THE STANDARD

States of Matter & Thermal Energy

Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.

ANCHORING PHENOMENON

The Ice Bath That Won't Warm Up

A beaker of crushed ice and water sits on a hot plate. The thermometer reads 0°C. Five minutes later, the ice is mostly gone, the water level is the same, and the thermometer still reads 0°C. The hot plate has been pumping heat in the whole time. Something is absorbing that energy without showing up as temperature. Students will keep circling back to this all week.

DRIVING QUESTION

"Where is the heat going if the temperature isn't changing?"

INVESTIGATIVE 1

Dry Ice on the Counter

A chunk of dry ice (solid carbon dioxide) sitting in a tray. No puddle forms underneath. Instead, the solid shrinks and a thick white fog pours over the edge of the tray. It skipped the liquid stage entirely. Use this to sharpen the lens the anchor is pushing on: phase changes are about particles breaking free of each other, not just heating up.

DRIVING QUESTION

"Why does dry ice turn straight into a gas without ever becoming a liquid?"

INVESTIGATIVE 2

The Boiling-Point Plateau

A pot of water on a stove with a thermometer in it. As it heats up, the temperature climbs steadily until it hits 100°C. Then it parks there. Even with the burner cranked all the way up, the thermometer doesn't budge above 100°C, no matter how long you wait. The water just keeps boiling away. Same kind of flat line as the anchor, only at the top of the curve instead of the bottom.

DRIVING QUESTION

"Why can't you make boiling water any hotter than 100°C, no matter how high the heat is?"