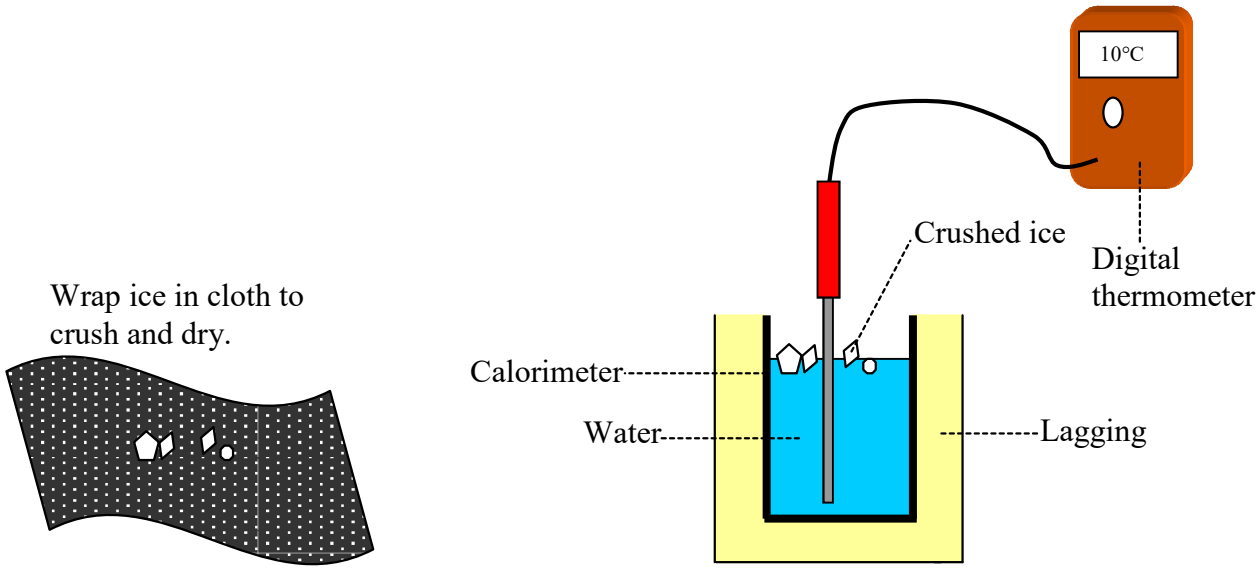
MEASUREMENT OF THE SPECIFIC LATENT HEAT OF FUSION OF ICE

Apparatus

Ice, water, calorimeter, lagging, beakers, kitchen paper, digital thermometer reading to 0.1 °C and electronic balance.



Procedure

1. Place some ice cubes in a beaker of water and keep taking the temperature with the thermometer until the ice-water mixture reaches 0 °C.
2. Find the mass of the calorimeter m_{cal}.
3. Half fill the calorimeter with water warmed to approximately 10 °C above room temperature. Find the combined mass of the calorimeter and water m_2. The mass of the water m_w is $m_2 - m_{cal}$.
4. Record the initial temperature θ_1 of the calorimeter plus water.
5. Surround the ice cubes with kitchen paper or a cloth and crush them between wooden blocks – dry them with the kitchen paper.
6. Add the pieces of dry crushed ice, a little at a time, to the calorimeter. Do this until the temperature of the water has fallen by about 20 °C.
7. Record the lowest temperature θ_2 of the calorimeter plus water plus melted ice. The rise in temperature of the ice $\Delta\theta_1$ is $\theta_2 - 0$ °C and the fall in temperature of the calorimeter plus water $\Delta\theta_2$ is $\theta_1 - \theta_2$.
8. Find the mass of the calorimeter plus water plus melted ice m_3. The mass of the melted ice m_i is $m_3 - m_2$.

Results

Mass of the calorimeter	m_{cal}	=	
Mass of the calorimeter plus water	m_2	=	
Mass of the water	m_w	=	$m_2 - m_{cal}$ =
Initial temperature of the calorimeter plus water	θ_1	=	
Final temperature of the calorimeter plus water plus melted ice	θ_2	=	
Rise in temperature of the ice	$\Delta\theta_1$	=	$\theta_2 - 0$ °C =
Fall in temperature of the calorimeter plus water	$\Delta\theta_2$	=	$\theta_1 - \theta_2$ =
Mass of the calorimeter plus water plus melted ice	m_3	=	
Mass of the melted ice	m_i	=	$m_3 - m_2$ =

Calculations

Assume heat losses cancel heat gains. Given that the specific heat capacity of water c_w and the specific heat capacity of copper c_c are already known, the latent heat of fusion of ice l may be calculated from the following equation:

Energy gained by ice = energy lost by calorimeter + energy lost by the water.

$$m_i l + m_i c_w \Delta\theta_1 = m_{cal} c_c \Delta\theta_2 + m_w c_w \Delta\theta_2$$

Notes

If a polystyrene container is used in place of the copper calorimeter, the energy gained by the ice is equal to the energy lost by the water.
The energy equation now reads: $m_i l + m_i c_w \Delta\theta_1 = m_w c_w \Delta\theta_2$.

To avoid melting the crushed ice, transfer it with a plastic spatula.