11–14 years

What happens when something dissolves?

ROYAL SOCIETY OF CHEMISTRY

Education
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https://rsc.li/3jwKgBO

Introduction

If you drink a cup of tea with sugar in, do you have a mouthful of solid sugar as your drink it?

No!

Sugar is a **soluble** solid. This means it can **dissolve** in water to form a **solution**.

There are many substances that will dissolve in liquids.

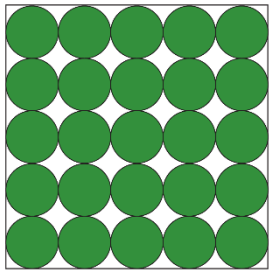
Learning objectives

1. Recall the structure of particle diagrams for solids and liquids.
2. Describe how particles of the solid are dispersed between particles of the liquid during dissolving.
3. Describe the process of diffusion during dissolving and explain why this is evidence of the movement of particles in a liquid.

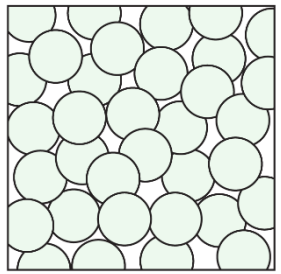
Starter

Today we are going to explore what happens visually and on a particle scale when substances dissolve.

In pairs, write a brief description of the arrangement of particles in a **solid** (salt) and in a **liquid** (water).



solid

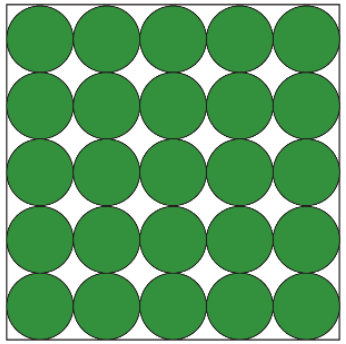


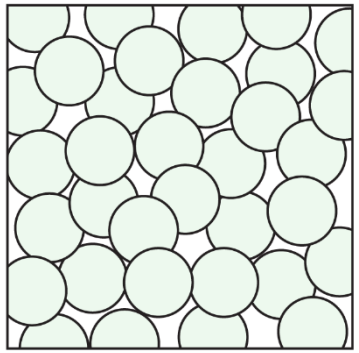
liquid

Starter activity

Paired task – self assess

Write a brief description of the arrangement of particles in a liquid (water) and a in a solid (salt).





Solid

1. Particles are the same size
2. Particles are in fixed positions
3. Particles vibrate
4. Particle form a regular pattern
5. Particles are touching

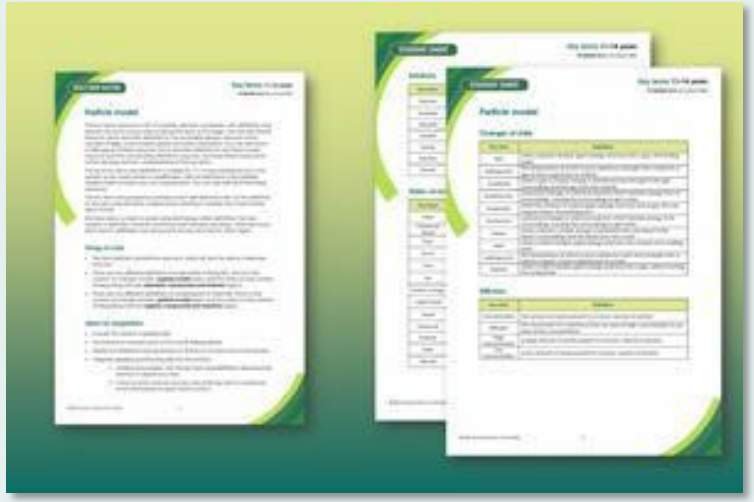
Liquid

1. Particles are the same size
2. Particles move around each other
3. Particles are in an irregular pattern/randomly arranged
4. Particles are touching

Key terms

Key term	Definition
Dissolve	when a solute is added to a solvent and the solute breaks into much smaller particles and spreads out
Diffusion	the movement of a substance from an area of high concentration to an area of low concentration
Insoluble	describes a substance which does not dissolve in a particular solvent
Miscible	when two liquids can mix and do not separate out into layers
Soluble	describes a substance which dissolves in a particular solvent
Solute	a substance that dissolves in a solvent to make a solution
Solution	the mixture produced when a solute dissolves in a solvent
Solvent	a substance that dissolves the solute to make a solution

Find more support for vocabulary in our Key terms support bundle for **11–14 Particle model**.



Available to download from: rsc.li/4cmvSbS

Teacher demonstration

Demonstration

You are going to observe potassium manganate(VII) crystals being added to a beaker of water. As you observe this, complete the table below to show your observations.

Chemical	Observations		
	Before	During	After
Water			
Potassium manganate(VII)			

Teacher demonstration

Share your observations in pairs. Student 1 presents their ideas. Student 2 actively listens and responds by agreeing, disagreeing or building on this point.

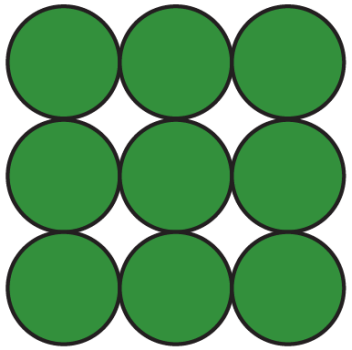
Chemical	Observations		
	Before	During	After
Water			
Potassium manganate(VII)			

Teacher demonstration

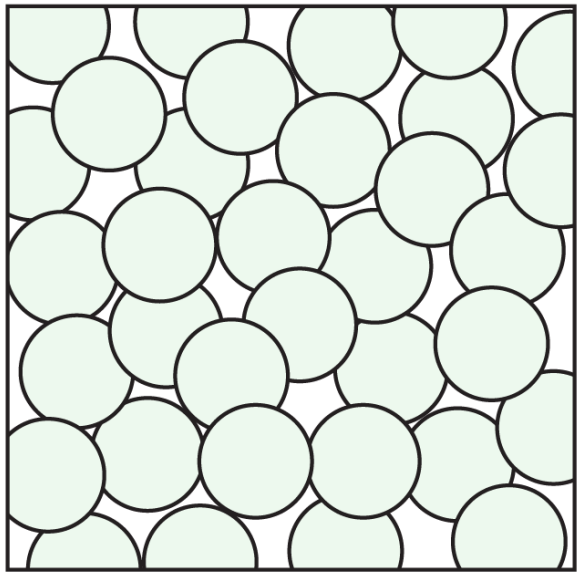
Self-assess your answers. Add in any information that you missed.

Chemical	Observations		
	Before	During	After
Water	Colourless liquid	Water closest to the crystal turns purple	All the water is now purple
Potassium manganate(VII)	Dark purple solid crystals	Starts to dissolve, purple colour moves into the water, crystals get smaller	No purple crystals remaining, solution is purple

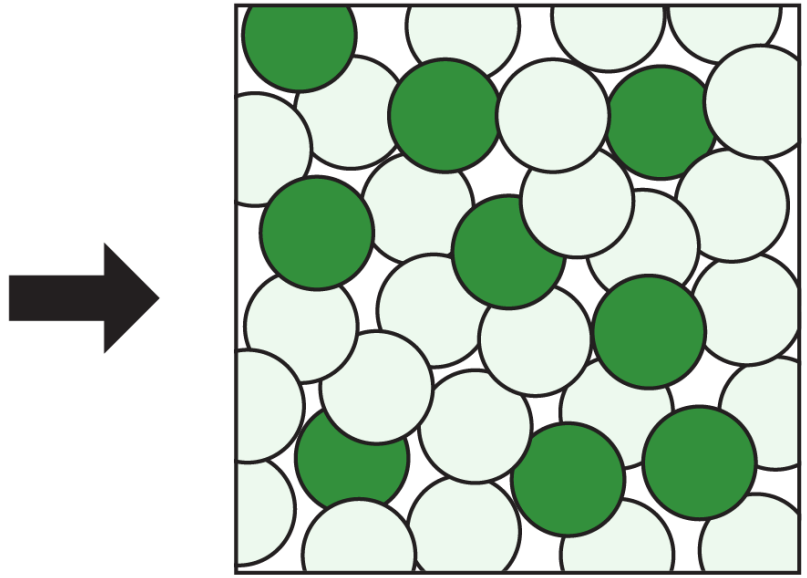
Teacher demonstration – particle model



Potassium manganate(VII) **(solute)**



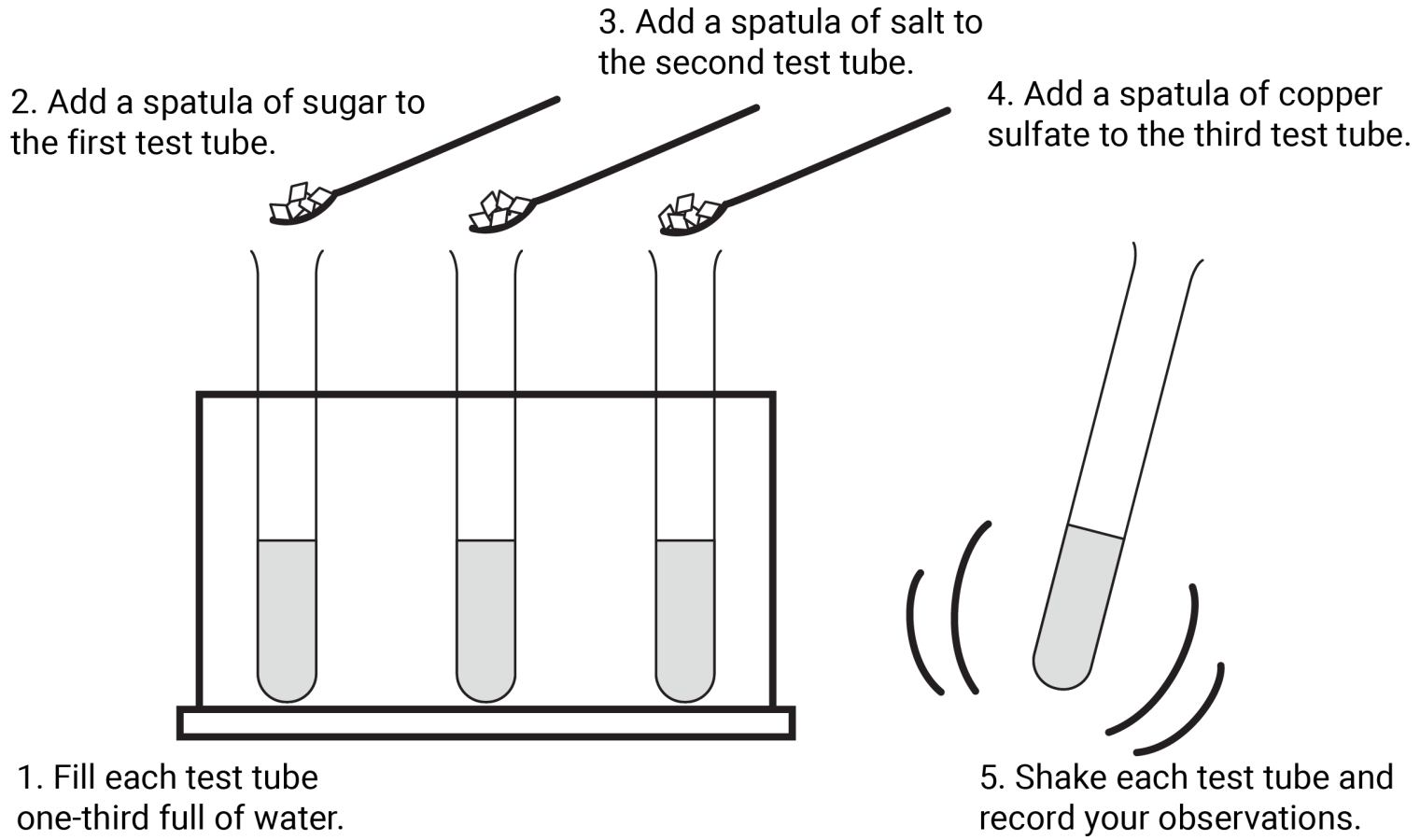
Water **(solvent)**



Potassium manganate(VII) aqueous solution **(solution)**

Class practical

Make observations when sugar, salt and copper(II) sulfate crystals are dissolved separately in test tubes of water.



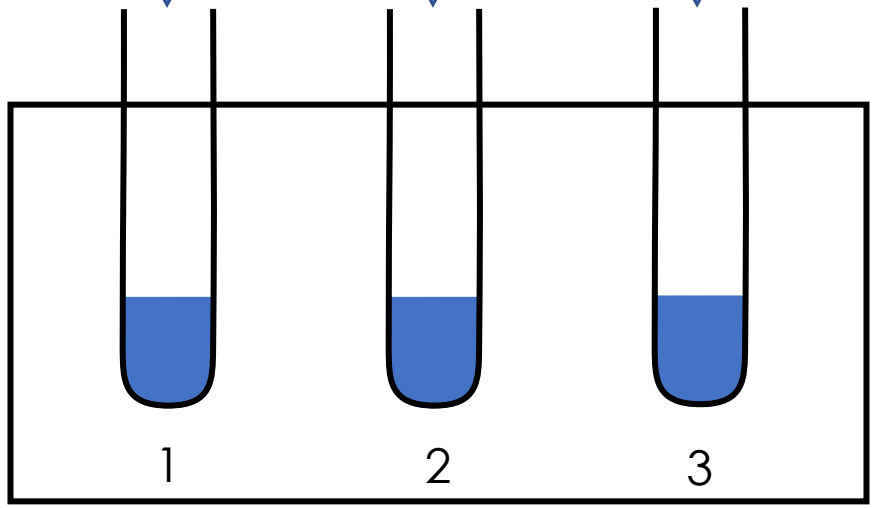
❸ 1 x spatula of salt ❑

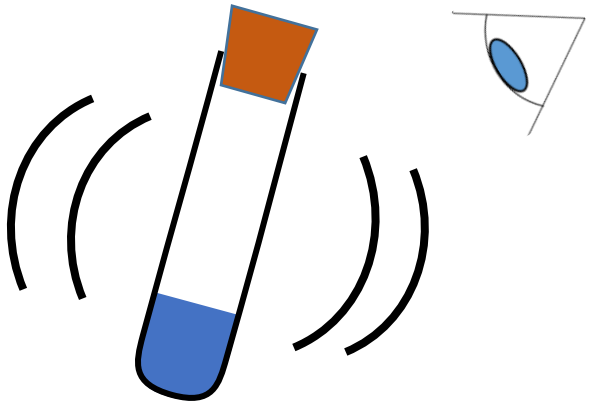
❹ 1 x spatula of copper(II) sulfate ❑

❷ 1 x spatula of sugar ❑

❶ 1/3 full of water ❑

❺ Shake each test tube and record your observations ❑





What happens when something dissolves, RSC Assessment for learning (11–14): rsc.li/3jwKgBO

Class practical – observations

Make observations when sugar, salt and copper(II) sulfate crystals are dissolved separately in test tubes of water.

Chemical	Observations		
	Before	During	After
Water			
Sugar			

Class practical – self-assess

Make observations when sugar, salt and copper(II) sulfate crystals are dissolved separately in test tubes of water.

Chemical	Observations		
	Before	During	After
Water	Colourless liquid	Colourless liquid with solid at the bottom	All the water is colourless again
Sugar	White solid crystals	Starts to dissolve, crystals get smaller	No white crystals remaining, solution is colourless

Class practical – observations

Make observations when sugar, salt and copper(II) sulfate crystals are dissolved separately in test tubes of water.

Chemical	Observations		
	Before	During	After
Water			
Salt			

Class practical – self-assess

Make observations when sugar, salt and copper(II) sulfate crystals are dissolved separately in test tubes of water.

Chemical	Observations		
	Before	During	After
Water	Colourless liquid	Colourless liquid with solid at the bottom	All the water is colourless again
Salt	White solid crystals	Starts to dissolve, crystals get smaller	No white crystals remaining, solution is colourless

Class practical – observations

Make observations when sugar, salt and copper(II) sulfate crystals are dissolved separately in test tubes of water.

Chemical	Observations		
	Before	During	After
Water			
Copper(II) sulfate crystals			

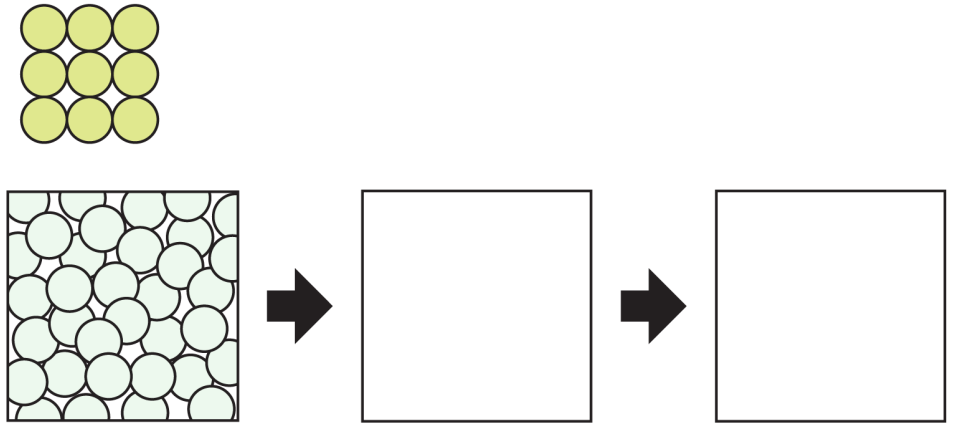
Class practical – self-assess

Make observations when sugar, salt and copper(II) sulfate crystals are dissolved separately in test tubes of water.

Chemical	Observations		
	Before	During	After
Water	Colourless liquid	Water closest to the crystals turns blue	All the water is now blue
Copper(II) sulfate crystals	Bright blue solid crystals	Starts to dissolve, blue colour moves into the water, crystals get smaller	No blue crystals remaining, solution is blue

Paired task – describing your observations

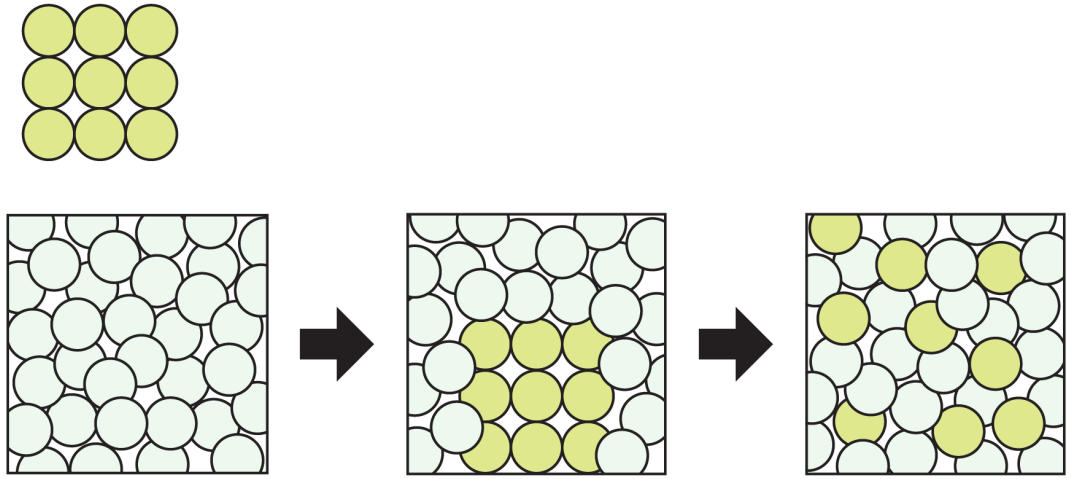
1. Draw particle diagrams to show what happens when a soluble solid (salt) dissolves in this liquid solvent (water).



2. Write an explanation of your observations from salt and water in terms of particles.

Paired task – self assess

1. Draw particle diagrams to show what happens when a soluble solid (salt) dissolves in this liquid (water).



2. Write an explanation of your observations from salt and water in terms of particles.

As a solid, there are enough particles of salt packed closely together to see a white solid. When salt is added to water, the salt particles move apart from each other and disperse, as the water particles move into the space between them. This can be seen as the crystals get smaller. The particles then spread out through the water by diffusion. This can be seen as we can no longer see white crystals.

Individual task

Using the information from the previous task to support you, write an explanation of your observations from copper(II) sulfate crystals and water in terms of particles.

The observations are below for convenience.

Chemical	Observations		
	Before	During	After
Water	Colourless liquid	Water closest to the crystals turns blue	All the water is now blue.
Copper(II) sulfate crystals	Bright blue solid crystals	Starts to dissolve, blue colour moves into the water, crystals get smaller	No blue crystals remaining, solution is blue

Individual task – self assess

Using the information from the previous task to support you, write an explanation of your observations from copper(II) sulfate crystals and water in terms of particles.

As a **solid**, there are enough particles of copper sulfate packed **close** together to see as **blue** crystals.

When copper sulfate is added to water, the **particles** in copper sulfate move apart from each other and **disperse**. This can be seen through the movement of blue colouring into the water as it **dissolves** and by the crystals getting **smaller**.

The particles then spread out through the water by **diffusion**. This can be seen through the solution turning **blue**.

Mass and dissolving

Complete the worksheet *Mass and dissolving* to identify and resolve any misconceptions that are still held following this investigation.