

The Nut, the Cup, and the Numbers



Figure 1: A tidy high school chemistry lab bench shown close up, with a polystyrene-cup calorimeter, a small metal stand holding a burning nut

Priya clamped a peanut under a soda can rig while Marcus filled a polystyrene cup with water. "Twenty degrees," Marcus read off the thermometer. "Light it." Priya struck the match. The nut caught, flame flickering under the can. They watched the thermometer climb. "Thirty-eight now. That's our delta t." Marcus scribbled: Q equals mass times specific heat times change in temperature. "So the water absorbed this much heat. That's the enthalpy released by the reaction, per gram of nut." "Scale it up to molar mass," Priya said, "and we get molar enthalpy. Negative, since it's releasing energy." "Delta H negative. Exothermic." They compared their number to the label's calorie count. "Close," Marcus grinned. "Calorimetry actually works." "Now imagine doing this."

Words to know

- **Enthalpy (H):** The heat content of a system at constant pressure; changes in enthalpy are measured as heat absorbed or released during a reaction.

- **Molar enthalpy:** The enthalpy change associated with a reaction expressed per mole of a specified substance.
- **$Q = mc\Delta T$** The formula relating heat transferred (Q) to mass (m), specific heat capacity (c), and temperature change (ΔT)
- **Calorimetry:** The experimental technique of measuring heat transfer during a physical or chemical process.
- **ΔH** A way of writing enthalpy change, with a negative sign for exothermic reactions and a positive sign for endothermic reactions.
- **Exothermic:** A reaction that releases heat energy to its surroundings.

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