THE STANDARD

# Endothermic & Exothermic

*Undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.*

ANCHORING PHENOMENON

## The Squeeze-and-It-Gets-Cold Pack

A sealed plastic pouch from a first-aid kit. Room temperature. Squeeze it once. The inside breaks. Within thirty seconds, the whole pouch is cold enough to use on an injury. No batteries. No freezer. No external power. It got cold all by itself just from being squeezed. Students will keep circling back to this all week.

> DRIVING QUESTION
> *"Where did the cold come from inside a sealed bag sitting at room temperature?"*

INVESTIGATIVE 1

### Calcium Chloride Hitting Water

A few spoonfuls of calcium chloride (the white pellets sold as ice-melt or moisture absorber) dropped into a beaker of room-temperature water. Stir for 30 seconds. The water is now noticeably warm to the touch. The thermometer climbs 15 to 20 degrees Celsius. Use this to sharpen the energy-flow lens: the reactant gave energy to the water.

> DRIVING QUESTION
> *"Where did the warmth come from when nothing was heated?"*

INVESTIGATIVE 2

### Baking Soda + Citric Acid: The Pantry Cold Pack

Same setup, opposite result. Stir a spoonful of citric acid into room-temperature water in a beaker. Drop in a spoonful of baking soda. It fizzes hard. Within 30 seconds the beaker is cool to the touch and the thermometer has dropped 4 to 8 degrees Celsius. Same kind of energy story as the calcium chloride, only running in reverse. Use this to push the lens further: energy moves both directions, and the chemistry decides which way.

> DRIVING QUESTION
> *"If everything started at room temperature, where did the missing thermal energy go?"*