THE STANDARD

Thermal Energy, Mass & Temperature

Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.

ANCHORING PHENOMENON

The Beach Where the Sand Burns and the Ocean Stays Cool

A summer day at the beach. The sun has been shining on both the sand and the ocean for hours. The sand is so hot it burns your feet. The ocean, only steps away, is cool enough to swim in. Same sun. Same time. Same beach. Two wildly different temperatures. Students will keep circling back to this all week.

> **DRIVING QUESTION**
> *"Why does the same amount of sunlight heat the sand and the ocean so differently?"*

INVESTIGATIVE 1

A Metal Can and a Plastic Cup Race to Cool

Pour the same volume of hot water into a metal can and a plastic cup. Drop a thermometer into each. Within minutes, the water in the metal can has cooled noticeably while the water in the plastic cup has barely moved. Same starting temperature, same volume, same room. Use this to sharpen the lens the anchor is pushing on: the type of matter around the energy controls how fast the temperature changes.

> **DRIVING QUESTION**
> *"Why does the metal cup lose its heat faster than the plastic one when everything else is the same?"*

INVESTIGATIVE 2

Two Cups of Water on the Same Burner

Put 100 mL of water in one beaker and 500 mL in another. Same hot plate, same starting temperature, same lid. Start the timer. The small beaker hits boiling in a few minutes. The big one takes much longer to get there, even though the burner hasn't changed. Same energy going in. Different mass on the receiving end.

> **DRIVING QUESTION**
> *"If the burner is putting out the same energy, why does more water take so much longer to boil?"*