

11–14 years

# Key terms accessible glossary: elements, compounds and mixtures



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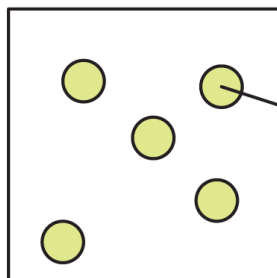
# Atom

the smallest possible particle of an element

## Sign it

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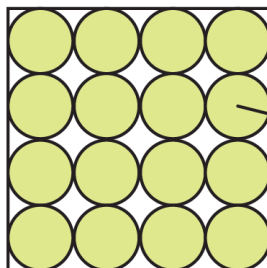
[bit.ly/3G7XpSi](https://bit.ly/3G7XpSi)



helium  
atom

## Example

Helium is an element; it is made up of helium atoms



aluminium  
atom

## Say it

At-am

## Don't confuse with ...

particle, compound or molecule

# Molecule

two or more atoms connected by chemical bonds

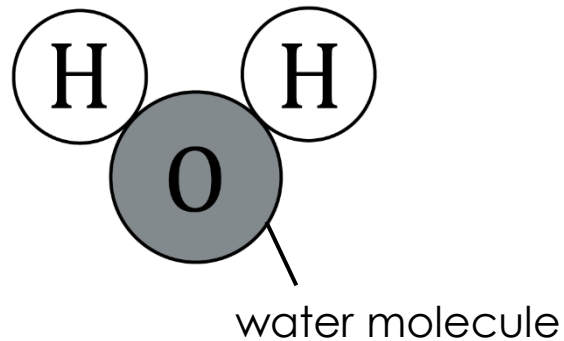
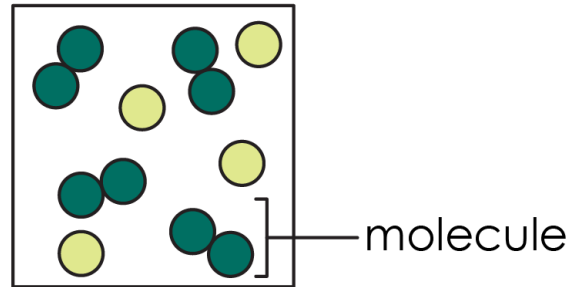
## In other words ...

two or more atoms  
joined together

## Sign it

Watch a video:

[bit.ly/4lBjGbG](https://bit.ly/4lBjGbG)



## Example

Water is a molecule made from two hydrogen atoms and one oxygen atom. Hydrogen is an element which forms a molecule of two hydrogen atoms

## Don't confuse with ...

a molecule can be an element or a compound, but a compound does not have to be made up of separate small molecules

## Say it

Mol-ic-yue-l

# Chemical property

## In other words ...

a characteristic that describes how a substance reacts with other substances

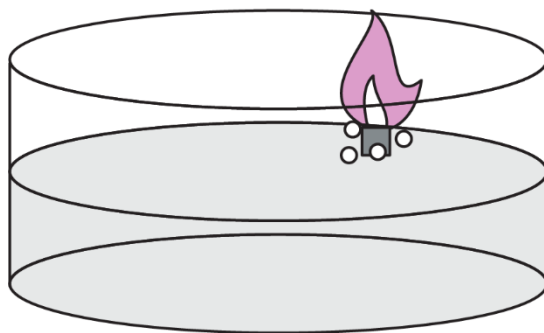
## Say it

Cem-i-cel pro-pa-ty

## Break it down

Chem (related to chemicals),  
ical (related to),  
property (feature)

describes something about how a substance reacts, such as its reactivity with water



potassium reacts vigorously with water, fizzing and producing a lilac flame

## Example

Some chemical properties of iron are:

- it reacts with oxygen and water to form rust
- it reacts with acids

## Similar words

Reactivity (if talking about how easily something reacts)

# Compound

a pure substance made of the atoms of two or more different elements joined by chemical bonds; the atoms are in a fixed ratio

## In other words ...

two or more different elements  
chemically bonded

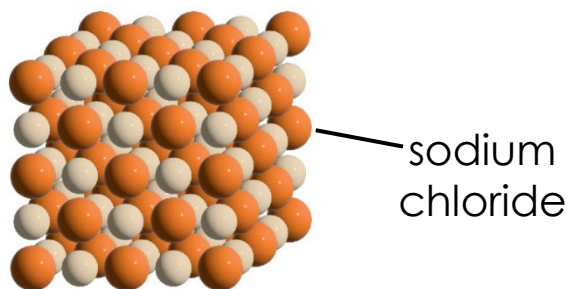
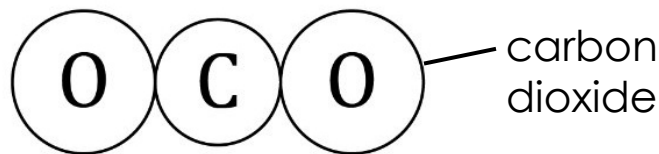
## Example

Carbon dioxide is a compound made up of two oxygen atoms and a carbon atom

## Sign it

Watch a video:

[bit.ly/4jDLKJD](https://bit.ly/4jDLKJD)



## Don't confuse with ...

mixture. In a compound, the atoms are chemically bonded together, but in a mixture the atoms can be physically separated

## Say it

Comp-ou-nd

## Break it down

Com (together),  
pound (put/place) –  
substances put together

## Similar words

Molecule – but not all  
molecules are compounds

## Other meanings

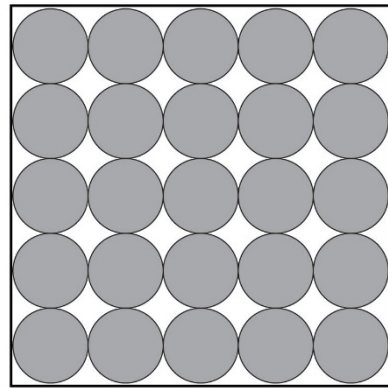
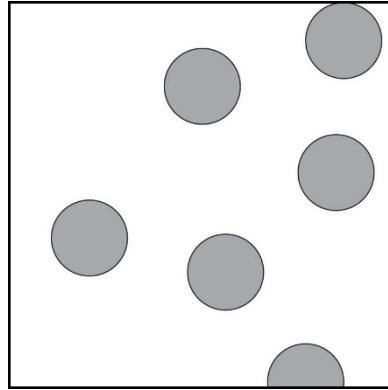
A compound can  
mean a fenced-off  
area e.g. a military  
compound

# Element

a pure substance made of only one type of atom

## In other words ...

a substance that is only made of the same type of atoms, with no other atoms types present



## Example

Nitrogen and oxygen are pure substances made of only one type of atom, so they are found on the periodic table

## Sign it

Watch a video:

[bit.ly/4jAYL6M](https://bit.ly/4jAYL6M)



## Say it

El-i-mant

## Don't confuse with ...

an atom. An element and an atom are not the same thing – an element is made up of atoms of the same type

# Impurity

a substance that is not wanted, which is mixed in with another substance

## In other words ...

something that is not supposed to be in the substance, it is not a pure substance

## Say it

Imp-j-ure-aty

## Break it down

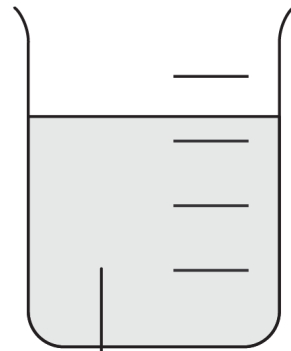
Im (not),  
pure (clean, single)

## Similar words

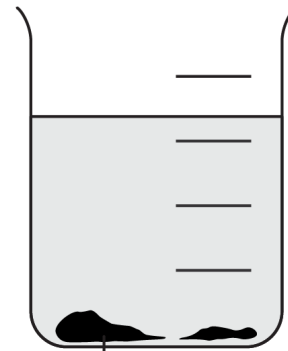
Contaminant

## Example

If tap water had dirt in it, the dirt would be an impurity



sometimes  
impurities  
cannot be  
seen in a  
sample



sometimes  
solid impurities  
can be seen  
in a sample

## Don't confuse with ...

mixture. Impurities mean that we have a mixture – but not all mixtures contain unwanted impurities. Tea is a mixture, but the 'impurities' are not unwanted!

# Mixture

two or more substances added together in any proportion; they are not chemically bonded, so they keep their own properties

## In other words ...

a combination of two or more particles that haven't been chemically joined. The particles could be elements or compounds

## Sign it

Watch a video:  

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## Say it

Mics-cha

## Similar words

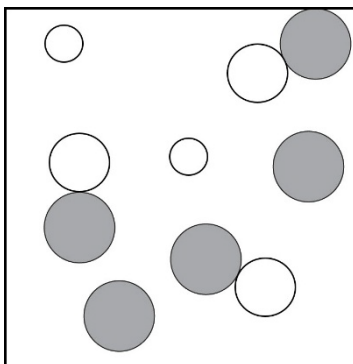
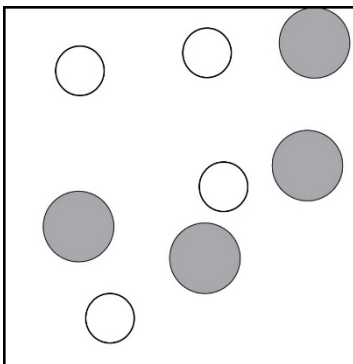
Blended

## Other meanings

Mixture in everyday life means a combination, like 'a mixture of emotions'

## Example

Sand and salt together make a mixture. They can be separated



## Don't confuse with ...

compounds.  
Compounds are chemically joined, mixtures are not.

## Break it down

Mix (combine),  
ture (result of)

# Physical property

describes something about the behaviour of a substance that does not involve a chemical reaction, such as its malleability

## In other words ...

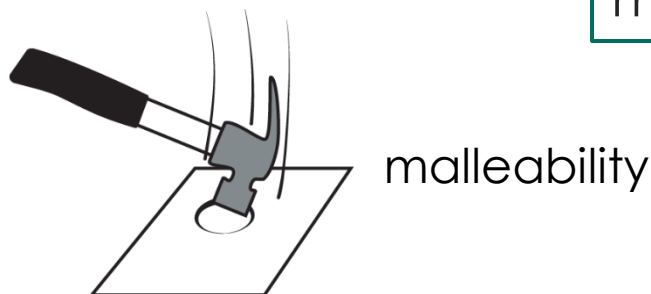
a characteristic of a material which can be observed without changing the substance and what it is made from

## Example

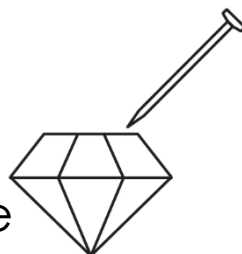
Some physical properties of gold are: it is a yellow, shiny metal, it has a high melting point and it is malleable

## Say it

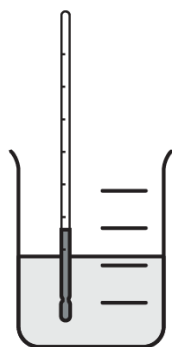
Fiz-i-cel pro-pa-ty



scratch resistance



melting point



## Don't confuse with ...

chemical properties – where the substance itself has changed and the particles are no longer the same as what we started with

## Similar words

Appearance and behaviour

## Other meanings

Physical often relates to the body, like 'physical exercise'

# Pure substance

a substance that is just one compound or element with nothing else mixed in

## In other words ...

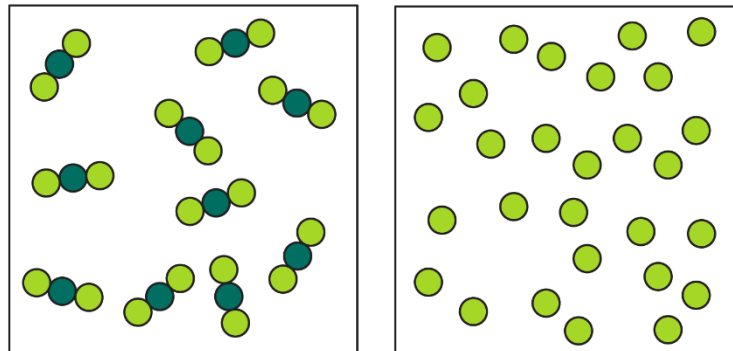
a substance containing just one type of particle, with nothing else added. The particle could be an element or a compound, as long as it is the same

## Example

Distilled water is a pure substance because it contains only water molecules

## Say it

P-j-ure sub-st-en-s



## Don't confuse with ...

clean or safe. Pure is about which particles are present

## Break it down

Pure (clean, only one thing),  
substance (material, matter)

## Other meanings

Pure can mean something completely genuine, like 'pure joy'

# Chromatography

a method of separation based on how easily each substance is carried by a liquid that is moving through a porous solid, like paper

## In other words ...

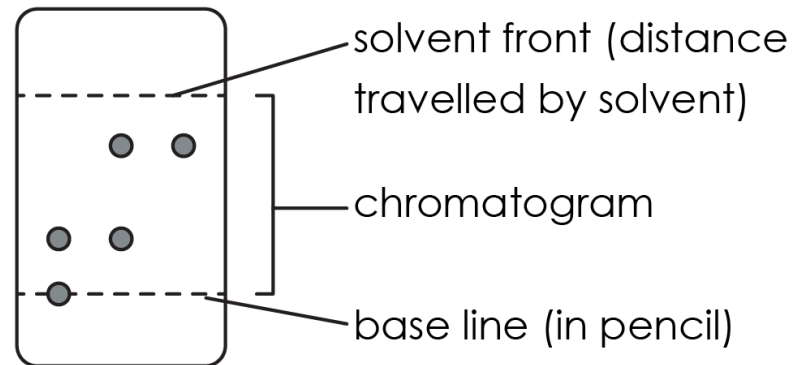
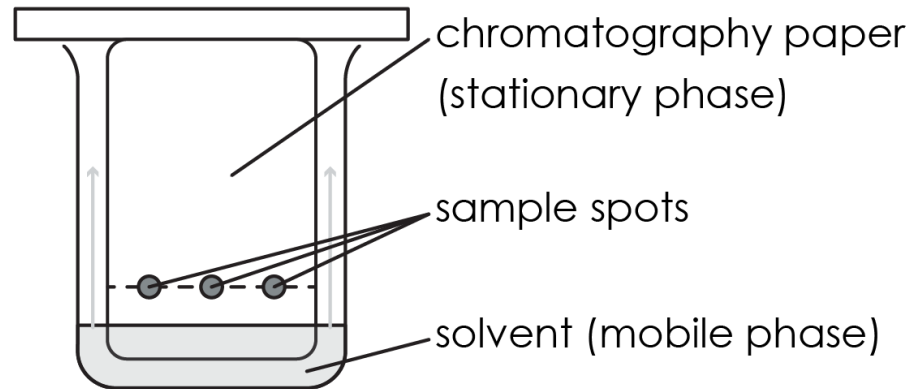
a way to separate different substances in a mixture by letting them move through a material at different speeds

## Break it down

Chrom (colours)

## Say it

Cro-ma-tog-ra-fy



## Example

We use chromatography to separate colours contained in inks

# Condenser

a glass tube used in distillation to condense a gas into liquid, by surrounding the tube with a continuous flow of cold water

## In other words ...

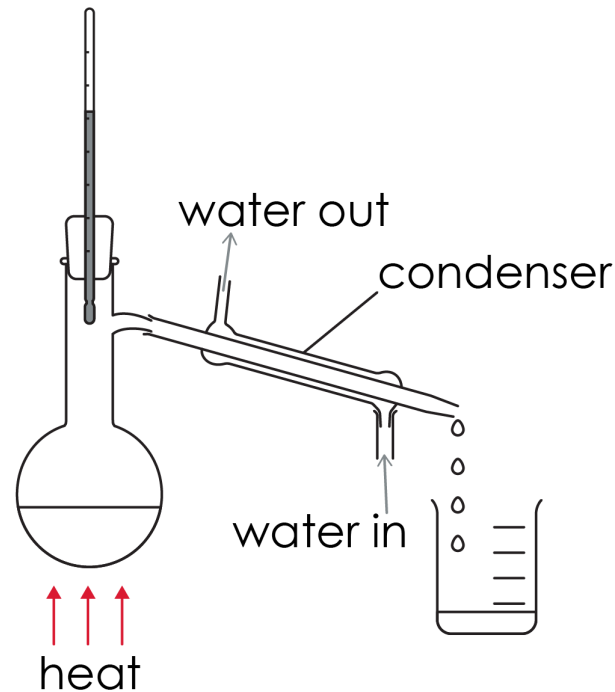
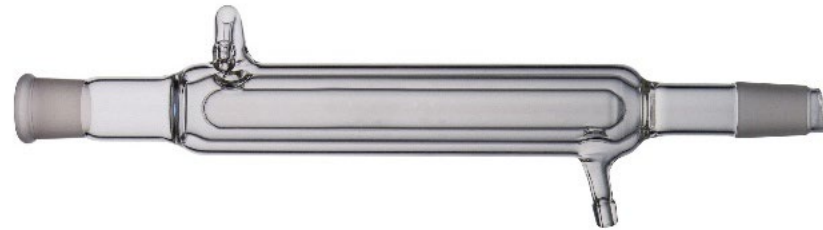
a tube that cools hot gases into liquid in distillation

## Say it

Can-den-sa

## Break it down

From the process of 'condensation', where a gas cools and changes state to form a liquid



## Example

When seawater is distilled, the steam passes through the condenser and cools into liquid water

## Similar words

Cooling tube

# Crystal

a piece of a solid that has formed in a regular shape

## In other words ...

a solid with a patterned shape

## Sign it

Watch a video:

[bit.ly/4k6aQ43](https://bit.ly/4k6aQ43)



## Say it

Cris-tel

## Break it down

From the Greek meaning 'frozen', observing patterned ice crystals

## Example

When water evaporates from a salt solution, salt crystals are formed



## Don't confuse with ...

gemstones. Not all crystals are expensive gemstones like sapphires, rubies or quartz!

## Other meanings

Crystal glass is used in decorations or expensive glassware

## Similar words

Gemstones are examples of crystals, but salts form crystals, too

# Crystallisation

a method of separation used to get crystals of a solid by very slowly evaporating the solvent from a solution

## In other words ...

when a dissolved solid forms crystals as the liquid part of the solution slowly evaporates

## Example

Rock salts form by crystallisation from seawater

## Say it

Cris-tel-eye-zay-shen

## Break it down

Crystal (solid with a repeating pattern),  
isation (process of making something)



## Don't confuse with ...

freezing

## Similar words

Solidification (but this can also relate to liquids freezing to form solids)

# Evaporation

a method of separation used to form solids by heating to remove the solvent from a solution

## In other words ...

a slow process where a liquid from a solution changes state into a gas, leaving any solids behind

## Sign it

Watch a video:

[bit.ly/4k0GLU1](https://bit.ly/4k0GLU1)

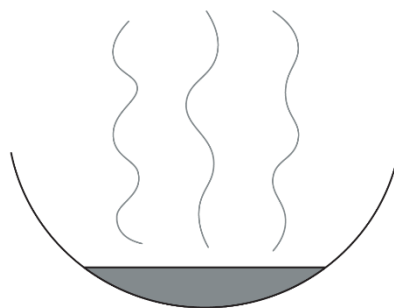


## Say it

Eye-vap-a-ray-shen

## Break it down

Evap (from Latin meaning 'turns to a vapour'),  
ation (the process)



## Example

Water is separated from salt water by evaporation, leaving behind the solid salt

## Don't confuse with ...

boiling. Evaporation and boiling are different processes.

Evaporation can happen at any temperature and is a slower process

## Other meanings

Wet clothes dry on the washing line by evaporation

## Similar words

Vaporisation (relates only to the gas)

# Filter paper

a porous type of paper that is used in filtration to prevent insoluble solids from passing through

## In other words ...

filter paper is a special type of paper with tiny holes. These holes allow the particles of liquids to pass through, but tiny pieces of solid are too large to pass through and are trapped

## Other meanings

Coffee filters remove solid coffee granules from our hot drinks

## Similar words

Strainer (used in cooking, with much larger holes!)

filter paper



## Example

We use filter paper in science experiments to separate sand from water

## Don't confuse with ...

a sponge. Filter paper doesn't absorb liquids. It allows them to pass through the tiny holes in the paper. The tiny pieces of solid particles are too large and get trapped

## Say it

Filt-a pay-pa

# Filtrate

in filtration, this is the liquid that passes through the filter paper

## In other words ...

filtrate is the liquid that passes through the filter paper when filtering a mixture

## Say it

Filt-ray-t

## Break it down

Filtr (to strain),  
ate (the result of)

## Similar words

Filtered



## Example

When filtering sandy water, the water is the filtrate, as it passes through the filter

## Don't confuse with ...

pure. Filtrates are not always pure. For example, salt water would be a filtrate, as the whole solution passes through filter paper

## Other meanings

Coffee or tea after brewing would be examples of filtrate

# Filtration

a method of separation used to remove an insoluble solid from a liquid

## In other words ...

a method of separating a solid which is not dissolved from a liquid. The mixture is passed through special porous paper called filter paper

## Example

Sand is not soluble in water, so filtration can be used to remove it. The sand remains in the filter, and the water passes through

## Sign it

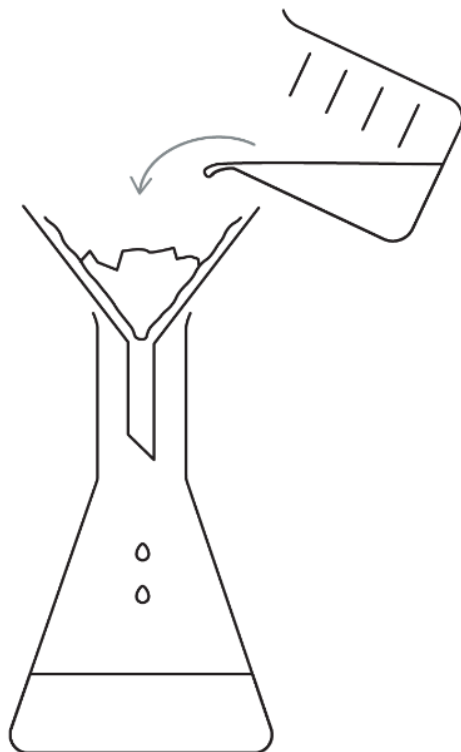
Watch a video:



[bit.ly/433R4z8](https://bit.ly/433R4z8)

## Say it

Filt-ray-shen



## Don't confuse with ...

evaporation. Filtration cannot separate dissolved substances, like salt from water. Only insoluble solids can be removed from solutions in this way

# Porous

describes a substance that allows liquid or gas to pass through

## In other words ...

a porous material has tiny holes that allow liquids or gases to pass through

## Say it

Por-ras

## Sign it

Watch a video:

[bit.ly/4d0OIWm](https://bit.ly/4d0OIWm)

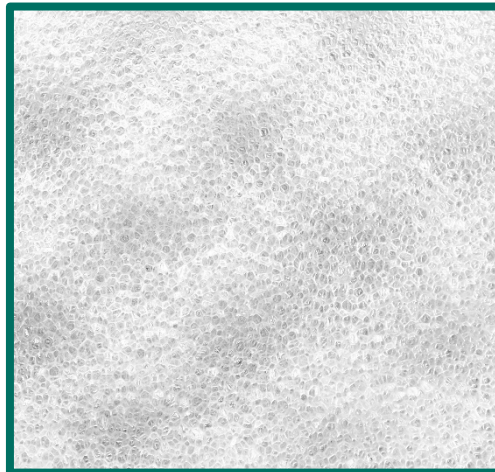


## Break it down

Por (from the latin 'pore'),  
ous (suffix meaning 'full of')

## Example

A colander is a porous piece of cooking equipment. It allows us to strain food, for example pasta from hot water



## Similar words

Pores

## Don't confuse with ...

absorption. Porous materials do not 'absorb' water, they allow the water to pass through them

## Other meanings

Porous bricks are used in building materials to allow air to flow through the walls

# Residue

in filtration, this is the solid that does not pass through the filter paper

## In other words ...

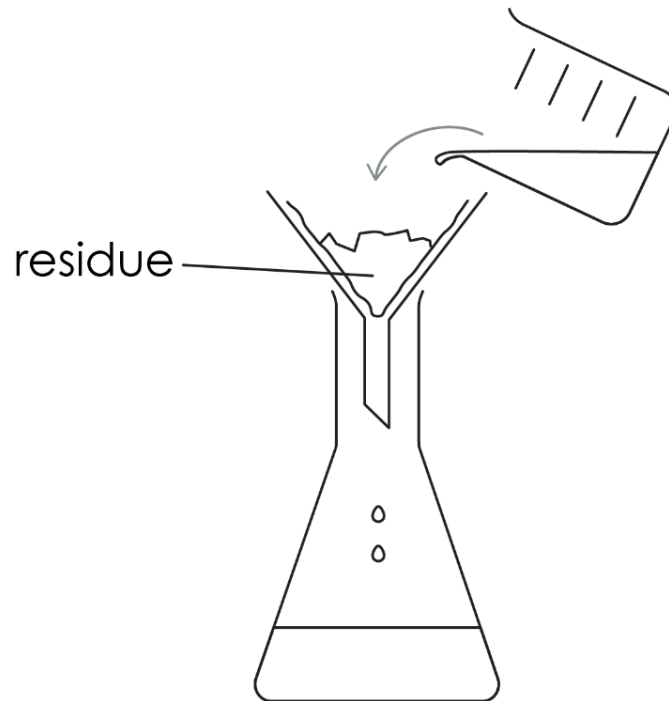
the solid left behind on the filter paper

## Say it

Rez-i-j-ue

## Break it down

Res (from Latin residuum, meaning 'left behind'),  
due (remains of something)



## Similar words

Leftover solid

## Example

When filtering sandy water, the sand is the residue, as it is left behind on the filter paper

## Don't confuse with ...

waste material. Often, we need to keep the residue and discard the filtrate!

## Other meanings

The sticky marks left behind when peeling a sticker is often called 'residue'

# Simple distillation

a method of separation involving evaporation and condensation used to separate the solvent from a solute that does not evaporate

## In other words ...

a way to separate a liquid from a solution by heating it until it changes into the gas state, then cooling it back into the liquid state

## Sign it

Watch a video:



[bit.ly/4jJMAoA](https://bit.ly/4jJMAoA)

## Say it

Sim-pel dis-til-ay-shen

## Break it down

From the Latin distil, meaning to drip down

## Example

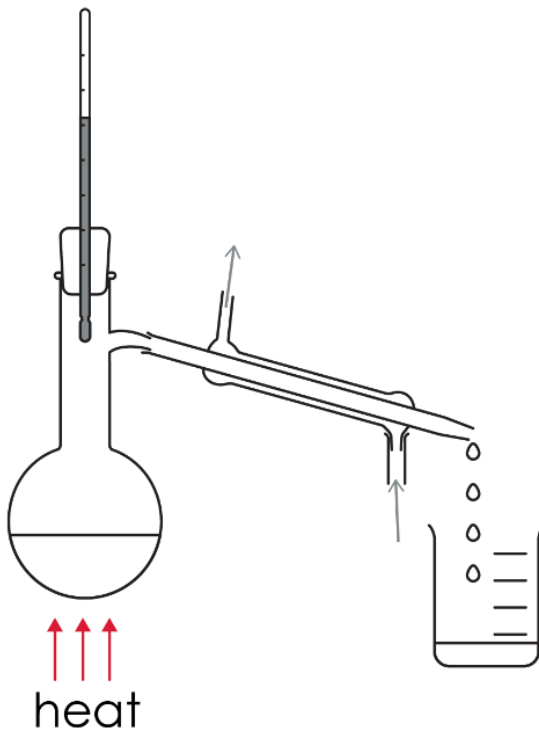
Pure water can be made from the distillation of seawater.

## Don't confuse with ...

just evaporation. This process collects the liquid. Evaporation and condensation take place in distillation

## Similar words

Distil



# Dissolve

when a solute is added to a solvent and the solute breaks down into particles that are too small to see that then spread out

## In other words ...

when a solid mixes with a liquid and spreads out until it looks like it has disappeared

## Sign it

Watch a video:



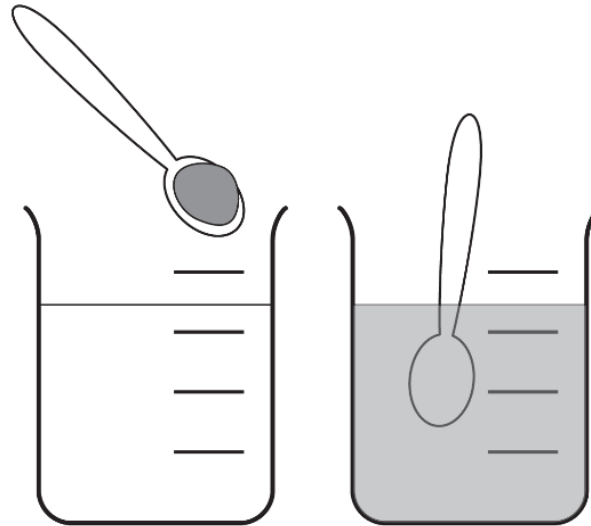
[bit.ly/3G7Xdm2](https://bit.ly/3G7Xdm2)

## Say it

Di-zol-v

## Example

A spoonful of sugar dissolves easily in a cup of tea



## Don't confuse with ...

melt; this is a change of state where a solid becomes a liquid

# Insoluble

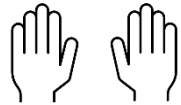
describes a substance which does not dissolve in a particular solvent

## In other words ...

a substance that does not dissolve and will either sink to the bottom or float on top of the liquid

## Sign it

Watch a video:



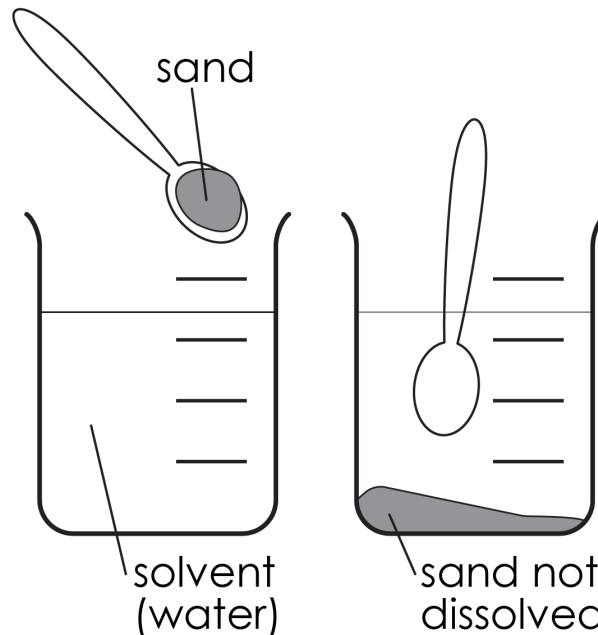
[bit.ly/4lx9wlQ](https://bit.ly/4lx9wlQ)

## Say it

In-sol-ya-bel

## Example

Sand is insoluble in water



## Break it down

This word has the prefix 'in' which means not. Insoluble means not soluble

## Don't confuse with ...

soluble. Soluble and insoluble have opposite meanings

# Miscible

when two liquids can mix and do not separate out into layers

## In other words...

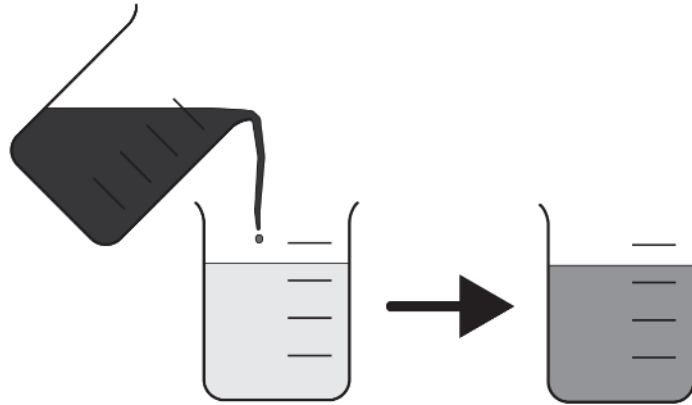
two or more liquids that can mix together

## Say it

Mis-a-bel

## Similar words

Mixable also means that two or more things can be mixed together



## Example

Milk is added to tea because it is miscible in water, so the two liquids are easily mixed



## Don't confuse with...

immiscible – two liquids that cannot mix together like oil and water

# Soluble

describes a substance which dissolves in a particular solvent

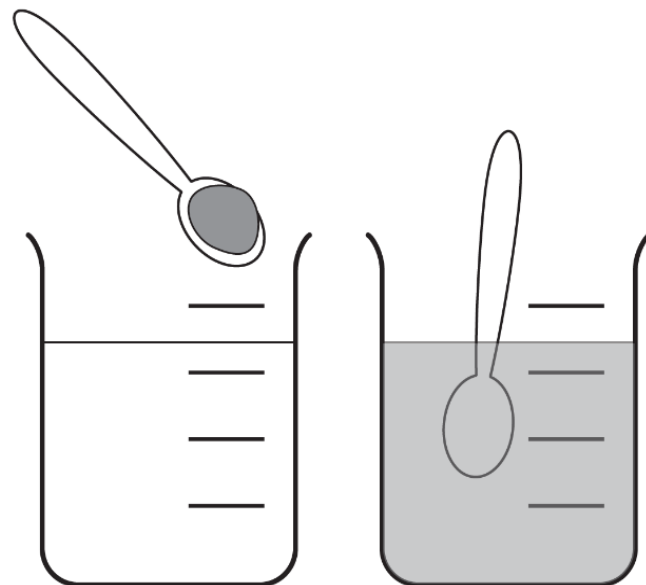
## In other words ...

this is a substance that will dissolve

## Sign it

Watch a video:

[bit.ly/3YdfXH3](https://bit.ly/3YdfXH3)



## Example

Salt is soluble in water

## Don't confuse with ...

disappeared. Just because a soluble substance cannot be seen it doesn't mean that it has disappeared, it is just really spread out

## Say it

Sol-ya-bel

# Solute

a substance that dissolves in a solvent to make a solution

## In other words ...

the solute is the substance that is dissolved in a liquid

## Sign it

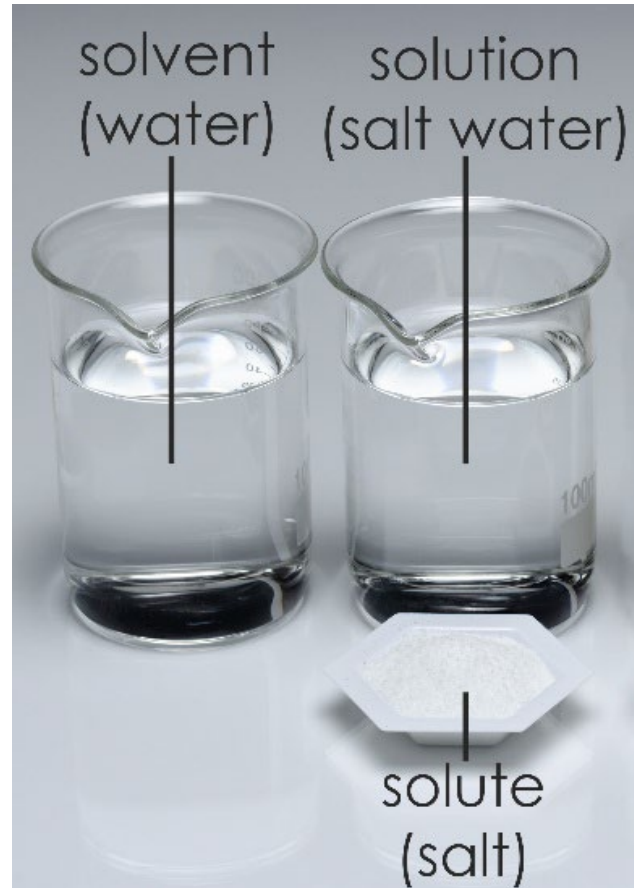
Watch a video:



[bit.ly/3S6Ttnv](https://bit.ly/3S6Ttnv)

## Say it

Sol-y-eut



## Example

When salt is dissolved in water the salt is the solute

## Don't confuse with ...

solvent; this is the liquid the solute is dissolved in

# Solution

the mixture produced when a solute dissolves in a solvent

## In other words ...

a mixture where one substance dissolves completely in another, such as salt in water

## Sign it

Watch a video:



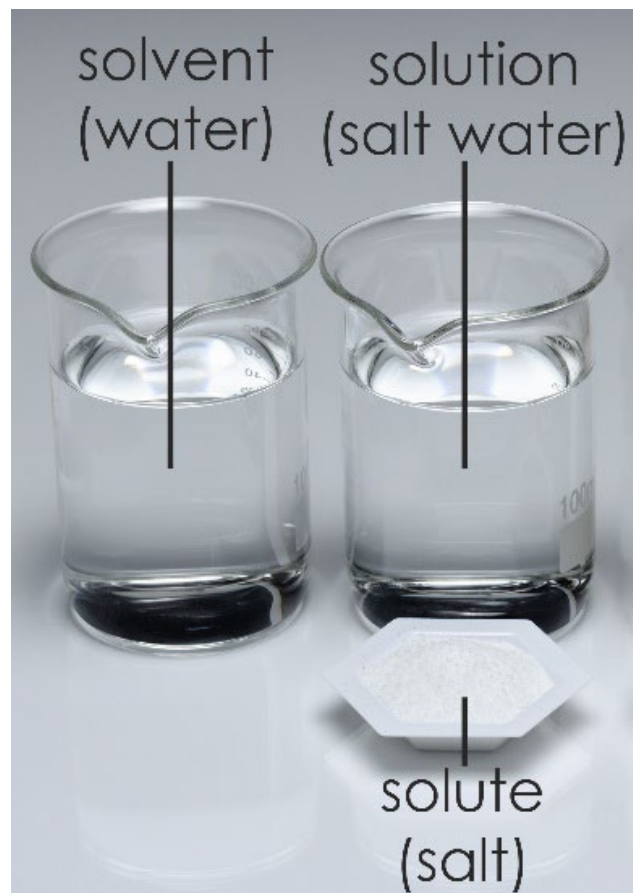
[bit.ly/44uofhF](https://bit.ly/44uofhF)

## Say it

Sal-ue-shen

## Break it down

Sol (dissolve),  
ution (process)



## Example

In a solution of salt water, the solute is salt and the solvent is water

## Don't confuse with ...

answer. Solution can also mean the answer to a problem. In maths and physics, you may be asked to work out the solution to a question

# Solvent

a substance that dissolves the solute to make a solution

## In other words...

the solvent is normally a liquid that other substances can dissolve into

## Sign it

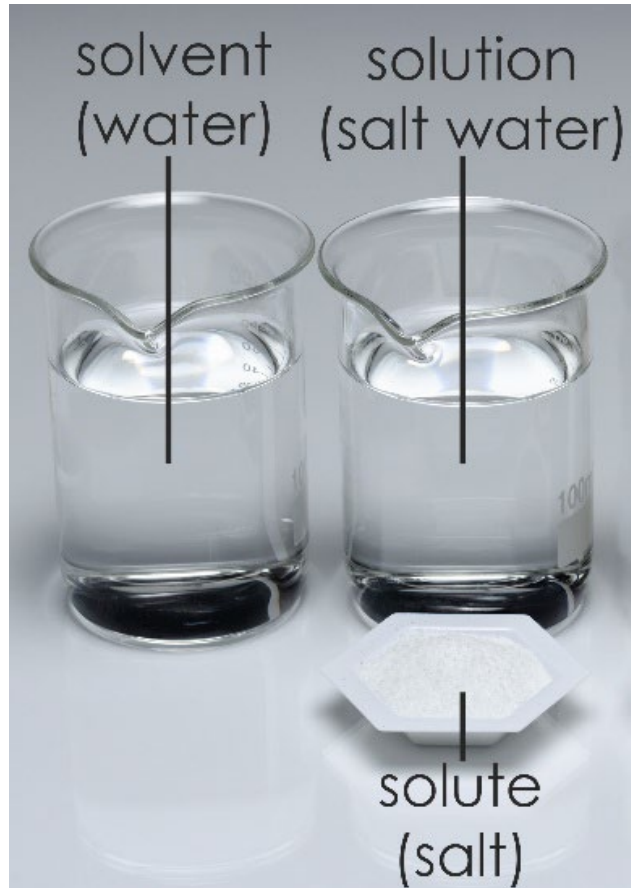
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## Say it

Sol-v-ant



## Example

When salt is dissolved in water the water is the solvent

## Don't confuse with...

solute; this is the substance dissolved in the solvent

# Aqueous

when a substance is dissolved in water; shown by the state symbol (aq)

## In other words ...

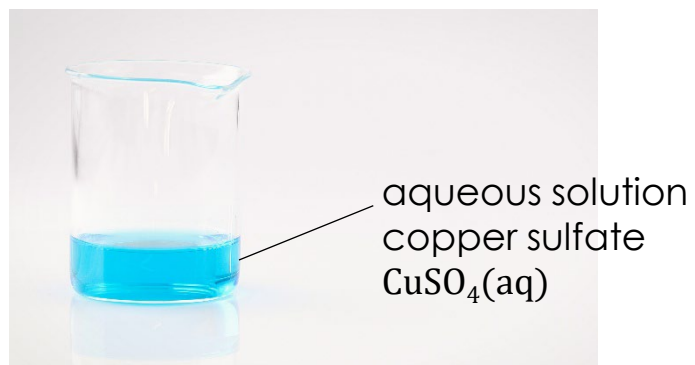
aqueous means that something has been dissolved in water to form a solution

## Say it

Ay-cw-ya-s

## Break it down

Aqua (from the Latin meaning 'water'),  
ous (suffix meaning 'full of')



## Similar words

Solution (a liquid mixture, often made with water)

## Example

Salt water is an aqueous solution of salt dissolved in water

## Don't confuse with ...

liquid. (aq) and (l) are not the same – aqueous means the substance has dissolved in water to form a solution. (l) shows that the substance is melted. Pure water is a liquid, not an aqueous solution, so it should have the state symbol (l)

## Other meanings

Aqua is often used for things related to water – aquariums and aquatic sports, for example

# Chemical formula

uses chemical symbols to show the relative number of the atoms of each element in a substance, such as  $\text{H}_2\text{O}$  for water or  $\text{CO}_2$  for carbon dioxide

## In other words ...

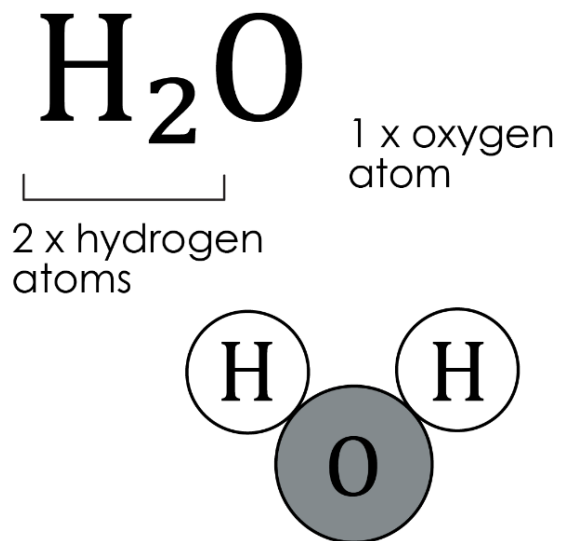
this type of formula gives the chemical symbols of the elements whose atoms make up the substance. The formula also shows the relative numbers of these atoms

## Say it

Cem-i-cel form-ya-la

## Break it down

Chemical (relating to substances), formula (a set way of writing things)



## Example

The chemical formula for water is  $\text{H}_2\text{O}$ . Each water molecule has two hydrogen atoms bonded to one oxygen atom

## Don't confuse with ...

the balancing numbers in a chemical equation. Small, subscript numbers tell us how many atoms there are of the element whose symbol they follow

## Other meanings

A formula can also mean a set of instructions, like a maths formula, or a recipe

# Chemical symbol

a single letter or two letters that is used to represent an element, such as C for carbon, Na for sodium

## In other words ...

a chemical symbol is a short way of writing the name of an element using one or two letters

## Sign it

Watch a video:   
[bit.ly/3Z25eQ6](https://bit.ly/3Z25eQ6)

## Say it

Cem-i-cel sim-bel

## Break it down

Chemical (relating to substances), symbol (a sign or a letter to represent something)

## Similar words

Element symbol

C

carbon

Na

sodium

## Example

The chemical symbol for carbon is C

## Don't confuse with ...

initials. Some elements have chemical symbols which match their name in English, e.g. O is for oxygen. Other elements, such as gold, Au, have unexpected chemical symbols, as their names come from other languages

# State symbol

used sometimes with the chemical formula to show the states of substances, where (s) is solid, (l) is liquid, (g) is gas and (aq) is aqueous

## In other words ...

a state symbol is a small letter in brackets that tells us whether a substance is in the solid, liquid or gas state or dissolved in water (aqueous)

## Example

In the reaction:  $\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow \text{H}_2\text{O}(\text{l})$ , the state symbols show that hydrogen gas and oxygen gas react together to form liquid water

## Sign it

Watch a video:

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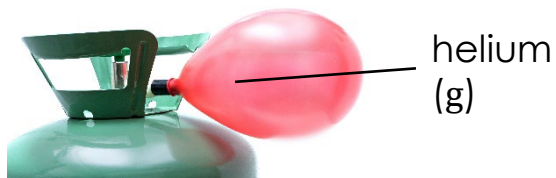
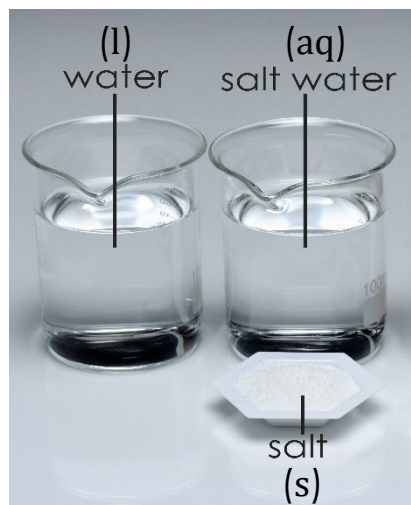


## Say it

St-ay-t sim-bel

## Break it down

State (the form something is in), symbol (a sign or letter to represent something)



## Don't confuse with ...

physical appearance. (aq) and (l) are not the same – aqueous means the substance has dissolved into water to form a solution, while (l) shows that the substance is melted

# Acknowledgements

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