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| Selected & Constructed Response Items C3.1c |
| Calculate ΔH for a chemical reaction using simple coffee cup calorimeter. |
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Selected/Constructed Response Items for Thermochemistry & Solutions

**C3.1c:** Calculate ΔH for a chemical reaction using simple coffee cup calorimeter.

1. The reason the heat capacity of the coffee cup calorimeters had to be determined in the laboratory was
	1. this was an interesting statistic to gather about the apparatus.
	2. the results of the rest of the laboratory would be less precise if this hadn’t been done.
	3. the results of the rest of the laboratory would be less accurate if this hadn’t been done.
	4. this was useful practice before a laboratory with real materials began.
2. When heated metal was placed in the calorimeter
	1. heat traveled from the water and calorimeter into the metal causing the temperature of the water and calorimeter to decline.
	2. heat traveled from the metal into the water and calorimeter causing the temperature of the water and calorimeter to decline.
	3. heat traveled from the water and calorimeter into the metal causing the temperature of the water and calorimeter to increase.
	4. heat traveled from the metal into the water and calorimeter causing the temperature of the water and calorimeter to increase.
3. When sodium hydroxide is added to water the temperature of the water increases, this indicates that
	1. ΔH for the solution of sodium hydroxide is negative and this is an exothermic process.
	2. ΔH for the solution of sodium hydroxide is negative and this is an endothermic process.
	3. ΔH for the solution of sodium hydroxide is positive and this is an exothermic process.
	4. ΔH for the solution of sodium hydroxide is positive and this is an endothermic process.
4. When ammonium nitrate is added to water the temperature of the water declines, this indicates that
	1. ΔH for the solution of ammonium nitrate is negative and this is an exothermic process.
	2. ΔH for the solution of ammonium nitrate is negative and this is an endothermic process.
	3. ΔH for the solution of ammonium nitrate is positive and this is an exothermic process.
	4. ΔH for the solution of ammonium nitrate is positive and this is an endothermic process.
5. In a calorimeter 2.30g of sodium is reacted with 3.54g of chlorine, producing 5.84g of NaCl. In the process it is recorded that the quantity of heat released to the calorimeter and water in it is 41,100J. What is the molar heat of reaction for sodium chloride?

Teacher companion Notes for Selected/Constructed Response Items
 for Thermochemistry & Solutions
**High School Chemistry:**

**Question 1:**

**Difficulty:** Low, all students should be able to answer this question correctly.

**Correct answer: c**, this was done to calibrate the calorimeter.

Distracter a, misdiagnosis of purpose of calibration.

Distracter b, confusion between precision and accuracy.

Distracter d, misdiagnosis of purpose of calibration.

**Question 2:**

**Difficulty:** Low, all students should be able to answer this question correctly.

**Correct answer: d**, heat energy travels from high temperature to low, causing an increase in temperature of the mater it travels into.

Distracter a, incorrect direction of heat travel.

Distracter b, incorrect effect on temperature resulting from heat transfer.

Distracter c, incorrect direction of heat transfer and effect on temperature resulting from heat transfer.

**Question 3:**

**Difficulty:** Average, a well prepared student should be able to answer this question.

**Correct answer: a**, definition of exothermic and sign of ΔH associated.

Distracter b, incorrect distinction of endothermic and exothermic.

Distracter c, improper sign for ΔH.

Distracter d, improper sign for ΔH and, incorrect distinction of endothermic and exothermic.

**Question 4:**

**Difficulty:** Average, a well prepared student should be able to answer this question.

**Correct answer: d**, definition of endothermic and sign of ΔH associated.

Distracter a, improper sign for ΔH and, incorrect distinction of endothermic and exothermic

Distracter b, improper sign of ΔH.

Distracter c, incorrect distinction of endothermic and exothermic.

**Question 5:**

**Difficulty:** High, this question should challenge the above average student.

**Correct answer:**

411kJ/mol NaCl