

## Chemistry in our Home

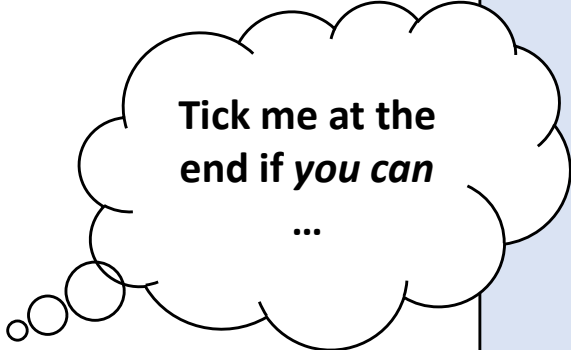
## Starter

1. List some examples of chemical reactions:



## Learning Intentions:

- To learn about the differences between physical and chemical changes



Tick me at the  
end if *you can*

...

## 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 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.





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?

[illegible]



## 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

## True or False

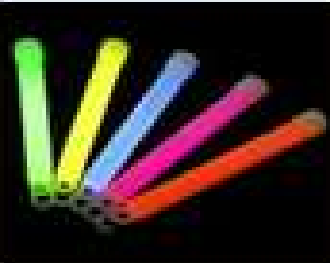


FALSE

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



|                                                                                         |                                                                                           |                                                                                           |
|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------|
| (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 |                      |                         |

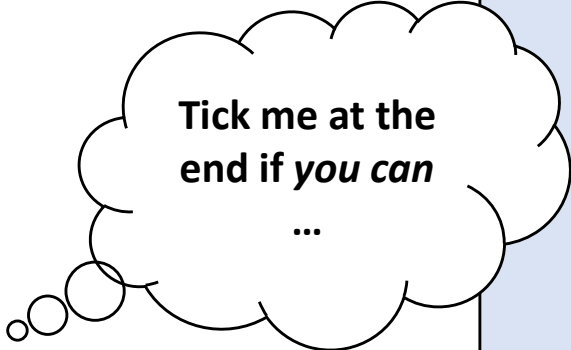
## **Starter**

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



Tick me at the  
end if *you can*

...

## Success Criteria

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

Chemical reactions happen every day in our home!



# Chemical reactions in cooking food

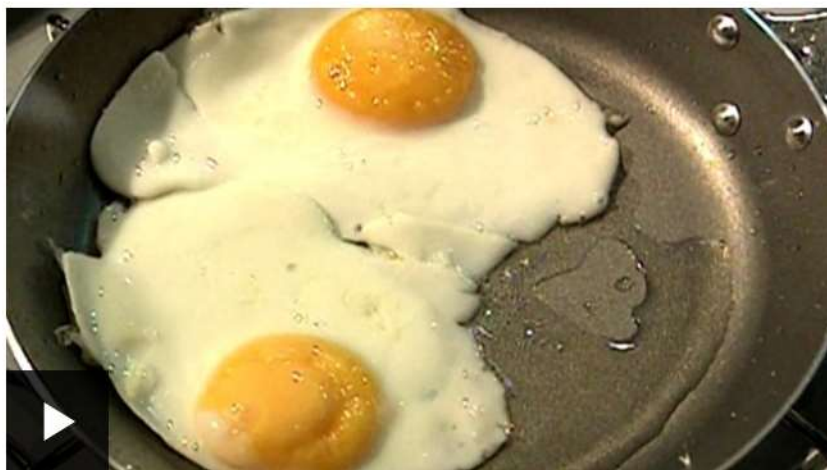
From the short video clip answer the following:

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?*



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



+            means “and”

$\longrightarrow$             means “changes into”

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  $\rightarrow$  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  $\rightarrow$  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.

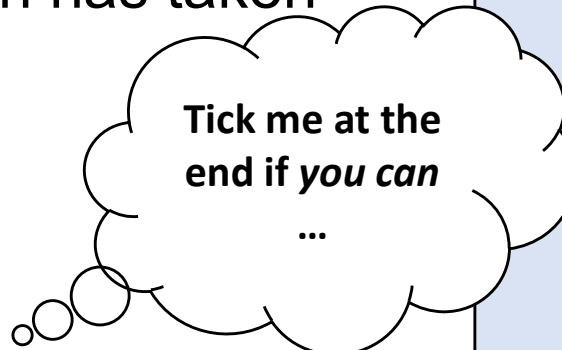
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- Comment on any real-world applications you can use for this information

## **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.



Tick me at the  
end if *you can*

...

## Success Criteria

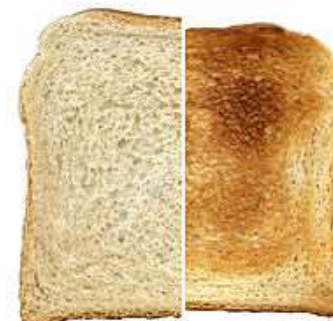
- ☐ I can state the terms used for the signs of a chemical reaction.

# 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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alamy stock photo

# Signs of a Chemical Reaction

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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



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## 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                |

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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- Comment on any real-world applications you can use for this information

## Starter

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

1. Effervescence

2. Chemical Change

3. Reactant

4. Physical Change

5. Precipitation

A. A change in which a new substance is made.

B. Formation of a solid when two liquids chemically join.

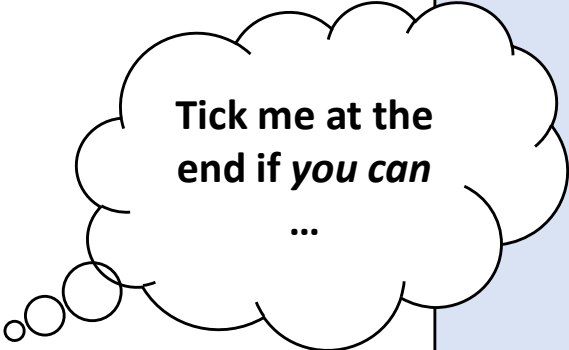
C. Gas produced during a chemical reaction.

D. Chemicals present at the start of a chemical reaction.

E. A change in which no new substance is made.

## Learning Intentions:

- To learn how to speed up the rate of reaction



Tick me at the  
end if *you can*

...

## Success Criteria

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



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.



**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:

**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.

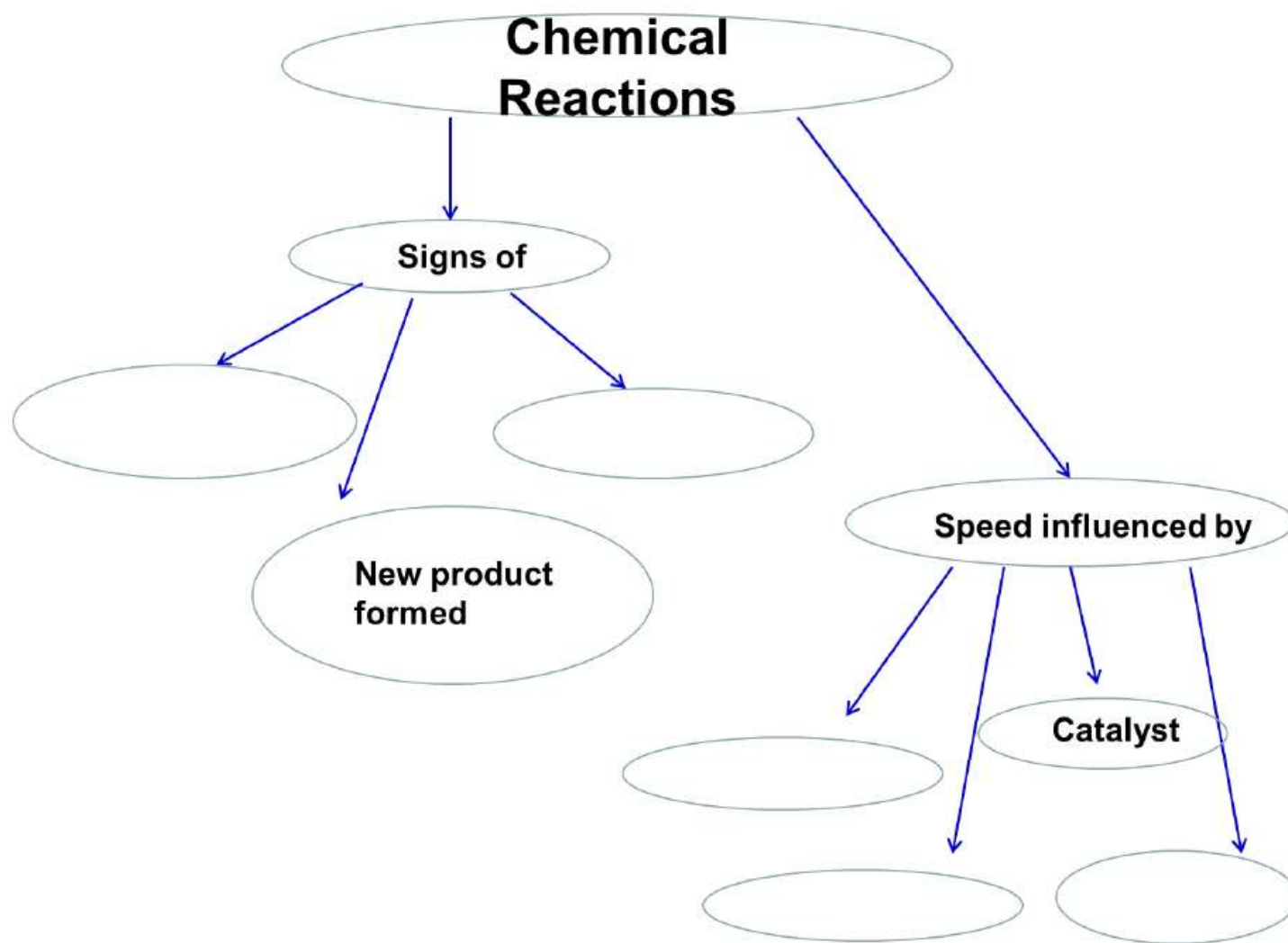
Washing powder works slower in cold water than in warm water.

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



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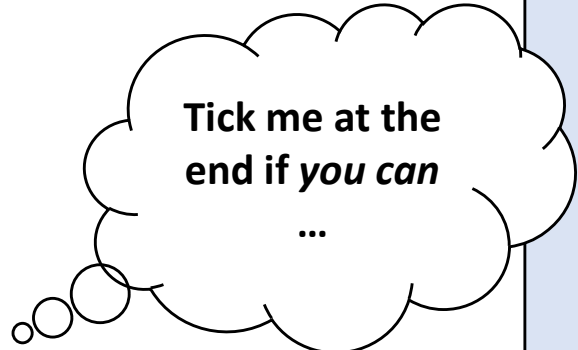
## Starter

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



Tick me at the end if *you can*

...

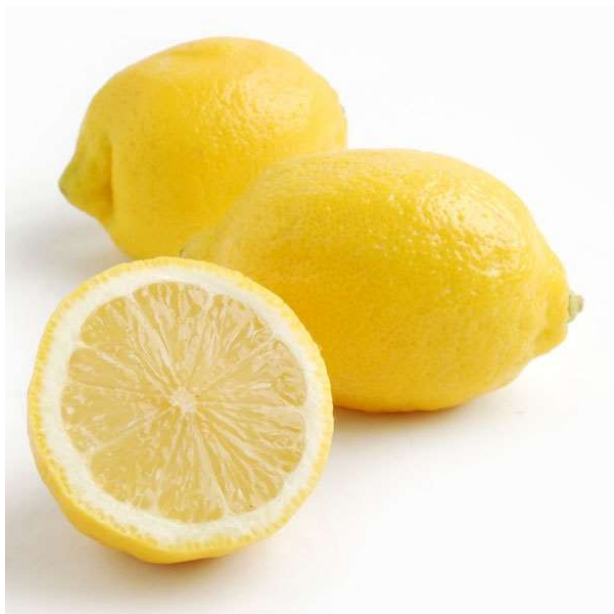
## Success Criteria

- ☐ 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

## TARTARIC ACID



bananas, grapes

## ETHANOIC ACID (ACETIC ACID)



vinegar for flavouring  
and pickling

## LACTIC ACID



milk, cheese,  
cream sour cream,  
yogurt



# Acids in Health

Science-Backed  
HEALTH BENEFITS  
of

**OMEGA 3**

**FATTY ACIDS**

Top10  
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- Improves Eye Health
- Promotes Brain Health during Pregnancy
- Supports Heart Health
- Prevents Cancer
- Improves Bone and Joint Health
- Improves Sleep
- Fights Inflammation



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?

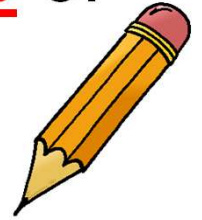
An acid is a group of chemicals which behave in a similar way.

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 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<br>blue |                |                |
| Phenolphthalein     |                |                |



| Indicator           | Colour in acid | Colour in base |
|---------------------|----------------|----------------|
| Litmus              | red            | blue           |
| Methyl orange       | red            | orange         |
| Bromothymol<br>blue | orange         | blue           |
| Phenolphthalein     | colourless     | pink           |



**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?

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## **Starter**

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

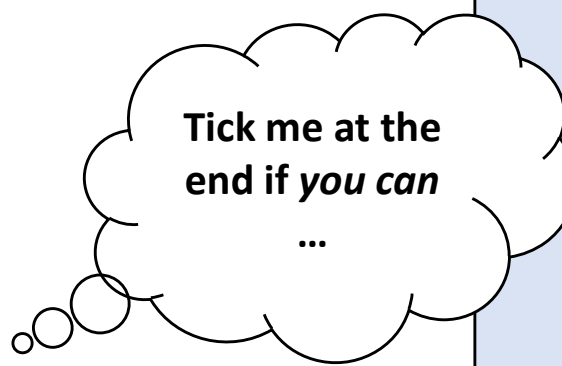
Why do you think we couldn't use hydrochloric acid on our chips?

Explain your answer.



## Learning Intentions:

- To learn about acids and bases in our home



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

# The pH Scale and Universal Indicator

**Acids**: substance with a pH less than 7

**Base**: substance with a pH more than 7

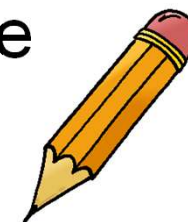


*Colour and label the pH scale below*



## **Aim:**

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



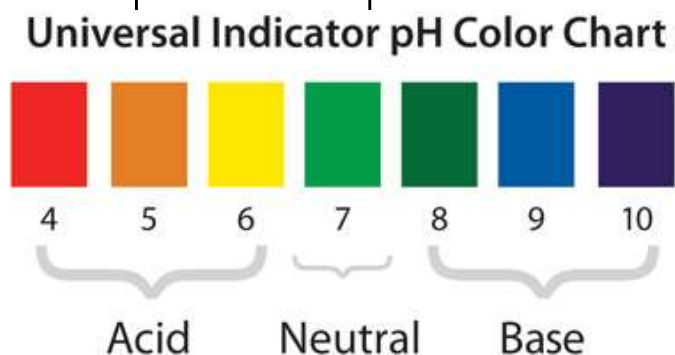
## **Method:**

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



- Go to **page 24**.
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    - Did what you learn change the way you think?
- Comment on any real-world applications you can use for this information

## **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*

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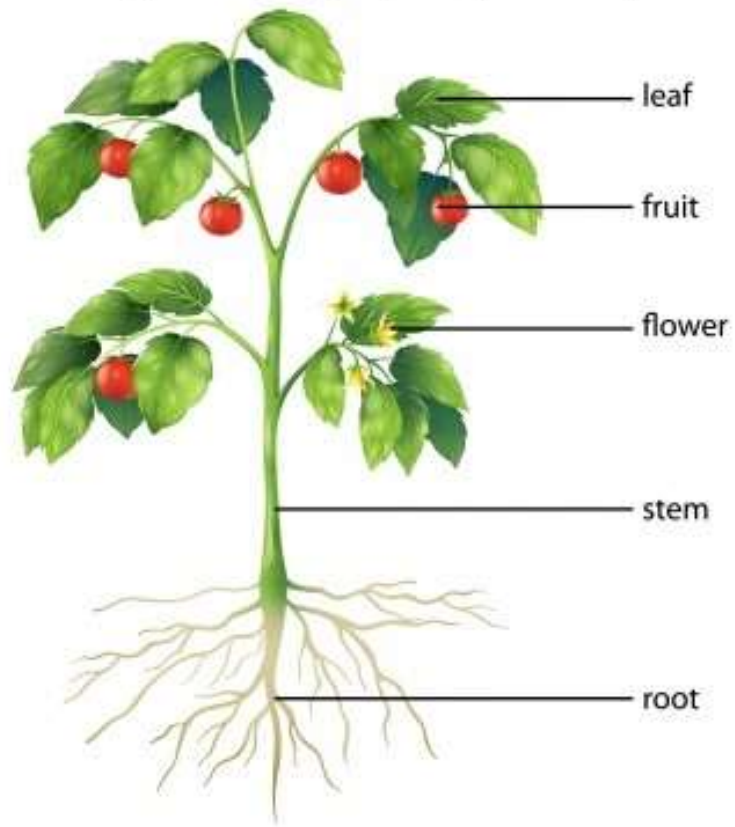
# Natural Indicators

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?*

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



Tick me at the  
end if *you can*

...

# 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.

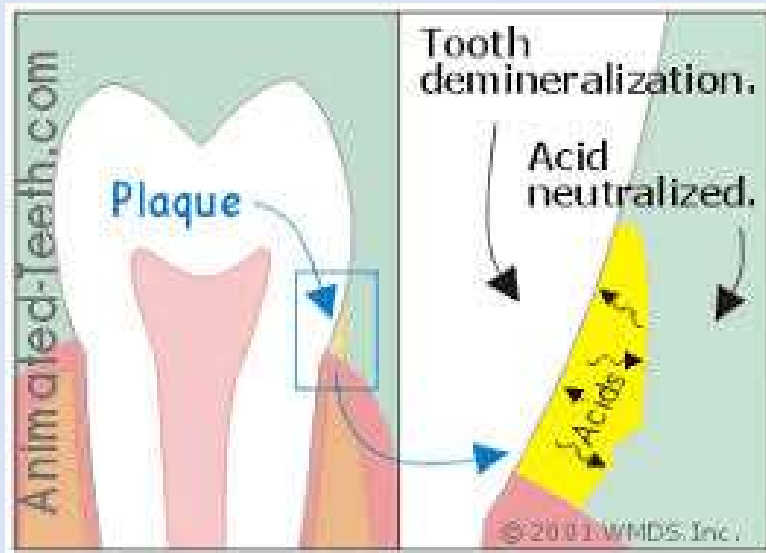
# Everyday neutralisation reactions

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.

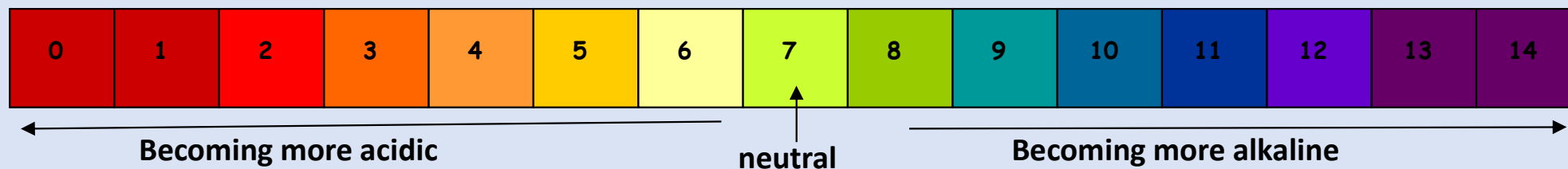
However too much acid can cause **indigestion** and we use indigestion remedies to **neutralise** excess acids.



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

Remember neutral solutions have  $\text{pH}=7$  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 cm<sup>3</sup> hydrochloric acid to test tube 1.
3. Read the following instructions very carefully;
4. In test tube 2, add 1 cm<sup>3</sup> of the acid from test tube 1 and 9 cm<sup>3</sup> of water.
5. In test tube 3, add 1 cm<sup>3</sup> of the acid from test tube 2 and 9 cm<sup>3</sup> of water.
6. In test tube 4, add 1 cm<sup>3</sup> of the acid from test tube 3 and 9 cm<sup>3</sup> of water.
7. In test tube 5, add 1 cm<sup>3</sup> of the acid from test tube 4 and 9 cm<sup>3</sup> of water.
8. In test tube 6, add 1 cm<sup>3</sup> of the acid from test tube 5 and 9 cm<sup>3</sup> of water.

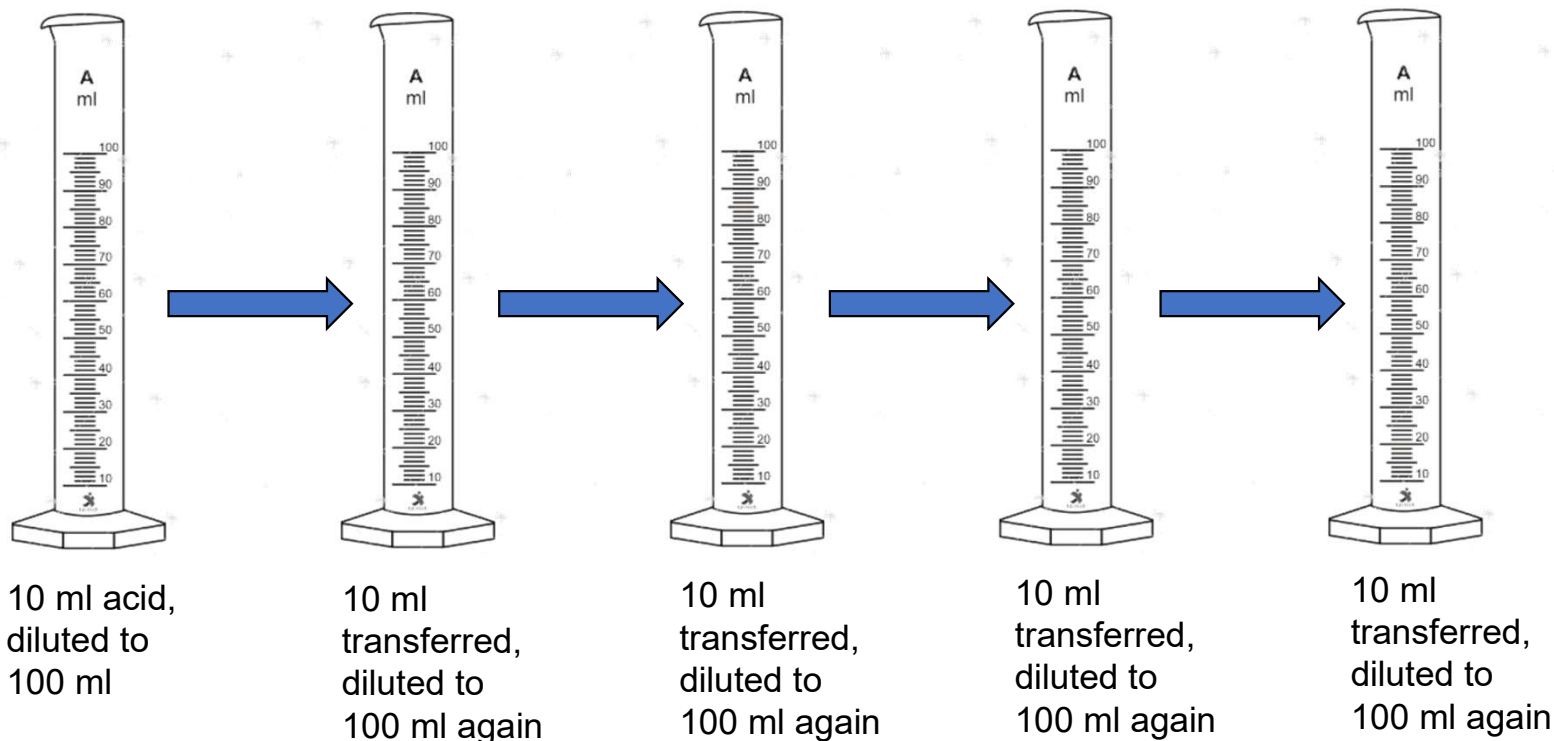
**Add Universal Indicator to each cylinder.**

# Dilution Experiment



Page 24

## Method:



**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  $10\text{cm}^3$  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  $1\text{cm}^3$  alkali to the beaker.
6. Note the colour and pH in your table
7. Add another  $1\text{cm}^3$  alkali and note result
8. Repeat until you have added  $9\text{cm}^3$ .
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



Page 25

## Results:

| Volume of alkali added (cm <sup>3</sup> ) | 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 \_\_\_\_\_ cm<sup>3</sup>.

- 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**.

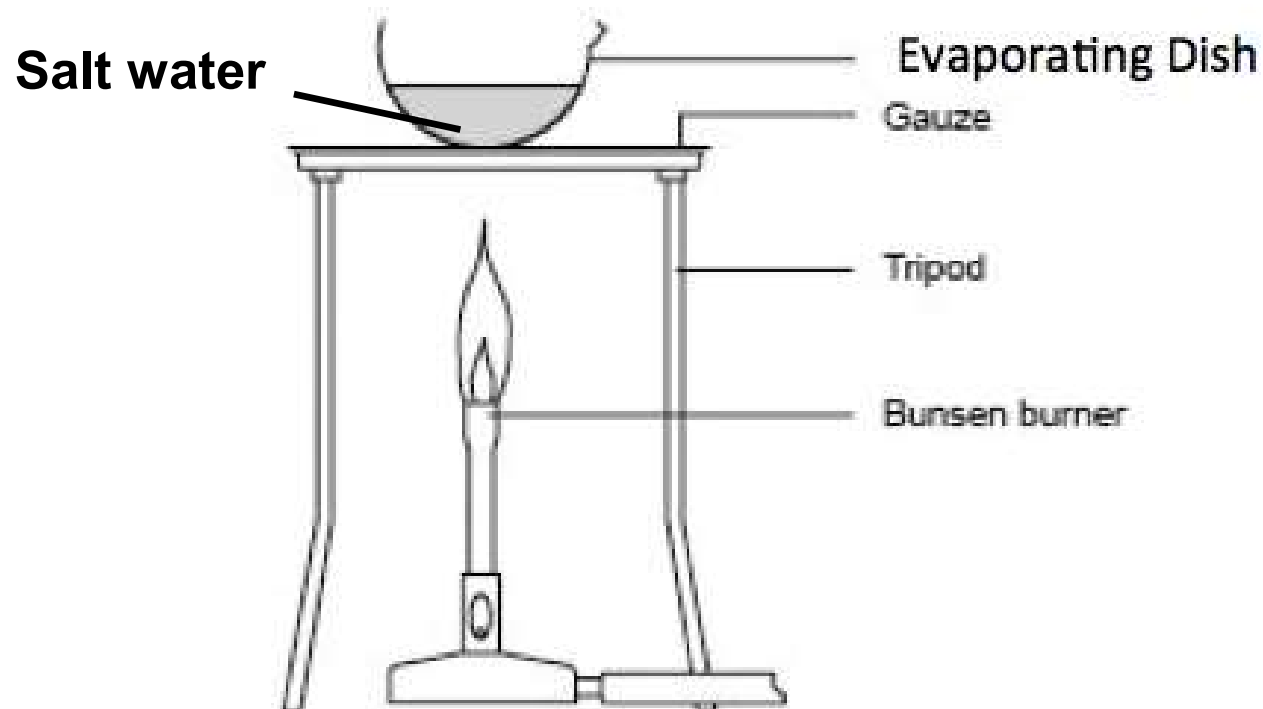




**Aim:** To obtain salt from a neutralisation reaction

**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.

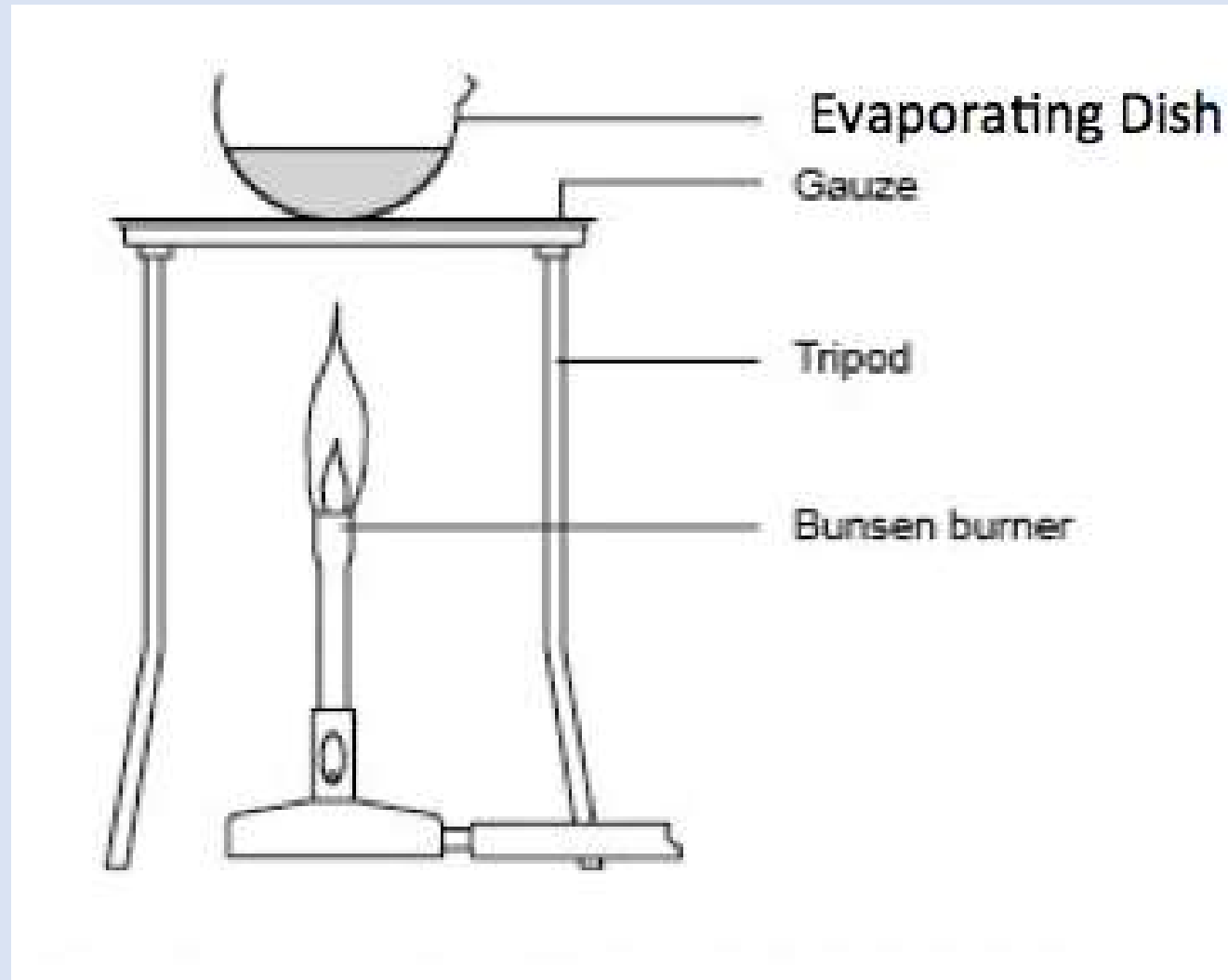


**Results:** *What did you observe?*

**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

