

Let's Learn

What Are the Melting and Boiling Points of Water?

In Stage 4, you have learnt that a change in state takes place when water gains or loses heat. Recall what you have learnt about melting.

The temperature at which a solid starts to melt is its **melting point**. The melting point of ice is 0°C . The temperature of melting ice remains at 0°C until all the ice has melted into water.



Ice melts at 0°C to form water.

When water is heated, it may start to boil. **Boiling** is the process where a liquid gains heat and changes into a gas. The temperature at which a liquid starts to boil is its boiling point.

The boiling point of pure water is 100°C . The temperature of boiling water remains at 100°C until all the water has changed into water vapour.



Water boils at 100°C to form water vapour.



Word Boost

process

What Happens When Water Solidifies?



Freezing happens when a liquid changes into a solid. You would observe that the solid ice seems to take up more space than liquid water. Water acts differently from many other substances. When water freezes, it expands. This means that the particles in ice are further apart than in liquid water.

Another property of water is that it can dissolve many substances. In the next section, you will explore the various solids that can be dissolved in water.



Word Boost

crack
froze

How Is Temperature Measured?

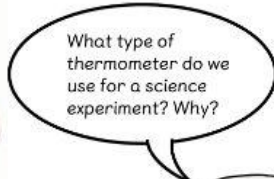
In the 'Let's Explore!' activity on page 73, a thermometer is used to measure the temperature of melting ice. It is an instrument that gives a measure of how hot or cold something is.



Different types of thermometers are used for different purposes.



Clinical thermometers are used to measure our body temperature.



What type of thermometer do we use for a science experiment? Why?



a clinical thermometer showing the temperature of a baby



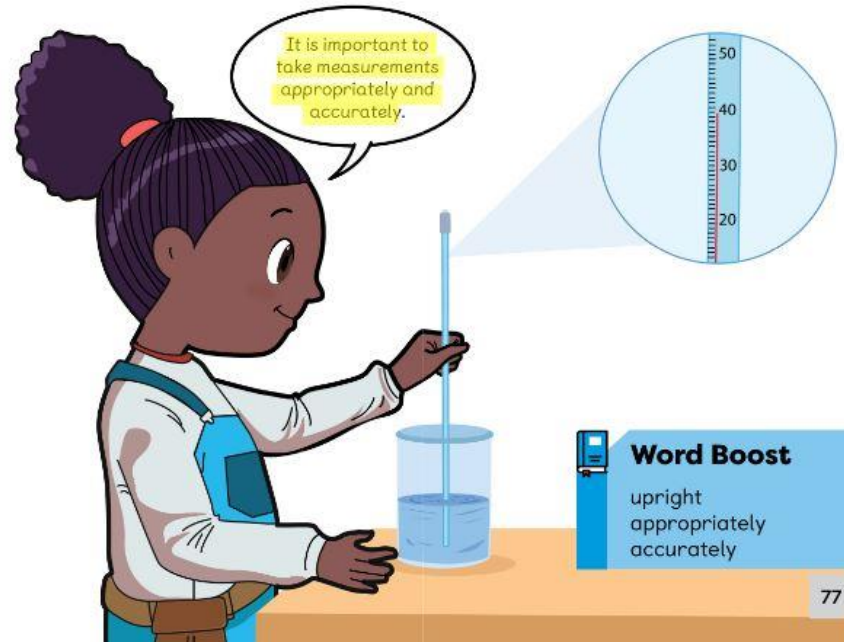
Word Boost

instrument
measure
purposes

In science experiments, laboratory thermometers are used to measure the temperature of substances. Laboratory thermometers can measure a wider range of temperatures than clinical thermometers.

To take accurate measurements, carry out the following steps:

- Step 1**
Ensure that the thermometer is placed upright.
- Step 2**
Locate the level of the liquid in the thermometer.
- Step 3**
Ensure that the thermometer is at your eye level when reading the measurement.
- Step 4**
Read the marking nearest to the level of the liquid.



It is important to take measurements appropriately and accurately.



Word Boost

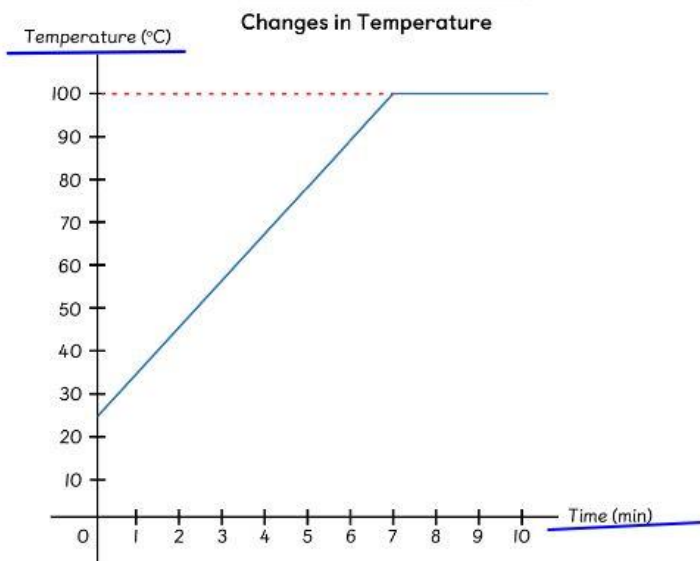
upright
appropriately
accurately



Changes in temperature can be recorded and shown on a line graph. This allows us to study the results.

The line graph below shows the changes in the temperature of water as the water is being heated.

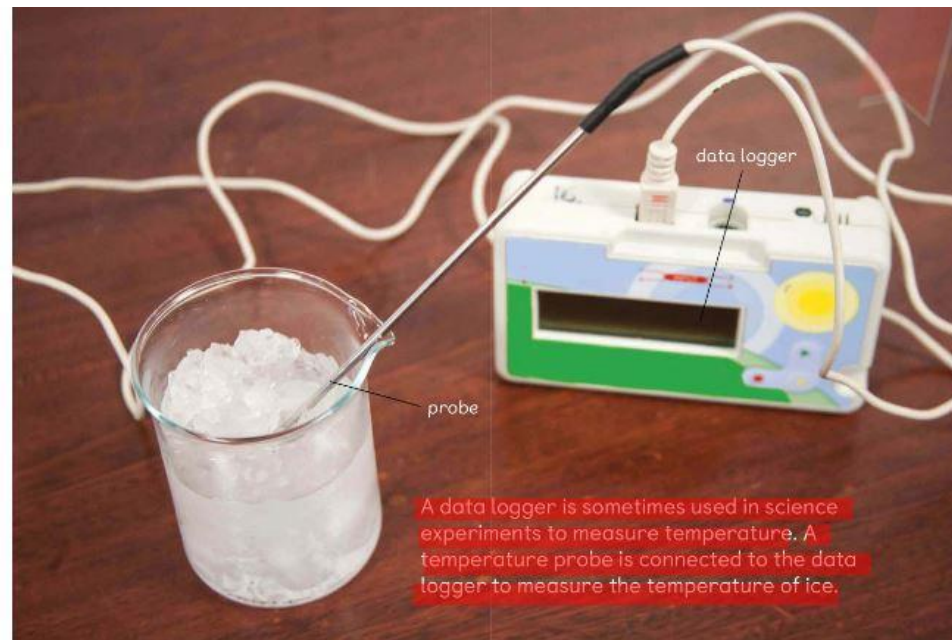
Title: _____



Observe the line graph carefully. Do you notice an increasing pattern? As time increases, the temperature of the water increases. However, the temperature does not keep increasing. After it reaches 100°C, it stops increasing. Why do you think that is happening?



Do you recall what you have learnt about the boiling point of water?



A data logger is sometimes used in science experiments to measure temperature. A temperature probe is connected to the data logger to measure the temperature of ice.

Check Your Learning



State the melting point of ice and boiling point of pure water.

Tick (✓) to show what you can do.

- I can state some properties of water.
- I can choose equipment and use it properly during an investigation.
- I can take measurements accurately.
- I can use line graphs to explain my results.
- I can describe patterns in results and identify any unexpected results.

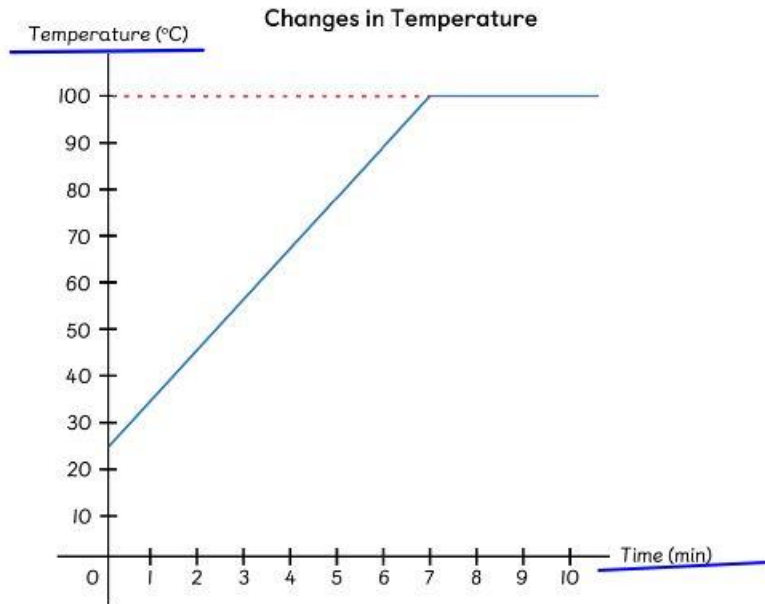
Activity Book
Activity 5A, p. 41



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Title:



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B

Solutes, Solvents and Solutions

In this section, I will

- describe and investigate how a solid dissolves in a liquid
- use the particle model to describe a solution
- describe and investigate how a solution can be separated
- describe if a prediction was accurate based on results
- use a diagram to illustrate a scientific idea
- choose equipment and use it properly during an investigation
- describe risks in practical work and ways to minimise them
- do practical work safely
- create tables and diagrams to present the results of my observations when appropriate
- use science to support my points of view in discussions

Thinking cap

Salt dissolves in water.
Do all solids dissolve in water?



Let's Explore!



What happened to the solids?

You will need:

- Teaspoon
- Two beakers
- Flour
- Salt
- Water

1. Work in groups.
2. Predict what will happen to each of the solids when they are put in water.
3. Put a teaspoon of salt into 100 ml of water in a beaker. Stir 20 times.
4. Repeat the previous step using flour.
5. Record your observations on the next page.

Salt: _____

Flour: _____

6. Discuss the following questions:

- (a) How accurate was your prediction compared to the results?
- (b) What happened to the salt when it was stirred in water?

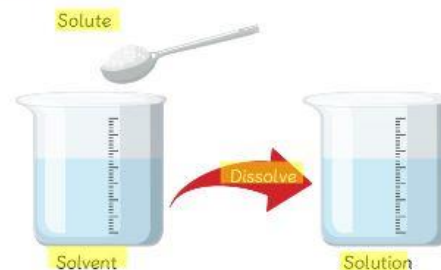
Let's Learn

What Are Solutes, Solvents and Solutions?

In Stage 3, we have learnt some differences in the properties of solids and liquids. Let us find out more about the properties of solids and liquids.

Some solids have the ability to dissolve in a liquid. The solid that dissolves in a liquid is known as the **solute**.

Some liquids have the ability to dissolve some solids. The liquid in which the solid dissolves is known as the **solvent**. When a solute dissolves in a solvent, they form a **solution**.



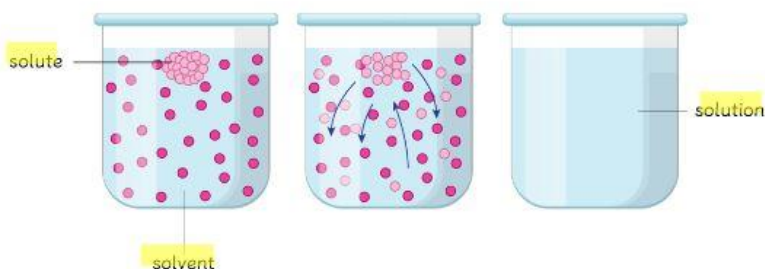
Water is a solvent for many solids, such as sugar. When sugar dissolves in water, they form a solution.



How Can the Particle Model Be Used to Describe Solutions?

We can use the particle model to describe solutions. When a solute is dissolved in a solvent, the solute breaks apart and mixes evenly with the solvent.

Choose a sticker from the back of the book and paste it to show the solution in the last beaker below.



The solute particles are broken apart and mixed evenly with the solvent particles to form a solution.

How Can the Solvent and Solute Be Separated From a Solution?

In Stage 3, we have learnt how a mixture of solids or a mixture of a solid and a liquid can be physically separated by sieving and filtration.

Dissolving is a reversible process. This means that a solute can also be separated from a solvent. However, this cannot be done by sieving or filtration. This is because the solute particles will be able to pass through the filter paper since they are so small.



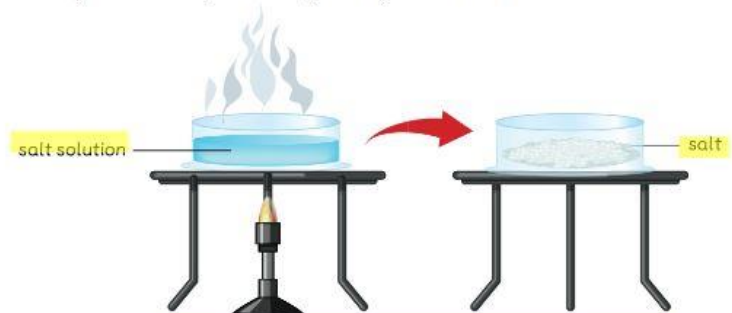
So how can we separate the solute and the solvent in a solution? Carry out an investigation to find out.

Plan an investigation to find out how a solute can be separated from a solvent in a solution.

Consider the following when planning the investigation:

- What equipment would you choose to use? How would you use it properly?
- What are some possible risks you may face during the investigation? How would you minimise them?

Carry out the investigation safely. Collect and record your observations in a diagram. Share your findings with your classmates.



When the water in the salt solution evaporates completely, the solute, which is salt here, will remain on the dish.

A solute can be separated from the solution by evaporation. This can be done by heating the solution over a heat source or leaving it in the open until all the water evaporates.



Salt is collected from seawater using evaporation.