

EXPERIMENT

Measurement of Specific Heat

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

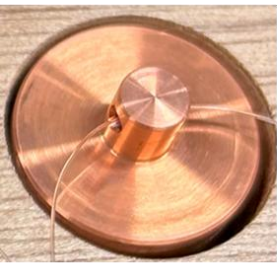
Color of metal



White



Black



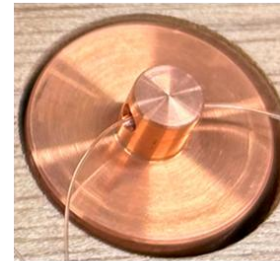
Red



White



Black



Red

Experimental Procedure



White



Black

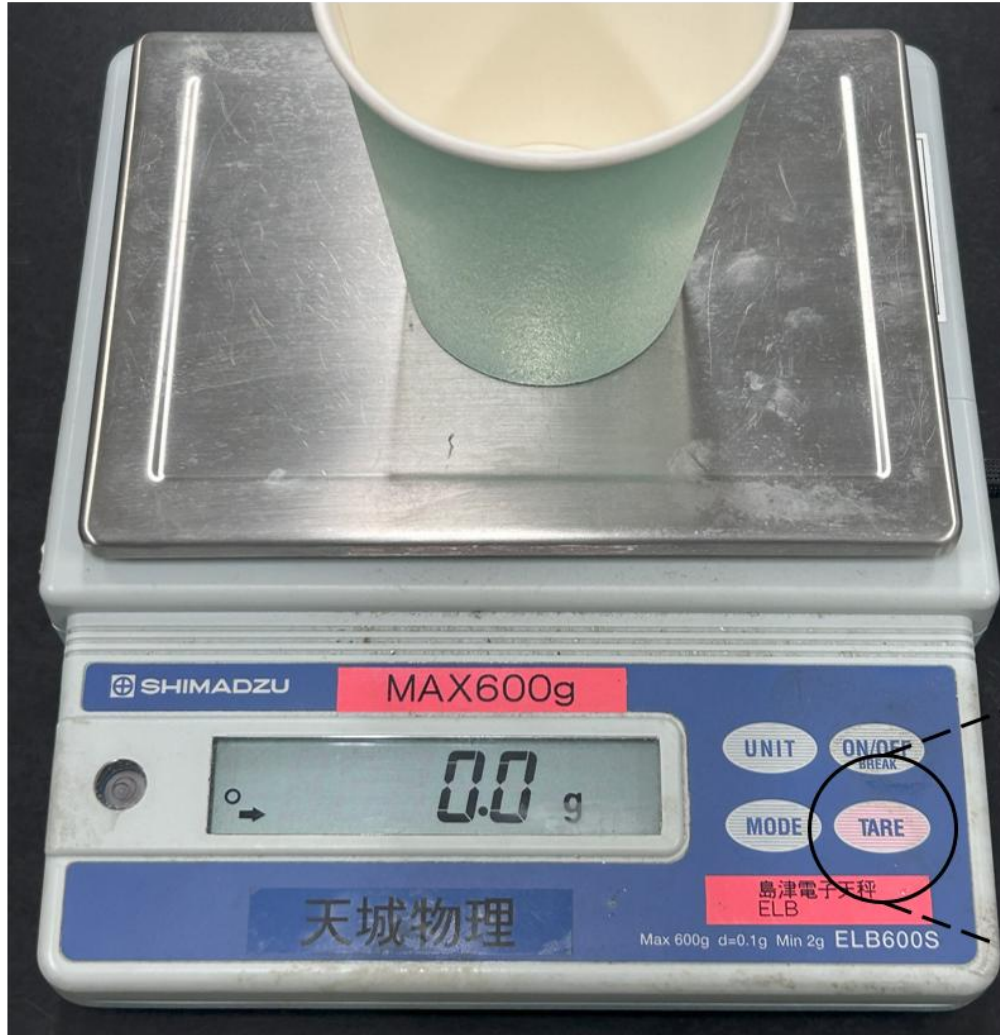


Red

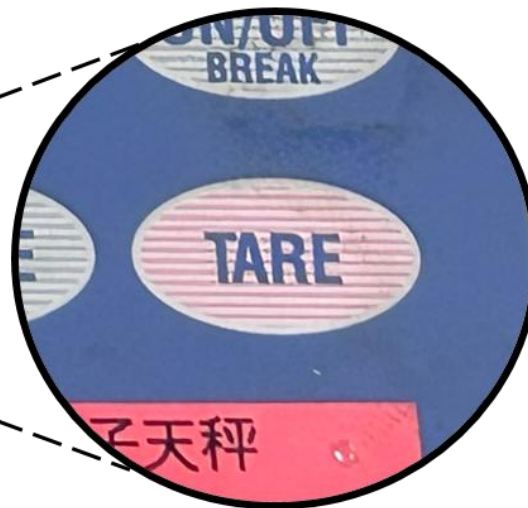
Mass of metal sample:

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

Experimental Procedure

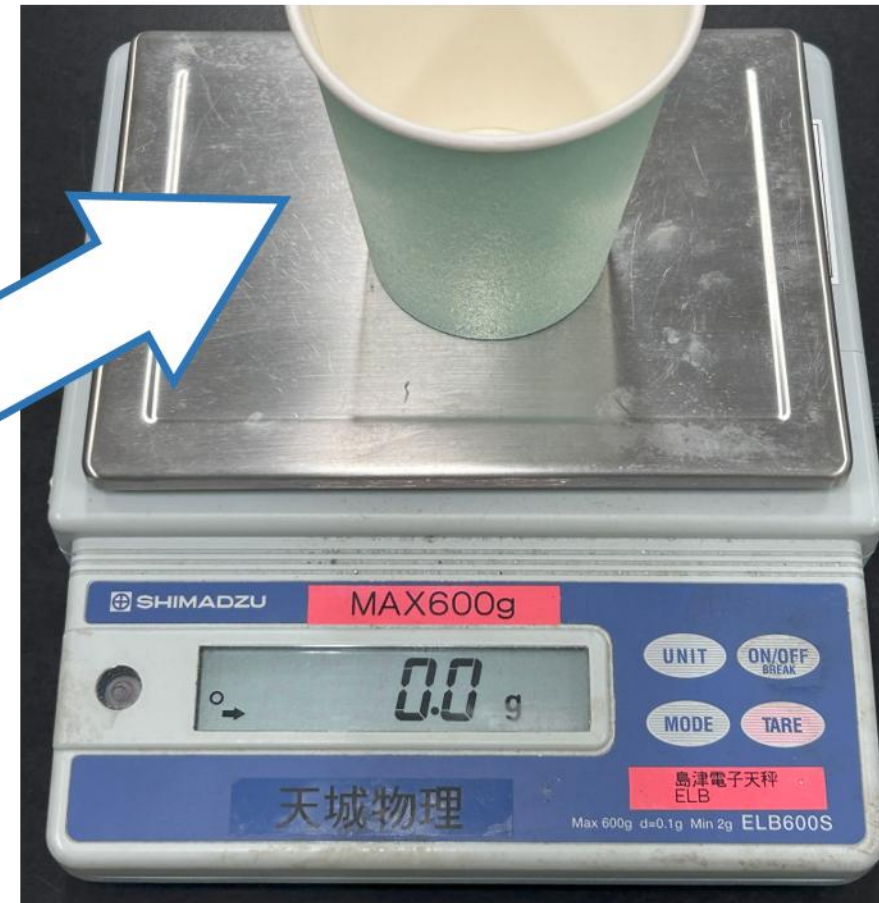
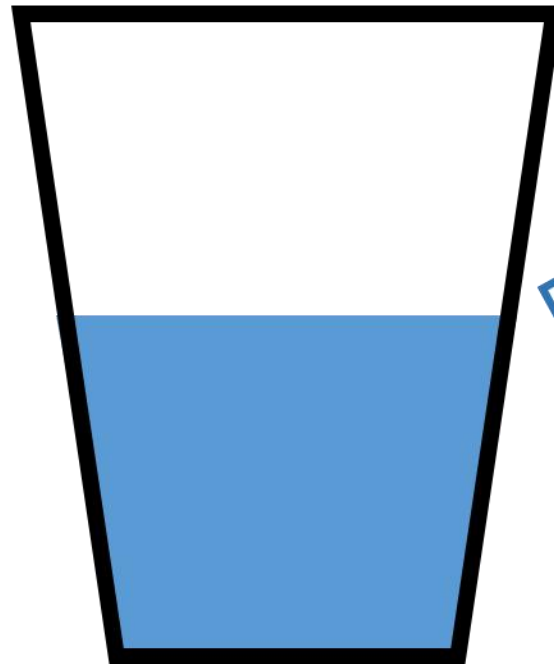


Member C (Materials Handler) :
Place the empty cup on the balance and press the **TARE** button to set the display to **zero**.



Experimental Procedure

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



Experimental Procedure

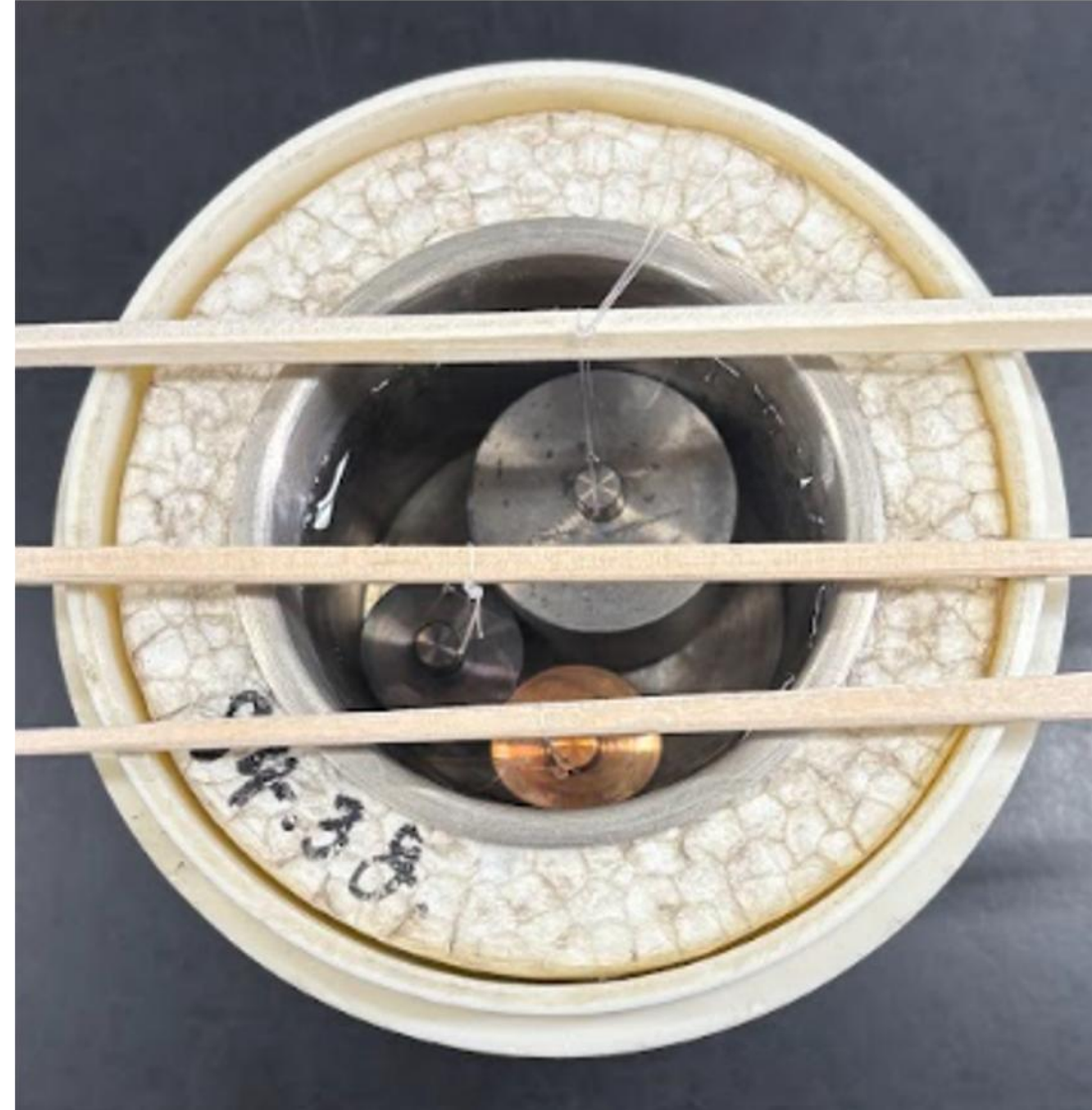
Member D (Temperature Monitor):
Allow the water to reach thermal equilibrium, then measure its initial temperature, t_2 .



Experimental Procedure

Member C (Materials Handler)

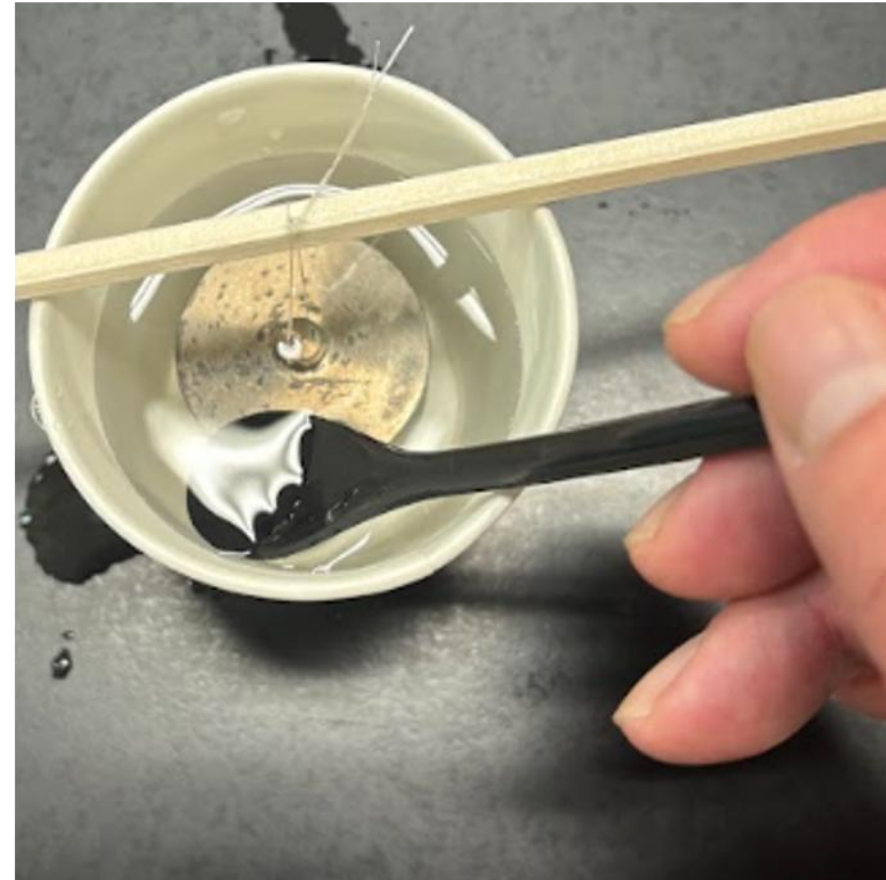
Carrie the cup containing the water to retrieve the metal sample. Report the initial temperature of the metal, t_1 , to **Member B (Recorder)**.



Experimental Procedure

Member D (Temperature Monitor)

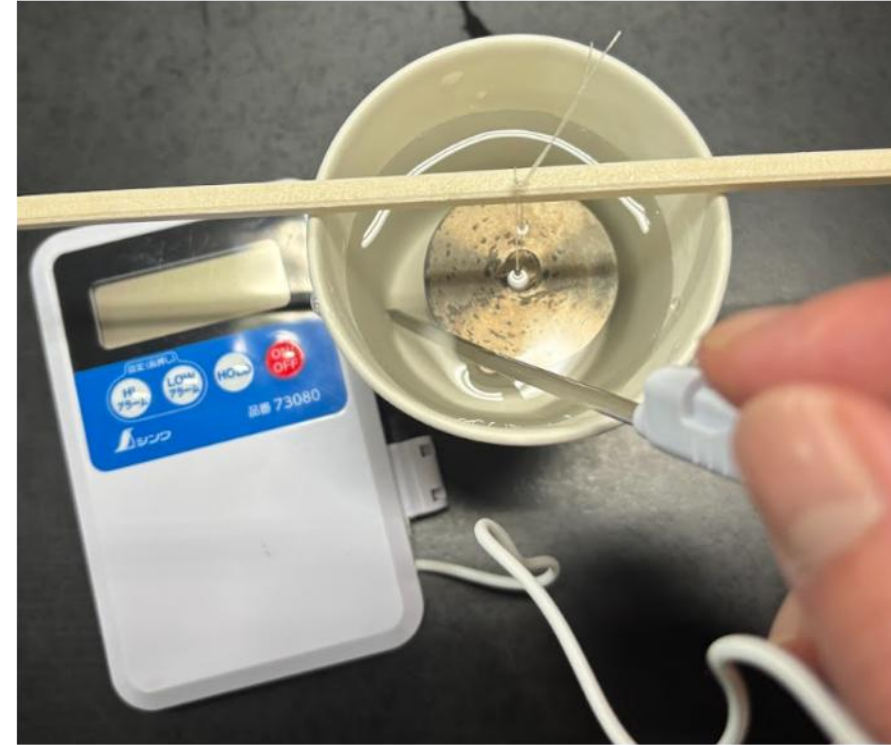
Use a spoon to gently stir the water for about 30 seconds to ensure that the temperature is uniform throughout the water.



Experimental Procedure

Member D (Temperature Monitor)

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



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 \times 100

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