THE STANDARD

Thermal Energy in Reactions (Design Project)

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

DCI
DISCIPLINARY CORE IDEA

PS1.B · Chemical Reactions

> *Some chemical reactions release energy, others store energy.*

Some chemical processes release thermal energy (exothermic). Some absorb it (endothermic). Dissolving calcium chloride in water warms the water. Mixing baking soda and citric acid in water cools it. **The standard pairs that core chemistry with engineering: students design a device that uses one of those reactions on purpose, then test and rebuild it to hit a target temperature change.**

SEP
SCIENCE & ENGINEERING PRACTICE

Constructing Explanations and Designing Solutions

> *Undertake a design project, engaging in the design cycle, to construct and/or implement a solution that meets specific design criteria and constraints.*

Students aren't just running a reaction. They're designing a device against criteria and constraints, testing it, reading the data, and changing one variable to make the next version better. The SEP is the full design cycle, not a single build. **Their notebook should show a v1, a test, a decision, and a v2.**

CCC
CROSSCUTTING CONCEPT

Energy and Matter

> *The transfer of energy can be tracked as energy flows through a designed or natural system.*

Energy doesn't appear or vanish. It flows. The reactants hold chemical energy in their bonds. When atoms rearrange, some of that energy becomes thermal energy that moves into (or out of) the water and the bag. Students track that flow with a thermometer. **The temperature reading IS the energy story.**