

RADICAL REACTIONS

Phase Transitions

Watch the video here:

[youtu.be/
RaYosPIOFuY](https://youtu.be/RaYosPIOFuY)

Name:



Swansea University
Science for
Schools Scheme



PHASE TRANSITIONS

Physics lesson

WHAT ARE WE LEARNING?

We will be learning what happens when matter changes phase.

Most substances are either a solid, a liquid, or a gas. These are the three STATES OF MATTER.

- **Solids have a definite shape and do not take the shape of their container.** Examples of solids: rocks, ice, trees, people.
- **Liquids do not have a definite shape** and will take the shape of their container. Liquids flow (move) because of gravity, and if there was no gravity they wouldn't flow. Examples of liquids: water, milk, lava, juice.
- **Gases do not have a definite shape.** They sometimes take the shape of their container and sometimes fly out of the top of their container. Air is a gas and has a certain weight. A gas will take the shape of its container if it is heavier than air or fly out of the top if it is lighter than air. Examples of gases: air, oxygen, carbon dioxide, steam.

When something changes from one state of matter to another (like liquid water changing to solid ice) it is called a PHASE TRANSITION.

Changing a substance's temperature is the easiest way to change its state of matter. For example, if we heat liquid water it turns into steam, which is a gas. Sometimes there are other things that we can do to create a phase transition. We will explore some of these, including changing the air pressure, adding a magnetic field and creating a chemical reaction.

WHY IS THIS IMPORTANT?

Solids, liquids and gases are the three most common states of matter. Each state of matter behaves in a specific way, making them suitable for different tasks. It is important for us to know if a material is a solid, liquid, or gas if we want to know how it will behave at a certain temperature, for example you wouldn't want to keep chocolate in your pocket on a hot day because it would melt and you wouldn't want to wash your bike outside on a cold day because the water would freeze.

- It is also important for us to know when a phase transition will occur. For example:
- It can be dangerous when water on the road turns to ice, so we want to know when this will happen and find ways to turn the ice back into water.
- Phase transitions are important for our bodies too. When we sweat, the liquid evaporates and becomes a gas, which takes heat energy from our bodies to cool us down.

HOW ARE WE SHOWING THIS?



We are going to explore three ways in which we can change a substance's state of matter.

1. First, we will explore how changing the air pressure inside a bottle causes a liquid to change into a gas and back to a liquid. We are going to change the air pressure inside the bottle which will change the liquid in the bottle into a 'cloud' that you can see.
2. Next, we are going to make oobleck. Oobleck is not a solid, liquid or gas. It is a special type of matter called a Non-Newtonian fluid. Non-Newtonian fluids sometimes behave like liquids and sometimes behave like solids.

3. We are then going to watch a chemical reaction between two liquids. When these two liquids are mixed together, there will be a reaction between their particles which will turn the mixture from a liquid into a 'slime'. This slime is another example of a non-Newtonian fluid.



Notes

SAFETY

Get an adult to help you with the matches.

EXPERIMENTS

MAKING OOBLECK

MATERIALS:

- Cornflour/Corn starch
- Water
- Food colouring (optional)
- Bowl
- Spoon

MAKING A CLOUD IN A BOTTLE

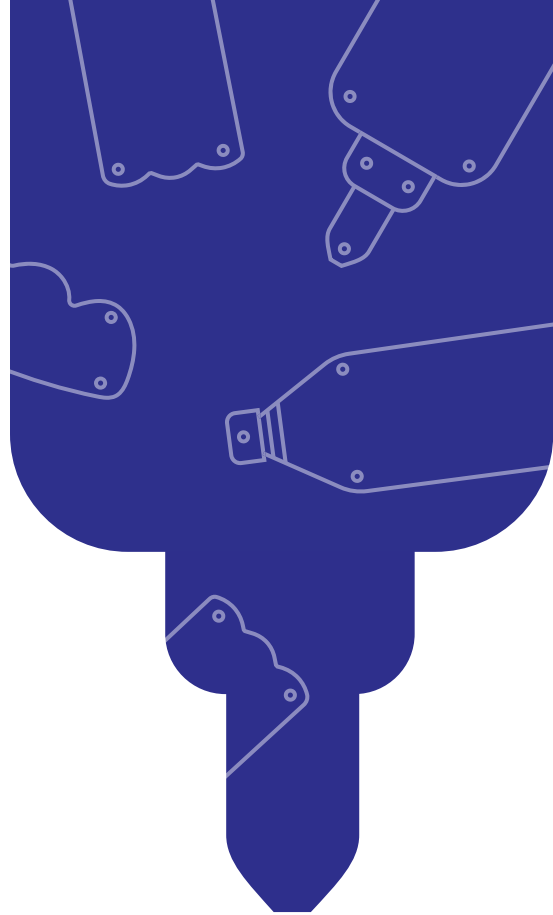
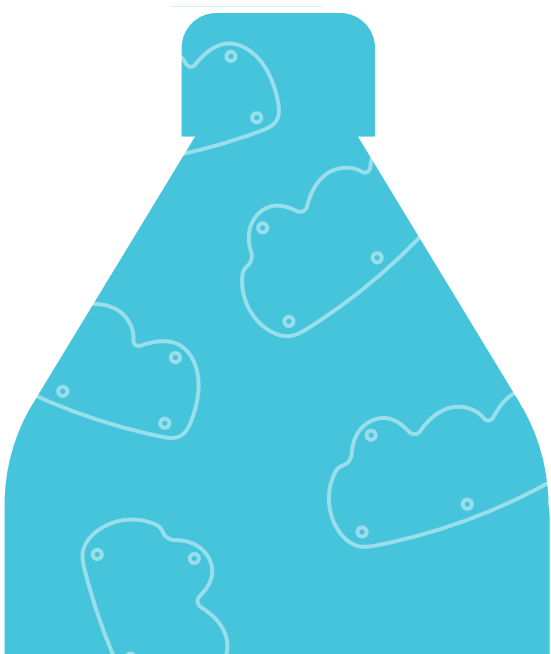
MATERIALS:

- Matches
- Water
- Empty plastic bottle

CLOUD IN A BOTTLE METHOD



1. Fill your bottle with water. You should fill between 1/2 and 3/4 of the bottle with water.
2. Put the lid on the bottle and squeeze it to increase the pressure inside the bottle. Release the bottle to decrease the pressure inside the bottle. Repeat this a few times to see if anything happens.
3. Take the lid off of the bottle.
4. Light a match - or ask an adult to light one for you.
5. Drop the lit match into the bottle so that it falls into the water. Quickly put the lid back onto the bottle.
6. Squeeze the bottle to increase the pressure again and release to decrease the pressure.
7. You should now be able to see a 'cloud' inside the bottle.
8. Think about what you could change to make the cloud more visible. If you put more or less water in the bottle, does it change how the cloud appears? What happens if you use colder or warmer water? Does this work with other liquids? **[Caution! Do not try this with flammable liquids]**



OUBLECK METHOD



1. Choose how much oobleck you would like to make. The recipe is the same for any amount of oobleck, you just need to make sure you use the right ratio of cornflour to water. You should use 2 parts cornflour to 1 part water. So, if you use 1 cup of cornflour, you should use 1/2 a cup of water.
2. Put the cornflour in your bowl.
3. If you are using food colouring, add a couple of drops to your water and stir.
4. Add the water slowly to the cornflour, stirring the mixture with a spoon as you go.
5. The end mixture should be a viscous (thick) liquid, like honey. If it is too stiff, add more water, if it is too runny, add more cornflour.
6. Now you can get messy! Try picking up the oobleck in your hands and playing with it. Now, keep your hands still above the bowl and watch the oobleck run through your fingers.

ACTIVITY SHEET

Is it a solid, liquid, or gas? (tick the correct box)

Milk	SOLID <input type="checkbox"/>	LIQUID <input type="checkbox"/>	GAS <input type="checkbox"/>	Honey	SOLID <input type="checkbox"/>	LIQUID <input type="checkbox"/>	GAS <input type="checkbox"/>
Water	SOLID <input type="checkbox"/>	LIQUID <input type="checkbox"/>	GAS <input type="checkbox"/>	Steam	SOLID <input type="checkbox"/>	LIQUID <input type="checkbox"/>	GAS <input type="checkbox"/>
Air	SOLID <input type="checkbox"/>	LIQUID <input type="checkbox"/>	GAS <input type="checkbox"/>	Carbon dioxide	SOLID <input type="checkbox"/>	LIQUID <input type="checkbox"/>	GAS <input type="checkbox"/>
Fish	SOLID <input type="checkbox"/>	LIQUID <input type="checkbox"/>	GAS <input type="checkbox"/>	Ice cube	SOLID <input type="checkbox"/>	LIQUID <input type="checkbox"/>	GAS <input type="checkbox"/>
Pencil	SOLID <input type="checkbox"/>	LIQUID <input type="checkbox"/>	GAS <input type="checkbox"/>	Sand	SOLID <input type="checkbox"/>	LIQUID <input type="checkbox"/>	GAS <input type="checkbox"/>

liquid

gas

solid

Complete each sentence with the words:

A has a definite shape. It does not take the shape of its container. If you put it in a bowl, it will stay the same shape and not move.

A does not have a definite shape. It takes the shape of its container. If you put it in a bowl, it will move and become the same shape as the bowl.

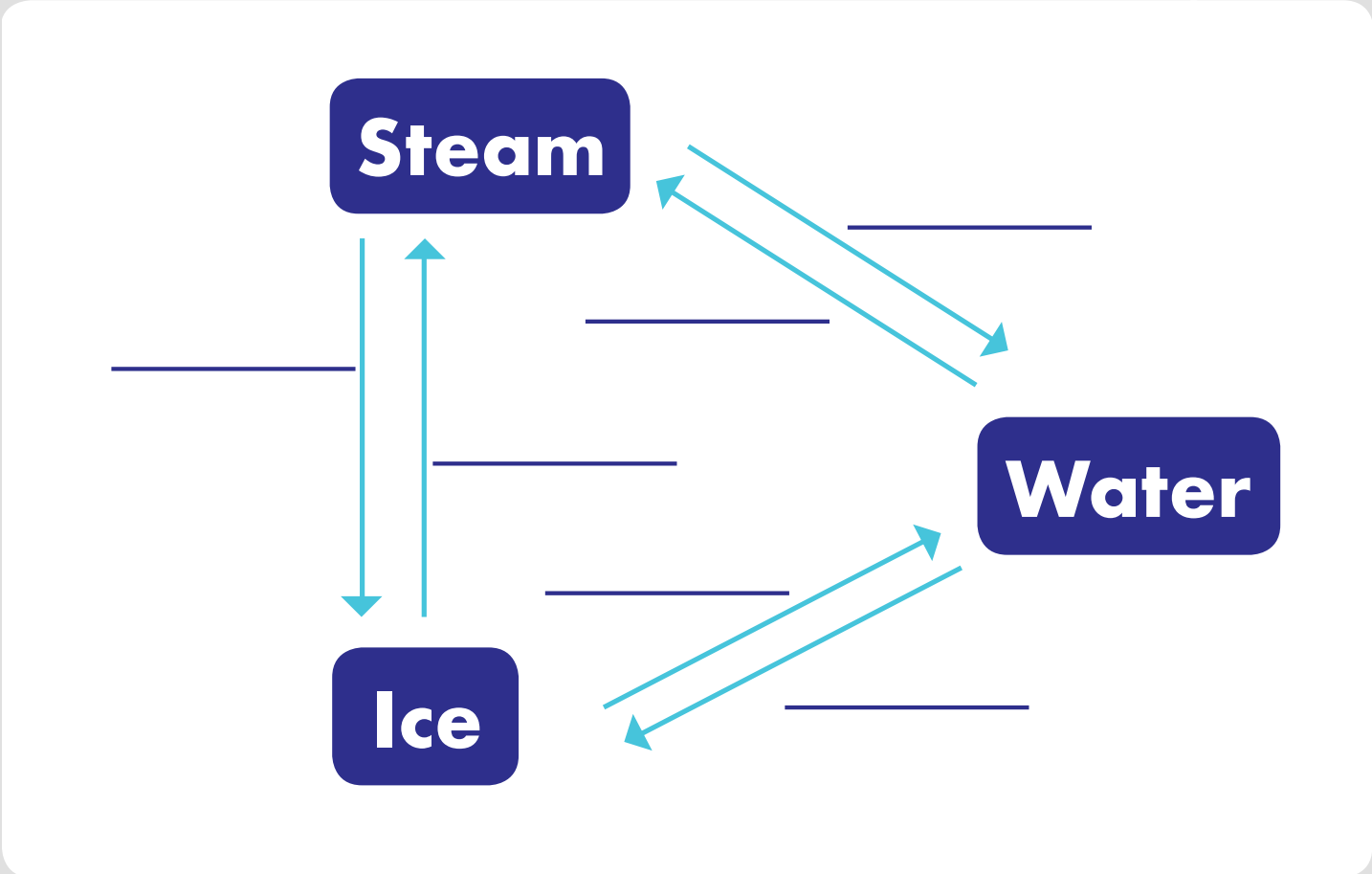
A does not have a definite shape. It sometimes takes the shape of its container and sometimes flies out of the top of the container. It moves around to fill the space it is in.



Watch how to make your own non-Newtonian slime! Watch it on YouTube by clicking here.

Fill in the missing words in the diagram

Words to use: melting, freezing, evaporating, condensing, sublimation, decomposition





Swansea
University

Prifysgol
Abertawe



Cronfa Gymdeithasol Ewrop
European Social Fund