

Enthalpy Changes and Calorimetry

Time: 20 min. 6 questions.

Instructions

Answer all six questions. For multiple choice, select the best answer. For short answer, write a complete sentence or brief explanation. For true or false, write True or False. For numeric questions, show your calculation and include units. You may use a calculator.

Questions

1. A student burns 2.0 g of sugar in a calorimeter and measures a temperature increase of 8.5 °C in 100 g of water. The specific heat capacity of water is 4.18 J/(g·°C). Calculate the heat released by the sugar, in joules. ([Outcome](#))
2. True or false: A negative ΔH value indicates an endothermic reaction. ([Outcome](#))
3. Which of the following best describes molar enthalpy?
A) The total energy released when one mole of a substance burns
B) The energy change per mole of reactant or product in a chemical reaction
C) The temperature increase of water in a calorimeter
D) The specific heat capacity of a substance multiplied by its mass
([Outcome](#))
4. In a calorimetry experiment, 50 mL of 1.0 M HCl is mixed with 50 mL of 1.0 M NaOH. The temperature of the solution increases from 20.5 °C to 27.3 °C. The mass of the solution is 100 g and its specific heat capacity is 4.18 J/(g·°C). Calculate the heat released by this neutralization reaction, in joules. ([Outcome](#))
5. A student uses calorimetry data from an experiment to determine that a combustion reaction releases 890 kJ per mole of fuel burned. What does this value represent? ([Outcome](#))
6. Multiple choice: Which equation is used to calculate the heat absorbed or released by a substance during a temperature change?
A) $q = mC\Delta T$
B) $Q = mc\Delta T$
C) $PV = nRT$
D) $E = hf$
([Outcome](#))

Curriculum Coverage

Question	Outcome	Description
1	Outcome	Apply $Q = mc\Delta T$ to transfer analysis
2	Outcome	Interpret ΔH , ΔH_f° , ΔH_c°
3	Outcome	Define enthalpy and molar enthalpy
4	Outcome	Use calorimetry data to determine enthalpy changes
5	Outcome	Use calorimetry data to determine enthalpy changes

6	Outcome	Apply $Q = mc\Delta T$ to transfer analysis
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Answer Key

- 3553 J (or 3.6 kJ)**, $Q = mc\Delta T$ for water, the heat released by the sugar equals the heat absorbed by the water.
- False**, A negative ΔH , exothermic reaction; endothermic reactions have positive ΔH values.
- B**, Molar enthalpy is the energy change per mole of reactant or product, allowing comparison of reactions regardless of the amounts used.
- 2842.4 J (or 2.8 kJ)**, $Q = mc\Delta T$ for water, the heat released by the neutralization reaction.
- The molar enthalpy (or ΔH , of combustion reaction)** The value represents the energy change per mole of fuel burned, expressed in kJ/mol, and is used to communicate the thermochemical properties of the reaction.
- B**, The equation $Q = mc\Delta T$ is transferred to the mass, specific heat capacity, and temperature change of a substance.