Winchester Science Centre
By Wonderseekers

Solid. Liquid. Squish!

Pre-visit resources for KS2

Solid. Liquid. Squish! KS1 Pre-visit Activities

These activities are designed to be completed before you visit for your workshop. We recommend working through the activities from 1 to 3 but you are welcome to pick and choose depending on your group's prior knowledge and any ideas they may spark along the way.

Through these activities, you will be exploring the different states of matter, comprising of solids, liquids and gases. We will also be exploring how a substance can change its state of matter when exposed to different factors like temperature.

Teacher Guide:

Learning Objectives:

- Identify materials as solids, liquids, or gases.
- Observe how materials change when heated or cooled.
- Describe these changes using scientific vocabulary.
- Record observations and use evidence to explain what they see.

Key Science:

We define anything in our world that has mass and takes up space as matter. All matter is made up of particles. We tend to group matter into three main groups; solids, liquids and gases. We group them because their particles are all arranged in different structures and this causes them to behave differently. The particles in a solid are bonded together in a strong structure. They can be held in our hands and often keep their shape unless we change it. This could be done by cutting or squeezing. Some solids include sand, stone and most metals. The particles in a liquid are still bonded but have weaker bonds than those of a solid. This means there is more space between the particles allowing them to move around more. This allows liquids to flow or be poured. They can also change their shape to fit any container, although they will always take up the same amount of space. The most common liquid we have on Earth is water. The particles in a gas are much freer, having lots of space because the bonds they have are very weak. This allows gases to change their shape and their volume to fill any container they are in. Most are invisible but are really important to us here on Earth. Gases like oxygen allow us to breathe and make up a part of our atmosphere.

Some things in our world can change their state of matter. The best example of this is water. Water usually exists as a liquid but it can be frozen into ice to become a solid or evaporated into water vapour or steam.

Curriculum links:

- Group materials by their state: solid, liquid, gas.
- Explore state changes including melting, freezing, evaporation, and condensation.
- Observe how temperature affects materials.

Key Definitions:

Solid - Something that stays in place and can be held. Solids keep their shape and do not flow. Solids take up the same amount of space, they do not spread out like gases. Solids can be cut or shaped. Even though they can be poured, sugar, salt and flour are all solids.

Liquid - Liquids can flow or be poured easily. They are not easy to hold in your hand. Liquids change their shape depending on the container they are in. Even though they can change their shape, they always take up the same amount of space.

Gas - Gases are often invisible. They do not have a fixed shape, they spread out and change their shape and volume (space they take up) to fill up whatever container they are in. Gases can be squashed.

Materials: Matter or substances that objects are made from. Different materials have different features, or properties, which make them suitable for different uses.

Freezing - Freezing is when the state of matter changes from a liquid to a solid, usually accompanied by a loss of energy in the particles. It can be triggered by a change in temperature.

Melting – The change in state of matter from a solid to a liquid, accompanied by a gain of energy in the particles. It can be triggered by a change in temperature.

Evaporating – The change in state of matter from a liquid to a gas, accompanied by a gain of energy in the particles. It can be triggered by a change in temperature.

Condensing - The change in state of matter from a gas to a liquid

Non-Newtonian fluid - A non-Newtonian fluid is a fluid that does not follow Newton's law of viscosity, that is, it has variable viscosity dependent on stress

Activity 1:
"State or Not?" Showdown!

Overview

This first activity is a quiz game between the students to get them comfortable with identifying solids, liquids and gases and justifying their choices.

You will need

- Images or objects that represents different states of matter.

Instructions

1. Introduce the class to the differences between solids, liquids and gases in their particle structure.
2. Then split the class into teams.
3. Show each image/hold up an object — is it a solid, liquid, gas... or not even matter? Buzz in with your answer, and explain why!

Take it further

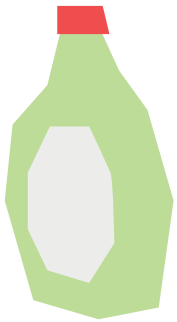
If you want to make the game a bit more competitive, try adding in the scoring system below.

- 2 points = right answer + correct explanation.
- 1 point = right answer.
- 0 = pass (next team can steal!)

Activity 2:
Melting Moments (15–20 mins)

Overview

In this activity, we will be exploring how we can move from a solid to a liquid through the melting of ice. The class will experiment by exposing the ice cube to different external conditions to see how this impacts how quickly it melts and whether the condition makes a difference.



You will need

- Ice cubes, clear cups, paper towels.
- Salt, sugar, cloth, sand.
- Paper.
- Timer.

Instructions

1. Get the class into pairs. Give each pair an ice cube in a clear cup on a paper towel.
2. Have the class take an initial observation of their ice cube What does your ice cube look like? Record your observations.
3. Have the pairs each pick a condition to test from the list below. Make sure all the conditions are being covered :
    - Sprinkle salt or sugar on the ice
    - Wrap it in cloth
    - Place it in sand
    - Move it in sun, shade, or lamp
    - Hold the ice cube
4. Start recording with your timer. Every minute, for a total of 5 minutes, write/draw what's happening. How long does it take to melt? At the end of the 5 minutes, note how much the ice cube has melted.
5. If you have spare ice cubes, you can give the students an opportunity to test another condition.
6. Pull the class back together and have a discussion about which of the ice cubes melted the most. Why do we think that could be? Anything that will increase the temperature will make it melt faster. Adding salt or sugar will stop the ice crystals from forming, causing it to crack.

Activity 3: The Vanishing Puddle(20-25 minutes)

Overview

In this activity we will be exploring how liquids can change to a gas through the process of evaporation. Using a missing puddle as an example, the children will investigate how when water vapour cools. This experiment will require warm-hot water which should be handled by adults only.

You will need

- Plastic cups.
- Ice cubes (optional).
- Warm water.
- Timer.
- Cling film + Elastic bands.

Instruction

1. The hook for this investigation is around your favourite puddle going missing, and the class needing to help you out. Feel free to give your puddle a name to make it more personal to you. You need the help of the class to help you find out what happened to your puddle as it has disappeared recently when the sun started shining.
2. Introduce the mystery to the class and let them know that we are going to see what happens to water when it is exposed to the sunlight.
3. Group up the children and give them a plastic cup, a timer, clingfilm and an elastic band.
4. The activity leader should then fill the cups top one-third of warm water. The children will then need to attach cling film to the top of their cup using the elastic band to secure it.
5. Then have the groups put their cups into an area which gets sunlight and start their timer.
6. Every 3 minutes for a total of 15 minutes have the class check their clingfilm. As the already warm water is heated further by the sun, the water will begin to evaporate into water vapour, rise up the cup and then condense at the clingfilm forming water droplets.
7. Ask the group if they have any ideas about what formed the water droplets. Once they have given their ideas, explain to the class what has happened to the water. As we've added heat from the sun, it has evaporated and then moved away from the source of heat and condensed. The puddle would've done the same, but instead headed up into the clouds, where it would've condensed again and come back down as rain.

Weather Adaptation:

1. Living in the UK we can't always ensure good sunshine, so another way of setting up the experiment is by using ice cubes.
2. Instead of having cling film, have the groups place another plastic cup upside down on top of their cup already one-third full of warm water.
3. Then on top of this cup, place an ice cube and start the timer, checking every 3 minutes for a total of 15 minutes. This ice cube will create a colder region allowing the water vapour to condense faster.
4. The class should then see water droplets begin to form around the top of the second cup. This is the water vapour condensing.
5. Ask the group if they have any ideas about what formed the water droplets. Once they have given their ideas, explain to the class what has happened to the water. As we've added heat from the sun, it has evaporated and then moved away from the source of heat and condensed. The puddle would've done the same, but instead headed up into the clouds, where it would've condensed again and come back down as rain.