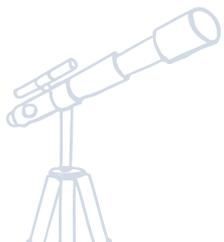


# States of Matter

Solids - Liquids - Gases

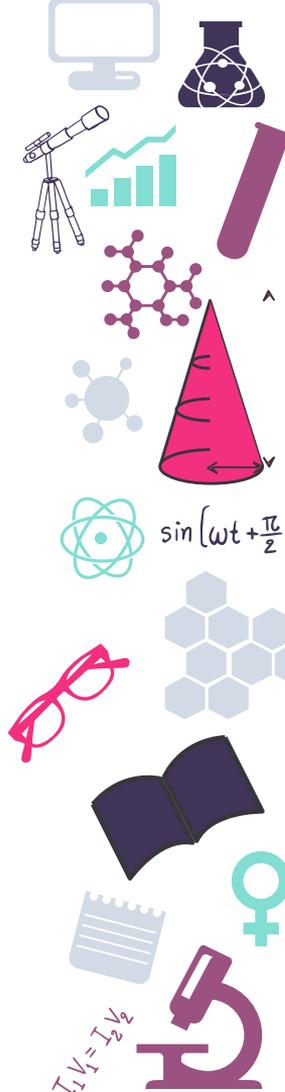
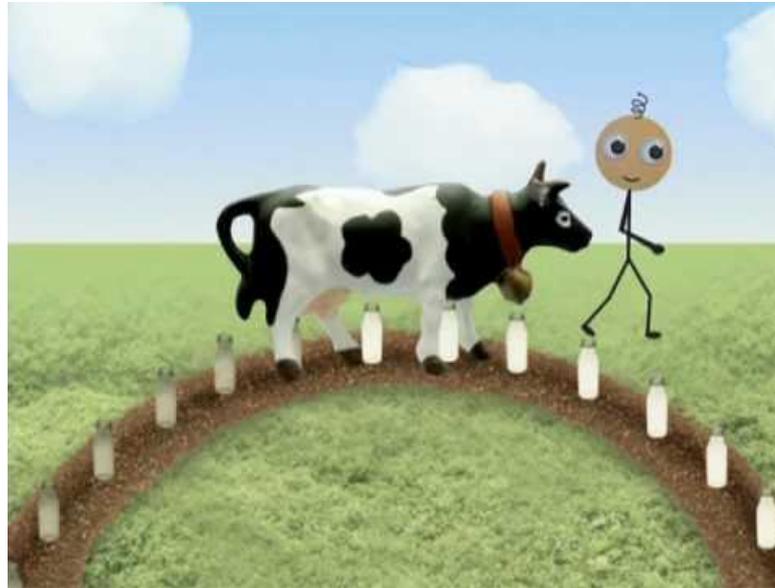


# So what do we know?

So it's time to go back and have a look at what we have found out about our 3 main states of matter.

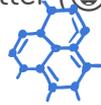
SOLIDS - LIQUIDS - GASES

But first, it's time to be a bit cringey and listen to They Might Be Giants.



# The little things....

Everything, it doesn't matter (☹️) if it is a solid, a liquid, or a gas, is made up of tiny particles.

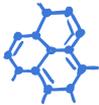


The only things that really change is how much those particles are moving and how tightly they are stuck together.

Now these particles aren't magnetic but they really do just want to be stuck next to each other - like kids and their beds in the morning. To get them moving and apart from each other they need energy to get them going and moving apart!



Gases have a lot of this energy and Solids have the least, liquids are kind of in the middle.



# The hard things...

The particles of a solid attract to each other very strongly - they pretty much stick together. They attract each other so strongly that they stay attracted to the same particles and don't like joining with other types of particles. The only moving they can do is vibrating the tiniest bit to and fro - you won't even notice them moving.

This means that solids have a fixed shape, it won't change unless it is forced to. Go on, try it - find a rock outside and try to squash it into a different shape with your hand!



The particles are all crammed together so solids tend to be heavy. If you've got Ice Cubes at home, pick one up and see if a cup of ice feels heavier than a cup of water?



# The splashy things...

The particles of a liquid attract to each other much more than the particles of a gas. The particles are loosely attached to their neighbours, however, because liquids are easy to move around the particles are constantly changing neighbours - different particles next to each other all the time.

This means liquids have no fixed shape - they will fit the shape of any container but filling the bottom of the container. No matter (☹️) what the shape.



$$\sin\left(\omega t + \frac{\pi}{2}\right)$$



# Going from one to another..

When you heat a solid the particles start to vibrate faster. When you heat a liquid the particles move faster, and when you heat a gas the particles whiz round even faster.

This is because heat is energy. When you heat a matter its the particles gain energy. When particles gain energy they move.

The energy making the particles move is what changes matter from one form to another. It's what make a solid turn into a liquid and then into a gas. And this isn't just for water, with enough heat to provide energy this can happen to nearly anything!



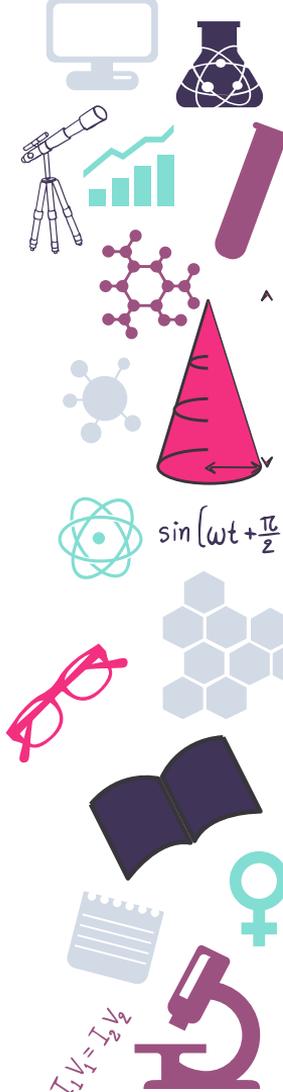
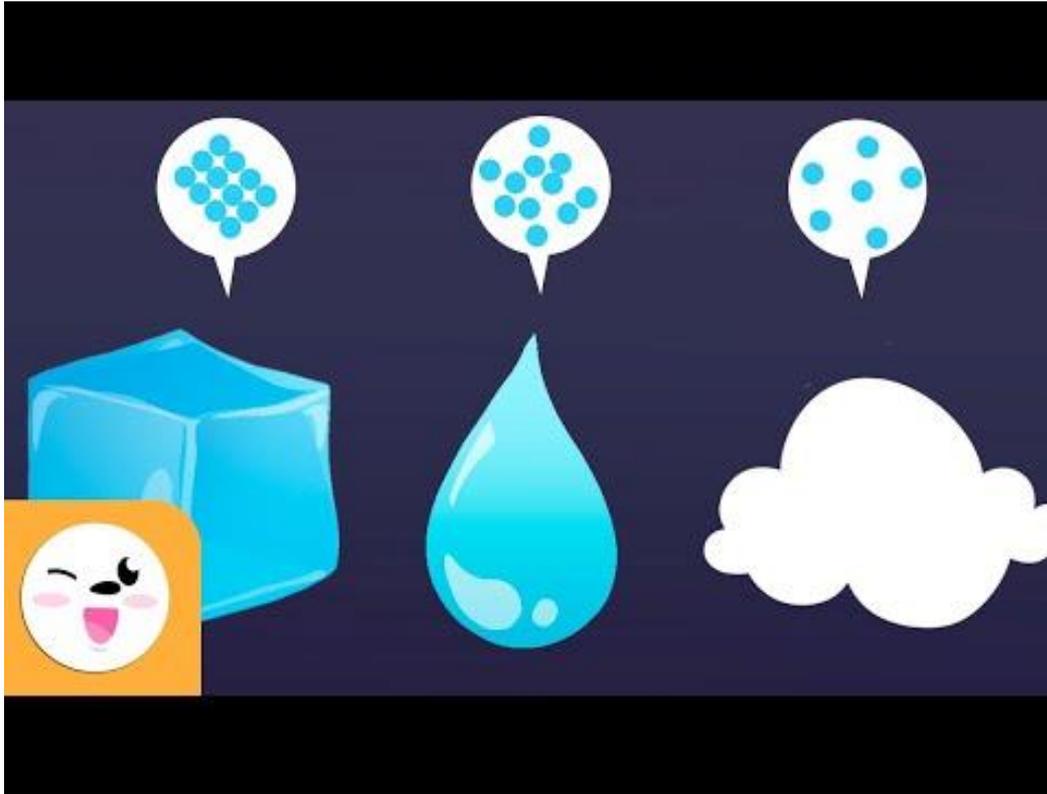
Lava is a form of liquid stone.



Mercury is metal that is liquid at room temperature



# Here's another way to show...



$$I_1 V = I_2 V$$



# So what's next...

The process can go the other way. We all know that steam or vapour can turn into water and water can turn into ice.

We've seen that the way to go from solid to liquid to gas is by using heat to 'give' energy so what would be the way to make it go from gas to liquid to solid?

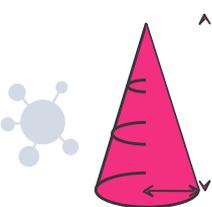
Chill out.....  
Seriously



To remove the energy we just chill the particles. Chuck some water in the freezer and you'll get ice. Do the same for spaghetti sauce and you'll turn a liquid into a solid.







# Tables to compare data

	A	B	C
Content A	100	200	400
Content B	\$67,000	\$56,000	\$78,000
Content C	4500	60000	\$8,000



