

The Particle Model of Matter

All matter is made of tiny particles that move and have spaces between them.



Figure 1: A classroom scene where a Grade 5 student stands at the front holding three containers: one with a wooden block, one with water, and one

Learning intentions

We are learning to explain the behaviour of solids, liquids, and gases using the particle model of matter.

Success criteria

I can describe how particles are arranged and move in solids, liquids, and gases ([Skills](#)).

I can explain how attractive forces between particles affect their movement and arrangement ([Skills](#)).

I can represent solids, liquids, and gases using the particle model ([Skills](#)).

Curriculum alignment

Students investigate the particle model of matter in relation to the physical properties of solids, liquids, and gases ([Outcome](#)). The particle model of matter explains the behaviour of particles in matter ([Understanding](#)). All matter is made up of small particles; particles of matter are always moving; particles of matter have spaces between them ([Knowledge](#)). In solids, particles are close together and vibrate in place. In liquids, particles are separated by spaces and can slide past each other. In gases, particles are separated by large spaces and are constantly moving in all directions. Attractive forces between particles are strongest in solids and weakest in gases ([Knowledge](#)).

Materials

For the whole class:

- Three clear containers (a jar, a cup, and a balloon or plastic bag)
- One wooden block or rock
- Water
- Air (in the balloon)
- Whiteboard or chart paper
- Markers

For each pair of students:

- Paper and pencil
- Printed diagram template showing three empty boxes labelled Solid, Liquid, and Gas (or students can draw these)
- Small objects to represent particles (dried peas, beads, or drawn circles)

Lesson sequence

Stage 1: Hook (5 minutes)

Hold up the three containers in front of the class. Ask: "What is inside each of these containers?" Students will identify the block, water, and air.

Ask: "Why does the block keep its shape, the water spreads out, and the air fills the balloon completely?" Pause and let students offer ideas. Do not correct yet. Write their ideas on the board.

Say: "Today we are going to discover what is happening at a level so tiny we cannot see it. We are going to think like scientists and use something called the particle model of matter."

Stage 2: Direct instruction (12 minutes)

Explain: "Everything around you, your desk, your water bottle, the air you breathe, is made of particles. Particles are tiny, tiny pieces of matter. They are so small we cannot see them even with a regular magnifying glass."

Draw three simple diagrams on the board or chart paper. Label them Solid, Liquid, and Gas.

For solids, draw dots very close together in a tight grid. Say: "In a solid, particles are packed very close together. They vibrate in place. Instead, they vibrate in place, like they are jiggling but staying in the same spot. The particles are held together by attractive forces, a kind of invisible pull between them. This is why a block keeps its shape. The particles stay where they are."

For liquids, draw dots with more space between them. Say: "In a liquid, particles have more space between them than in a solid. The attractive forces are weaker, so particles can slide past each other. This is why water can pour and flow. The particles move, but they stay close enough to hold the liquid

together."

For gases, draw dots spread far apart. Say: "In a gas, particles have huge spaces between them. The attractive forces are weakest in gases. Particles are constantly moving in all directions. This is why air fills the entire balloon. The particles spread out as much as they can."

Point to each diagram and say: "All three of these contain particles. Particles of matter are always moving. Particles of matter have spaces between them. The difference is how close together they are and how much they can move around" ([Knowledge](#)).

Ask: "Why does the block not spread out like water? Because the particles are held tightly together by stronger attractive forces."

Ask: "Why does air fill the balloon completely? Because the particles have large spaces and weak attractive forces, so they spread out everywhere."

Stage 3: Guided practice (15 minutes)

Distribute the diagram template (or have students draw three boxes). Work through one example together as a class.

Say: "We are going to represent ice cream using the particle model. Ice cream is a solid. Let's draw how we think the particles look in ice cream."

Guide students to draw dots close together in the first box. Ask: "Should the particles be touching or have space between them?" (They should have tiny spaces.) "Should they be able to move around?" (No, they vibrate in place.)

Repeat with water. Say: "Now let's show water using the particle model. Water is a liquid. Draw dots with more space between them." Ask: "Can these particles slide past each other?" (Yes.) "Why does water not spread out like air?" (The particles are closer together and have stronger attractive forces.)

Repeat with steam. Say: "Steam is a gas. Draw dots far apart." Ask: "Why are these particles so spread out?" (Large spaces and weak attractive forces.) "What would happen if we opened the container?" (The particles would spread out into the air.)

Walk around the room and check each pair's diagrams. Ask clarifying questions: "Why did you draw the particles close together?" "Can you show me how these particles would move?"

Diagram 2: Three side-by-side diagrams showing particle arrangement.

Stage 4: Independent practice (6 minutes)

Give students a new scenario. Say: "Choose one of these: a pencil, juice, or the air in the classroom. Draw the particle model for your choice. Label it. Then write one sentence explaining why the particles are arranged the way they are."

Circulate and listen to student thinking. Ask: "What state of matter is your object?" "How are the particles arranged?" "What forces are holding them together?"

Stage 5: Consolidation (2 minutes)

Bring the class back together. Ask three students to share their drawings and explain their choice.

Finish with: "The particle model helps us understand why things behave the way they do. Solids hold their shape because particles are packed tightly. Liquids flow because particles can slide past each other. Gases spread out because particles have lots of space and move in all directions. You can use this model to explain almost any property of matter" ([Understanding](#), [Understanding](#)).

Differentiation

Support

Provide pre-drawn particle diagrams with blanks to fill in. Give students sentence frames: "In a solid, particles are _____. In a liquid, particles are _____. In a gas, particles are _____."

Use real objects during the hook: let students hold the block, pour water, and feel air from the balloon. Concrete experience helps students build the mental model.

Extension

Ask: "What happens to particles when ice melts into water? Where do the particles go? Do new particles appear?" Have students draw before and after diagrams.

Ask: "If you squeezed a balloon full of air, what would happen to the particles? Why can you do this with air but not with water?" (Gases are compressible because particles have large spaces; liquids are not.)

Challenge students to predict: "If we heated water until it became steam, how would the particle model change?" Connect this to the video resource ([Resource](#)) if available.

Assessment

Formative check during Stage 4 (independent practice):

Look for evidence that students can:

- Draw particles in the correct arrangement for their chosen state of matter (closer together for solids, moderate spacing for liquids, far apart for gases)
- Explain one reason why particles are arranged that way (e.g., "Particles in a solid are close together because attractive forces hold them in place")

Ask each student: "Show me your drawing. Tell me what state of matter you chose and why the particles look like that."

If a student struggles, ask a scaffold question: "Is your object hard and keeps its shape, or does it flow, or does it spread out?" This helps them identify the state first, then match the particle arrangement.