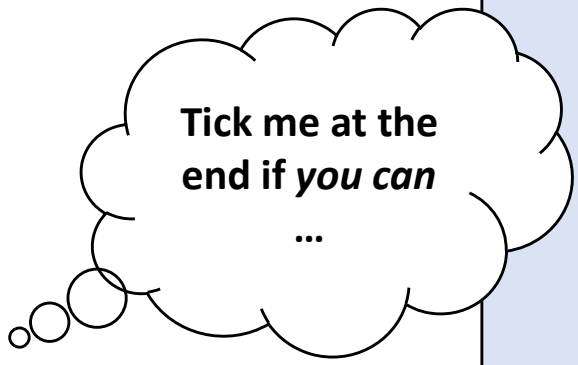
Chemistry in our Home

Starter

1. List some examples of chemical reactions:

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?

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 <u>physical change</u> is one in which **NO** new **substances** are made.
- <u>Physical changes</u> are usually (<u>but not always</u>) quite easily **reversed**.

- A <u>chemical reaction</u> is a change in which a **new substance** is **always** made.
- A chemical reaction is **<u>not</u>** easily reversed.

Chemical and Physical Changes

24/09/2024

Look at the following pictures and decide if they are a chemical reaction or physical change. Can you think of some of your own that happen at home?

Chemical Reaction	Physical change

A burning match

Making toast

Ice cube melting

Glass breaking

Roof rusting

Frying an egg

Paint Drying

Bananas Rotting

Water Boiling

Baking a cake

Moulding Bread

Explosion

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 or 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

(a) 

(b) 

(c) 

(d) 

(e) 

(f) 

(g) 

(h) 

(i) 

(j) 

(k) 

(l) 

- 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		

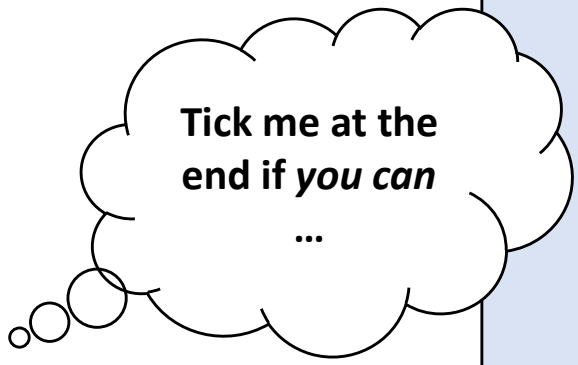
Starter

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

24/09/2024

Chemical reactions happen every day in our home!

Chemical reactions in cooking food

From the short video clip answer the following:

1. What does the words <u>reactant</u> and <u>products</u> mean?

Video link

Chemical Reactions

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.

Iron + Oxygen → Iron Oxide

reactants *change into* *products*

\+ means “and”

→ means “changes into”

Symbols used in word equations:

+	“and”
→	“changes into”

Symbol never used in word equations:

=	“equals”

acid + alkali ~~=~~ salt + water

Chemical Reactions

<u>Example:</u> Burning coal in a fire

Coal and oxygen **<u>react</u>** together
to **<u>produce</u>** carbon dioxide.

<u>Questions:</u>

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 ⟶ Carbon dioxide

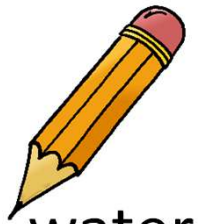
Chemical Reactions Demonstration

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

Chemical Reactions Demonstration

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.

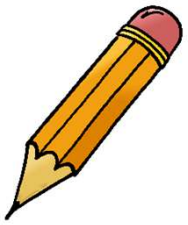
Glucose + potassium chlorate → carbon dioxide + water + potassium chloride

- What did you see happening?

Energy change, colour change, new substance formed.

Chemical Reactions Demonstration

Demonstration 2: Elephants toothpaste



Write up:

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

- Write the *word* equation for this reaction.

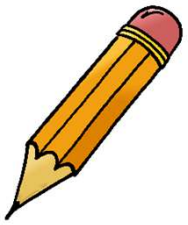
Hydrogen peroxide → oxygen + water

- What did you see happening?

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

Chemical Reactions Demonstration

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.

Plenary

- Go to **page 24**.
- Summarise what you have learned in the table by:
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Starter

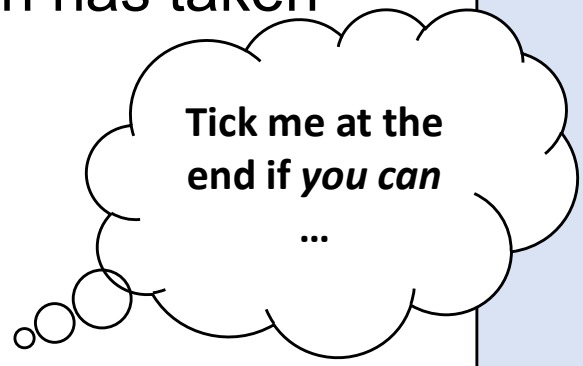
1. You have just baked a cake; how do you know a chemical reaction has taken place?

2. Your chocolate melted in the sun, how do you know a chemical reaction has not taken place?

Signs of a Chemical Reaction

Learning Intentions:

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

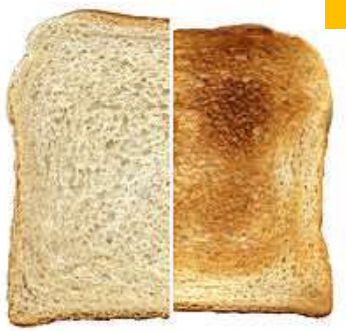


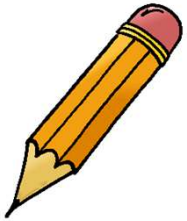
Success Criteria

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

Signs of a Chemical Reaction

- 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.

Signs of a Chemical Reaction

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

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

Signs of a Chemical Reaction

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:

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 and got hot.	Yes

Signs of a Chemical Reaction

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

Evaluation: *how could you improve your experiment?*

Match the definition – plenary

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 no new substance is made.

Plenary

- Go to **page 24**.
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Starter

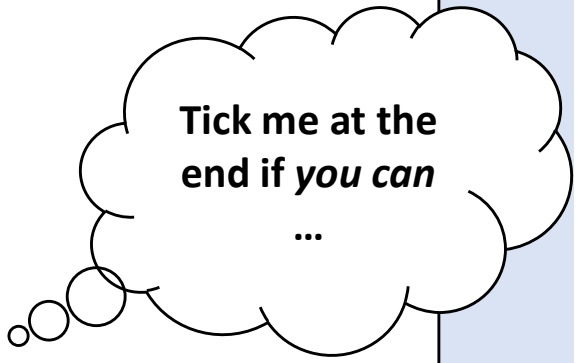
1. Match the term on the left to the correction definition on the right.

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 no new substance is made.**

Speeding up a chemical reaction

Learning Intentions:

- To learn how to speed up the rate of reaction



Success Criteria

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

Speeding up a chemical reaction

24/09/2024

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

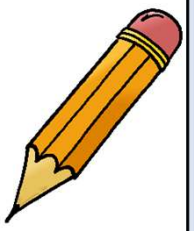
24/09/2024

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

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



Method: *Draw method*

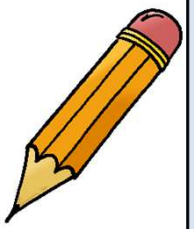
Speeding up a chemical reaction

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:

Conclusion:



Evaluation:

Speeding up a chemical reaction

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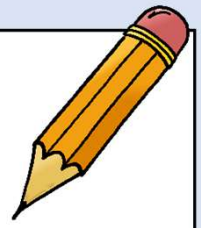


Particle size

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.

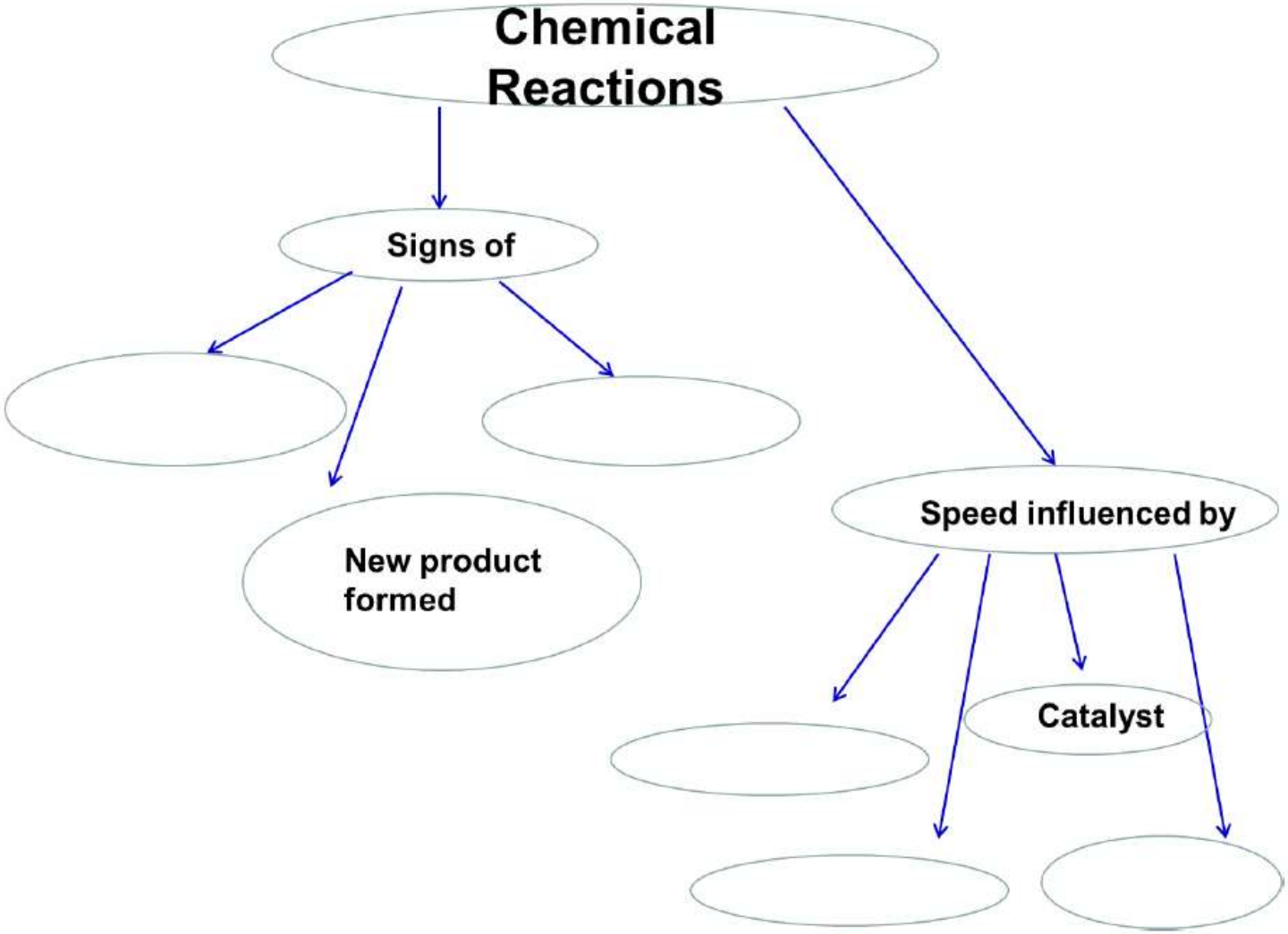
Washing powder works slower in cold water than in warm water.

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



Plenary

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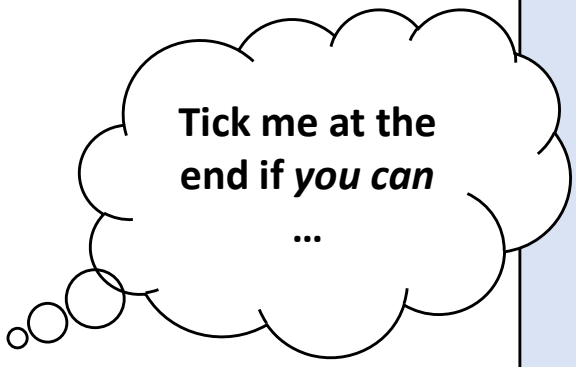
Starter

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



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

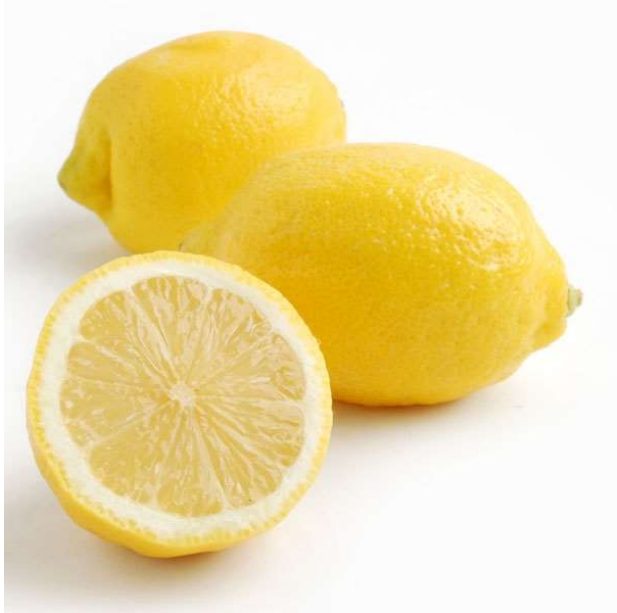
Acids and Bases

24/09/2024

How do these foods and drinks taste?

What do you think they have in common?

Are they dangerous?



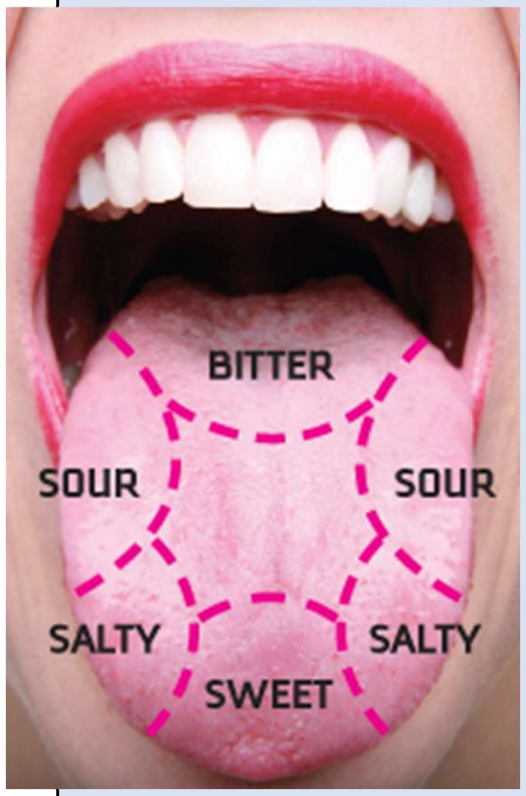
Acids in Food

24/09/2024

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

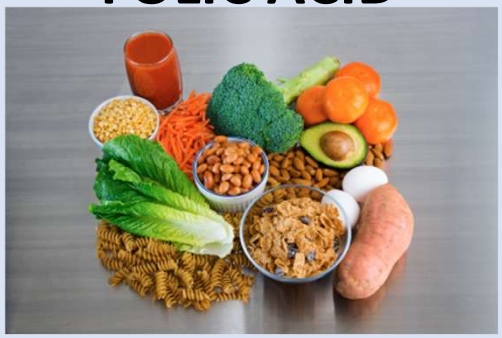
Acids are found in our food and drinks. Acids are important as they:

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

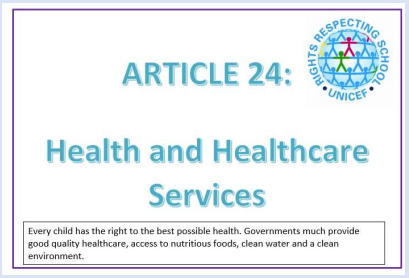


Acids in Food

FOLIC ACID



vegetables,
grains and nuts,
fruit



CITRIC ACID

oranges, lemons
limes grapefruits.

TARTARIC ACID

bananas, grapes

ETHANOIC ACID (ACETIC ACID)

vinegar for flavouring
and pickling

LACTIC ACID

milk, cheese,
cream sour cream,
yogurt

Acids in Health

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!

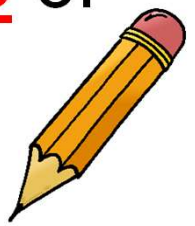
What is a strong acid?

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.

What is a base?

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

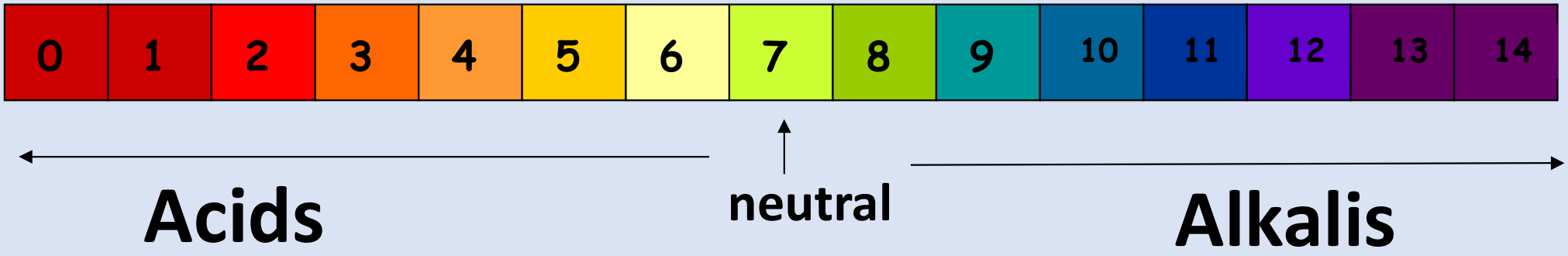
Indicators

<u>Indicators</u> 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		

Indicators

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


0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Acids
neutral
Alkalis

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?

Plenary

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Starter

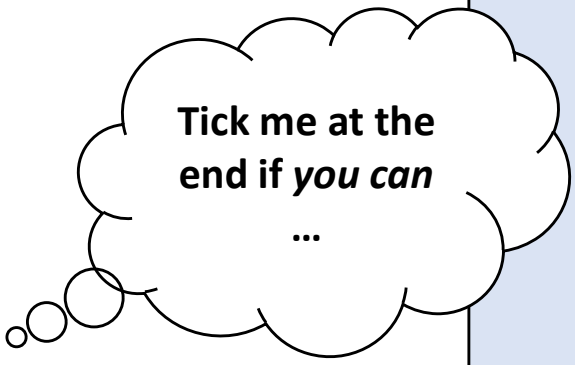
1. Vinegar is an acid we use on our chips.

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



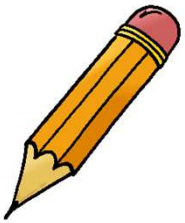
Success Criteria

- ☐ 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

The pH Scale and Universal Indicator

Acids: substance with a pH less than 7

Base: substance with a pH more than 7



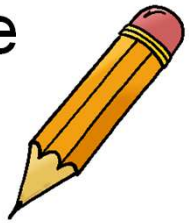
Colour and label the pH scale below

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14

Measuring the pH of household items

Aim:

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

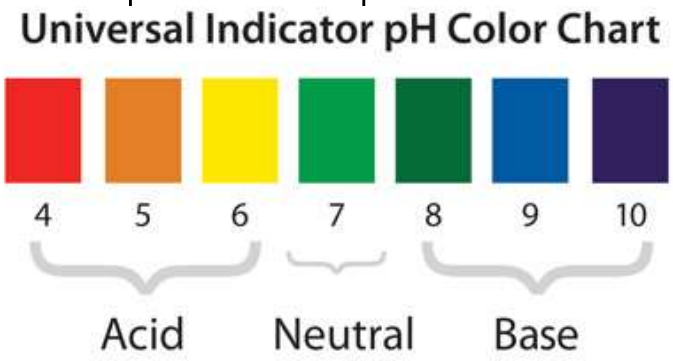


Method:

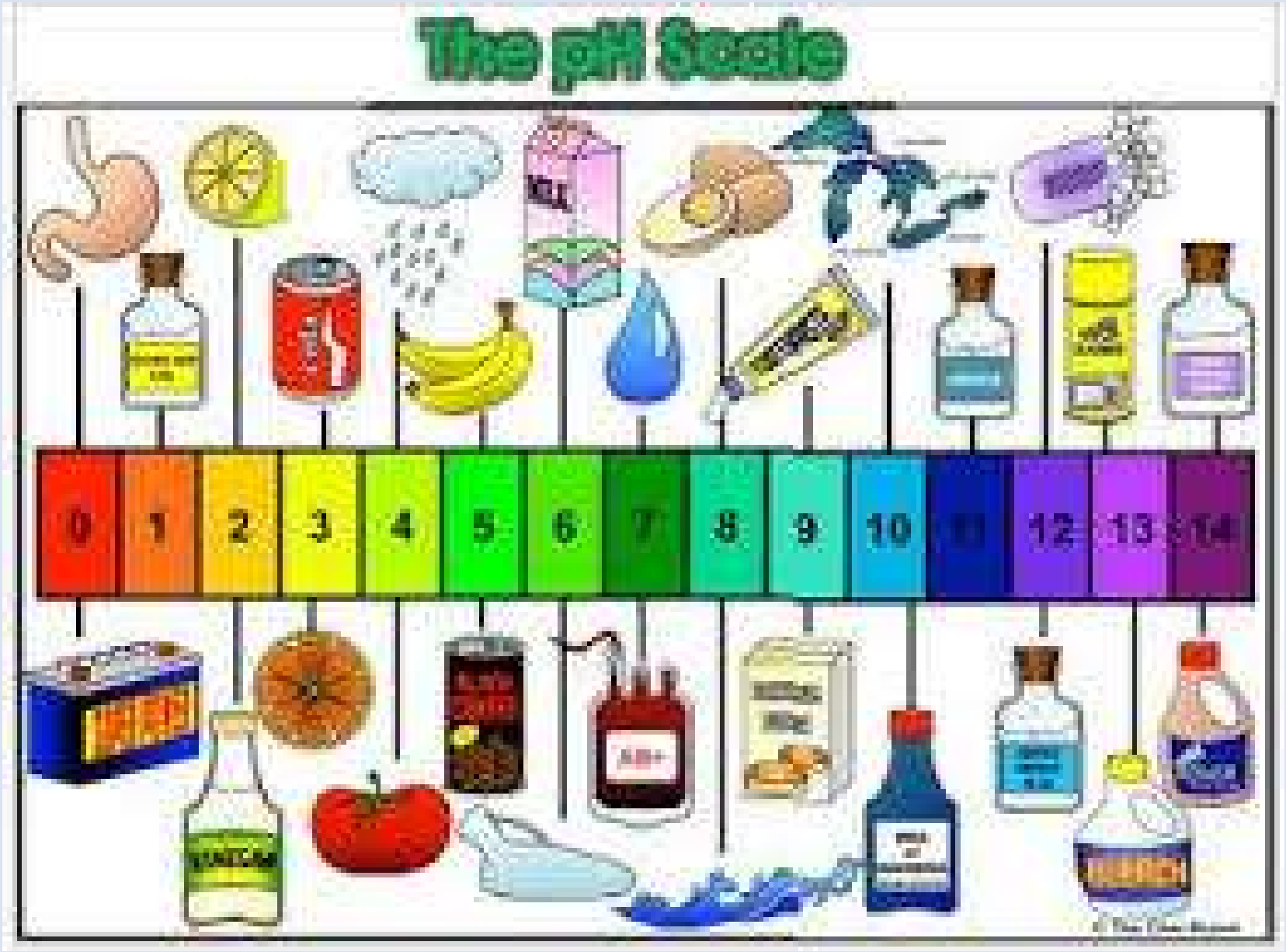
1. Put one of the solutions or powders in the dimple tile
2. Add a few drops of universal indicator and observe the colour.
3. Use the colour chart to find the pH number of the substance.
4. Note the result in your table.
5. Record whether the solution is acid, neutral or alkali.
6. Wash the dimple tile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

Measuring the pH of household items

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



Plenary

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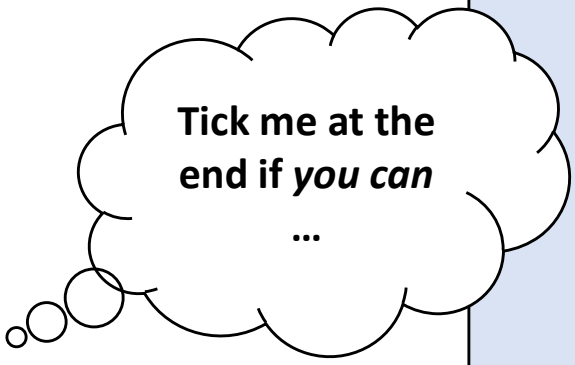
Starter

1. What is an indicator?

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

Learning Intentions:

- To make a natural indicator from plants



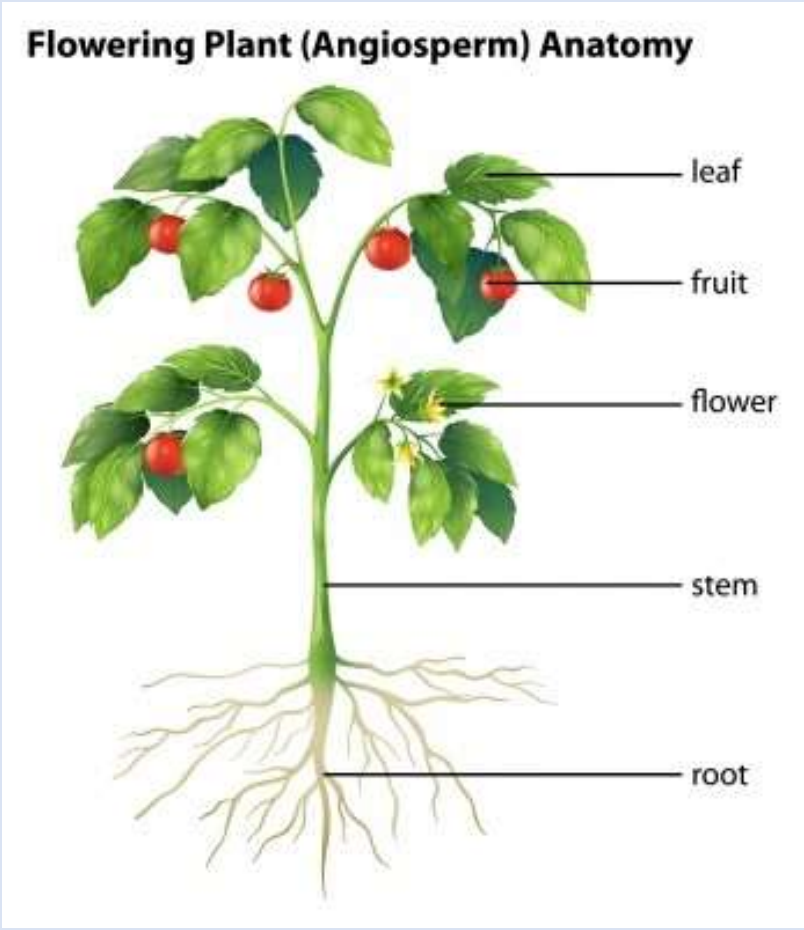
Success Criteria

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

Natural Indicators

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

Natural Indicators



Investigating natural indicators

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.

Investigating natural indicators

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

Evaluation: *How could you improve your experiment?*

Extra: Investigating natural indicators

Results (how “good” is your indicator?)

SUBSTANCE	**INDICATOR COLOUR**			
	Red Cabbage	Raspberries	Blueberries	Beetroot
Baking soda				
Fizzy water				
Salt (sodium chloride)				
Distilled (pure) water				
Lemon juice				
Orange juice				
Oven Cleaner				
Soap solution				
Vinegar				
Washing Soda				
Ethanol				

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 of the liquid into a test tube... this is your indicator.
- Add a couple of drops of household chemical to a dimple in a dimple tile, then add two drops of your indicator.
- Note the results in your table.
- Repeat the experiment with other plant parts.

Extra: Investigating natural indicators

Conclusion (how “good” is your indicator?)

Evaluation

Plenary

- 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. Why is universal indicator better than litmus indicator?

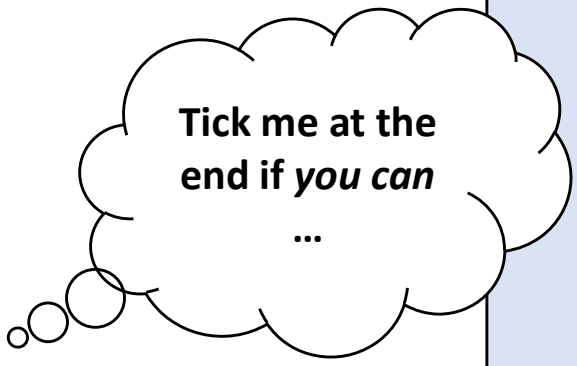
2. What is the pH range of acids?

3. What is the pH range of alkalis?

4. What is the pH of a neutral solution?

Learning Intentions:

- To learn about neutralisation reactions

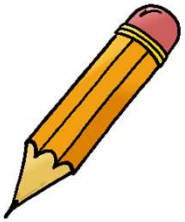


Success Criteria

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

Neutralisation Reactions

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.

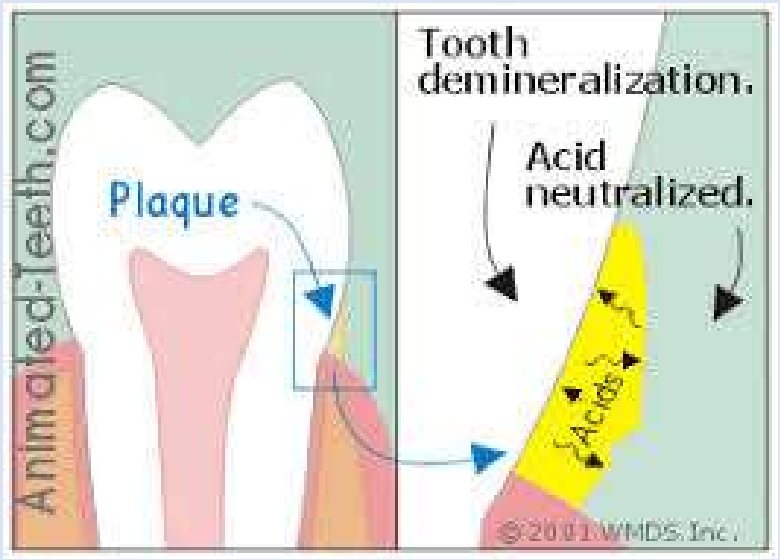
This is called a ___Neutralisation___ reaction.

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

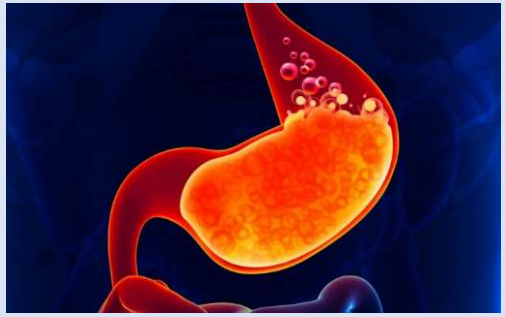
Wasp stings are **alkaline**, why can vinegar be used to treat them?

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.

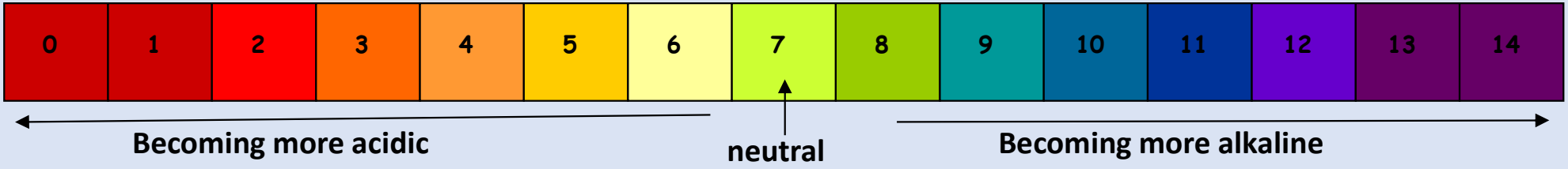
However too much acid can cause **indigestion** and we use indigestion remedies to **neutralise** excess acids.



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

Remember neutral solutions have 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

Dilution Experiment

Aim:

To investigate the effect of dilution on pH.

Method/Results: *Draw your method below*

Dilution Experiment

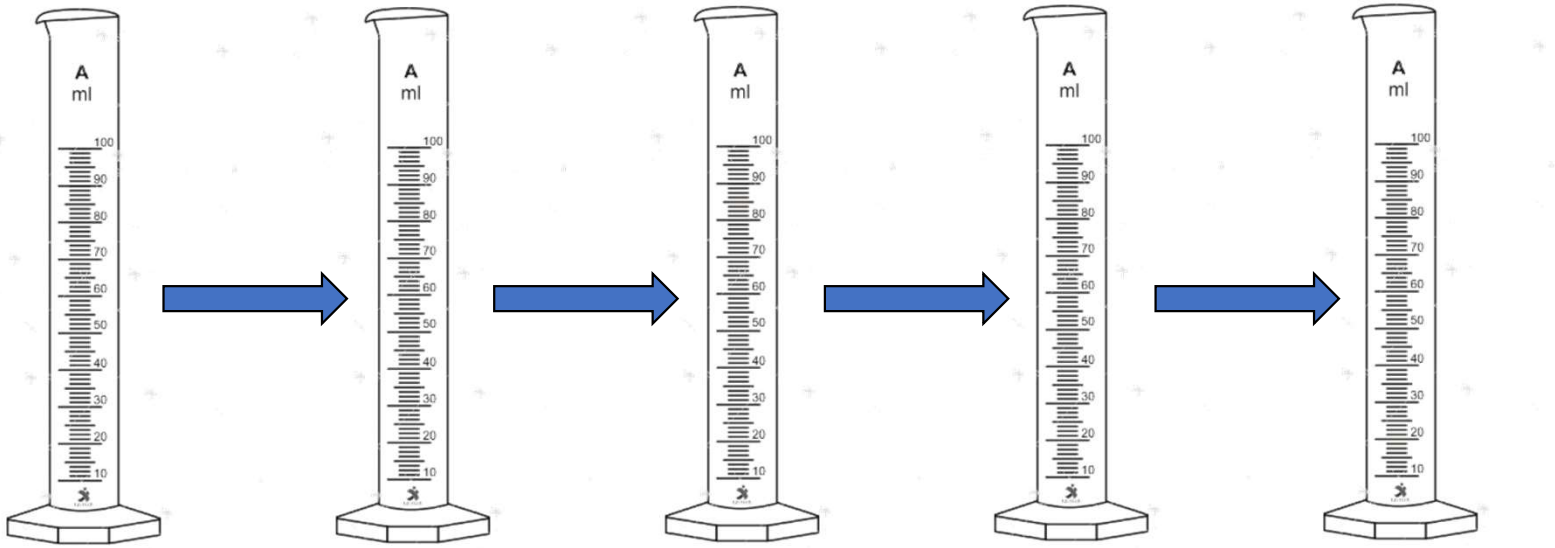
Method:

1. **Set up a test tube rack with six test tubes**. Label them 1-6.
2. Add 10 cm^3 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 cm^3 of water.
6. In test tube 4, add 1 cm3 of the acid from test tube 3 and 9 cm^3 of water.
7. In test tube 5, add 1 cm3 of the acid from test tube 4 and 9 cm^3 of water.
8. In test tube 6, add 1 cm3 of the acid from test tube 5 and 9 cm^3 of water.

Add Universal Indicator to each cylinder.

Dilution Experiment

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

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

Dilution Experiment

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

Evaluation: *How could you improve your experiment?*

Neutralisation 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

Results:

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

Neutralisation Experiment

Conclusion:

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

Plenary

- 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:

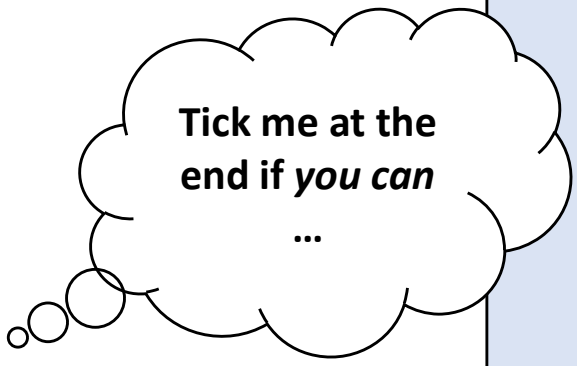
Green:

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

Neutralisation Reactions

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**.

acid + base → salt + water

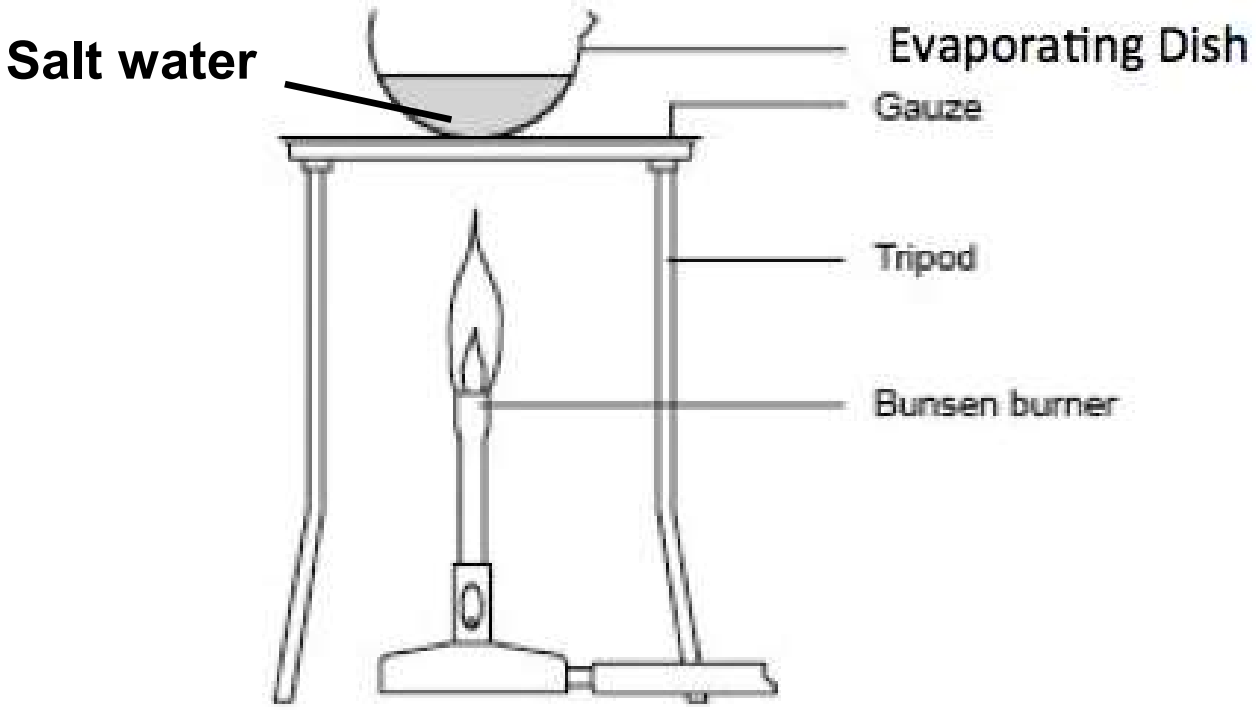
reactants *change into* *products*

Forming Salt Experiment

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.

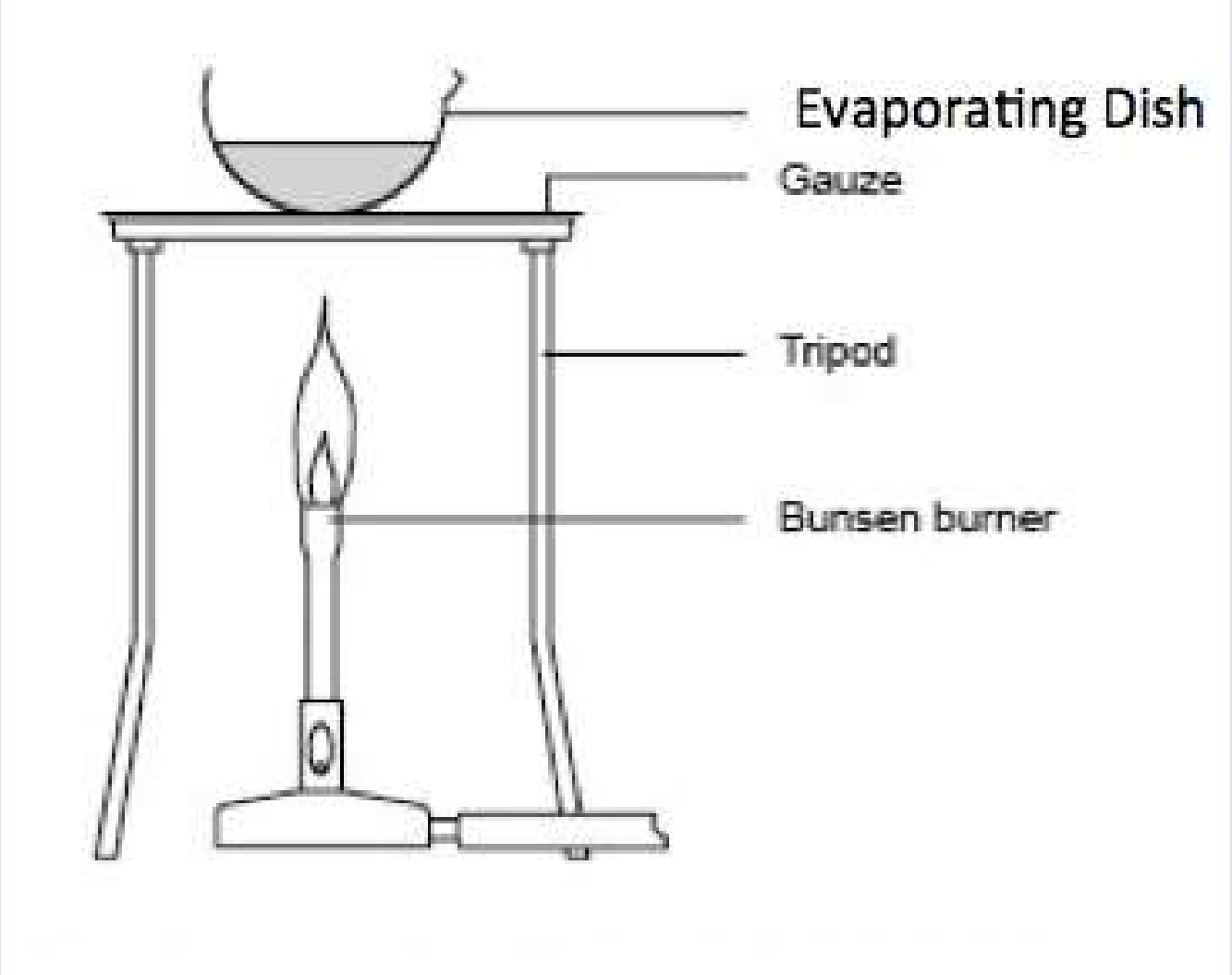
Forming Salt Experiment

Results: *What did you observe?*

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

Evaluation: *How could you improve the experiment?*

Forming Salt



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

Experiment Extension

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: _____