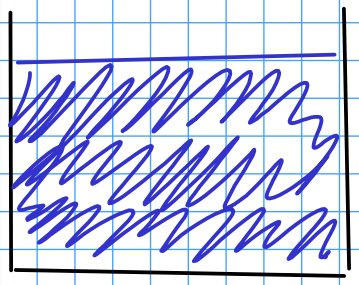
# Measuring specific heat

- We can measure the specific heat of a solid sample by taking advantage of conservation of energy

Zinc metal sample

MASS: 50.8319 g

INITIAL TEMP 98.9 C

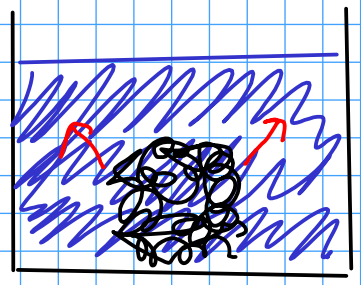


Room-temp water sample

MASS: 50.0 g

INITIAL TEMP 19.9 C

We'll heat the zinc sample up to a constant temperature using a boiling water bath (because it's easy to get a constant temperature this way)!



FINAL TEMP OF ZINC AND WATER MIXED: 26.4 C

Water:

ENERGY = MASS × SPECIFIC HEAT × TEMPERATURE CHANGE

$$\begin{array}{r} 26.4\ ^\circ C \\ -\ 19.9\ ^\circ C \\ \hline 6.5\ ^\circ C \end{array}$$

$$\text{ENERGY} = 50.0\ g \times 4.184 \frac{J}{g\ ^\circ C} \times 6.5\ ^\circ C$$

$$= 1359.8\ J$$

This number has two significant figures, but we'll wait until the final answer to round!

By conservation of energy, this energy gained by the water is also equal to the energy LOST be the zinc!

The temp change of the metal is different from the temp change of the water!

Zinc:

$$\text{SPECIFIC HEAT} = \frac{\text{ENERGY}}{\text{MASS} \times \text{TEMPERATURE CHANGE}}$$

$$\begin{array}{r} 98.9\ ^\circ C \\ -\ 26.4\ ^\circ C \\ \hline 72.5\ ^\circ C \end{array}$$

$$\text{SPECIFIC HEAT} = \frac{1359.8\ J}{50.8319\ g \times 72.5\ ^\circ C}$$

$$= 0.37\ J/g\ ^\circ C \qquad 0.36897818\overline{2}$$