In this unit we will

1. Compare and group everyday materials according to their properties
2. Investigate the separation of materials, including filtration and evaporation
3. Explore how some materials will dissolve and what this means in terms of the particle model
4. Learn that some changes are reversible, while others are irreversible

**Science Skills that we will develop:**

**Properties and Changes of Materials**

**Explaining Science**

1. I use complex science words correctly
2. I use a science model to describe and explain
3. I draw & annotate diagrams to help describe/explain

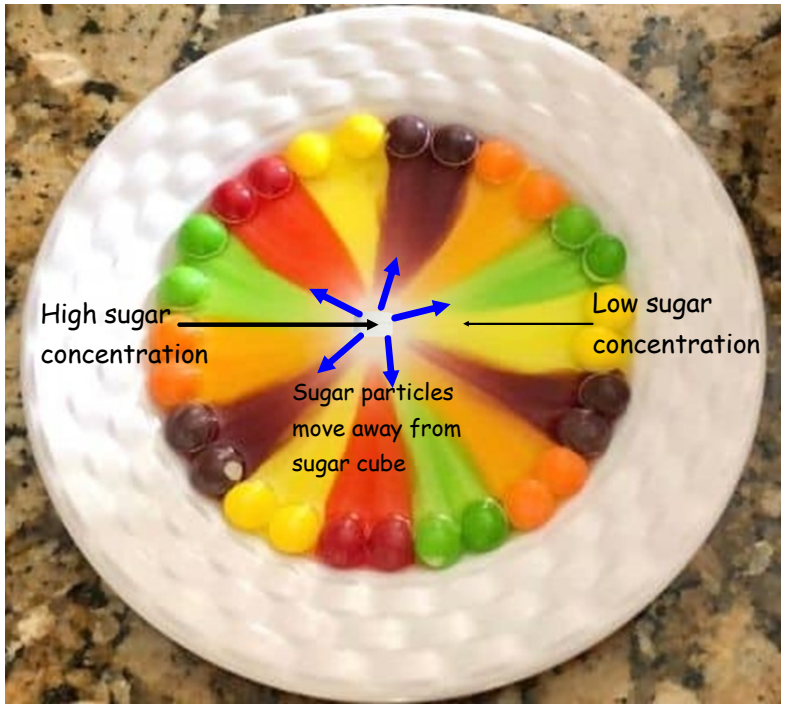
**Designing Experiments**

1. I use knowledge & understanding to make a hypothesis
2. I plan a reliable fair test
3. I plan to minimise risk & act on safety suggestions
4. I plan to collect repeat readings and calculate the mean

What can you remember about last week's lesson about the way sugar particles move when they dissolve in water?

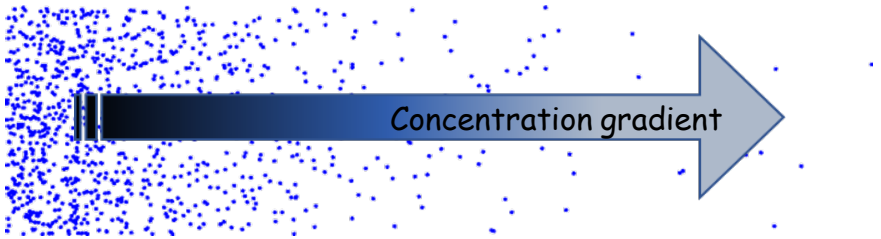
These words might help:

**solid** **liquid** **particles** **moving** **smaller** **break apart**




Did you remember that particles always move along a concentration gradient?

The pure sugar that was dissolving from the sugar cube was highly concentrated, so of course moved outwards, pushing away the less concentrated coloured sugar rainbow of the Skittles.



Today, we will be thinking about how to separate materials from solutions

tap water

salt water

brown sugar solution


ink

Discuss: which of these liquids is pure, and which have solids dissolved in them?

How could we get the solids back out of them?

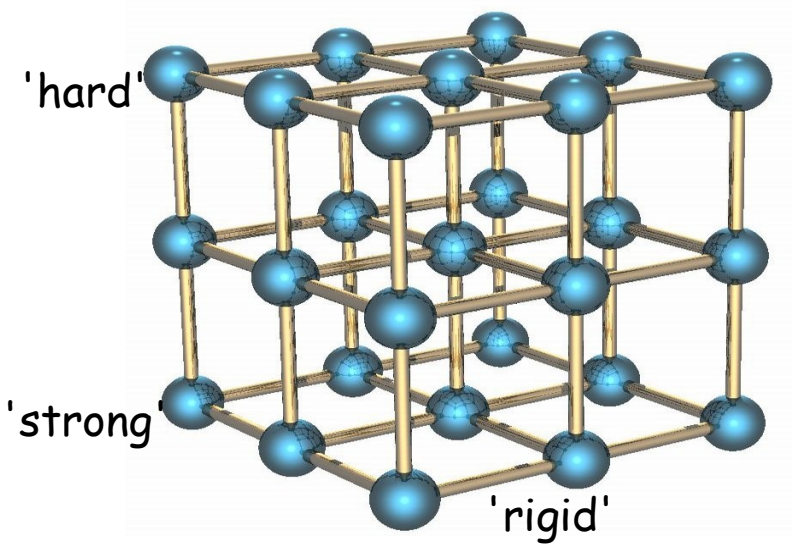
**Evaporation** - what does this actually mean?

Tell a partner then share your ideas with the class.

As we have learnt, a liquid is made up of many particles that can move around; these **particles** are not completely free, but are joined to each other very loosely by weak links called **bonds.**

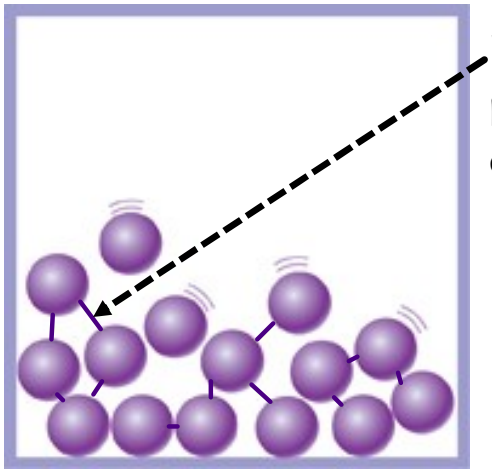
These bonds play a very important part in how materials behave when they are solids, liquids or gases.

A **solid** has strong links or bonds between each particle. Although the particles cannot move around easily, they still **vibrate** or shiver on the spot.




Even a more flexible, soft or malleable material is still a solid, and the particles within it have strong bonds between them, which keep the material from falling apart.

A liquid has weak links or bonds between each particle. This allows the particles to **flow** and cover the bottom of a container.

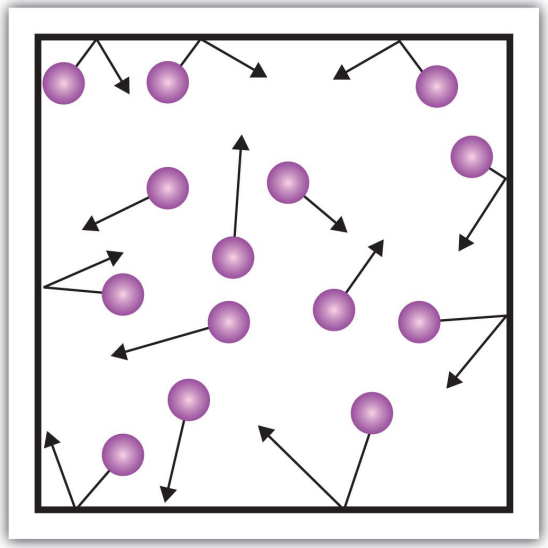


Weaker bonds allow particles to move around each other - particles are continually sticking to each other and breaking away as they bounce around the container.

How can we make the strong bonds of a solid weaker, so it becomes a liquid?

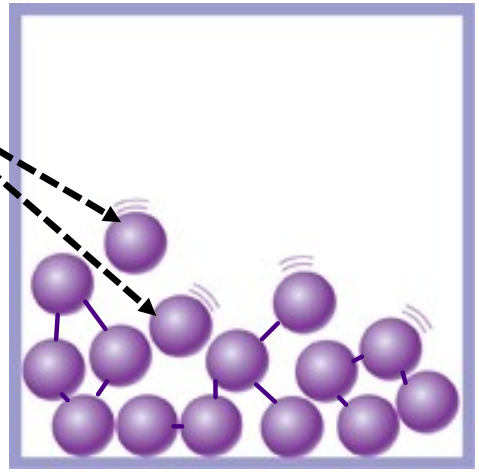
A gas has almost no links or bonds between each particle. The particles are free to bounce all around the container, and if there is no lid, the particles bounce out into the atmosphere, away from the concentrated gas in the container.

What makes a liquid turn into a gas? How do we break the already weak bonds in the liquid?



Evaporation is the process where particles from a liquid that are bouncing around near its surface break free and leave the container to enter the air.

Did you notice before that these particles have no bonds with others, and are free to bounce into the air? They are now no longer part of the liquid. They are **gas** particles.



During evaporation, a liquid turns into a gas.

These two videos might help you understand how solids, liquids and gases behave:

https://www.youtube.com/watch?v=oaiTKgc8cjc

Spr1'14-Science-4-particle model role play.mp4

Back to our four solutions;  let's see what will happen when we evaporate a small amount of each.

We could just sit and wait for all their particles to bounce into the atmosphere, but have you ever heard of the expression, 'As boring as watching paint dry'?

tap water

salt water

brown sugar solution


ink

Think: what ways can you think of to help our solutions to evaporate/dry out?

In order to help the water particles bounce out of the liquid and turn into a gas, we need to

1.) Either increase the flow of air particles past the surface of the water, or

2.) Increase the energy of the water particles so that they move around and break away more quickly

In other words, make it windy, or make it hot, or both!

Pure water:

This one is easy - place a wet hand-print in the centre of a dry paper towel, but before you take your hand off, draw around it.

Now watch the print as it dries - you can see the water turning into a gas (water vapour) as the damp print shrinks away from your pencil outline.

Can you speed up the process and make the water evaporate more quickly?

Salt solution / brown sugar solution / ink:

Carefully place a single drop of the liquid onto the centre of a paper towel.

Now we'll make it very hot and windy to help the evaporation along. What do you think will happen before we do it? Will all the liquid evaporate? Will there be anything left behind? Can you say why?

# Evaporating Solutions

| Science skills success criteria | Me | Teacher |
|---|---|---|
| *I can use the Particle Model to help me describe evaporation of different solutions | | |
| ** I use the Particle Model to describe and begin to explain what happens when different solutions evaporate | | |
| *** I use the Particle Model to describe and explain confidently what happens when different solutions evaporate | | |

| Particles | vibrate | bonds | evaporate | gas | vapour | liquid | solid | energy |
|---|---|---|---|---|---|---|---|---|

| What happened when each of these evaporated – can you explain **why?** | |
|---|---|
| Tap Water: | |

What do we see when we heat a liquid so it gets very hot?

What will happen if the salt water is boiled?

Will the steam be salty?

Why? Why not?