

MORE THERMOCHEMICAL CALCULATIONS (MIXED)

- An orange contains 445kJ of energy. What mass of water could this same amount of energy raise from 25.0°C to 100.0°C?
- How much heat, in kilojoules, must be added to 178 g of water to increase the temperature of the water by 5.00°C?
- The temperature of unknown metal with a mass of 18.0 g increases from 25.0°C to 40.0°C when the metal absorbs 124.2J of heat. What is the specific heat of the unknown metal?

Substance	Specific Heat Capacity (J/g°C)
Water (liquid)	4.18
Water (steam)	2.0
Aluminum (s)	0.89
Iron (s)	0.45
Mercury (l)	0.14
Gold (s)	0.13

- What is the specific heat of a substance that has a mass of 25.0 g and requires 2195 Joules to raise its temperature by 15.0°C?
- Calculate the amount of heat evolved when 15.0g of Ca(OH)₂ forms from the following reaction.
CaO + H₂O → Ca(OH)₂ ΔH° = -65.2kJ
- Calculate the amount of heat produced when 52.4 g of methane, CH₄, burns in an excess of air, according to the following equation. CH₄ + 2O₂ → CO₂ + 2H₂O ΔH° = -890.2kJ
- A nutritional chemist burns one pulverized peanut with a mass of .887g in a bomb calorimeter. The calorimeter contains 2.50 kg of water, and its temperature increases from 25°C to 27°C as the peanuts burn. What is the energy content of the peanuts?
- How much energy must be absorbed by 20.0 g of water to increase its temperature from 283°C to 303°C?
- When 15.0 g of steam drops in temperature from 275.0°C to 250.0°C, how much heat energy is released?
- If it takes 41.72 Joules to heat a piece of gold weighing 18.69 g from 10.0°C to 27.0°C, what is the specific heat of the gold?
- A certain mass of water was heated with 41,840 Joules, raising its temperature from 22.0°C to 28.5°C. Find the mass of the water.
- If 150.0 grams of iron at 95.0°C, is placed in an insulated container containing 500.0 grams pf water at 25.0°C, and both are allowed to come to the same temperature, what will that temp be? HINT: ΔH_{H₂O} + ΔH_{Fe} = 0
- Calculate the specific heat of a metal if 55.0 g sample of an unknown metal at 99.0°C causes a 1.70°C temperature rise when added to 225.0 g or water at 22.0°C.
- An aluminum pan of mass 5.00 x 10² grams and at a temperature of 400.0°C is plunged into a vat of water.
 - If the pan and the water end up at 50.0°C, how much energy did the aluminum pan lose?
 - Assuming no energy goes into the environment, how much energy must the water have gained from the aluminum?
 - Try and calculate the mass of water that must have been present if it started at 25.0°C.
- If you put 150.0g of oil in your calorimeter instead of water, and the oil had a specific heat of 8.90 J/g°C, how much energy would a substance have to produce to raise the temperature of the oil by 155°C?
- If the average Bic lighter holds 4.50g of butane, how much energy would you get out of burning all of the fuel?
2C₄H₁₀ + 13O₂ → 8CO₂ + 10H₂O ΔH°= -2878 kJ
- The energy of a chemical reaction went into 100.0 ml of water at 26.5°C. The temperature rose to 31.8°C. How much energy did the chemicals release?
- 1000 J of thermal energy is pumped into 55.0 g each of water liquid, aluminum, and gold. Each of the materials is initially at 22.0°C. Calculate the ending temperature of each.
- 242 grams of water (initially at 20.0°C) are mixed with an unknown mass of iron (initially at 500.0°C). When thermal equilibrium is reached, the system has a temperature of 42.0°C. Find the mass of iron.

Answers:

- 1) 1.42g 2) 3.72kJ 3) .460J/g°C 4) 5.85J/g°C 5) -13.2kJ 6) -2920kJ 7) -21,000J 8) 1670J 9) -7.50x10²J
 10) .131J/g°C 11) 1540g 12) 27.2°C 13) .386J/g°C 14) a. -156kJ b. -156kJ c. 1490g 15) -207kJ 16) -112kJ
 17) -2220J 18) 26.3°C, 42.2°C, 161°C 19) 108g