

Unit 2: Matter and Energy
Specific Heat of Metals Lab

Name _____

Block # _____

Metals have low specific heat capacities. This means that metals heat up quickly, and lose the heat quickly. In this experiment, a piece of metal will be heated and transferred into room temperature water. The Law of Energy Conservation states that energy is neither created nor destroyed. Therefore, the heat energy transferred from the metal will be equal to the heat energy absorbed by the water. The purpose of this lab is to calculate the amount of heat absorbed by the water and use it to calculate the specific heat of the metal.

DATA TABLE:

Type of Metal	Copper	Steel
Mass of Styrofoam Cups	3.79 g	4.27 g
Mass of Water	192.70 g	191.41 g
Initial Temp of Water	22.0 °C	24.5 °C
Final Temp of Water	27.0 °C	28.5 °C
Mass of Metal	57.50 g	56.83 g
Initial Temp of Metal	317 °C	281.6 °C
Final Temp of Metal	27.0 °C	28.5 °C

ACTUAL SPECIFIC HEAT =

0.385 J/g °C

0.49 J/g °C

Claim: _____

Evidence: _____

Reasoning: _____

Copper Calculations:

1. Calculate the amount of heat absorbed by the water when the hot piece of copper was added.
(The specific heat of water is $4.184 \text{ J/g}\cdot^\circ\text{C}$.)

$$+ Q_{\text{water}} = m_{\text{water}} \times S_{\text{water}} \times (T_{\text{f water}} - T_{\text{i water}})$$

2. According to the Law of Energy Conservation, $+ Q_{\text{water}} = - Q_{\text{metal}}$. Using the answer from #1 above calculate the specific heat of copper.

$$- Q_{\text{metal}} = m_{\text{metal}} \times S_{\text{metal}} \times (T_{\text{f water}} - T_{\text{i water}})$$

3. The actual specific heat of copper is $0.3845 \text{ J/g}\cdot^\circ\text{C}$. Calculate the percent error based on your calculations from above.

Iron Calculations:

1. Calculate the amount of heat absorbed by the water when the hot piece of iron was added.
(The specific heat of water is $4.184 \text{ J/g}\cdot^\circ\text{C}$.)

$$+ Q_{\text{water}} = m_{\text{water}} \times S_{\text{water}} \times (T_{\text{f water}} - T_{\text{i water}})$$

2. According to the Law of Energy Conservation, $+ Q_{\text{water}} = - Q_{\text{metal}}$. Using the answer from #1 above calculate the specific heat of copper.

$$- Q_{\text{metal}} = m_{\text{metal}} \times S_{\text{metal}} \times (T_{\text{f water}} - T_{\text{i water}})$$

3. The actual specific heat of iron is **$0.4494 \text{ J/g}\cdot^\circ\text{C}$** . Calculate the percent error based on your calculations from above.