkali)
1	Light Red	1 or 2	0
2			
3			
4			
5			
6	Purple	12 to 14	

Analysis/Conclusion:

1 What does the ethanoic acid smell like? _____ .

2 What colour does the ethanoic acid give when with universal indicator. _____

3. What does this tell you about the pH? _____

4 What type of a substance is ethanoic acid?_____

5 Draw a diagram of your results (or take a photo and stick it in)

7. NaOH is called sodium hydroxide. What type of substance is NaOH?

8. What type of reaction is occurring? _____

9. How many drops of NaOH are needed to make the acid neutral? _____

10. When you felt the test tube, did you feel any temperature change?

11. What is also produced in most of these types of reactions

_____

Extension: Find out other ways in which an acid can be neutralized.

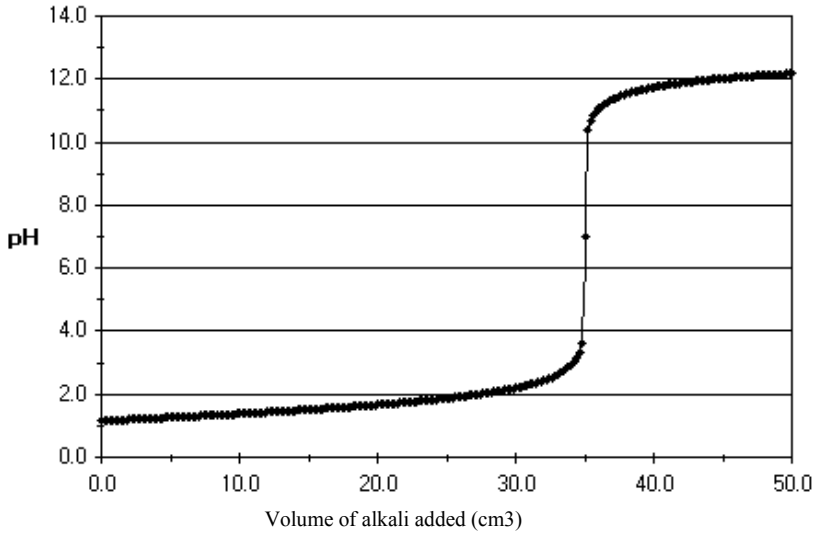
What is a salt? Find the names of some common salts.

What is an alkali? Find the chemical names of a few.

What is an exothermic reaction?

7C 12b pH Curves during Neutralisation

The graph below shows how pH changes as an alkali is slowly added to a beaker of acid.



Use the graph to answer the following questions;

a) How can you tell from the graph that the beaker contained acid to begin with?

b) How much alkali had to be added to make the solution neutral? Explain how you made your decision.

c) At the end of the experiment is the solution in the beaker acid, alkali or neutral? Explain how you decided.

d) There was 20cm^3 of acid in the beaker at the beginning. Using the graph explain if the alkali added was stronger or weaker than the acid?

e) The beaker also contained universal indicator. Describe the colour you would observe at each of the volumes of alkali added:

0cm^3 = 10cm^3 = 20cm^3 =

30cm^3 = 40cm^3 = 50cm^3 =

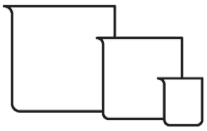
7C 13a INVESTIGATING ANTACIDS – Student Information Sheet

Which indigestion remedy works best?

Indigestion remedies react with acid in our stomachs and cancel it out (neutralize it). We can test different indigestion remedies by reacting them with some dilute acid and measuring the pH of the mixture.

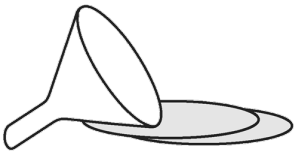
Planning/designing your experiment

Equipment options



100cm^3 beaker
250cm^3 beaker
500cm^3 beaker

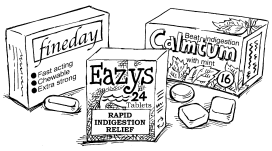
Pestle and mortar



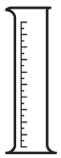
Funnel and filter paper

Hydrochloric acid
25cm^3

Universal indicator solution



Four types of antacid tablets



Measuring cylinder

?

Other

VARIABLES

Control, independent

- ☐ volume of acid
- ☐ type of antacid
- ☐ amount of indicator
- ☐ concentration of acid
- ☐ amount of antacid powder added

Dependent

- ☐ pH of solution after 5 minutes reacting with antacid

SAFETY

Risks

- ☐ hydrochloric acid
- ☐ eating antacid tablets
- ☐ glass beakers
- ☐ spillages
- ☐ burns
- ☐ other?

REPEATS

Will you repeat each measurement to make your data more reliable?

Recording your results

Design a results table to record your results.

You will need to draw a graph to present your results too.

Conclusion

What happened to the pH when the remedies reacted with the acid?

Which remedy worked best?

How do you know? Give some examples from your graph.

Try and explain what happened in terms of Science and neutralization.

Evaluation

Can you suggest any **errors** in your experiment?

If so, what **improvements** could you suggest to make the results more precise?

MYP 1: Year 7 Science

Criterion B Assessment – Inquiring and Designing

Criterion C Assessment – Processing and Evaluating

UNIT:	**Chemical Reactions**
ASSESSMENT TITLE:	Investigating Which Antacid is Most Effective at Neutralizing Stomach Acid
Statement of Inquiry:	Observing chemical reactions gives **evidence** to help understand **patterns** and **relationships** in the world around us.
Key Concept:	Relationships
Related Concepts:	Patterns and Evidence
ATL Focus:	Thinking Skills Social and Collaboration Skills

Key Scientific Vocabulary:

Data	Measurement of a parameter that can be quantitative (volume, temperature, pH and so on) or qualitative (colour, shape, texture and so on).
Dependent variable	The variable in which values are measured in the experiment.
Prediction	Give an expected result of an upcoming action or event.
Hypothesis	A tentative explanation for an observation or phenomenon that requires experimental confirmation; can take the form of a question or a statement.
Independent variable	The variable that is selected and manipulated by the investigator in an experiment.
Qualitative data	Refers to non-numerical data or information that is difficult to measure in a numerical way.
Quantitative data	Refers to numerical measurements of the variables associated with the investigation.
Validity of the method	Refers to whether the method allows for the collection of sufficient valid data to answer the question. This includes factors such as whether the measuring instrument measures what it is supposed to measure, the conditions of the experiment and the manipulation of variables (fair testing).

Command Terms:

Design	Produce a plan, simulation or model.
Evaluate	Make an appraisal by weighing up the strengths and limitations.
Interpret	Use knowledge and understanding to recognize trends and draw conclusions from given information
Analyze	Break down in order to bring out the essential elements or structure. To identify parts and relationships, and to interpret information to reach conclusions.

Assignment Instructions (GRASPS)

Goal	You are required to investigate **either**: 1. Which antacid brand is the most effective at combating indigestion problems. OR 2. How antacids affect pH over time.
Role	You are a pharmacist **either…** 1. …recommending a brand of antacid to your customer (if Goal 1 is selected) 2. …explaining to your customer how long it will take for the antacid to work (if Goal 2 is selected).
Audience	A customer in your pharmacy.
Situation	You will work ***collaboratively*** in ***groups of twos or threes***. You are required to ***design an organized practical investigation*** that will assist you in addressing the goal above. You may refer to the practical work that has been completed already in the Chemical Reactions unit. You must then ***perform the practical*** you have designed so that you can collect results that will help you determine the relationship the brand of antacid and its ability to neutralize an acid. You will be given the following ***chemicals and equipment to conduct your investigation***: HCl, beakers, pestle and mortar, Funnel and filter paper, universal indicator, brands of antacid tablets, measuring cylinders.
Product	A ***scientific report*** should be completed to include a ***design, analysis and evaluation*** section. This report will be an electronic document that will be submitted via Google classroom for marking and will ***communicate*** the science of your investigation. You teacher will advise you of the due date for the report.
Success Criteria for Assessment	The ***final scientific report MUST include*** (see MYP Practical Report Checklist for Students in your booklet): - Title - Research Question - Background information - Hypothesis - Variables - Apparatus - Method - Safety considerations - Results table - Observations - Calculations - Graph - Conclusion - Strengths and Weaknesses - Improvements

Level Descriptors and Task Specific Clarifications for Criterion B:

Level	Level Descriptor	Task Specific Clarification
0	The student does not reach a standard described by any of the descriptors below.	i. No research question stated. ii. No prediction stated. iii. Variables not identified. iv. Method and safety precautions not stated.
1-2	The student is able to: i. **select** a problem or question to be tested by a scientific investigation ii. **select** a testable prediction iii. **state** a variable iv. design a **method with limited success**.	i. A research question is stated but not relevant to the investigation. ii. A prediction with limited reference to acids and alkalis. iii. Independent, dependent and controlled variables identified but with inaccuracies. Method of data collection not indicated. iv. A method is presented but incomplete or not relevant to the investigation. Safety precautions not mentioned.
3-4	The student is able to: i. **state** a problem or question to be tested by a scientific investigation ii. **outline** a testable prediction iii. **outline** how to manipulate the variables, and **state** how **data** will be collected iv. design a **safe method** in which he or she **selects materials and equipment**.	i. A relevant research question is stated, but is not too clear or focused. ii. A prediction with some reference to the variables is made. iii. Independent, dependent and controlled variables identified but incomplete. Basic method of data collection is stated. iv. Method is presented in steps but does not clearly show how the experiment is conducted and/or how data is collected. Safety precautions stated but are not specific to the experiment.
5-6	The student is able to: i. **outline** a problem or question to be tested by a scientific investigation ii. **outline and explain** a testable hypothesis using **scientific reasoning.** iii. **outline** how to manipulate the variables, and **outline** how sufficient **relevant data** will be collected iv. design a **complete and safe method** in which he or she **selects appropriate materials and equipment**.	i. A research question is stated with reference to some correct variables. ii. A prediction with reference to the relationship between the independent and dependent variables is outlined. iii. Independent, dependent and controlled variables correctly identified, with an outline of how relevant data is collected. iv. Method is presented in clear steps with relevant details, with suitable materials and apparatus chosen. A labelled diagram to show how the apparatus is set up. Relevant safety precautions discussed.

7-8	The student is able to: i. **describe** a problem or question to be tested by a scientific investigation ii. **outline and explain** a testable hypothesis **using correct scientific reasoning** iii. **describe** how to manipulate the variables, and **describe** how **sufficient, relevant data** will be collected iv. Design a **logical, complete and safe method** in which he or she **selects appropriate materials and equipment**.	i. A research question clearly and explicitly identifies the independent and dependent variables with reference ii. A prediction with reference to the relationship between the independent and dependent variables is outlined and explained using relevant scientific reasoning. The explanation should mention neutralisation. iii. Independent, dependent and controlled variables correctly identified, outlining how they are manipulated, measured or controlled. Values of variables stated where appropriate. Outline how sufficient, relevant data is collected. iv. A complete method is presented in clear steps with all relevant details, stating values and measuring equipment used. A fully labelled diagram to show how the apparatus is set up. v. Safety precautions discussed and are relevant to this investigation.

Level Descriptors and Task Specific Clarifications for Criterion C:

Level	Level Descriptor	Task Specific Clarification
0	The student does not reach a standard described by any of the descriptors below.	i. No data presented. No graph plotted. ii. Trend not stated. iii. No conclusion on whether the prediction is supported by data. iv. No strengths or limitations relevant to the investigation stated. v. No improvement or extension stated.
1-2	The student is able to: i. **collect and present** data in numerical and/or visual forms ii. Accurately **interpret** data iii. **state** the validity of a hypothesis **with limited reference** to a scientific investigation. iv. **state** the validity of the method **with limited reference** to a scientific investigation v. **state limited** improvements or extensions to the method	i. Raw, quantitative data is presented in a table. A graph is attempted. ii. A trend is stated but is not supported by data. No scientific explanation given to explain the trend. iii. A conclusion is attempted , but with inaccuracies. iv. At least one limitation relating to the investigation is stated, but not relevant to the investigation. v. At least one improvement or extension stated but is not relevant to the limitation identified.
3-4	The student is able to: i. **correctly collect and present** data in numerical and/or visual forms ii. **accurately interpret** data and **describe** results	i. Raw, quantitative data is neatly presented in a table with headings. A graph is plotted with labelled axes. ii. Trend shown in the graph is outlined by stating a basic relationship between variables.

	iii. **state** the validity of a hypothesis based on the outcome of a scientific investigation iv. **state** the validity of the method based on the outcome of a scientific investigation v. **state** improvements or extensions to the method that would benefit the scientific investigation.	iii. A correct conclusion is drawn with reference to the prediction. iv. At least one limitation relating to the validity of the investigation is stated. v. At least one improvement relating to each limitation raised is stated.
5-6	The student is able to: i. **correctly collect, organize and present** data in numerical and/or visual forms ii. **accurately interpret** data and **describe** results **using scientific reasoning** iii. **outline** the validity of a hypothesis based on the outcome of a scientific investigation iv. **outline** the validity of the method based on the outcome of a scientific investigation v. **outline** improvements or extensions to the method that would benefit the scientific investigation.	i. Raw, quantitative data from multiple trials are neatly presented in a table with headings and relevant units. An attempt has been made to calculate averages. A correct type of graph is plotted. The graph has correctly labelled axes including units and suitable scales. Some observations are recorded. ii. Trend shown in the graph is correctly outlined and explained using some correct scientific knowledge relating to neutralisation. Anomalies/outliers are identified. iii. A conclusion is drawn. Student states if the data supports the prediction. iv. At least two limitations relating to the validity of the investigation are outlined. v. At least one improvement relating to each limitation is outlined. Extensions of investigation outlined.
7-8	The student is able to: i. **correctly collect, organize, transform and present** data in numerical and/ or visual forms ii. **accurately interpret data** and **describe** results **using correct scientific reasoning** iii. **discuss** the validity of a hypothesis based on the outcome of a scientific investigation iv. **discuss** the validity of the method based on the outcome of a scientific investigation v. **describe** improvements or extensions to the method that would benefit the scientific investigation.	i. Raw, quantitative data from multiple trials are neatly presented in a **table** with informative **headings** and relevant units. **Averages** are correctly calculated and presented in the table. A correct type of **graph** is accurately plotted. The graph has a **title**, correctly **labelled axes** including units and suitable scales. A line of best fit is included. Meaningful observations are recorded. ii. Trend shown in the graph relating to the factor investigated is correctly outlined with reference to specific data points. **Trend** is explained using correct scientific knowledge relating to neutralisation. Anomalies/outliers are correctly identified. iii. Correct conclusion is drawn as to how well the data supports the prediction, with reliability of the data discussed. iv. One strength and three limitations relating to the validity of the investigation are discussed. Consider how the limitations affected the data and how well the research question could be answered. v. At least one improvement relating to each limitation raised is described. Relevant extensions of investigation described.

Student Task Planning Notes:

MYP Science
Practical Report Template

Name:	Form:

UNIT:	
Statement of Inquiry:	
Key Concept:	
Related Concepts:	
Investigation Title:	

Criterion B - Inquiring and Designing

Research Question

(What are you trying to find out?)

Background Scientific Information and Hypothesis

(What do you think will happen and why?)

Variables

Independent *(What will change and how will you change it?)*	
Dependent *(What will you measure to gather result?)*	
Control *(What variables will you keep the same to make it a fair test? How will you keep the variables constant?)*	

Apparatus Set-up

(Draw a labelled diagram of the assembled apparatus that you will use. Write the name of any equipment not shown in the diagram)

Method

(Write a step by step account of how you conduct your experiment – the method must be DETAILED)

1.

2.

3.

4.

5.

Safety

(How will you make sure your method is safe?)

Reliability

(What will you do to ensure your results are reliable?)

Criterion C - Processing and Evaluating

Results

Raw Data

(A neat, organized table of results should be drawn, with headings, units, repeats and averages include)

Observations

(What changes did you notice as the experiment was conducted, e.g. colour change, bubbles, heat change?)

Graphing Results

You should draw a graph of your results and attach it to this report.

Analysis of Graph

(What did your results show? Are there any trends or patterns in your results? Can you give an example of a pattern or trend from your results?

Conclusion and Evaluation

Scientific Conclusion and Explanation of Results

(Summarize what your results show. Does this support your prediction? Can you explain your results using scientific knowledge?)

Evaluation of Scientific Method and Results

How reliable were your results? How well did your investigation answer the research question? What went well with your method?)

(Were there any problems or parts of your investigation that were not very accurate or could have been done better?)

Issue with justification	Suggested SCIENTIFIC Improvement

MYP Practical Report Checklist - Student

Before you submit your practical report to your teacher you must use the checklist below to ensure all parts of your report have been completed.

	Section	What you need to do	Completed Y/N
DESIGN **(MYP Criterion B: Inquiring and Designing)**	Title	Give a **name** to the experiment you are conducting	
	Research Question	The research question should be **clear, concise**, and include the independent variable and the dependent variable.	
	Background Information	You should give the **science theory** behind your investigation, and it should include scientific terminology. This should be presented as a **short scientific paragraph.**	
	Hypothesis	**What** do you predict will happen in your experiment and **why**?	
	Variables	**Independent** Variable - what will you change and how will you change it? **Dependent** Variable - what will you measure and how will you measure it? **Control** Variables - what are they? How and why are they controlled?	
	Apparatus	Have you completed a **diagram of assembled equipmen**t that shows how to successfully collect data? Have you used a **ruler and penci**l to do this? Have you **labeled** all the chemicals and equipment in your diagram?	
	Method	Have you written your method in the following format: - **Stepwise** - **Logical** order of steps in investigation - Used **correct names for chemical and equipment** - Provided detailed account of the steps in the method - Describe how you will **change the independent** variable - Describe how **control variables are monitored**	
	Safety	Discuss any **safety issues** with chemicals or equipment being used, and describe what **precautions** should be taken to ensure you conduct the investigation safely.	

RESULTS and CONCLUSION **(MYP Criterion C: Processing and Evaluating)**	Results Table	A **table of results must include**: - Headings - Units - Repeats - Averages	
	Observations	Record **detailed** observations: - At **start** of experiment - **During** experiment - At **end** of experiment Observations can include colour change, bubbles, heat etc.	
	Calculations	Calculate **averages** of repeats. Show **formula** for calculation Show **working out** for calculations Give final answer to calculation with **correct units**.	
	Graph	Draw a graph to include the following; - **Heading, labels with units** on each axis - **Suitable scales** that occupy minimum ¾ of each axis - **Plot** all points accurately - Draw a **curve or straight line of best fit** that ignores points that do not fit the pattern. - **Discuss trends or patterns** observed in graph.	
	Conclusion	**Summarize** what your results show. Does this support your **prediction/hypothesis**? Explain your results using **scientific knowledge**?	
	Evaluation	Discuss the **reliability** of your **results**. Discuss the **validity** of the **method** you used.	
	Improvements	Suggest improvements to the **scientific method** and describe how they can **reduce or eliminate errors**	

7C 15a Summary Sheets Chemical Reactions

Chemical reactions

In a **chemical reaction** a new substance is always formed. Most chemical changes are not easily reversed; they are **irreversible**. The chemicals that you start with are called the **reactants**. The chemicals at the end are called the products.

In a **physical change** no new substance is formed. Melting and evaporation are examples of physical changes. Physical changes are usually reversible.

You can tell that a reaction has occurred if there is a **colour change** or when a **gas** is given off. Most chemical reactions also involve an **energy change**. This is usually in the form of heat, but can also involve light being given off (for example, when something burns).

Reactions of acids

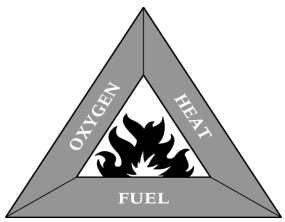
Some metals react with acids, and hydrogen gas is produced.
When acids react with chemicals called carbonates, carbon dioxide gas is given off. Carbonates are found in rocks such as limestone or marble, and in some cooking ingredients and indigestion tablets.

You can test the gas made in a reaction to find out what it is:

- **Hydrogen** burns with a squeaky pop if a lighted splint is held near the test tube.
- **Carbon dioxide** will put out a lighted splint, and it makes limewater turn milky.

Burning

A fire needs three things to keep burning: fuel, oxygen and heat. We show these three things on the **Fire Triangle**.



If any one of these three things runs out, the fire will go out.

When a metal burns, the metal combines with oxygen from the air to form a chemical called an **oxide**. We can show this using a **word equation**.

Combustion

Fossil fuels contain a lot of carbon and hydrogen. When they burn they use up oxygen from the air and produce water and carbon dioxide. We can show the reaction using a word equation. Energy is in brackets in this equation because it is not a chemical substance.

fuel + oxygen → carbon dioxide + water

Indicators are coloured dyes which often come from plants such as red cabbage and beetroot.
Acids make indicators change colour.
Litmus is an indicator which turns red in acids. 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**.

Alkalis have a different effect on indicators to acids. Litmus turns blue in alkalis. Alkalis can also be corrosive. Weak alkalis include soap and toothpaste.

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. Some of the common warning signs are:

toxic (poisonous)

harmful (irritant)

corrosive

flammable

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.

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 powders, washing powder, oven cleaner

lemon juice, fizzy drinks, milk, blood, toothpaste

Alkalis can react with acids, making a **neutral** chemical.

Neutralization reactions 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
- to keep foods such as jam at the correct pH.

7C 15b Quick Quiz (Chemical Reactions)

Circle the correct letter for each question.

7C 1

1 Two liquids were mixed together in a test tube. Which one of these would **not** show that a chemical reaction had taken place?

A The tube got warm.

B Bubbles of gas were given off.

C A brightly coloured solid formed in the tube.

D One of the liquids floated on top of the other.

2 Which of these changes is a chemical reaction?

A melting some margarine in a pan

B boiling a kettle of water

C frying an egg

D cooling a drink by putting an ice cube in it

3 The substances that you get at the end of a chemical reaction are called:

A reactants.

B chemicals.

C products.

D gases

4 A chemical reaction:

A always produces a gas.

B is always reversible.

C makes new substances.

D does not make new substances.

7C 2

1 Which kind of chemical will react with an acid to form hydrogen?

A metal

B water

C carbon

D petrol

2 To test for hydrogen you must:

A Put the gas over a Bunsen Burner.

B Mix the gas with limewater.

C Put a lit splint into the gas.

D Smell the gas.

3 Hydrogen gas:

A burns with a squeaky pop.

B makes a glowing splint relight and burn brightly.

C puts a glowing splint out.

D turns universal indicator solution red.

7C 3

1 Which two chemicals would you mix together to make carbon dioxide?

A an acid and a metal

B an acid and a carbonate

C an alkali and a metal

D an alkali and a carbonate

2 Carbon dioxide is used:

A to make the bubbles in fizzy drinks.

B to fill party balloons.

C to help people breathe more easily.

D in gas cookers, to provide heat.

3 Which of these will show that a gas is carbon dioxide?

A milk turns to water

B rosewater turns pink

C limewater turns milky

D burns with a squeaky pop

4 Which substance does not contain carbonates?

A indigestion tables

B limestone

C baking powder

D sugar

7C 4

1 When a metal burns it:

A combines with oxygen from the air.

B combines with nitrogen from the air.

C gives off carbon dioxide.

D gives off oxygen.

2 Which is the correct equation to show what happens when magnesium burns?

A magnesium + nitrogen → magnesium nitride

B magnesium + oxygen → magnesium oxide

C magnesium + oxygen → carbon dioxide + water

D magnesium oxide → magnesium + oxygen

3 A fire needs three things to keep burning. They are:

A coal, air, smoke

B natural gas, wood, heat

C heat, fuel, nitrogen

D heat, fuel, oxygen

4 A fire can be put out by:

A removing its fuel.

B removing its oxygen.

C cooling it down.

D any of the above.

7C 5

1 Which list contains only fuels?

A wood, iron, plastic

B wood, petrol, oxygen

C petrol, oil, natural gas

D air, wood, oil

2 When a fuel burns there is:

A a reversible physical change.

B a reversible chemical change.

C an irreversible physical change.

D an irreversible chemical change.

3 Which statement finishes off this word equation for burning?

fuel + oxygen → _____

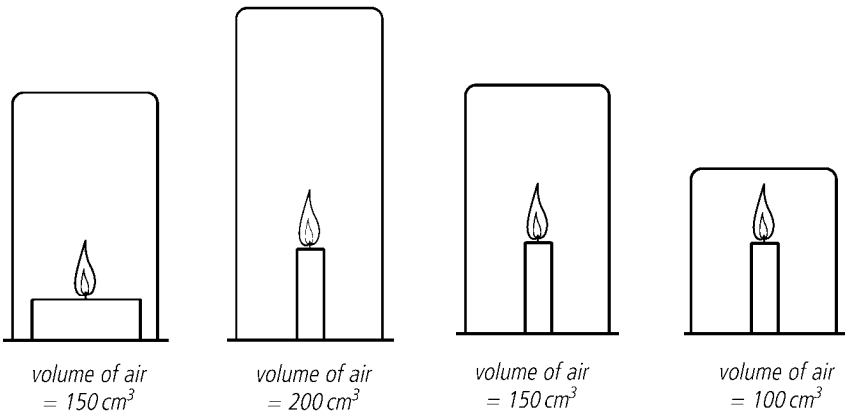
A carbon dioxide + water (+ energy)

B carbon dioxide + carbon monoxide

C fuel oxide + oxygen (+ energy)

D methane + carbon dioxide (+ energy)

4 Which of these candles will burn the longest?



7C 6

1 What does this sign mean?

A flammable
B harmful
C poisonous
D explosive

2 Acids:

A are always dangerous.
B are more dangerous when strong than when weak.
C are more dangerous when weak than when strong.
D can be made safe by heating them.

3 The hazard warning signs on chemical tankers:

A tell the driver of the lorry what the maximum safe driving speed is.
B tell other drivers the distance to stay back from the lorry.
C allow the police to check the speed of the tanker.
D help the emergency services deal with a spillage if there is an accident.

4 Alkalis:

A are much safer than acids.
B can be more dangerous than acids.
C are always more dangerous than acids.
D are not allowed to be transported by road.

7C 7

1 Acids taste:

A sweet.
B bitter.
C sharp.
D salty.

2 The name of an acid in lemon juice is:

A citric acid.
B hydrochloric acid.
C sulphuric acid.
D acetic acid.

3 Which of these foods will contain most acid?

A frozen peas
B rice pudding
C pickled onions
D chips

4 Which list has three foods which all contain vitamin C (ascorbic acid)?

A peas, oranges, cabbage
B bread, peas, baked beans
C oranges, bread, baked beans
D oranges, bread, cabbage

7C 8

1 Litmus can be used as an indicator because it:

A is an acid.

B is an alkali.

C changes colour.

D comes from a plant.

2 Which one of these is an acid?

A tap water

B salt water

C vinegar

D soap

3 Which one of these is an alkali?

A lemon juice

B toothpaste

C vinegar

D tap water

4 Which of these is not neutral?

A salty water

B sugary water

C tap water

D soapy water

7C 9

1 The pH scale indicates

A how hot something is.

B how acid or alkaline something is.

C how long something is.

D how much substance is dissolved in a solution.

2 The pH number of a strong acid is:

A 1

B 5.5

C 7

D 9

3 The pH number of a weak alkali is:

A 1

B 5.5

C 7

D 9

4 What colour will universal indicator turn when mixed with a strong alkali?

A red

B orange

C green

D purple

7C 10

1 A wasp sting has a pH of about 10. You could treat it best using:

A a strong acid.

B a weak acid.

C a weak alkali.

D a strong alkali.

2 The word which best describes what happens when an acid reacts with an alkali is:

A acidification.

B evaporation.

C neutralisation.

D alkification.

3 If you took a solution of pH 5 and diluted it with water, the pH number would:

A go down by one or two.

B stay the same.

C go up by one or two.

D go up by three or four.

4 If you mixed a solution of pH 4 with one of pH 8, the final pH could be:

A 2

B 6

C 10

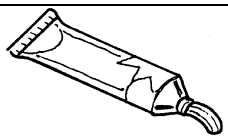
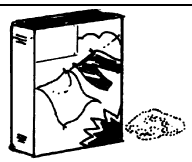
D 12

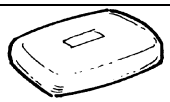
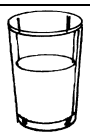
7C 16a Additional Practice Questions

CHEMICALS IN THE HOME

The chart shows the names of some substances you find in the home.

Five of them are acids, five are alkali. Use the internet to find out which are which. Write 'acid' or 'alkali' in each blank box. One has been done for you.

				
vinegar	toothpaste	picked onions	orange juice	washing powder

				
soap	lemonade	bleach	milk of magnesia	hair perming lotion
		acid		

Extension: Find out what the word 'Alkali" means.

What can alkalis be used for?

7C 16b CRACKING THE HAZCHEM CODE (Extension)

The number code:			
1 Jets	**3** Foam		
2 Fog	**4** Dry agent		
P R	V	FULL	DILUTE
S T	V	BA	
W X	V	FULL	CONTAIN
Y Z	V	BA	
E consider evacuation			

What the numbers mean:

1 **Jets** means that the fire can be put out using jets of water from a hose.

2 **Fog** means that the fire brigade can still use water. It has to be a fine mist or spray rather than full power jets.

3 **Foam** means that the tanker needs to be sprayed with a layer of thick foam to smother the flames.

4 **Dry agent** means that water must NOT be used on this fire. It has to be kept dry. Examples of dry agents are sand, powders, or carbon dioxide gas.

Using the information above attempt to answer the following questions


A


B

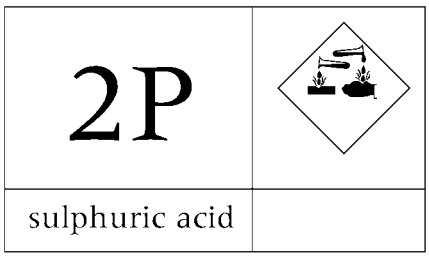

C


D

1 Which of these hazard warnings means that a chemical is:

a flammable **b** poisonous **c** corrosive **d** an irritant?

2 The Hazchem Code tells the police and fire services about the hazards of a chemical in a tanker. Look at the Hazchem symbol.



Hazchem code on a tanker.

a What chemical is being carried in the tanker?

b What is the **number** on the Hazchem warning sign?

c What word matches this number on the code chart?

d How should the fire brigade put out a fire on this tanker? Choose from:

A use jets of water

B use a fine spray mist of water

C use a dry powder.

e What is the **letter** on the Hazchem warning sign?

f The 'V' means that there could be a violent reaction with the chemical. Is this a problem with the sulphuric acid?

g The fire brigade will either have to wear breathing apparatus and gloves (BA) or a FULL protective suit. Which should they wear in this case?

h A spillage of the chemical may be able to be washed away (DILUTE). Some chemicals need to be collected up (CONTAIN). Which should the fire brigade do in this case?

i Does the warning sign have an ‘E’ in the code?

j Should the police clear the area, or is it safe for people to stay where they are?

k How do you know?