Measuring Relative Volume using Thermometer

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The Specific Heat Capacity, C, of a material is defined as:

The amount of heat required the raised the temperature of 1 kg of the substance by 1 K.
In SI units, C has the unit of $J * Kg^{-1} * K^{-1}$.

From the definition, if Q Joules of heat energy is supplied to a substance of mass M, and a ΔT Kelvin temperature change is observed using a thermometer, then:

$$C = \frac{Q}{M * \Delta T}$$

$$\implies Q = C * M * \Delta T$$

Now, suppose we have two beakers of water (or any liquid of known Density and Specific Heat Capacity):

Beaker **1**:
Volume of water: V_1 [Known; supposed to be the base volume unit]
Temperature of water: T_1 [Known; measured using thermometer]

Beaker **2**:
Volume of water: V_2 [Unknown; our goal is to figure out this volume]
Temperature of water: T_2 [Known]

Without loss of generality, let's assume that $T_1 > T_2$.

Now, we take another large beaker, and pour in the contents of both Beaker 1 and Beaker 2. Then, after ensuring that thermal equilibrium has been reached (maybe after giving it a few stirrings), we measure the temperature of the combined water in the large beaker, T_3.

(We are assuming idealised scenario here; the heat transfer between our system and surrounding is neglected. This is indeed the case for a short amount of time if we use insulating beakers/styrofoams, for instance.)

Now, from the Fundamental Principle of Calorimetry:

(At thermal equilibrium)

$Q_{lost\ by\ 1} = Q_{gained\ by\ 2}$ *(We have assumed that $T_1 > T_2$)*

$$\implies C_{water} * M_1 * (T_1 - T_3) = C_{water} * M_2 * (T_3 - T_2)$$

$$\implies \rho_{water} * V_1 * (T_1 - T_3) = \rho_{water} * V_2 * (T_3 - T_2)$$

$$\implies V_2 = V_1 * \frac{(T_1 - T_3)}{(T_3 - T_2)}$$

$$\implies V_2 = V_1 * \frac{|T_1 - T_3|}{|T_2 - T_3|}$$

Hence, we have calculated the unknown volume to be

$\frac{|T_1 - T_3|}{|T_2 - T_3|}$ times the base volume unit.

I leave it to the readers to investigate further possibilities of this method and test the result experimentally.

I came up with this method for the need of estimating volumes of liquids at my home, where measuring cups were sadly not available, but thermometers were. :)