

Exercise walk-through

6.4

Heat Capacity and Calorimetry

AP Chemistry

Calorimetry

Specific heat c warms 1 g by 1° :

Heat transferred

$$q = mc\Delta T$$

Calorimetry : an isolated system, so

$$q_{\text{rxn}} = -q_{\text{water}}.$$

Worked example

100 g water warms 5.0° :

$$q = 100(4.18)(5.0) = 2090 \text{ J}$$

The reaction released -2090 J – exothermic. For 0.010 mol : $\Delta H = -209 \text{ kJ/mol}$.

Exercises 2.1·2.3

2.1 Write the equation $q = mc\Delta T$ and name each symbol. [2]

2.2 Find the heat to warm 100 g of water ($c = 4.18$) by 5.0°C . [2]

2.3 In a calorimeter the water warms. Was the reaction exo- or endothermic? [1]

Exercises 2.1-2.3

2.1 Write the equation $q = mc\Delta T$ and name each symbol. [2]

2.1

- q heat, m mass, c specific heat, ΔT temperature change
-

2.2 Find the heat to warm 100 g of water ($c = 4.18$) by 5.0°C . [2]

2.2

- $q = (100)(4.18)(5.0) = 2090 \text{ J}$
-

2.3 In a calorimeter the water warms. Was the reaction exo- or endothermic? [1]

2.3

- Exothermic (it released heat to the water)

Exercise 3.1

3.1 In $q = mc\Delta T$, ΔT is

[1]

☐

A $T_{\text{initial}} - T_{\text{final}}$

B $T_{\text{final}} - T_{\text{initial}}$

C the average temperature

D always positive

Exercise 3.1

3.1 In $q = mc\Delta T$, ΔT is

[1]

☐

A $T_{\text{initial}} - T_{\text{final}}$

B $T_{\text{final}} - T_{\text{initial}}$

C the average temperature

D always positive

3.1 B

- $T_{\text{final}} - T_{\text{initial}}$

Exercise 3.2 (a)

3.2 A reaction in a calorimeter warms 200 g of water ($c = 4.18$) by 6.0°C .

(a) Find the heat absorbed by the water.

[2]

Exercise 3.2 (a)

3.2 A reaction in a calorimeter warms 200 g of water ($c = 4.18$) by 6.0°C .

(a) Find the heat absorbed by the water.

[2]

(a)

- $q = (200)(4.18)(6.0) = 5016 \text{ J} \approx 5.0 \text{ kJ}$

Exercise 3.2 (b)

3.2 A reaction in a calorimeter warms 200 g of water ($c = 4.18$) by 6.0°C .

(b) State q for the reaction (sign and value).

[2]

Exercise 3.2 (b)

3.2 A reaction in a calorimeter warms 200 g of water ($c = 4.18$) by 6.0°C .

(b) State q for the reaction (sign and value).

[2]

(b)

- $q_{\text{reaction}} = -5.0 \text{ kJ}$ (exothermic)

Exercise 3.3

3.3 Burning 0.50 g of a fuel raises 100 g of water ($c = 4.18$) by 10.0°C . Find the heat released per gram of fuel. [4]

Exercise 3.3

3.3 Burning 0.50 g of a fuel raises 100 g of water ($c = 4.18$) by 10.0°C . Find the heat released per gram of fuel. [4]

3.3

- $q_{\text{water}} = (100)(4.18)(10.0) = 4180 \text{ J}$; heat released = 4180 J for 0.50 g; per gram
= $4180/0.50 = 8360 \text{ J/g}$