



What happens when a substance changes state?

Learning objectives

- 1 Recall the definitions of freezing, boiling, condensing and melting as changes of state.
- 2 Describe the difference between particle diagrams at different states.
- 3 Explain that molecules do not break up and reform when a substance boils and cools.

Introduction

Explore what happens when substances are heated or cooled and the impact this has on their state and the arrangement of their atoms/molecules.

What happens when water boils?

Using your observations from the boiling water in front of you, independently decide whether each of the statements is true or false and add a tick to that column.

If you don't know, place a tick in that column instead.

Q.	Statement	True	False	Don't know
1.	The bubbles contain a mixture of hydrogen and oxygen <i>Hint: mixture means that hydrogen and oxygen are not bound together</i>			
2.	The bubbles contain carbon dioxide <i>Hint: carbon dioxide contains carbon and oxygen atoms</i>			
3.	The bubbles contain steam (water vapour) <i>Hint: vapour means gas</i>			
4.	The bubbles are empty (vacuum) <i>Hint: vacuums contain no atoms</i>			
5.	The bubbles contain air <i>Hint: air contains oxygen, nitrogen, carbon dioxide and water vapour</i>			
6.	The bubbles contain oxygen only			

My group agreed that statement number _____ was true.

I changed my ideas because I now know that... _____



What happens when ice melts?

Using your observations from the ice in front of you, independently decide whether each of the statements is true or false and add a tick to that column.

If you don't know, place a tick in that column instead.

Q.	Statement	True	False	Don't know
1.	The molecules in ice get smaller because water takes up less space than ice <i>Hint: do the particles change size when they change state?</i>			
2.	The molecules in ice get warmer because the water is hotter than ice			
3.	The molecules move around more as water than they did in the ice <i>Hint: particles in a liquid have more energy than particles in a solid</i>			
4.	Ice molecules and water molecules have different chemical structures <i>Hint: water is made from two hydrogen atoms and one oxygen atom bound together</i>			
5.	Ice changes to water at 0°C <i>Hint: the melting point of water is 0°C</i>			
6.	Ice only melts above its melting point			

Changes of state in water

Use the terms **boiling** and **melting** to label the changes of state shown as particle diagrams below.

Label the arrows to show whether these state changes occur with **increasing** temperature or **decreasing** temperature.

