

Enthalpy Changes and Calorimetry Formative Quiz

Time: 25 min. 6 questions.

Instructions

Answer all six questions in the space provided or on separate paper. Show all steps for the numeric question, including the formula used and correct units. Read each question carefully before answering.

Questions

1. A 150 g sample of water absorbs heat and its temperature rises from 22.0°C to 46.5°C. Using $Q = mc\Delta T$, calculate the quantity of heat absorbed by the water, in joules. ([Outcome](#))
2. Which of the following statements correctly defines molar enthalpy?
 - A) The total heat content of a substance at standard pressure
 - B) The energy change, in kJ, associated with a reaction as written in the balanced equation
 - C) The enthalpy change, in kJ/mol, associated with a physical or chemical change per mole of a specified substance
 - D) The activation energy required to begin a reaction, per mole of reactant([Outcome](#))
3. Write the thermochemical equation for the complete combustion of methane gas, $\text{CH}_4(\text{g})$, given that the reaction releases 890 kJ per mole of methane burned. Use correct symbols for this energy change. ([Outcome](#))
4. True or false: The combustion of a hydrocarbon fuel is classified as an endothermic process, since it releases heat to the surroundings. ([Outcome](#))
5. A student wants to determine the enthalpy change for the reaction: $\text{A} + \text{B} \rightarrow \text{C}$, but this reaction is difficult to carry out directly. Which strategy allows a chemist to calculate ΔH for this net reaction using a series of related reactions with known enthalpy changes?
 - A) The bond energy method
 - B) Hess' law
 - C) The activation energy diagram
 - D) The specific heat capacity formula([Outcome](#))
6. A student performs a calorimetry experiment to determine the enthalpy change of a reaction. Describe how the temperature change measured in the calorimeter and the mass and specific heat capacity of the calorimeter contents are used to determine the enthalpy change of the reaction, in kJ/mol. ([Outcome](#))

Curriculum coverage

Question	Outcome alias
1	Outcome
2	Outcome
3	Outcome

4	Outcome
5	Outcome
6	Outcome

Answer key

1. $Q = mc\Delta T$ The formula multiplies mass, specific heat capacity and the temperature change to find the heat absorbed.
2. C. Molar enthalpy expresses the enthalpy change per mole of a specified substance undergoing a physical or chemical change, in kJ/mol.
3. $\text{CH}_4(\text{g}) + 2\text{O}_2(\text{g}) \rightarrow \text{CO}_2(\text{g}) + 2\text{H}_2\text{O}(\text{l})$, $\Delta H = -890 \text{ kJ/mol}$ The negative sign indicates an exothermic reaction, and the value is expressed per mole of methane as written in the balanced equation.
4. False. Combustion reactions release heat to the surroundings, which makes them exothermic, not endothermic.
5. B. Hess' law allows the enthalpy change of a net reaction to be calculated by combining the enthalpy changes of a series of reactions that sum to give the overall equation.
6. The heat released or absorbed by the reaction is calculated using $Q = mc\Delta T$, specific heat capacity and temperature change of the calorimeter contents (typically water). This heat quantity is then divided by the number of moles of the reacting substance to obtain the enthalpy change in kJ/mol, with the sign chosen based on whether the reaction released or absorbed heat.