Year 4 Science - States of Matter

What should I already know?

Everyday materials can be grouped and compared according to their properties. Materials are used for certain purposes because of their properties.

Cross- Curricular links

Maths - measuring volume and reading scales on containers, reading the temperature on a thermometer, measure and weight of materials.

Vocabulary

States of matter – materials can be one of 3 states of matter: solid, liquid or gas. Some materials can change from one state to another and back
Solid – a substance that stays the same shape and turns to a liquid when heated
Liquid – a substance that flows freely but is a constant volume
Gas – a substance that has no fixed shape or volume
Volume - the amount of space occupied by an object
Particles – small piece or portion of a substance
Bond – joined securely to something else
Condensation – a gas changes to a liquid
Evaporation – a liquid changes to a gas
Boiling point – the temperature at which a liquid boils and turns to vapour
Melting point – the temperature at which a given solid will melt
Sublimation - when a substance changes from a solid to a gas without becoming a liquid
Thermometer – an instrument for measuring and indicating temperature
Water cycle – the cycle of processes by which water circulates between the earth's land, seas and atmosphere
Precipitation – liquid or solid particles that fall from a cloud as rain, sleet, hail or snow
Transpiration – water vapour that forms from water on the leaves of plants
Groundwater – water held underground in soil and rock crevices
Run off – excess water that runs from land into nearby streams and rivers

What I will know at the end of the topic

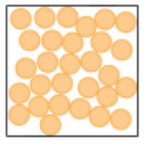
How can solids, liquids and gases be compared and grouped?

What are the 3 main states of matter that all materials are composed of?
The 3 main states of matter are solids, liquids and gases. Materials can be sorted into these 3 main groups. All materials are made up of particles and these are organised differently in different states of matter.

What are the properties of solids, liquids and gases?

Solids
Particles are packed close together
Particles are arranged in a regular pattern
Particles do not move freely
Particles are held together by bonds

Liquids
Particles are packed closely but not as tight as solids
Particles are arranged randomly
Bonds hold the particles together but not as strongly as in solids so the particles can move
Liquids take the shape of any container

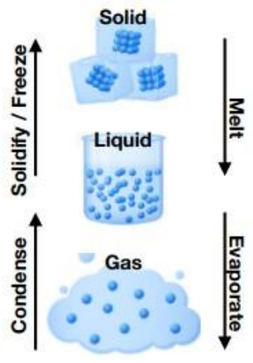


Gases
Particles are very far apart
Particles move around randomly
Gases take the shape of any container
Gases can be compressed and squeezed

When do some materials change their state of matter?

What can cause a material to change its state of matter?
Heating and freezing can cause materials to change their states of matter.

When will a solid change into a liquid and when will a liquid change to a solid? What is needed for these changes to occur?
A solid will change into a liquid when it melts. The reverse of this is freezing, when a liquid changes to a solid. Water melts at 0 oC, below this the water will freeze. Change in behaviour of particles causes the change of state.



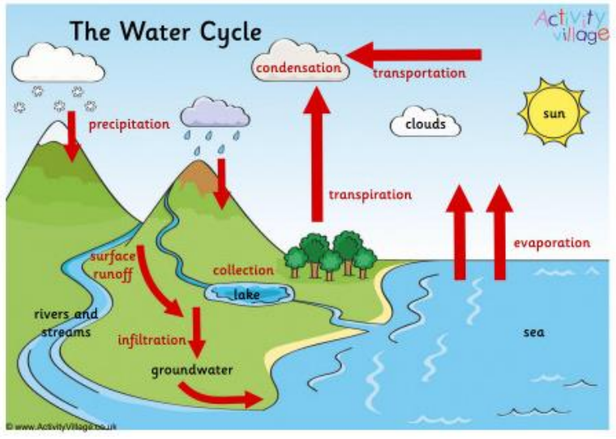
When will a liquid change into a gas and when will a gas change to a liquid? What is needed for this change to occur?
A liquid will change to a gas when it evaporates, the reverse of this process is called condensation. Water will evaporate even at lower temperatures, increased temperatures increase rate of evaporation.
Water boils at 100 o C. Change in behaviour of particles causes the change of state.

What is sublimination?
When a material changes from a solid to a gas without going through the liquid stage it is called sublimination. An example of sublimination is dry ice. Dry ice is solid carbon dioxide which changes directly to a gas when it freezes.

What is the Water Cycle and how does this link to states of matter?

What is the continuous process where water flows around our world?
The Water Cycle is the continual process what keeps water flowing around the world.

How does the Water Cycle work? Where do evaporation and condensation occur in the water cycle and how does this link to changes in temperature?
The Water cycle is the process whereby water from the rivers and the sea evaporate due to heat from the sun (liquid changing to gas). Higher water temperature will increase evaporation. Along with evaporation, water also moves to the air through transpiration. This is where water turns into water vapour (gas) on the surface of leaves of plants. When the water vapour reaches cooler air then it condenses to form clouds (gas to liquid). Precipitation (rain) then occurs and the water runs off the land back to the rivers and seas.



Investigate

Can you group materials into solids, liquids and gases? Do all liquids behave in the same way? Is honey a solid or a liquid?
Is there a pattern in how long it takes different sized ice lollies to melt? Can you explain your results?
How does the level of water in a container change when it is left on a windowsill? How does this link to global warming?

Famous Scientists

Antonie Lavoiser 1743 – 1794 Discovered the role that oxygen plays in combustion. Recognised and named oxygen (1778) and hydrogen (1783)
Robert Boyle 1627 – 1691 Discovered that the volume of a gas decreases with increasing pressure and vice-versa – Boyle's Law
John Dalton 1766 – 1844 In 1803 he proposed that matter is made up of atoms that are indivisible and indestructible