

Chemistry in our Home

Starter

1. List some examples of chemical reactions:



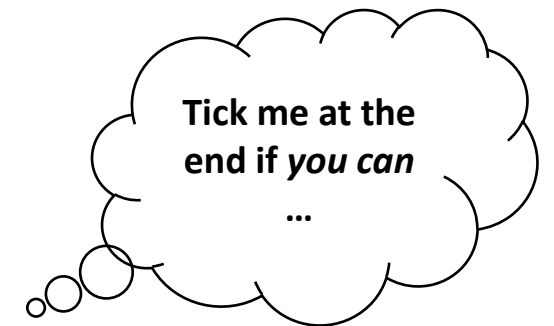
Chemical and Physical Changes

Learning Intentions:

- To learn about the differences between physical and chemical changes

Success Criteria

- ☐ I can describe the differences between physical and chemical changes
- ☐ I can name examples of chemical and physical changes



What do you think the difference between a chemical and a physical change is?



Chemical and Physical Changes

Page 2

Matter is everywhere and is anything that takes up space and has mass. Matter is constantly experiencing both chemical and physical changes.

Changing from a solid to a liquid to a gas, is a physical change. The chemical nature is still the same.



- A physical change is one in which **NO** new **substances** are made.
- Physical changes are usually (but not always) quite easily **reversed**.
- A chemical reaction is a change in which a **new substance** is **always** made.
- A chemical reaction is **not** easily reversed.



[illegible][illegible]



A burning match





Making toast





Ice cube melting





Glass breaking





Roof rusting





Frying an egg





Paint Drying





Bananas Rotting





Water Boiling



Chemical and Physical Changes

Page 3



Baking a cake





Moulding Bread





Explosion



Chemical and Physical Changes



Learning Check

Chemical Reaction	Physical change
A burning match	Ice cube melting
Making toast	Glass breaking
Roof rusting	Paint drying
Frying an egg	Water boiling
Banana rotting	
Baking a cake	
Moulding bread	
Explosion	



TRUE

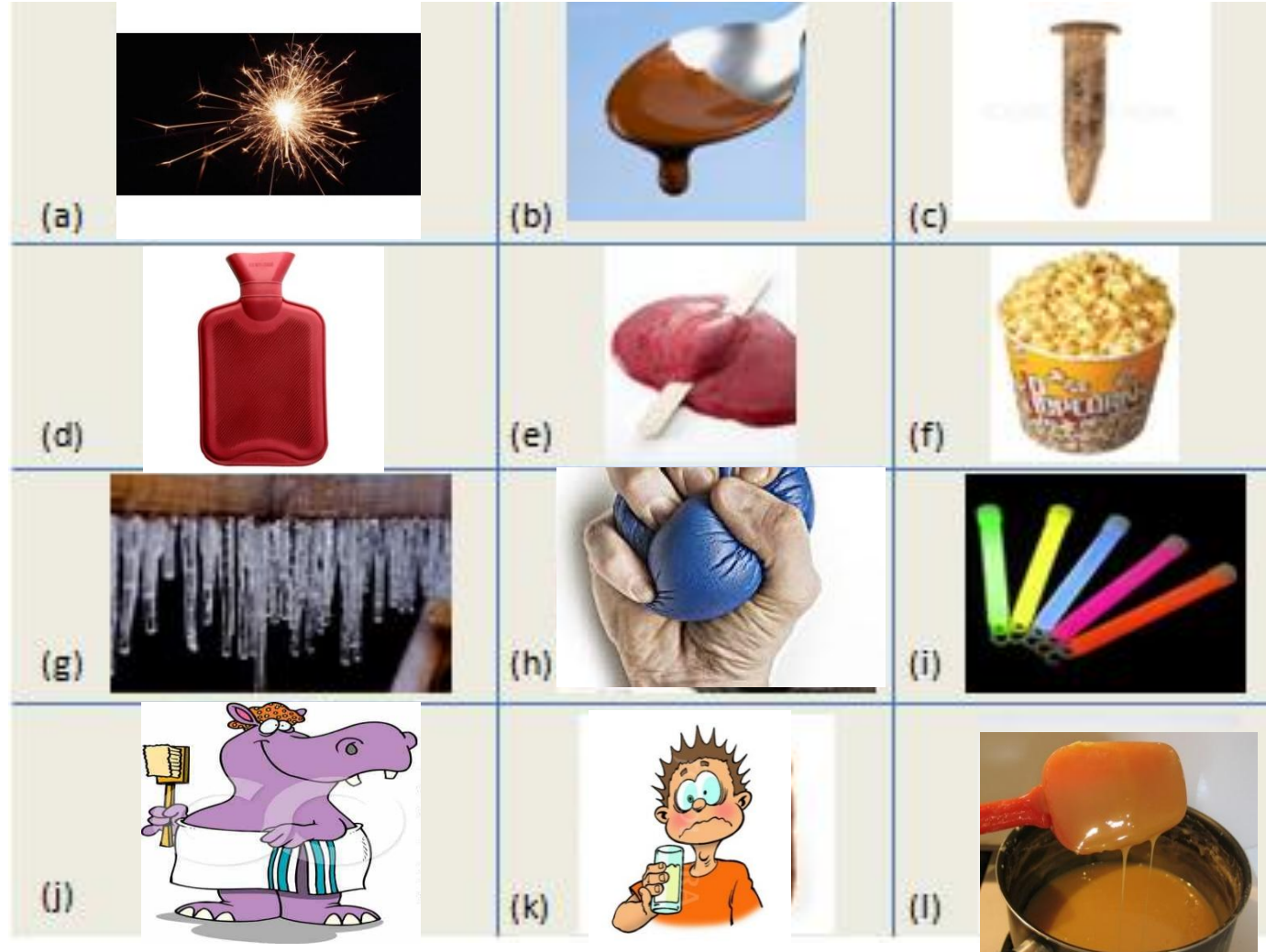
True or False



FALSE

1. In a chemical reaction a new substance is always formed. -
2. A physical change is usually easily reversed.
3. Crushing a can is an example of a chemical change.
4. Puddles evaporating is an example of a physical change.
5. Baking a cake is an example of a chemical change.

Chemical or physical? – extension task



BLOOKET

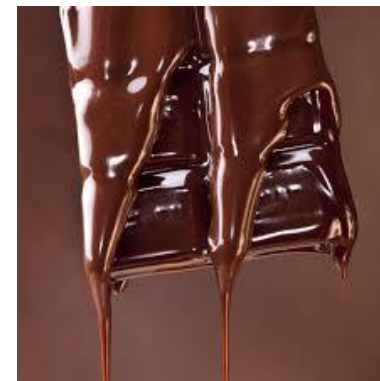
<https://dashboard.blooket.com/set/68c31041533a5a2dbab73094>

- Go to **page 24**.
- Summarise what you have learned in the table by:
 - Writing down/drawing key concepts learned
 - What did you learn?
 - Did what you learn change the way you think?
- Comment on any real-world applications you can use for this information

Lesson	Key Concepts Learned	Real-World Applications
Chemical and physical changes		

Starter

1. Explain why chocolate melting is an example of a physical change.
2. Give an example of physical changes and chemical changes which happen in your home.

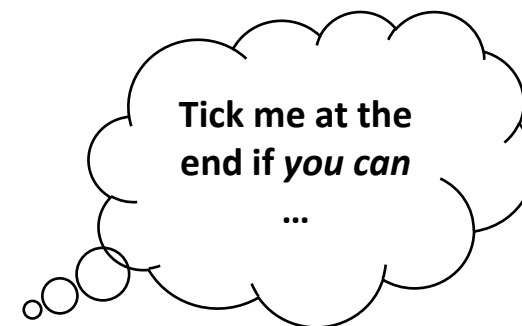


Learning Intentions:

- To learn how to identify when a chemical reaction is taken place
- To learn how to write a chemical equation

Success Criteria

- ☐ I can identify when a chemical reaction has taken place
- ☐ I can write a chemical word equation



Chemical Reactions

Chemical reactions happen every day in our home!



Chemical Reactions

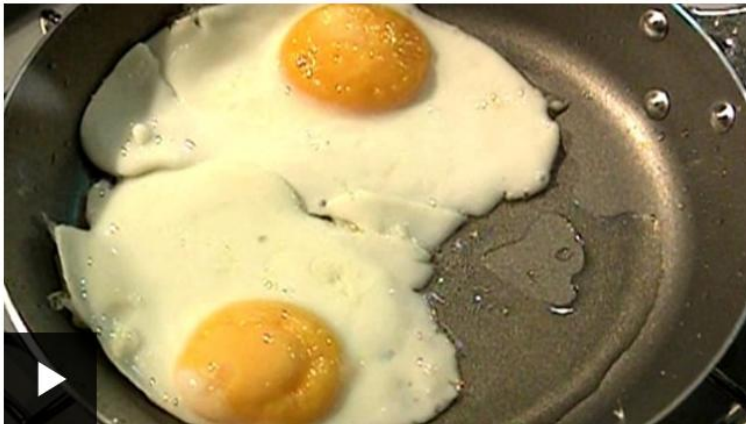
From the short video clip answer the following:

1. What do the words reactant and products mean?

Chemical reactions in cooking food

Part of [Design and Technology](#) | [Cooking](#)

Duration 01:14



More Clips



Optimum temperatures to make fudge and toffee



The bread-making process

[All KS2 Cooking videos](#)



Video link

The substances that react together are called the reactants.



The new substances made are called products.

Example: When your car rusts



Iron and oxygen react together to form iron oxide (rust). What are the reactants? What are the products?

Word Equations



In chemistry we can write word equations for everyday chemical reactions.



+ means “and”

$\longrightarrow$ means “changes into”

Word Equations

Symbols used in word equations:

+

“and”



“changes into”

Symbol never used in word equations:

=

“equals”

acid + alkali ~~=~~ salt + water

Example: Burning coal in a fire

Coal and oxygen react together to produce carbon dioxide.



Questions:

1) What are the reactants? What are the products?

Reactants: coal and oxygen. Products: carbon dioxide

2) Write the word equation for this reaction.

Coal + oxygen $\longrightarrow$ Carbon dioxide

Chemical Reactions Demonstration

How do you know if a chemical reaction has taken place? What did you see?

Write the word equations for the first three.

Screaming Jelly Baby
Elephants toothpaste
Whoosh bottle



Demonstration 1: Screaming jelly baby



Write up:

Sugar reacts with potassium chlorate to produce carbon dioxide, water and potassium chloride.

- Write the *word* equation for this reaction.

Glucose + potassium chlorate → carbon dioxide + water + potassium chloride

- What did you see happening?

Energy change, colour change, new substance formed.

Demonstration 2: Elephants toothpaste

Write up:

Hydrogen peroxide decomposes to **produce** oxygen and water.

- Write the *word* equation for this reaction.

Hydrogen peroxide → oxygen + water

- What did you see happening?

Energy change, colour change, effervescence, new substance formed.



Demonstration 3: Whoosh Bottle

Write up:

Alcohol burns in oxygen to produce water and carbon dioxide.

- Write the *word* equation for this reaction.

Alcohol + oxygen → water + carbon dioxide

- What did you see happening?

Energy change, colour change, new substance formed.



Extension:

Given the descriptions of chemical reactions, write the word equations.



For example:

Iron and oxygen react together to form iron oxide (rust).

Iron + oxygen → iron oxide (rust)

If you complete this task, there is another extension where you write a description from the word equation.

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Starter

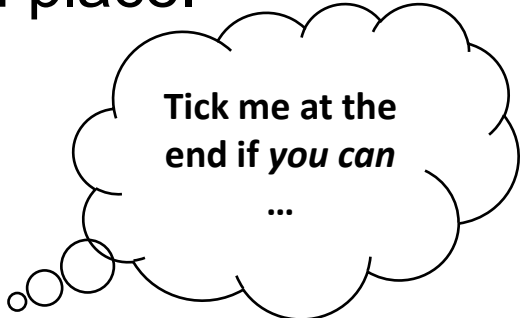
1. You have just baked a cake; how do you know a chemical reaction has taken place?
2. Your chocolate melted in the sun, how do you know a chemical reaction has not taken place?

Learning Intentions:

- To learn how to identify when a chemical reaction has taken place.

Success Criteria

- ☐ I can state the terms used for the signs of a chemical reaction.



Tick me at the
end if *you can*

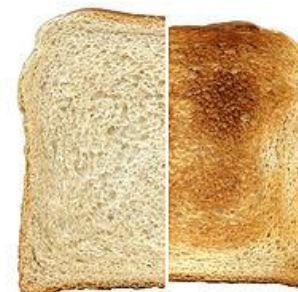
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Signs of a Chemical Reaction

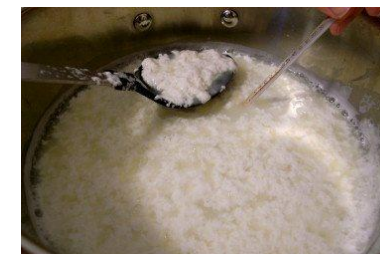
Page 10

- There may be a Colour Change.
- There may be Effervescence.
- There may be Precipitation.
- There may be an Energy Change.

A new substance is **always** formed.



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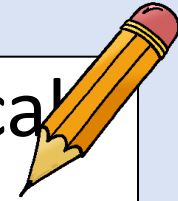
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Signs of a Chemical Reaction

Page 10

Effervescence - **gas** produced during a chemical reaction.



Precipitation - Formation of a **solid** when two liquids chemically join.

Aim: To identify a chemical reaction.

Method:

You will now work in pairs or groups of 3 to carry out the following experiments.

There will be experiment stations placed around the room

Your teacher will show you how much of each substance you will use.

Wash your hands after using chemicals

Keep your safety specs on

You may need to finish this next lesson



Signs of a Chemical Reaction

Results:



Page 11

Station	Substances Mixed	Observation	Chemical reaction?
A	Dilute Sulfuric Acid (0.5M) + Copper Carbonate	Fizzing, smell, colour change	Yes
B	Dilute Sulfuric Acid + Sodium Hydroxide	Got hot	Yes
C	Ethanoic Acid (vinegar) + Baking Soda	Fizzing	Yes
D	Water + Copper Oxide	No Change	No
E	Lead Nitrate Solution + Potassium Iodide Solution	Yellow solid formed	Yes
F	Dilute Sulfuric Acid + Copper	No change	No
G	Water + Iron nail	No Change	No
H	Dilute Sulfuric Acid + Magnesium	Fizzing	Yes
I	Copper Sulfate Solution + Iron Filings	Colour change, got hot.	Yes

Conclusion: *what is the answer to your aim?*

Evaluation: *how could you improve your experiment?*



Extension:

Using the descriptions of the experiments, explain how you know a chemical reaction has taken place.

Use the signs of chemical reaction we have discussed already.



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Starter

1. Match the term on the left to the correct definition on the right.

1. Effervescence	A. A change in which a new substance is made.
2. Chemical Change	B. Formation of a solid when two liquids chemically join.
3. Reactant	C. Gas produced during a chemical reaction.
4. Physical Change	D. Chemicals present at the start of a chemical reaction.
5. Precipitation	E. A change in which <u>no</u> new substance is made.

The diagram shows five colored arrows connecting the terms on the left to the definitions on the right:

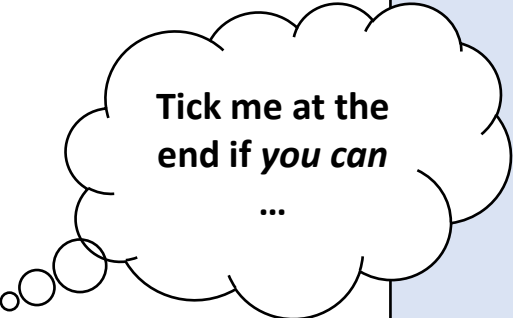
- A blue arrow connects "1. Effervescence" to "C. Gas produced during a chemical reaction."
- A red arrow connects "2. Chemical Change" to "A. A change in which a new substance is made."
- A green arrow connects "3. Reactant" to "D. Chemicals present at the start of a chemical reaction."
- A black arrow connects "4. Physical Change" to "B. Formation of a solid when two liquids chemically join."
- A red arrow connects "5. Precipitation" to "E. A change in which no new substance is made."

Learning Intentions:

- To learn how to speed up the rate of reaction

Success Criteria

- ☐ I can state the factors that change the speed of a reaction.



Tick me at the
end if *you can*

...

Speeding up a chemical reaction

Scientists have developed ways of controlling chemical reactions. Sometimes we want fast reactions and sometimes we want slow reactions. Rusting of cars can be slowed down by painting over the exposed metal.



Chemical reactions that make food rot can be controlled by putting it in the fridge. This slows the reaction down as the temperature is much lower.



Speeding up a chemical reaction

Sometimes we are interested in speeding up reactions. In industry a catalyst can be added to speed up a reaction.

When cooking, you chop food into smaller pieces so they cook faster.

You also increase the temperature to ensure they cook faster.



Speeding up a chemical reaction

Page 14

Aim: To find out different ways we can speed up a chemical reaction



Method: *Draw method*



Results:

Effect	Reaction	Quickest reaction
Concentration	5 mL of Low/high concentration vinegar + one small spatula of sodium bicarbonate	
Particle size	5 mL of 0.1M hydrochloric acid + marble lumps/chips	
Temperature	1 Glow stick in cold and 1 glow stick in hot water	

Conclusion:

Speeding up a chemical reaction

Page 14

Conclusion:



Evaluation:



Particle size

Potatoes cook faster when cut up into smaller pieces.
A block of wood burns slower than wood shavings.

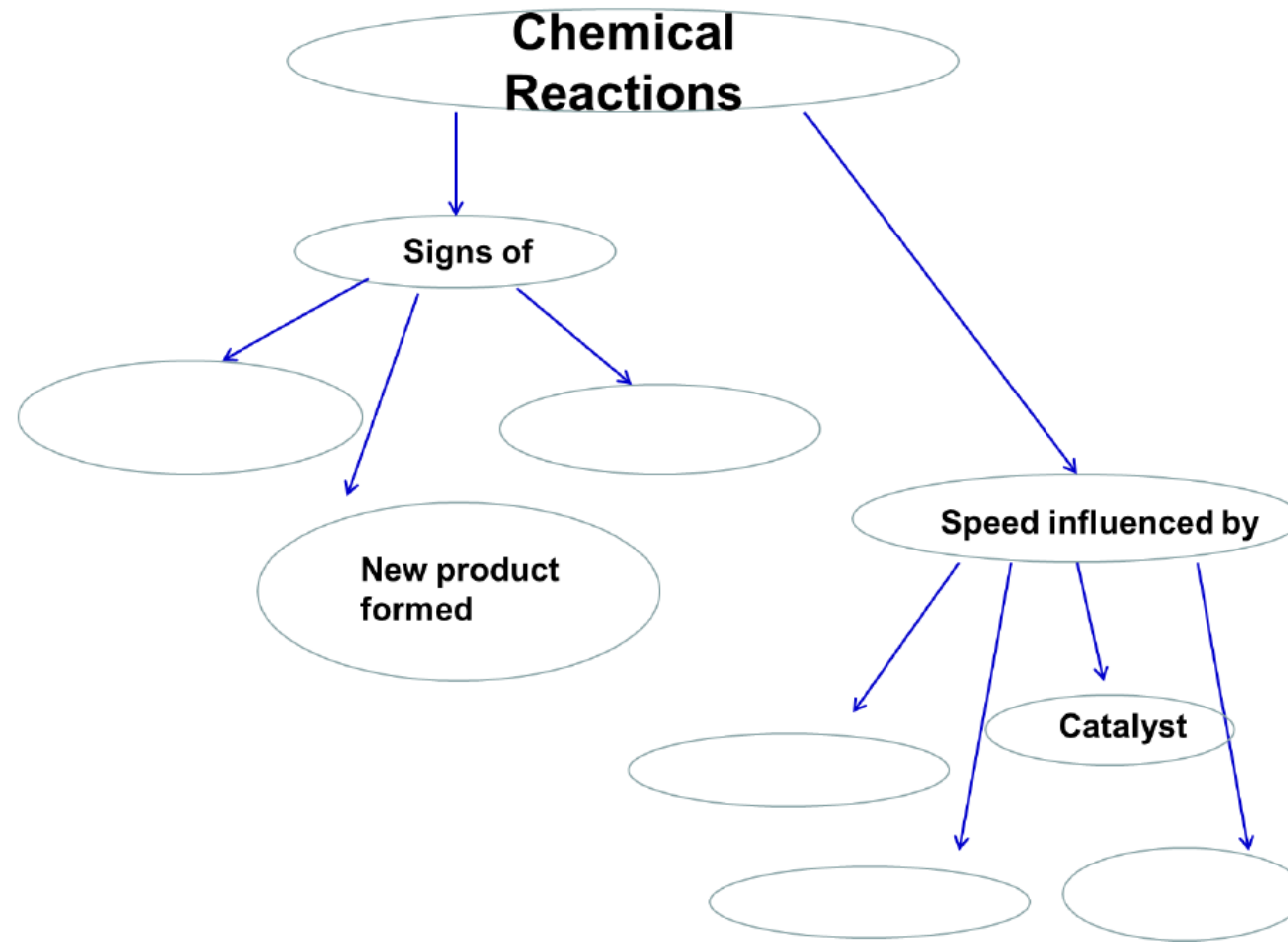
Temperature

A car exhaust rusts faster than the rest of the car.
Food goes off slower in the fridge and even slower in the freezer.
Washing powder works slower in cold water than in warm water.
Plants grow faster in a greenhouse than outside.

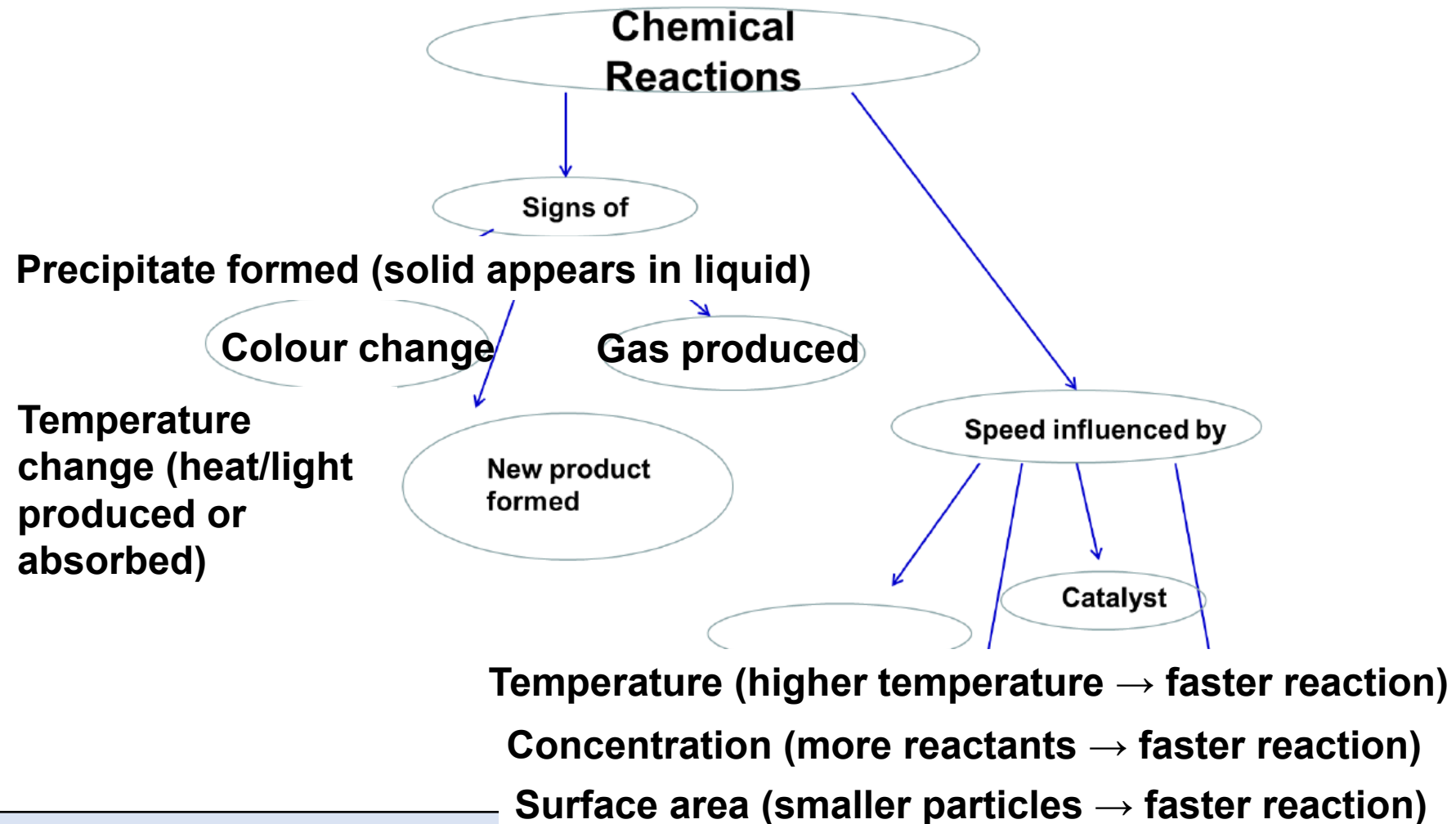
Concentration

Ships rust faster at sea than on a river because of the higher concentration of salt.

Fill in the blanks



Fill in the blanks



- Go to **page 24**.
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- Comment on any real-world applications you can use for this information

Starter

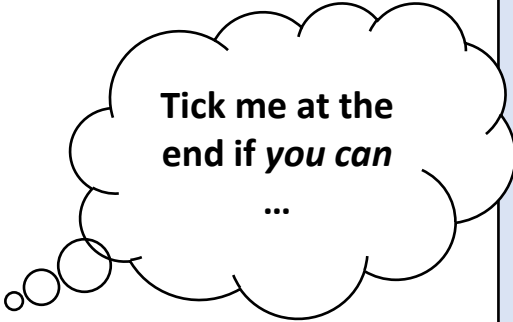
1. State which headings are required in a lab report in order.

Learning Intentions:

- To independently investigation and write up a scientific report.

Success Criteria

- ☐ I can safely take part in a practical investigation
- ☐ I can record my findings accurately
- ☐ I can clearly report my investigation.
- ☐ I can draw a line/bar/scatter graph



Tick me at the
end if *you can*

...

You will be undertaking a practical investigation and doing a formal scientific report write-up which must include:

- **Title**
- **Date**
- **Aim**
- **Hypothesis** (what do you think will happen?)
- **Variables**
 - Independent (what you change or control)
 - Dependant (what you measure)
- **Measurements and observations**
- **Method** (a labelled diagram)
- **Safety**
- **Results** (in a table with headings and units)
- **Graph**
- **Conclusion** (what did you find out)
- **Evaluation** (How could you improve the experiment)

**YOUR TEACHER
WILL GIVE YOU AN
OUTCOME 1 REPORT
HANDOUT!**

Investigation outline

- You will be investigating how the concentration of acid affects the rate of reaction.

Procedure

1. **Place** 3 clean test tubes into a test tube rack.
2. Measure:
 - Test tube 1:** 5 ml of 0.1 M concentration acid.
 - Test tube 2:** 5 ml of 0.5 M concentration acid.
 - Test tube 3:** 5 ml of 1.0 M concentration acid.
3. **Measure** $\frac{1}{4}$ spatula of calcium carbonate powder into test tube 1 and start the timer immediately.
 1. **Record** the time it takes for the bubbles (effervescence) to stop.
 2. **Repeat** with **test tube 2** and **3**.

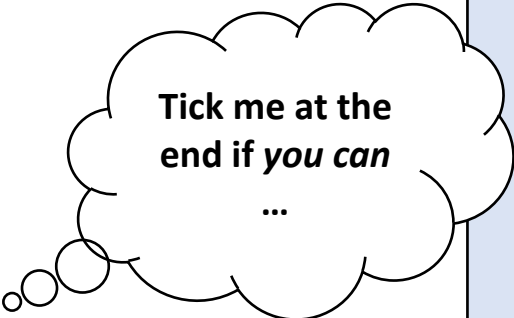
Starter

1. You are cooking chicken for a stir fry, list 2 different ways to speed up the cooking process?
2. Why does keeping vegetables in the fridge prevent them from rotting quickly?



Learning Intentions:

- To learn about acids and bases in our home



Tick me at the
end if *you can*
...

Success Criteria

- ☐ I can identify examples of acids and bases
- ☐ I can state the difference between an alkali and a base
- ☐ I can determine if a substance is acidic or basic using an indicator

How do these foods and drinks taste?

What do you think they have in common?

Are they dangerous?



Acids have a sour taste. The word “acid” comes from the Latin Acidus, meaning “sour”.

Acids are found in our food and drinks. Acids are important as they:

- Contribute to the taste of food.
- Preserve food preventing food rotting.
- Essential for providing Important chemicals for our body.



FOLIC ACID



vegetables,
grains and nuts,
fruit



CITRIC ACID



oranges, lemons
limes grapefruits.

Acids in Food

ETHANOIC ACID (ACETIC ACID)



vinegar for flavouring
and pickling

TARTARIC ACID



bananas, grapes

LACTIC ACID



milk, cheese,
cream sour cream,
yogurt



Acids in Health



Health and Healthcare Services

Every child has the right to the best possible health. Governments must provide good quality healthcare, access to nutritious foods, clean water and a clean environment.

Acids in our food and in vitamins are used by our body to carry out important reactions.
These are *weak* acids.

Not *all* acids are dangerous!

What is a strong acid?

An acid is a group of chemicals which behave in a similar way.

Some acids are very dangerous (too dangerous to taste or touch). These are *strong* acids and are corrosive.



Bases are another group of chemicals, the opposite of acids.



- We use *weak* bases daily for cleaning purposes.



What is a strong base?

Some bases, like those in the laboratory or in cleaning materials are too dangerous to touch.

These bases are said to be caustic because they can burn skin and damage other materials! They are *strong* alkalis.



What is a base?

- An alkali is a base, but alkalis also dissolve in water.

Acid

Opposite of base

Base

Opposite of acid

Alkali

Also dissolves
in water



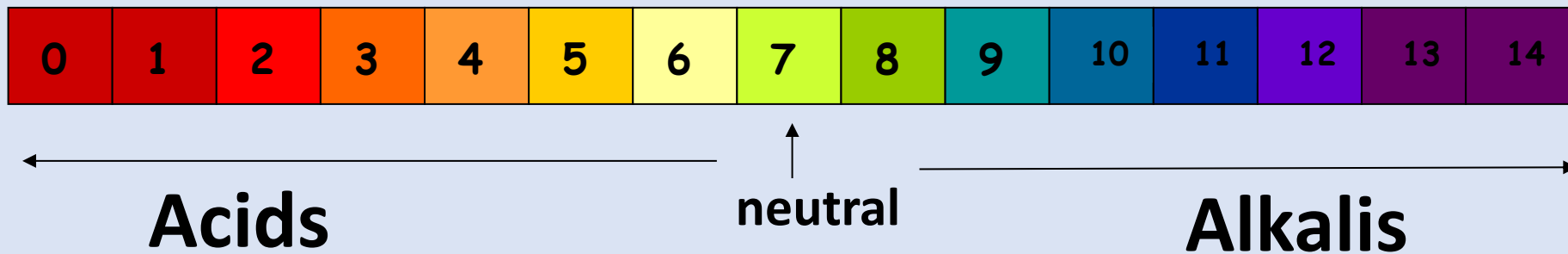


Indicators are special substances used to tell the difference between acids and bases. Their colours are affected by acids and bases.

Indicator	Colour in acid	Colour in base
Litmus		
Methyl orange		
Bromothymol blue		
Phenolphthalein		



Indicator	Colour in acid	Colour in base
Litmus	red	blue
Methyl orange	red	orange
Bromothymol blue	orange	blue
Phenolphthalein	colourless	pink



Found in citrus fruit
like lemons

Can be cleaning
products

Can form corrosive rain that can
damage lakes and crops

Acid or Base?

Foods that contain
this taste sour

Can cut through
grease – used as
oven cleaner

Found in your
stomach

What are substances called that are
neither acid or base?

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Starter

1. Vinegar is an acid we use on our chips.

Why do you think we couldn't use hydrochloric acid on our chips?

Explain your answer.

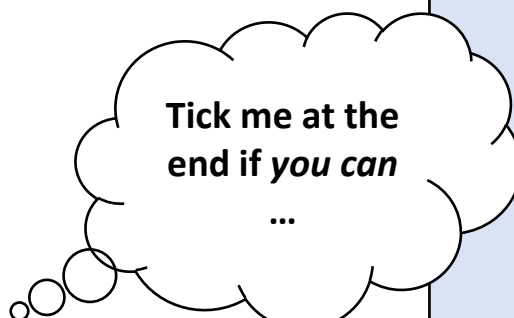


Learning Intentions:

- To learn about acids and bases in our home

Success Criteria

- ☐ I can identify examples of acids and bases
- ☐ I can state the difference between an alkali and a base
- ☐ I can determine if a substance is acidic or basic using an indicator



Tick me at the
end if *you can*

...

The pH Scale and Universal Indicator

Page 19

Acids: substance with a pH less than 7

Base: substance with a pH more than 7



Colour and label the pH scale below



Aim:

To find out which household items are acid and which are alkaline.



Method:

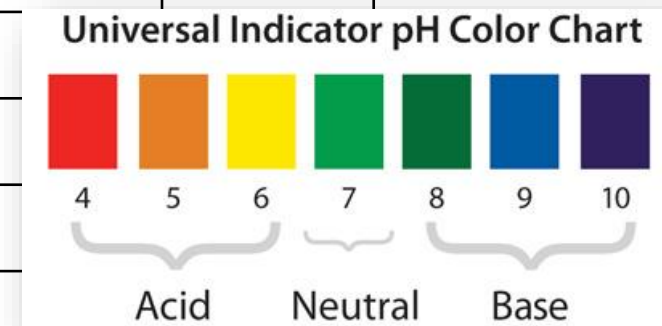
1. Put one of the solutions or powders in the dimple tile
2. Add a few drops of universal indicator and observe the colour.
3. Use the colour chart to find the pH number of the substance.
4. Note the result in your table.
5. Record whether the solution is acid, neutral or alkali.
6. Wash the dimple tile thoroughly with water.
7. Test the other substances and record your results.

Measuring the pH of household items

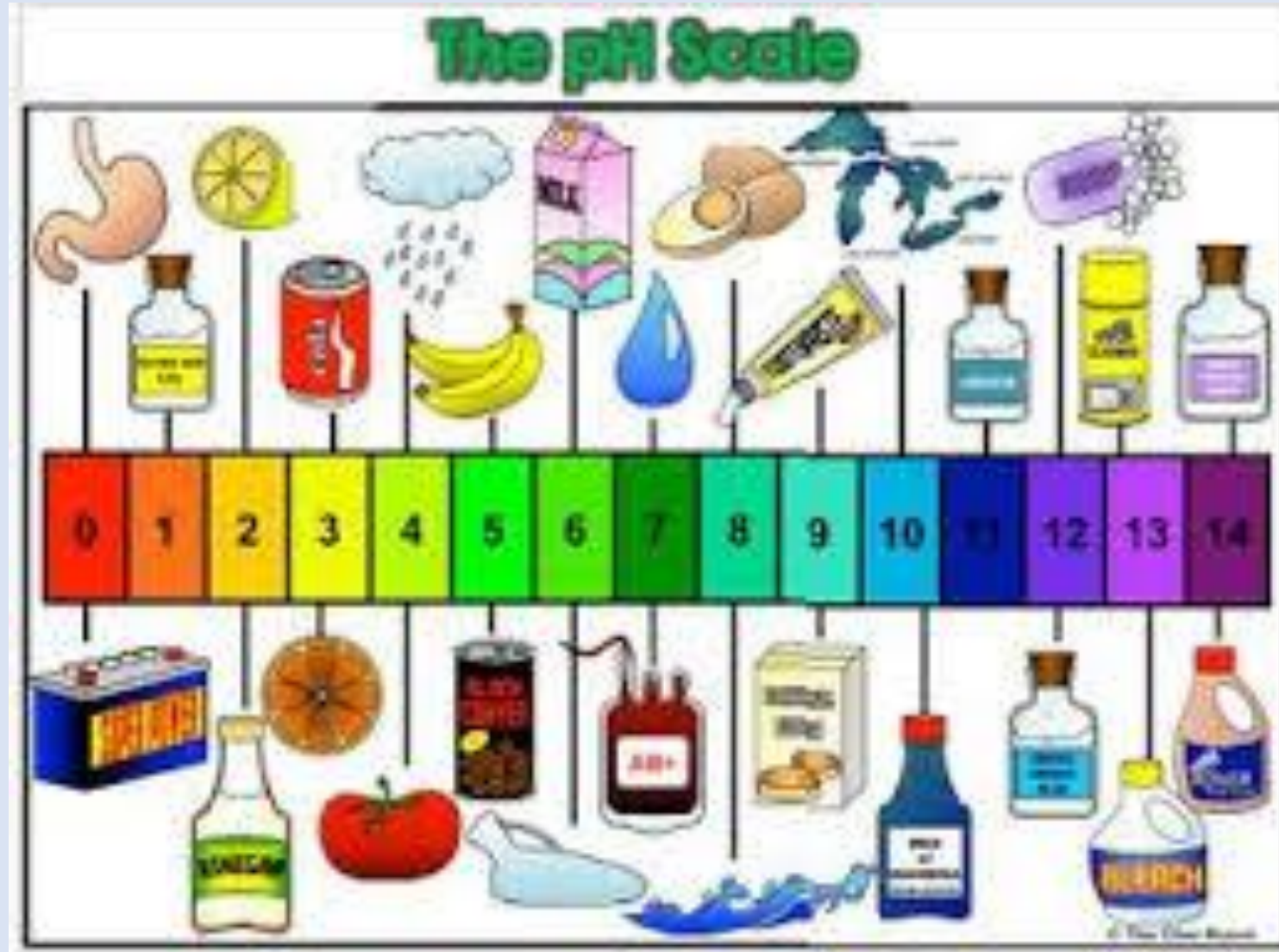
Page 20



SUBSTANCE	COLOUR	pH	ACID or ALKALI
Baking soda			
Fizzy water			
Salt (sodium chloride)			
Distilled (pure) water			
Lemon juice			
Orange juice			
Oven Cleaner			
Soap solution			
Vinegar			
Washing Soda			
Ethanol			



Measuring the pH of household items



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Starter

1. What is an indicator?

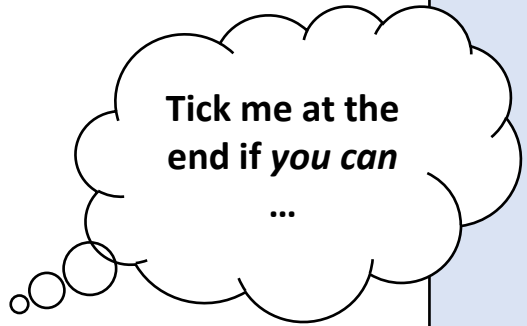
2. What would be the characteristics of a good indicator?

Learning Intentions:

- To make a natural indicator from plants

Success Criteria

- ☐ I can make an indicator from plants
- ☐ I can determine if an indicator is effective or not



Tick me at the
end if *you can*

...

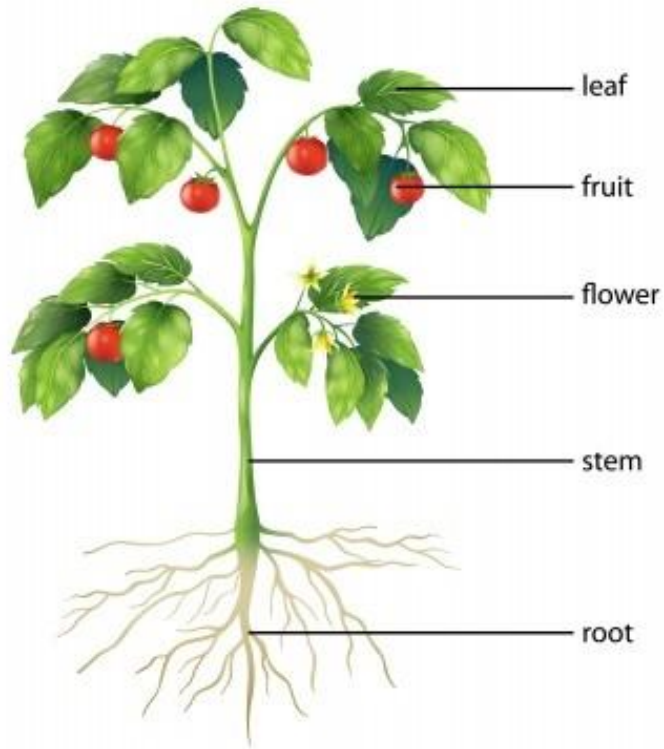
Natural Indicators

Many natural substances such as fruit and vegetables contain a chemical which can be used to make indicators



Natural Indicators

Flowering Plant (Angiosperm) Anatomy





Aim: To investigate which plant part is the best indicator.

Results:

Plant Part	Colour in Acid	Colour in Alkali
Root (red onion, beetroot)		
Leaves (red cabbage)		
Fruit (blueberries, raspberries)		

Method

- Break your plant part (berry, flower petal, leaf or root) into small pieces and place them in a mortar.
- Crush the plant pieces using a pestle.
- Add a little water.
- Keep crushing until all the colour has come out. (Add a little methylated spirit if there is not much colour)
- Use a dropper to put some liquid into two test tubes.
- Add a little acid to one test tube and a little alkali to the other. Observe the colours.
- Repeat the experiment with other plant parts.
- Note the results in your table.

.



Conclusion: *what is the answer to your aim?*

Evaluation: *How could you improve your experiment?*

Use the following pH scales help answer the questions on page 21.

	pH: 2	7	12
Beetroot			
Blueberry			
Red Cabbage			

7

12

Beetroot

Blueberry

Red Cabbage

- Go to **page** .
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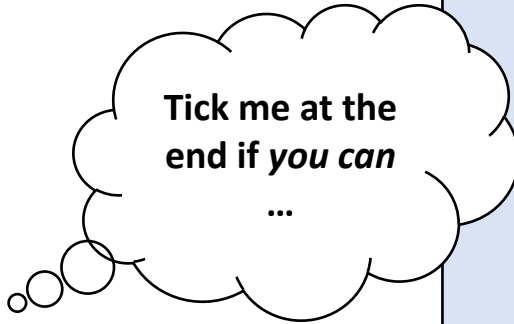
1. Why is universal indicator better than litmus indicator?
2. What is the pH range of acids?
3. What is the pH range of alkalis?
4. What is the pH of a neutral solution?

Learning Intentions:

- To learn about neutralisation reactions

Success Criteria

- ☐ I can identify a neutralisation reaction
- ☐ I can describe what happens to the pH when a neutralisation reaction occurs



Tick me at the
end if *you can*

...

Neutralisation Reactions

Page 23

Acids and alkalis are chemical opposites.

They react together and “cancel each other out”.



If you mix just the right volume and concentration of acid and base together, you get a **neutral** solution.

This is called a Neutralisation reaction.

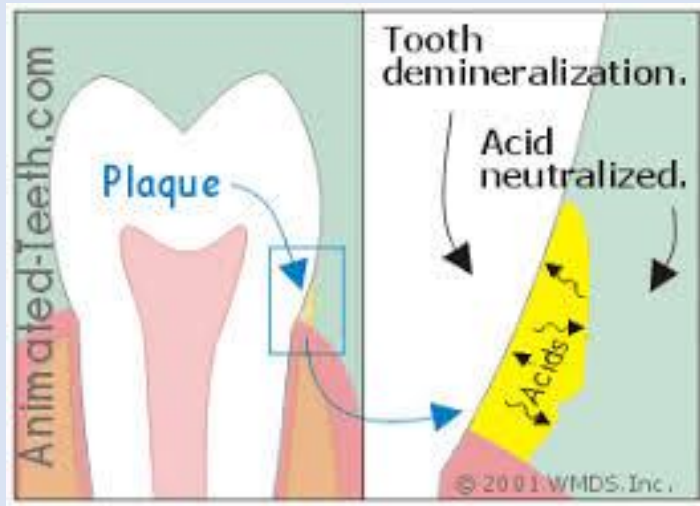
Everyday neutralisation reactions

Shampoos are mildly alkaline which causes your hair to tangle. Hair conditioners are mild acid the acidity in the hair conditioner will neutralise the alkalinity.



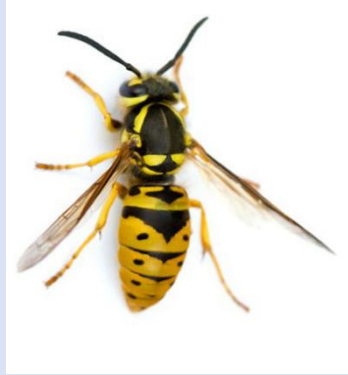
Everyday neutralisation reactions

Alkaline toothpaste neutralises acid that would cause tooth decay.



Everyday neutralisation reactions

Wasp stings are **alkaline**, why can vinegar be used to treat them?



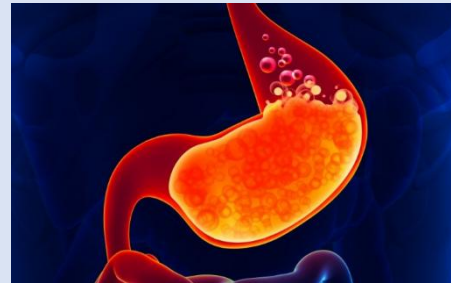
Bee stings are **acidic**, why can baking soda be used to treat them?



Everyday neutralisation reactions

Hydrochloric acid is used in the body to help digestion and kill bacteria.

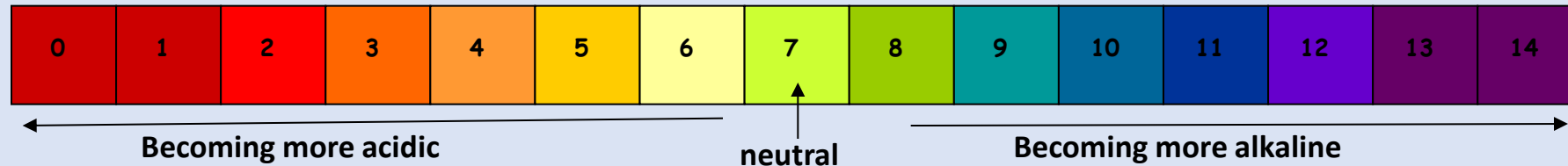
However too much acid can cause **indigestion** and we use indigestion remedies to **neutralise** excess acids.



An indigestion remedy contains a **base** which reacts to form a **neutral** compound and raises the pH of the stomach.

Remember neutral solutions have $\text{pH}=7$ and give a **light green colour** with universal indicator or pH paper

The pH Scale - Acids and Alkalis



The colours of solutions with universal indicator



Aim:

To investigate the effect of dilution on pH.

Method/Results: *Draw your method below*

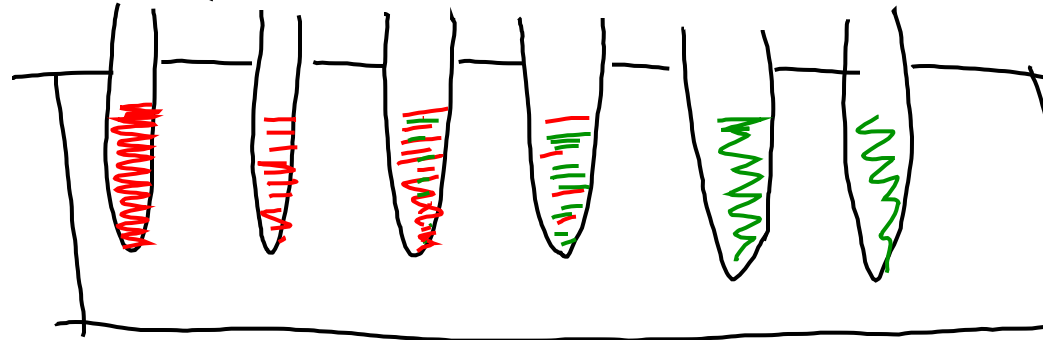


Method:

1. **Set up a test tube rack with six test tubes.** Label them 1-6.
2. Add 10 cm³ hydrochloric acid to test tube 1.
3. Read the following instructions very carefully;
4. In test tube 2, add 1 cm³ of the acid from test tube 1 and 9 cm³ of water.
5. In test tube 3, add 1 cm³ of the acid from test tube 2 and 9 cm³ of water.
6. In test tube 4, add 1 cm³ of the acid from test tube 3 and 9 cm³ of water.
7. In test tube 5, add 1 cm³ of the acid from test tube 4 and 9 cm³ of water.
8. In test tube 6, add 1 cm³ of the acid from test tube 5 and 9 cm³ of water.

Add Universal Indicator to each cylinder.

10 cm³ hydrochloric acid

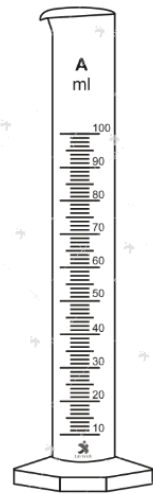


Dilution Experiment

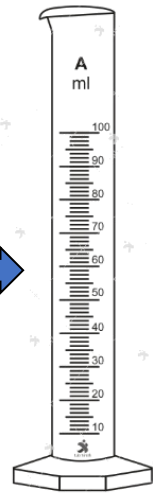


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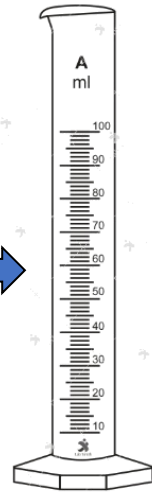
Method:



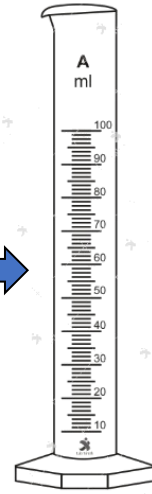
10 ml acid,
diluted to
100 ml



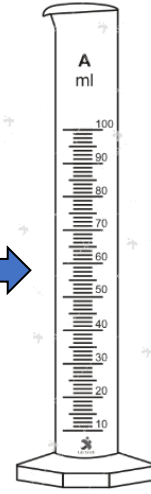
10 ml
transferred,
diluted to
100 ml again



10 ml
transferred,
diluted to
100 ml again



10 ml
transferred,
diluted to
100 ml again

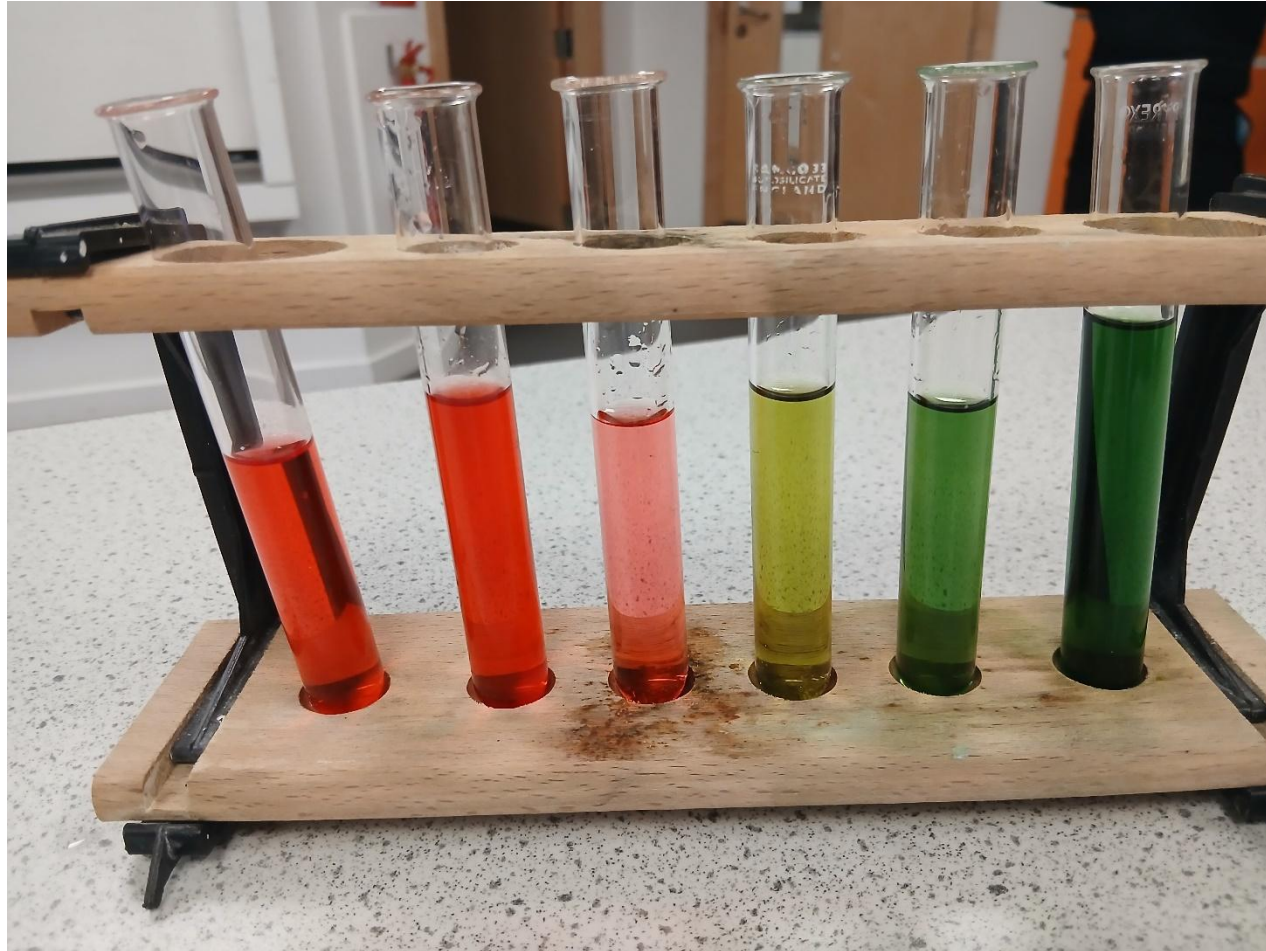


10 ml
transferred,
diluted to
100 ml again

Dilution Experiment

Page 24

Results: *colour in each test tube with the corresponding colour shown with universal indicator.*





Conclusion: *what is the answer to your aim?*

Evaluation: *How could you improve your experiment?*



Aim:

To find out when a neutralisation reaction has taken place.

Method: *Draw your method below*

Neutralisation Experiment

Method

1. Use a measuring cylinder to measure 10cm^3 acid into a clean small beaker.
2. Add a few drops of universal indicator.
3. Note the colour and pH in your table
4. Rinse the measuring cylinder with water.
5. Add 1cm^3 alkali to the beaker.
6. Note the colour and pH in your table
7. Add another 1cm^3 alkali and note result
8. Repeat until you have added 9cm^3 .
9. Now use a dropper and add alkali drop by drop until the solution turns green
10. Note the final volume of alkali used.

Neutralisation Experiment



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Results:

Volume of alkali added (cm ³)	Colour of solution	pH
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		



Conclusion:

The exact final volume of alkali needed to neutralise the acid was _____ cm³.

- Go to **page 24**.
- Summarise what you have learned in the table by:
 - Writing down/drawing key concepts learned
 - What did you learn?
 - Did what you learn change the way you think?
- Comment on any real-world applications you can use for this information

Starter

1. Name 2 everyday neutralisation reactions.
2. Indicator was added to an acid, an alkali and a neutral substance. Match acid, alkali and neutral up with the colours below:

Red:

Purple:

Green:

3a) What is the name of the reaction called when you add the same volume of acid and alkali together?

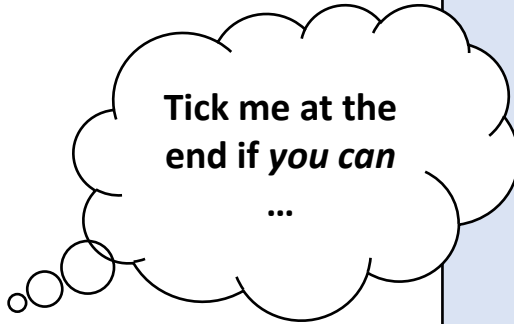
b) What pH will the reaction be at the end?

Learning Intentions:

- To learn about neutralisation reactions

Success Criteria

- ☐ I can identify a neutralisation reaction
- ☐ I can describe what happens to the pH when a neutralisation reaction occurs



Tick me at the
end if *you can*

...



The new substances made when a base is exactly neutralised by an acid are a **salt** and **water**.

The reaction can be shown by a **word equation**.

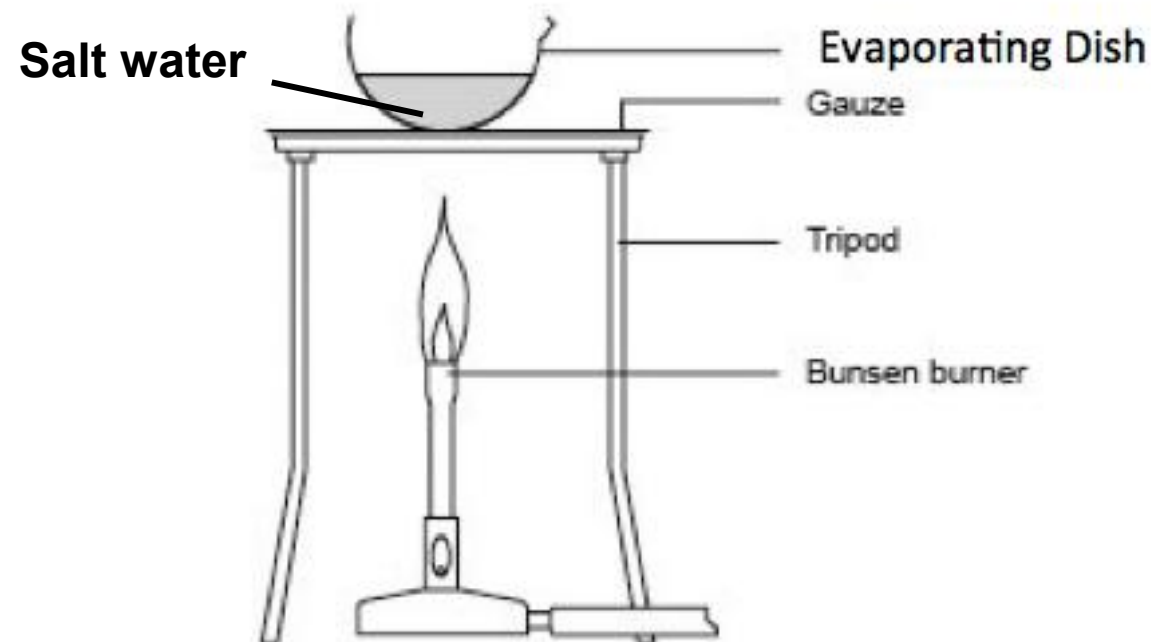




Aim: To obtain salt from a neutralisation reaction

Method: *Draw method*

How do you think we could separate the salt from the water?



Forming Salt Experiment

Method:

1. Collect some pre-made neutral solution (salt water)
2. Do not add indicator! Check the pH with pH paper – this should be neutral!

Then...

1. Pour your solution into a ceramic dish.
- 2 Heat carefully with a Bunsen as shown by your teacher
3. Only heat until you have about half the volume of solution.
4. Leave your equipment to cool then move your dish to the window ledge where the rest of the water will evaporate by next lesson.

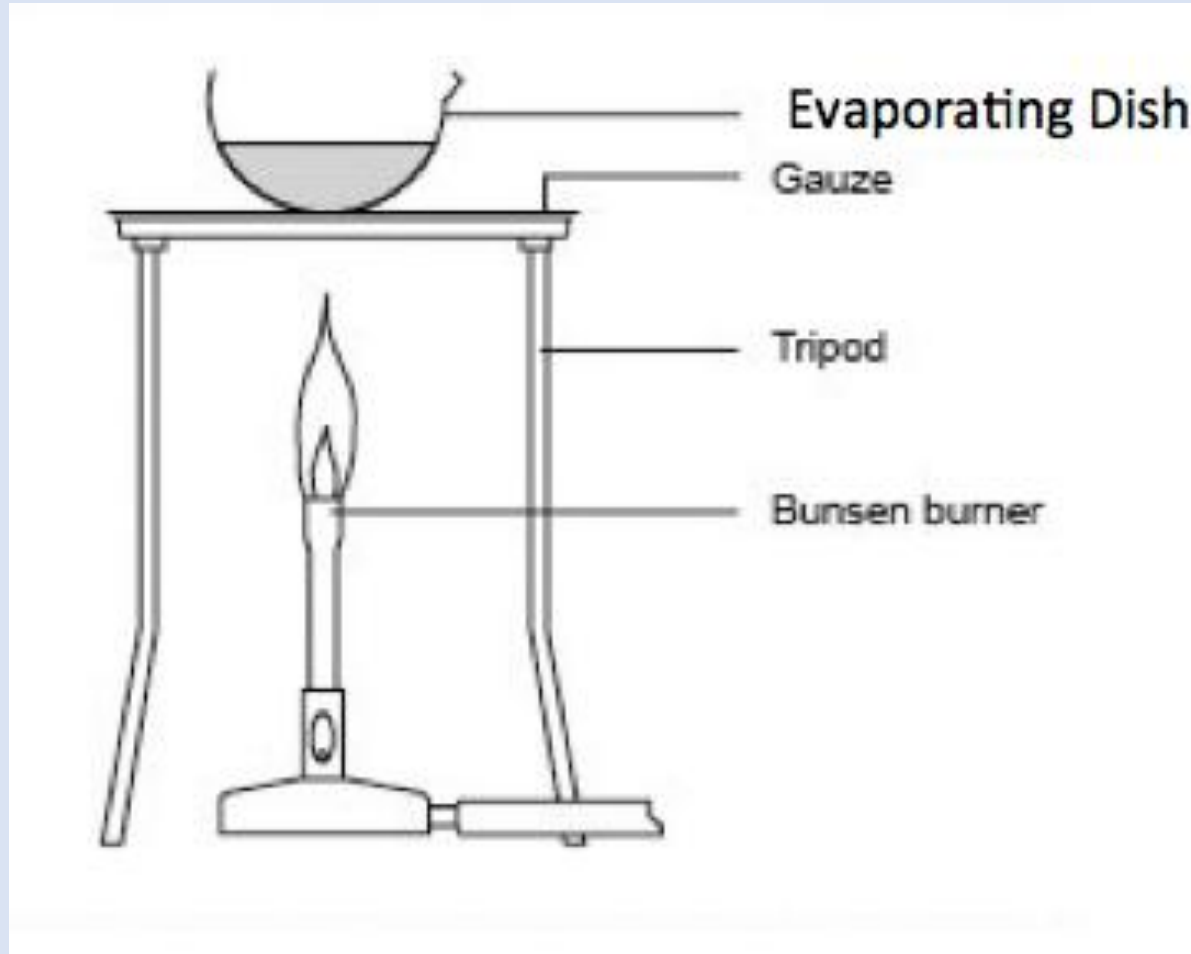


Results: *What did you observe?*

Conclusion: *What is the answer to your aim?*

Evaluation: *How could you improve the experiment?*

Forming Salt



Question: How would you separate a salt that does not dissolve in the water?



We can identify the metal in the salt we have made by carrying out a flame test.

Dip a wire loop into your salt. Burn the crystals in a blue flame to see what colour they give. You can also try different flame colours.

Flame colour: _____ Metal identified: _____

FLAME TEST COLOURS

