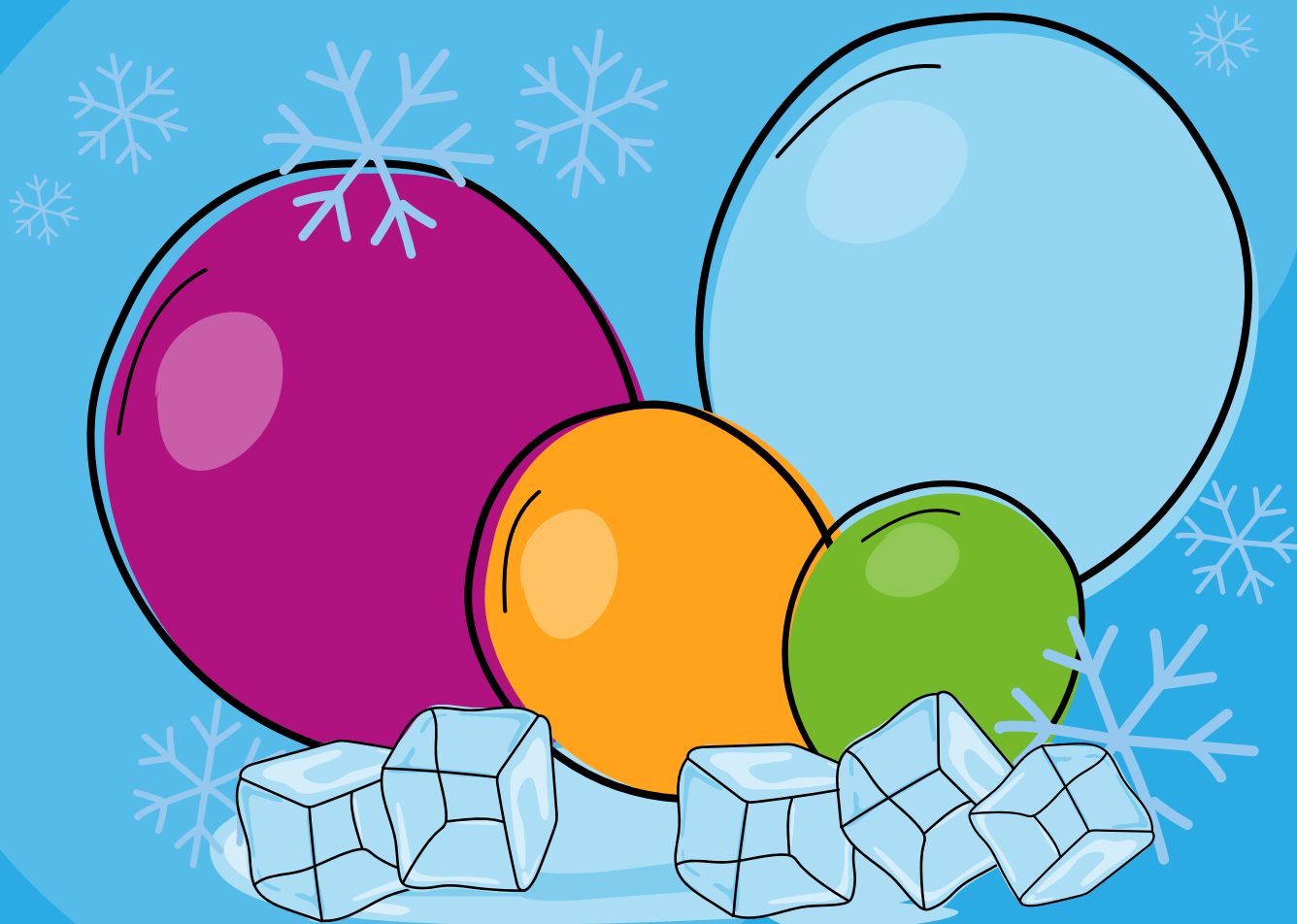


ACTIVITY

9

CHEMISTRY AT HOME

WACKY WATER



●○○ EASY



6-11



30 MINS

*to prepare +
overnight freezing time*



1

Observe
what
happens
to water
below 0°C

2

Find out
why ice
floats

3

Learn how
salt stops
water freezing

ENCOURAGING TOMORROW'S CHEMISTS TODAY

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WACKY WATER

Water is wacky stuff. Have you ever wondered why huge icebergs can float in the sea? Why do water pipes burst in cold weather and why do we put salt on the road in the winter?

The freezing point of water, where it turns from a liquid into solid ice, is 0°C. Freezing temperatures make life difficult for humans and animals. Ice on roads is dangerous and frozen pipes cause damage.

You will need

Pack of balloons
(any colour)

3 different colours
of food colouring

Small plastic basin
/ food tray

Washing up basin
or bucket

Ruler

Marker pen

An empty plastic milk
or drink bottle with lid
that will fit upright in
the freezer

Half a sheet of A4 paper and
a piece of sticky tape

100g table salt

Teaspoon

Access to a freezer
and a sink tap

Warning

Most plastic bottles are made of materials that can stretch to hold the expanding ice without cracking. **NEVER** put a glass bottle in a freezer or it may shatter.

Instructions

Activity 1

Making ice marbles

- Take an empty balloon and hold it over a sink so that the neck is open and add 6-7 drops of food colouring into the balloon.
- Carefully stretch the neck of the balloon over the end of a tap, then turn on the tap slowly while supporting the bottom of the balloon.
- Fill the balloon with water until it is about 10cm long, remove the balloon and let out any air before tying a knot at the end.
- Repeat the process with the other food colourings to make different coloured balloons.
- To ensure there are no spillages in your freezer, put the filled balloons in a small plastic basin or shallow food tray and transfer to a freezer. Leave overnight until fully frozen.

Activity 2

Why do pipes burst in cold weather?

- Fill an empty plastic bottle with water until about 3/4 full.
- Keeping the bottle upright, mark the water level in the bottle using a marker pen.
- Place the bottle upright in a freezer overnight.
- When the water is completely frozen, remove the bottle from the freezer. Compare the level of the ice with the marked water level line – are they the same? Does water take up more space when it is a solid (ice) or a liquid (water)?



Safety

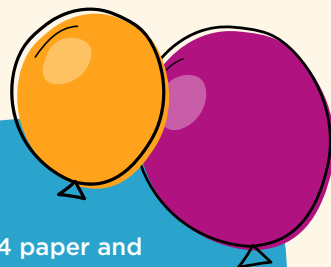
Take care handling ice.

Mop up any spillages to prevent slips.

Food colourings may stain fabrics or furniture.

Dispose of burst balloons safely.

This activity should be supervised at all times.



Challenge 1

Why do we put salt on roads in winter?

Emmanuelle wants to know why no ice forms on the roads when nearby puddles are covered in ice. She has watched salt being spread on the roads and wonders if that stops ice from forming.

How can she test whether adding salt can stop the water from freezing?

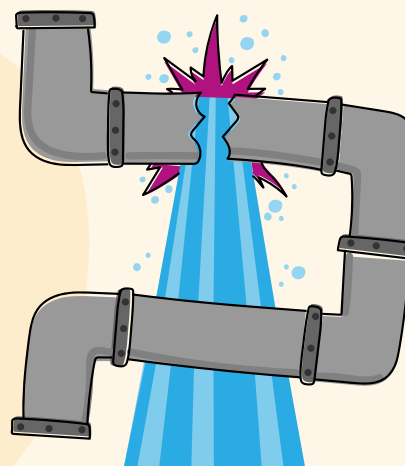
Does it matter how much salt is added?

She could try making ice marbles (using the instructions in activity 1) with no salt and then with 2, 5 and 10 teaspoons of salt and investigate whether they freeze or not (remember to keep the size of each balloon the same so that it's a fair test). It is easier to add the salt to the balloon before adding the water. To pour the salt into the balloons, a simple funnel can be made by making a cone shape out of half a piece of A4 paper, leaving a tiny open gap at the narrow end, and securing with tape.



Did you know?

Each year almost £50 million of damage is caused to houses due to pipes freezing, leading to water leaking out when temperatures warm up. Pipes crack in winter because ice takes up more space than water. So when the ice forms, the expansion puts pressure on the pipe. This eventually causes the pipe to crack.



What's happening?

Water freezes at 0°C and expands to take up more space. Water is the only common liquid in the world that takes up more volume as a solid than as a liquid. Ice cubes float because they are lighter than the same volume of water. This is also why large heavy icebergs can float in the sea.

When water freezes, tiny particles of water start to pack tightly together like a 3D jigsaw and are fixed into a solid shape which is ice. Salt can act as an antifreeze. When enough salt is added, the salt gets in the way of the water particles packing together. As more salt is added to the water, it becomes more difficult for the ice to form.

