

Calorimetry: Measuring Heat

Definitions:

Heat Capacity (C): The heat required to change the temperature of an object by 1.00°C

How would the heat capacity change if more food were added?

*More food ⇒
.....More heat required
.....Higher heat capacity*

How this situation responds to heat will depend on both the wok and the food.



$$C_{\text{wok \& food}} = 500. \text{ kJ/}^{\circ}\text{C} \quad (\text{approx.})$$

500 kJ/°C is how the wok & food respond to heat energy.



Calorimetry: Measuring Heat

Definitions:

Specific heat (c): The heat (J) required to change the temperature of **1.00 gram** of a substance by **1.00°C**

How this situation responds to heat will depend on both **how much water** there is and on the **temperature change** required.



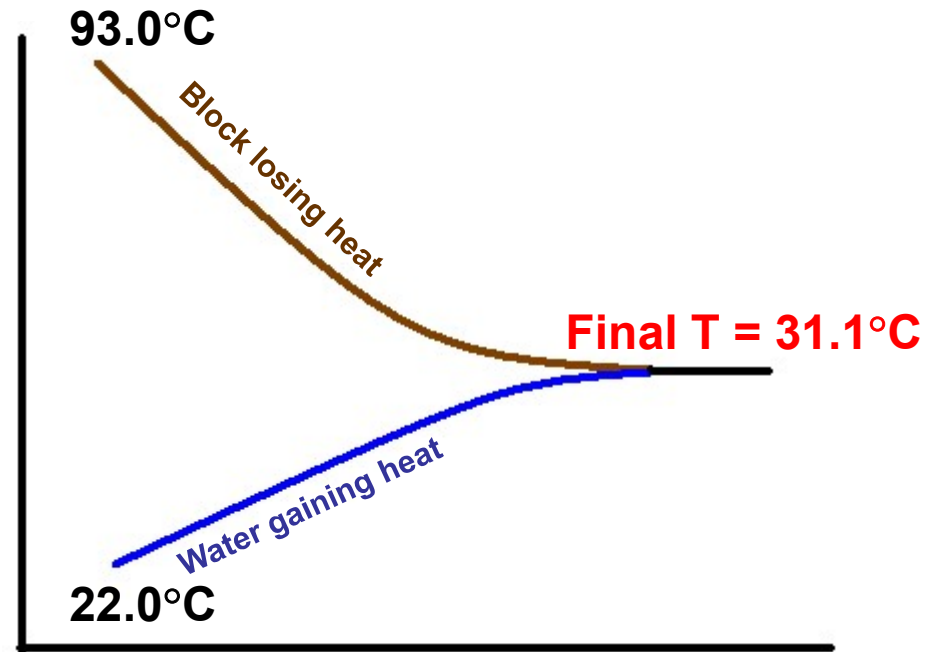
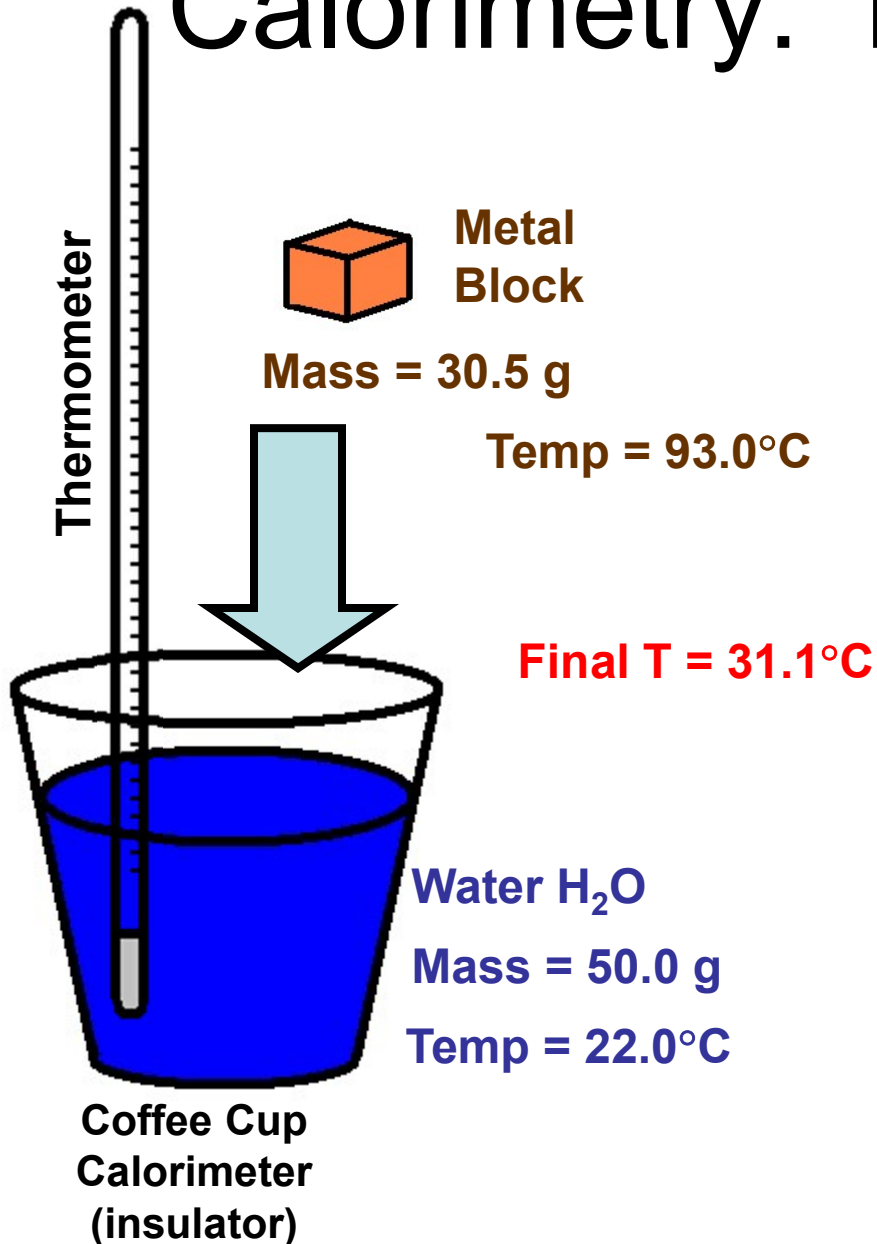
$$C_{\text{water}} = 1.00 \text{ cal/g}^{\circ}\text{C}$$

$$C_{\text{water}} = 4.184 \text{ J/g}^{\circ}\text{C} \quad (\textit{know this number and units})$$

To increase the temp. of 1 gram of water by 1°C will require 4.184 J of heat energy.



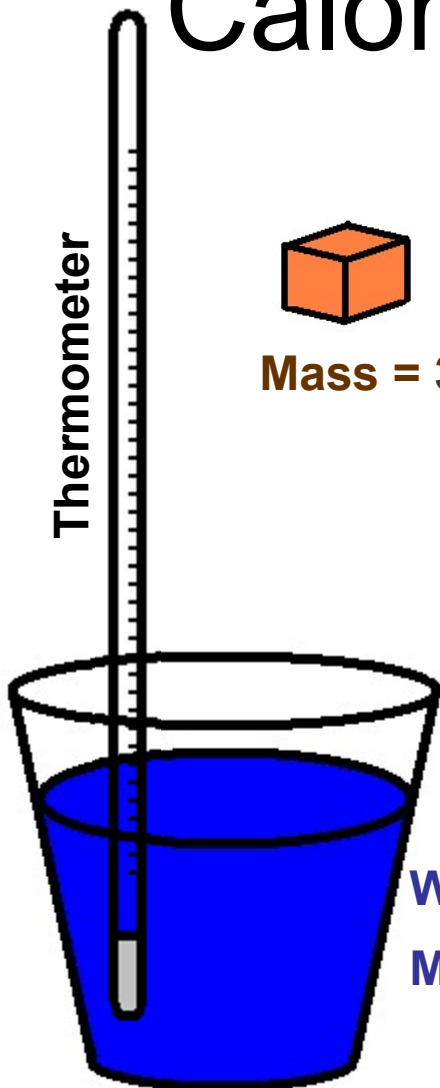
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What is the specific heat (c) of the metal block?



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 **Metal Block**
Mass = 30.5 g
Temp = 93.0°C

Final T = 31.1°C

Water H₂O
Mass = 50.0 g
Temp = 22.0°C

Coffee Cup Calorimeter (insulator)

Heat Lost by the Metal Block

$$q = m \times c \times \Delta T$$

$$q = m \times c \times (T_f - T_i)$$

$$q = 30.5 \times c \times (31.1 - 93.0)$$

$$q = -1887.95 \times c$$

Heat gained by the Water

$$q = m \times c \times \Delta T$$

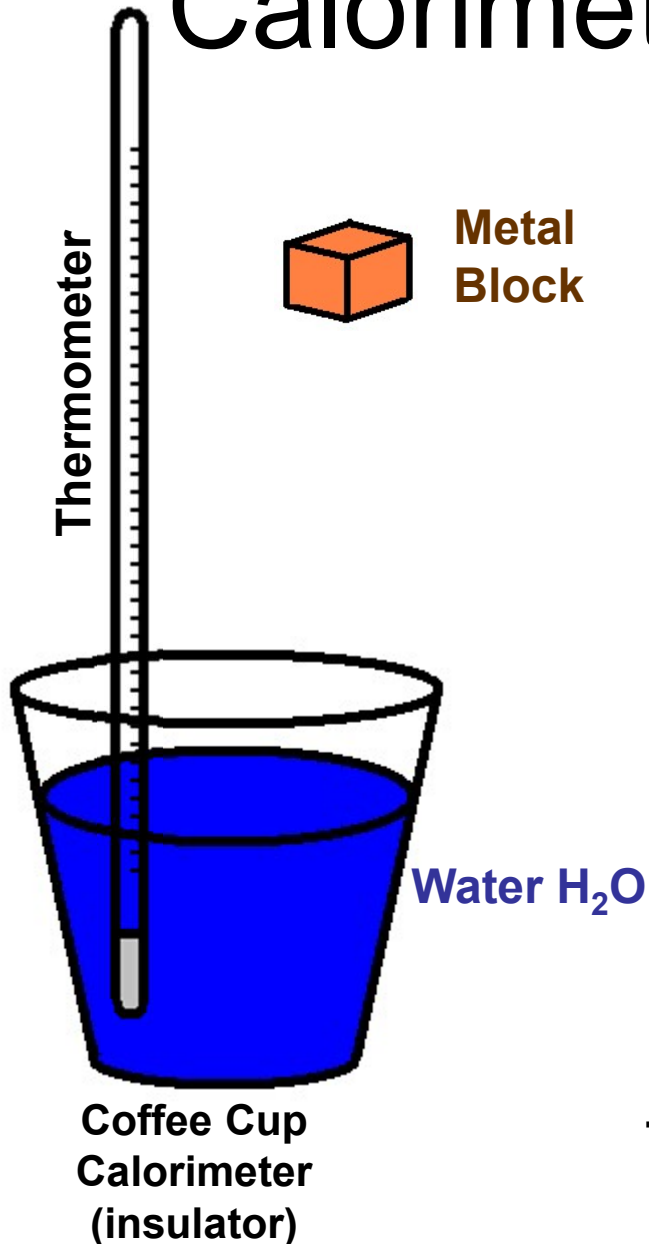
$$q = m \times c \times (T_f - T_i)$$

$$q = 50.0 \times 4.184 \times (31.1 - 22.0)$$

$$q = 1903.72 \text{ J}$$



Calorimetry: Measuring Heat



$$q_{\text{lost}} + q_{\text{gained}} = 0$$

$$-1887.95 \times c + 1903.72 = 0$$

$$1887.95 \times c = 1903.72$$

$$c = 1.008 \text{ J/g}^\circ\text{C}$$

The specific heat of the block is 1.008 J/g°C

