

## EXPERIMENT

# Measurement of Specific Heat

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## OBJECTIVE

To determine the **specific heat capacity** of a metal by applying the principle of conservation of thermal energy.

# **ASSIGNED ROLES**

**A:** Leader

**B:** Recorder

**C:** Materials Handler

**D:** Temperature Monitor

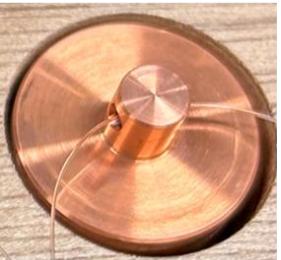
## Color of metal



*White*



**Black**



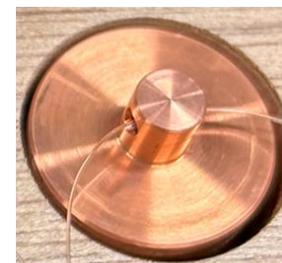
***Red***



*White*



**Black**



***Red***

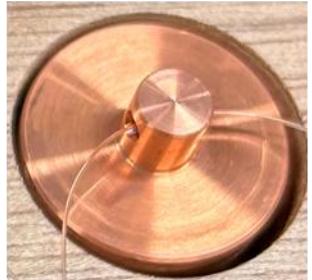
# Experimental Procedure



**White**



**Black**

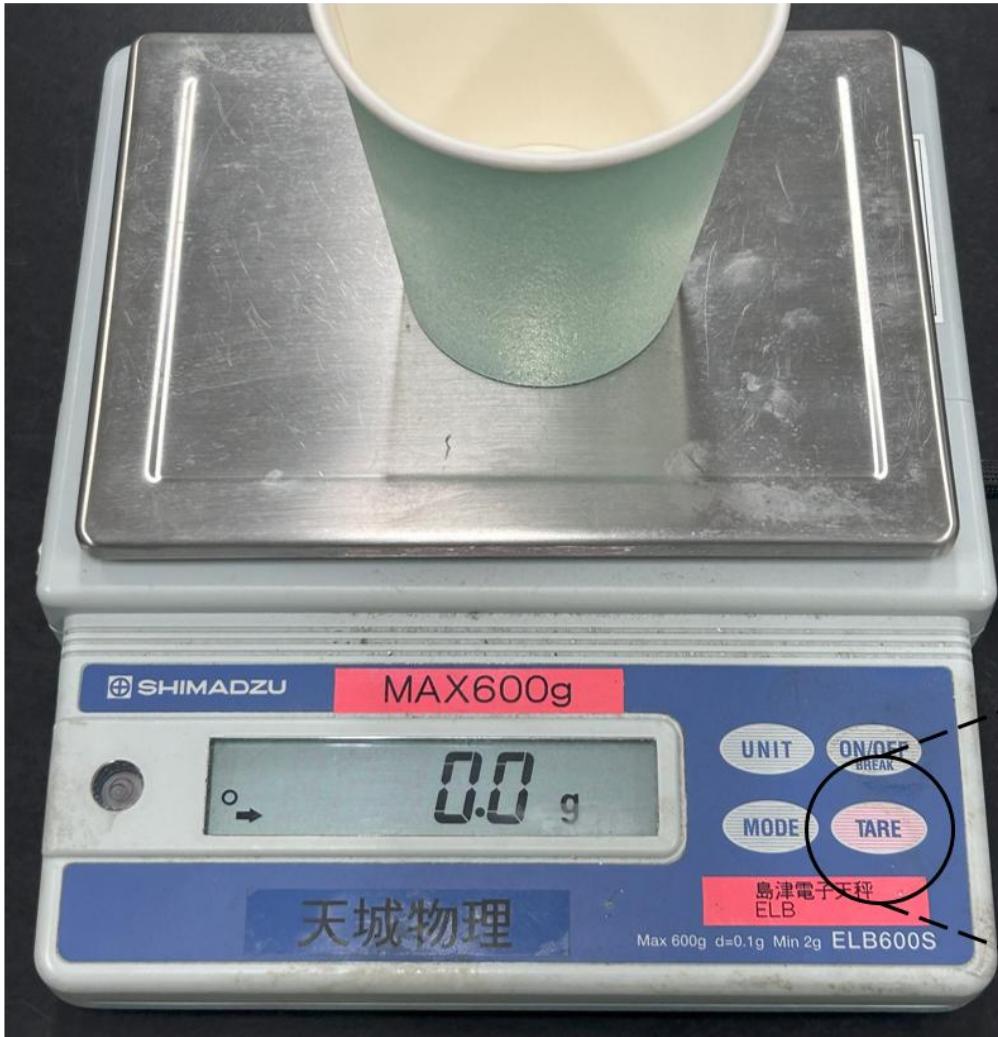


**Red**

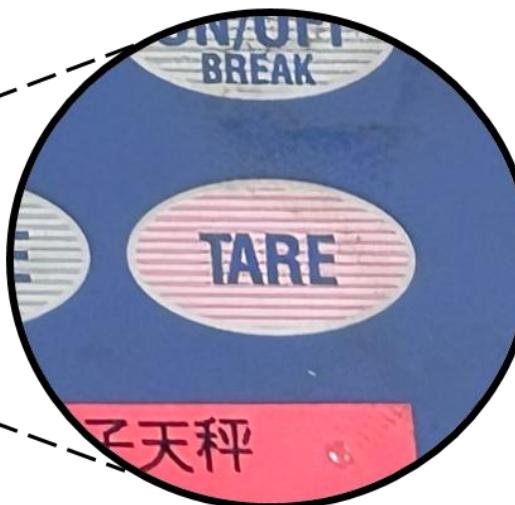
Mass of metal sample:

$$m_1 = 100 \text{ [g]}$$

# Experimental Procedure

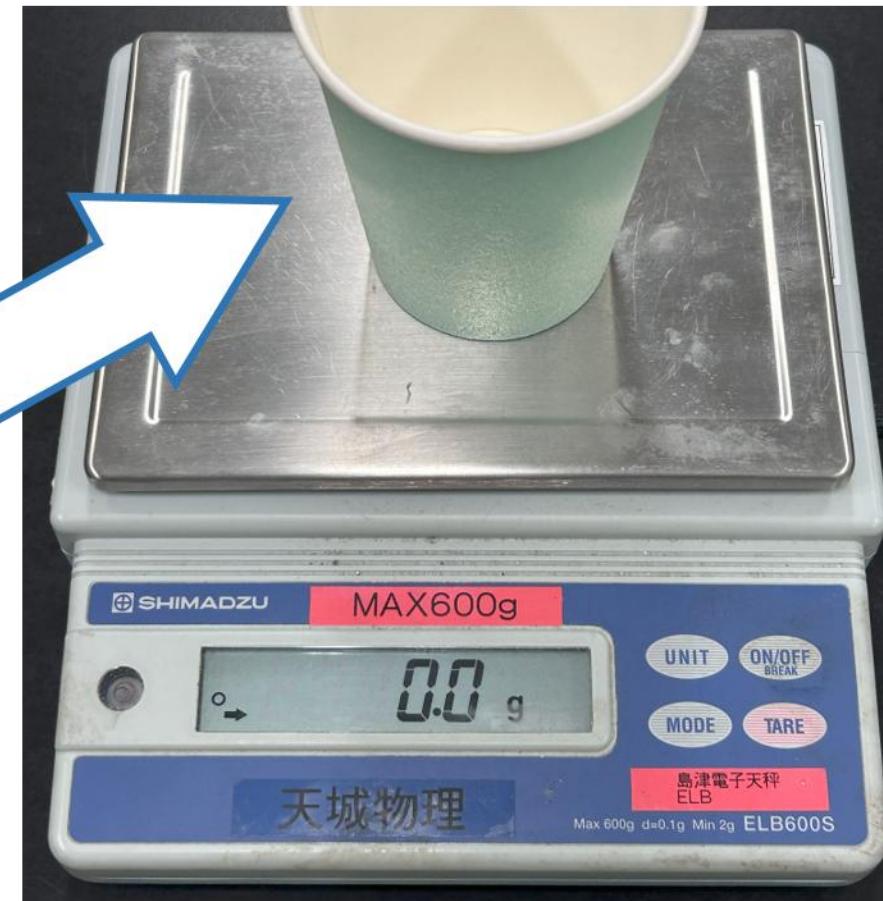
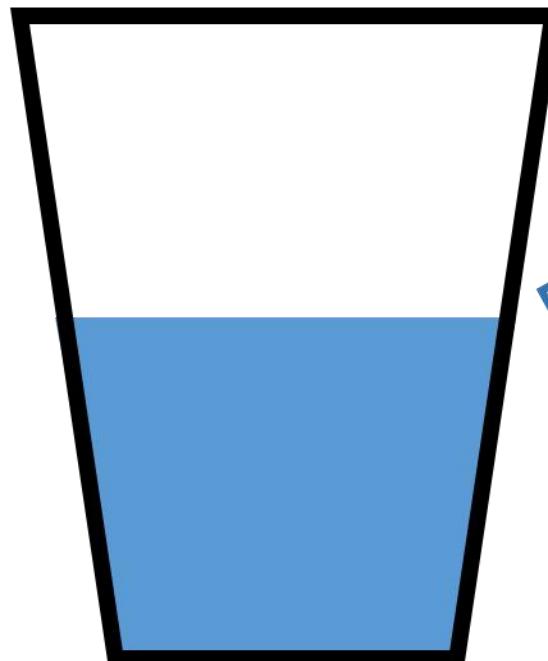


**Member C (Materials Handler) :**  
Place the empty cup on the balance and press the **TARE** button to set the display to **zero**.



# Experimental Procedure

Fill the insulated cup approximately halfway with **water** and measure its mass,  $m_2$ .



# Experimental Procedure

**Member D (Temperature Monitor):**  
Allow the water to reach thermal equilibrium, then measure its initial temperature,  $t_2$ .

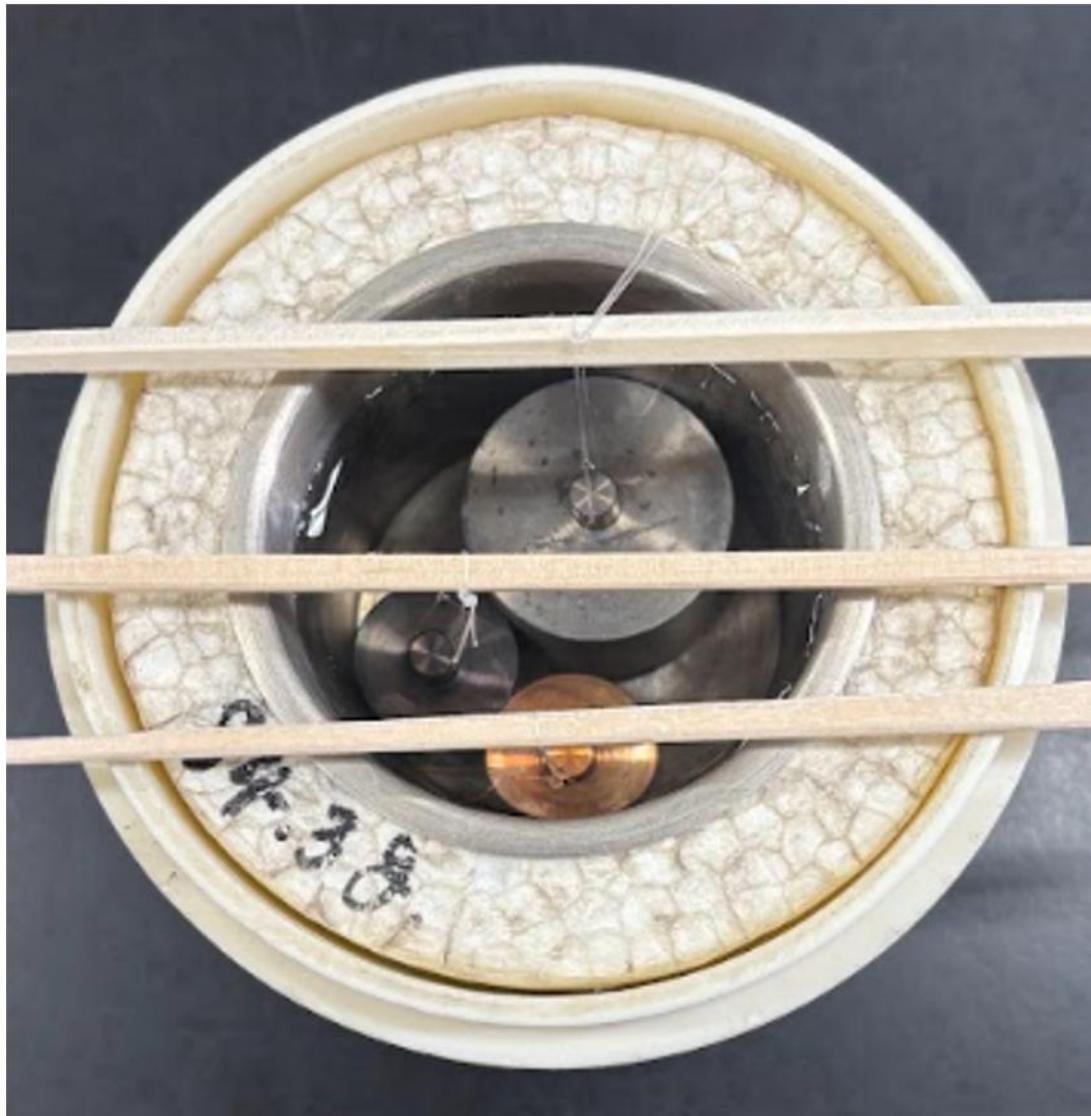


# Experimental Procedure

## **Member C (Materials Handler)**

Carrie the cup containing the water to retrieve the metal sample. Report the initial temperature of the metal,  $t_1$ , to

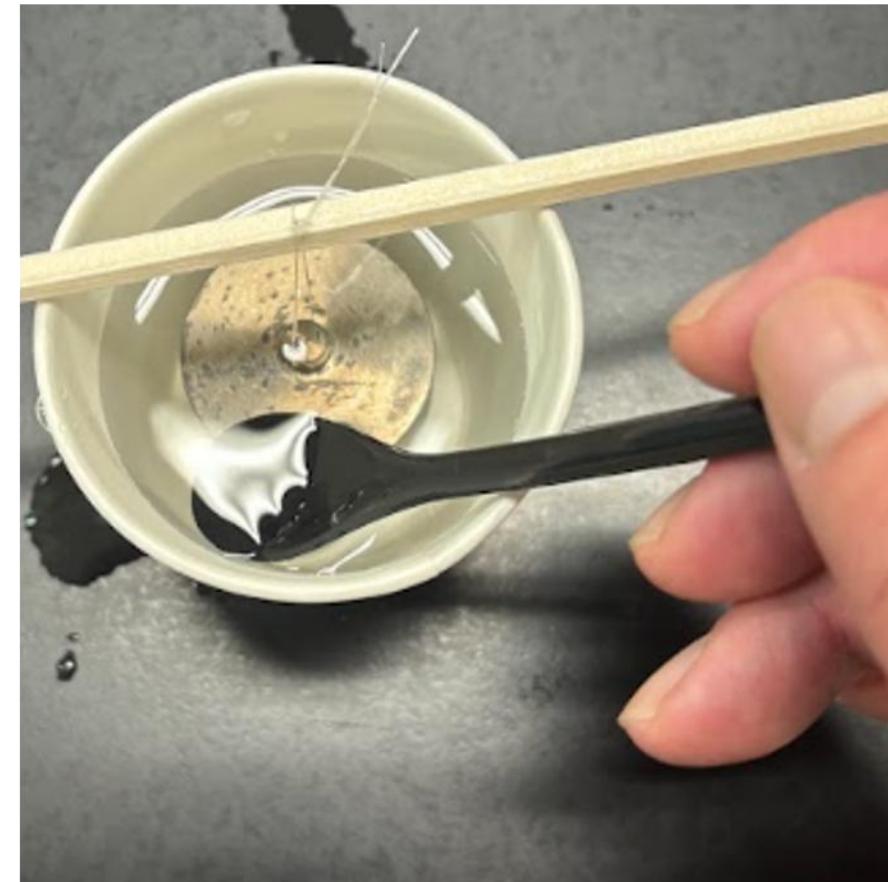
## **Member B (Recorder)**.



# Experimental Procedure

## **Member D (Temperature Monitor)**

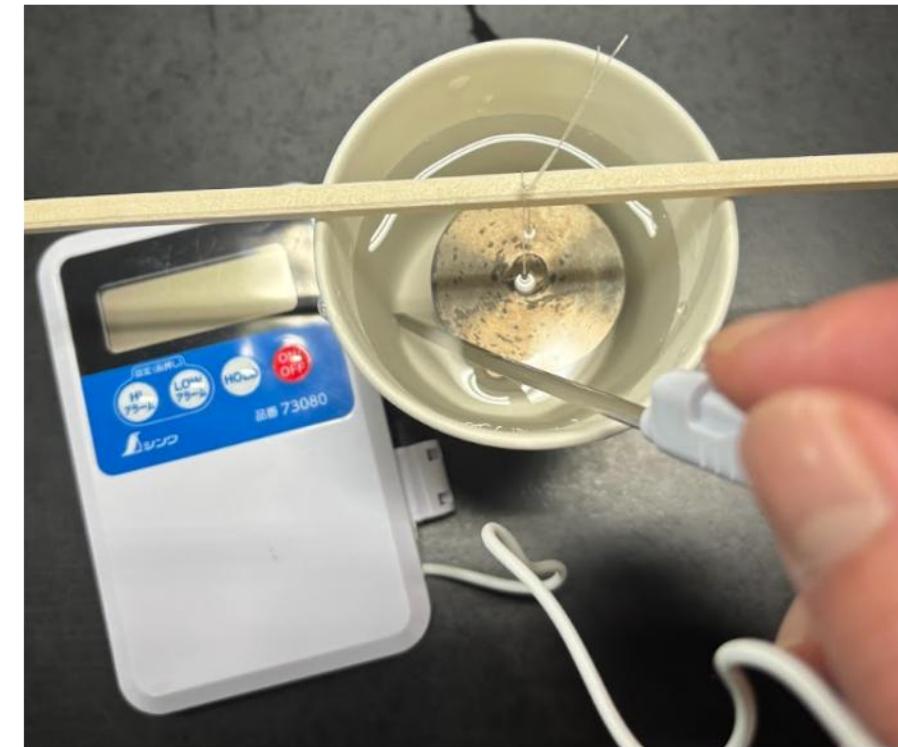
Use a spoon to gently stir the water for about 30 seconds to ensure that the temperature is uniform throughout the water.



# Experimental Procedure

## **Member D (Temperature Monitor)**

Measure the maximum temperature of the water,  $t_3$ , using the thermometer.



**CAUTION**

Be careful not to allow the sample to come into contact with the thermometer.

**Repeat the procedure**

using a second cup to perform Experiment B  
(the second trial).

# Specific heat of commonly used metals

Substance	At 100 K	At 200 K	At 298.15 K
Zn (zinc)	0.2967	0.3668	0.3885
Al (aluminum)	0.4822	0.7980	0.9025
Au (gold)	0.1091	0.1240	0.1285
Ag (silver)	0.187	0.225	0.235
Hg (mercury)	0.1209	0.1360	0.1395
C (carbon: diamond)	0.021	0.194	0.510
C (carbon: graphite)	0.138	0.411	0.710
Fe (iron)	0.215	0.385	0.448
Cu (copper)	0.2518	0.3561	0.3844
Pb (lead)	0.118	0.125	0.129
Ni (nickel)	0.232	0.383	0.445
Pt (platinum)	0.100	0.125	0.133

Unit:  
**[J/(g · K)]**

# Error

## **Absolute Error**

(In general usage, the term *error* usually refers to the absolute error.)

**Absolute error =**  
**measured value – true value** (accepted or theoretical value)

## **Relative Error**

**Relative error = absolute error / true value**

## **Percent Error**

**Percent error = relative error × 100**

Relative error and percent error are sometimes used interchangeably, depending on the context.