

Enthalpy Changes and Calorimetry: Chemistry 30 Rubric

Task

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

Curriculum Alignment

The rubric assesses the following outcomes:

- Defining enthalpy and molar enthalpy for chemical reactions ([Outcome](#))
- Recalling the application of $Q = mc\Delta T$ and $Q = n\Delta H$ ([Outcome](#))
- Using calorimetry data to determine the enthalpy changes in chemical reactions ([Outcome](#))
- Using and interpreting ΔH , ΔH_f° and ΔH_c° to communicate and calculate energy changes in chemical reactions ([Outcome](#))

Rubric

Criterion	Beginning	Developing	Proficient	Exemplary
Conceptual Understanding of Enthalpy and Heat Transfer	Defines enthalpy or molar enthalpy with significant omissions or inaccuracies. Shows minimal understanding of $Q = mc\Delta T$	Defines enthalpy and molar enthalpy with minor gaps. Applies $Q = mc\Delta T$ and $Q = n\Delta H$ accurately or explanation.	Defines enthalpy and molar enthalpy correctly. Applies $Q = mc\Delta T$ and $Q = n\Delta H$ accurately to describe heat transfer in calorimetry.	Defines enthalpy and molar enthalpy with precision. Explains $Q = mc\Delta T$ and $Q = n\Delta H$ and connects it explicitly to energy conservation principles.
Use of ΔH , ΔH_f° and Calculations	Uses ΔH , ΔH_f° inconsistently or incorrectly. Calculations are largely incomplete or contain major errors.	Uses ΔH , ΔH_f° mostly correctly. Calculations are present but contain minor errors or lack clear steps.	Uses ΔH , ΔH_f° correctly throughout. Calculations are accurate and logically sequenced with proper units.	Uses ΔH , ΔH_f° with precision and consistency. Calculations are accurate, well-organized, and include interpretation of sign and magnitude.
Analysis of Calorimetry Data	Presents calorimetry data with minimal organization. Interpretation is absent or largely incorrect.	Presents calorimetry data in organized form. Interpretation shows partial understanding of energy changes.	Presents calorimetry data clearly and organized. Interprets data to determine enthalpy changes with reasonable accuracy.	Presents calorimetry data systematically with clear labelling. Interprets data to determine enthalpy changes and discusses sources of experimental error.

Presentation and Labelling	Model or report lacks clear labels or organization. Presentation is difficult to follow or incomplete.	Model or report includes most necessary labels. Presentation is generally clear but may have minor gaps or inconsistencies.	Model or report is clearly labelled with all key components. Presentation is well-organized and easy to follow.	Model or report is comprehensively labelled with precise detail. Presentation is professional, logical, and enhances understanding of concepts.
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Scoring

Assign each criterion a level: Beginning (B), Developing (D), Proficient (P), or Exemplary (E).

Count the number of criteria at each level. An overall result of Proficient requires at least three criteria at the Proficient level or higher, with no more than one criterion at Beginning. An overall result of Exemplary requires all four criteria at Exemplary or three at Exemplary and one at Proficient.

Notes for the Teacher

- Ensure students understand that ΔH indicates an exothermic reaction. Check that students distinguish between heat (Q) and enthalpy change (ΔH). Explanations.
- When evaluating calorimetry data analysis, accept reasonable experimental values even if they differ from theoretical values, provided the student acknowledges and discusses the source of difference (measurement uncertainty, heat loss, incomplete combustion).
- For models, require labels on key components (system, surroundings, thermometer placement, insulation) and clear indication of energy flow direction. For reports, require organized sections addressing the relationship between $Q = mc\Delta T$ and $Q = \Delta H$ determination.
- Proficiency at Grade 12 requires accurate calculation and correct use of notation; do not advance a student to Proficient if calculations contain unit errors or if ΔH is not correctly determined, even if conceptual understanding is otherwise sound.