

Specific Heat & Phase Changes

Specific Heat

- _____ (c) – the amount of heat required to raise the temperature of 1 g of a substance 1 °C
- The units for specific heat are J/g°C
- The specific heat of water (in a liquid form is 4.18 J/g°C)
- All substances have a particular specific heat

Specific Heat

- The greater the specific heat, the less the temperature will rise when heat is absorbed
- Let's say you have concrete and wood
 - $c_{\text{concrete}} = 0.88 \text{ J/g}^\circ\text{C}$
 - $c_{\text{wood}} = 1.76 \text{ J/g}^\circ\text{C}$

Specific heat equation

- $q = mc\Delta T$
- q = heat gained or lost (J)
- m = mass (grams) note that this is different than the energy calculations
- c = specific heat (J/g°C)
- ΔT = change in temperature (°C) = $T_f - T_i$

Specific heat calculations

- How much heat is required to raise 250 g of water from 22°C to 98°C?

Specific heat calculations

- A piece of metal with a mass of 4.68 g absorbs 256 J of heat when its temperature is increased by 182°C. What is its specific heat?

Specific heat calculations

- 60.0 J of heat are applied to a 5.00 g sample of calcium ($c = 0.647\text{J/g}^\circ\text{C}$). If the final temperature is 51.1°C, calculate the original temperature.

Calorimetry

- A _____ is an insulated device used for measuring the amount of heat absorbed or released during a chemical or physical process.

Calorimetry

- When using calorimetry, you are usually trying to determine the identity of an unknown metal by finding its specific heat
- The heat lost from the metal will be gained by the water
- $q_{\text{metal}} = -q_{\text{water}}$

Calorimetry

- $q_{\text{metal}} = -q_{\text{water}}$
- $(m_{\text{metal}})(c_{\text{metal}})(\Delta T_{\text{metal}}) = - (m_{\text{water}})(c_{\text{water}})(\Delta T_{\text{water}})$

Calorimetry Examples

- A 58.0 g sample of a metal at 100.0 °C is placed in a calorimeter containing 60.0 g of water at 18.0 °C. The temperature of that water increases to 22.0 °C. Calculate the specific heat of the metal.

Calorimetry Examples

- A piece of metal with a mass of 4.68 g at 135 °C is placed in a calorimeter with 25.0 g of water at 20.0 °C. The temperature rises to 35.0 °C. What is the specific heat of the metal?