

Specific Heat Capacity

$$Q = c_p m \Delta T$$

$$c_{p,\text{water}} = 4.18 \text{ J/g}^\circ\text{C}$$

Use specific heat capacity ideas to answer the following questions. On any numerical problems, show all of your work.

1. If the same amount of energy were added to equal masses of aluminum and iron, which one would experience the bigger temperature change? Why? (Hint: The c_p value for aluminum is $0.9\text{J/g}^\circ\text{C}$ and for iron it's $0.45\text{J/g}^\circ\text{C}$.)
2. If the same amount of energy were added to equal masses of water and an unknown metal, which one would most likely experience the bigger temperature change? Why?
3. How much energy is required to raise the temperature of 120g of water by 27°C ? (Hint: Don't forget that you always know the c_p of water.)
4. How much energy is required to raise the temperature of 37g of water from 51°C to 65°C ?
5. How much energy is required to raise the temperature of 1.4kg of water by 43°C ? (Hint: Show your factor-label work to convert 1.4kg into grams. $1000\text{g}=1\text{kg}$.)

6. A 30g sample of iron is heated from 20°C to 50°C. How much energy was required to accomplish this? (Iron's specific heat capacity is 0.45 J/g°C.)
7. Determine the specific heat capacity of a 10g object if its temperature goes changes by 34°C when 85J of energy is added.
8. Determine the specific heat capacity of a 240g object if its temperature goes from 2°C to 26°C when 2000J of energy is added.
9. A heated sample of brass is dropped into a container of cooler water. Heat flows from the brass into the water, causing the brass to cool down and the water to heat up until they both reach the same final temperature of 6.8°C.
- a. The water's mass is 2800g, and its initial temperature is 5°C. How much energy must the water gain in order to arrive at the final temperature of 6.8°C?
- b. The 590g brass sample is initially at 98°C, and cools down to the final temperature of 6.8°C. Assuming that no energy was lost to the environment as heat flowed from the brass to the water, use your answer from part A to help you calculate the specific heat capacity of brass.