

STUDENT ACTIVITY: Water molecules in drama

Activity idea

In this activity, students use drama to model water molecules in solid, liquid and gaseous states and how changes of state involve the addition or removal of heat.

By the end of this activity, students should be able to:

- use drama and movement to model states of matter
- identify at least one physical characteristic of water in its solid state
- identify at least one physical characteristic of water in its liquid state
- identify at least one physical characteristic of water in its gaseous state
- provide a simple explanation of the role of heat in melting or freezing.

[Introduction/background notes](#)

[What you need](#)

[What to do](#)

[Extension ideas](#)

Introduction/background

Solids, liquids and gases are known as states of matter. Everything around us is made up of matter – whether it is the chair you are sitting on or the air you are breathing. Matter is made up of atoms and molecules. Very simply, atoms are like individual LEGO blocks, and molecules are the structures you build with them. The physical characteristics of atoms and molecules (particles) decide the state the matter is in. When water is in its three different states – solid, liquid or gas – the molecules don't change, but the way they behave does.

Water, like all other types of matter, requires heat (energy) to change states. When heat is added to ice (solid water), it becomes liquid water. Continue adding heat, and the water will turn into water vapour (a gas). If heat is removed – another way of saying made colder – the gas turns back to water and then the water can become ice – a solid.

Water can change states over and over again. There is no loss of water during or after these changes.

Ideally, this activity should follow the activity [Looking at water – solid, liquid or gas](#) so that students have an understanding of some of the properties of a solid, liquid or gas.

What you need

- Access to the image [Water molecule](#)
- Access to the image [Water in its three states of matter](#)
- Access to the interactive [Water: solid, liquid and gas](#)
- Large open space
- Chairs or cones to mark boundaries

What to do

1. Water is a clear colourless liquid. It is represented by the symbol H_2O – two hydrogen (H) atoms and one oxygen (O) atom that are chemically bonded together. Show students the image [Water molecule](#). Briefly discuss that a water molecule is so tiny that we can only see it with a very special microscope.
2. Show students the image [Water in its three states of matter](#). Look at each of the three states and discuss properties described in the text.

3. Use a magic wand or similar to turn students into water molecules. Explain they are going to use drama and movement to model the three states of water. As molecules, they stand tall with their hands to their sides and mime their actions. Water doesn't talk. (To model an H₂O molecule, each student can hold their two fists – the two hydrogen atoms – close to their sides with their body forming the larger oxygen atom.)
4. To model ice as a solid, mark out a space with cones or chairs. Students line up in a regular array or pattern filling the entire space. Students should stand in one spot but shake their shoulders and hips just a little bit to simulate vibrations.
5. To model liquid water, keep students in the same space. They are able to move about, slipping past each other, but they are still confined to the space or container.
6. To model water vapour (a gas), students can move freely about the entire room with open spaces between them. Gases tend to be fairly energetic so students can move more quickly (but still as molecules with hands to their sides and quietly).
7. To model how water changes state, turn off the lights and organise students into a solid block of ice – back into a regular pattern or array. Add heat energy – the Sun – (turn on the lights). As the solid heats up, the water molecules (already vibrating) begin to move past each other as the ice melts and the solid turns into a liquid. Continue with the heat, and the water becomes water vapour, with water molecules moving freely around the room.
8. Turn off the light and explain that you are taking heat away and making the area cooler. Ask the water molecules to move back into the marked space to simulate condensation, water vapour becoming liquid water. As more heat energy is removed, ask students to become a solid.
9. Depending on time, simulate the changes in state again.
10. Discuss whether the number of molecules (students) stayed the same throughout the changes. Were any lost or gained? Explain that the same thing happens with actual water molecules. Nature recycles our water over and over again. When water evaporates from a puddle, the water does not disappear or turn into air but changes state.
11. Follow up this activity with the interactive [Water: solid, liquid and gas](#).

Extension ideas

With older students, introduce the concept that a molecule consists of one or more atoms bonded together. Ask students to form groups of three – one atom of oxygen and two atoms of hydrogen. The students hold hands or link arms – are bonded together – as they simulate solids, liquids or gases.

Sublimation is when a solid or gas changes state without first becoming a liquid. Two common ways to view this is when ice in ice cube trays 'disappears' over time or with freezer burn in meats or other frozen foods. Introduce this concept to students as they change states.