

Marking Guide: Enthalpy Changes and Calorimetry

Task

Students present a labelled model or report on enthalpy changes and calorimetry. The submission must define enthalpy, apply the relationship $Q = mc\Delta T$ to calorimetry data to determine the enthalpy change of a chemical reaction, with calculations and supporting diagrams or data tables clearly labelled.

Curriculum alignment

- 30-A1.3k: define enthalpy and molar enthalpy for chemical reactions ([Outcome](#))
- 30-A1.1k: recall the application of $Q = mc\Delta T$ to calorimetry data to determine the enthalpy change of a chemical reaction ([Outcome](#))
- 30-A1.8k: use calorimetry data to determine the enthalpy changes in chemical reactions ([Outcome](#))
- 30-A1.5k: use and interpret $Q = mc\Delta T$ to calculate energy changes in chemical reactions ([Outcome](#))
- 30-A1.3s: analyze data and apply mathematical and conceptual models to develop and assess possible solutions ([Outcome](#))
- General Outcome 1: determine and interpret energy changes in chemical reactions ([Topic](#))

Rubric

Criterion	Beginning	Developing	Proficient	Exemplary
Enthalpy concept and $Q = mc\Delta T$	States enthalpy is related to heat but gives no definition; $Q = mc\Delta T$ notation absent or incorrect (Outcome, Outcome).	Defines enthalpy with minor inaccuracy; uses $Q = mc\Delta T$ inconsistently across the report (Outcome, Outcome).	Correctly defines enthalpy and molar enthalpy; applies $Q = mc\Delta T$ notation consistently and correctly (Outcome, Outcome).	Defines enthalpy precisely and explains molar enthalpy in context; $Q = mc\Delta T$ correctly with signs and units throughout (Outcome, Outcome).
Application of $Q = mc\Delta T$	Formula stated but not applied, or applied with major errors in variables or units (Outcome).	Applies $Q = mc\Delta T$ with one significant error in substitution, units, or arithmetic (Outcome).	Correctly applies $Q = mc\Delta T$ and accurate arithmetic throughout (Outcome).	Applies $Q = mc\Delta T$ accurately and explains the physical meaning of each variable within the calorimetry context (Outcome).
Use of calorimetry data to determine enthalpy change	Calorimetry data present but not connected to an enthalpy calculation (Outcome).	Uses calorimetry data to calculate enthalpy change with incomplete reasoning or an unaddressed error source (Outcome).	Uses calorimetry data correctly to determine enthalpy change, with reasoning that matches procedures such as those in a calorimetry lab (Outcome, Resource, Resource).	Uses calorimetry data to determine enthalpy change accurately and evaluates sources of experimental error affecting the result (Outcome, Resource, Resource).

Data analysis and presentation	Data or diagrams included with little organization; labels missing or unclear (Outcome).	Data presented in tables or diagrams with basic organization; some labels missing (Outcome).	Data and diagrams are organized, labelled, and support the calculations presented (Outcome).	Data and diagrams are organized, fully labelled, and used to assess the validity of the reported energy change (Outcome).
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Scoring

Assign each criterion a level: Beginning (1 point), Developing (2 points), Proficient (3 points), or Exemplary (4 points). Sum the four scores for a total out of 16. Convert to a percentage grade if required by school reporting practice, or report the total alongside the level descriptors so students can see strengths and gaps by criterion.

Notes for the teacher

- Apply the calorimetry criterion consistently whether students conduct a hands-on investigation, such as those described in [Resource](#) or [Resource](#), or analyze provided calorimetry data.
- Distinguish between a student who applies $Q = mc\Delta T$ but fails to connect the result to enthalpy change (score lower on the third criterion) and one who makes both connections.
- Award Exemplary on the enthalpy notation criterion only when sign conventions for exothermic and endothermic processes are used correctly, not merely present.
- When moderating across a class set, review a sample of Proficient and Exemplary submissions together to confirm a shared standard before finalizing grades.