

Enthalpy Changes and Calorimetry

Task

Students present a labelled model or report on enthalpy changes and calorimetry.

Curriculum alignment

Students are assessed on their understanding of the following outcomes:

- Define enthalpy and molar enthalpy for chemical reactions ([Outcome](#))
- Recall the application of $Q = mc\Delta T$ for heat transfer ([Outcome](#))
- Use calorimetry data to determine the enthalpy changes in chemical reactions ([Outcome](#))
- Use and interpret ΔH to communicate and calculate energy changes in chemical reactions ([Outcome](#))

Rubric

Criterion	Beginning	Developing	Proficient	Exemplary
Conceptual Understanding of Enthalpy	Identifies enthalpy or molar enthalpy with incomplete or incorrect definitions (Outcome).	Defines enthalpy and molar enthalpy with minor gaps or imprecision.	Defines enthalpy and molar enthalpy accurately and distinguishes between the two concepts.	Defines enthalpy and molar enthalpy precisely and explains their relationship to chemical reactions.
Application of Heat Transfer Formula	Attempts to use $Q = mc\Delta T$ with significant errors in variables or calculation (Outcome).	Uses $Q = mc\Delta T$ with mostly correct variables; minor computational or unit errors present.	Applies $Q = mc\Delta T$ correctly with proper variables, units, and calculations throughout.	Applies $Q = mc\Delta T$ correctly and explains the role of each variable in determining heat transfer.
Calorimetry Data Analysis	Collects or interprets calorimetry data with major gaps; minimal connection to enthalpy determination (Outcome).	Collects or interprets calorimetry data with minor errors; shows partial connection to enthalpy calculation.	Analyzes calorimetry data accurately and determines enthalpy changes with correct methodology.	Analyzes calorimetry data accurately, determines enthalpy changes, and evaluates experimental precision or sources of error.
ΔH Communication	Uses ΔH inconsistently or with incorrect signs; communication is unclear (Outcome).	Uses ΔH with mostly correct signs and units; communication is generally clear.	Uses ΔH correctly with proper signs, units, and values; communication is clear and organized.	Uses ΔH correctly and explains the significance of sign and magnitude in interpreting reaction thermochemistry.

Scoring

Assign each criterion a level: Beginning (1), Developing (2), Proficient (3), or Exemplary (4). Sum the four scores to obtain a total out of 16.

- 13 to 16: Excellent
- 10 to 12: Good
- 7 to 9: Satisfactory
- 4 to 6: Needs improvement

Notes for the teacher

- Ensure students label all variables in calculations (m , c , $9E@$, Q) and show unit cancellation to verify dimensional analysis.
- Accept both endothermic and exothermic reactions; check that the sign of $9D$, $\ddot{O}$ $F6\uparrow W2$ $F\uparrow R$ $F\text{---}\&V7F\text{---}\ddot{o}\hat{a}$ of heat flow (negative for exothermic, positive for endothermic).
- If assessing a model, require clear labelling of the calorimeter components, reactants, and thermometer placement; verify that the model reflects the experimental procedure from [Outcome](#).
- For reports, require students to identify their data source (experimental measurement, literature value, or simulated data) and explain any discrepancies between expected and observed enthalpy values.