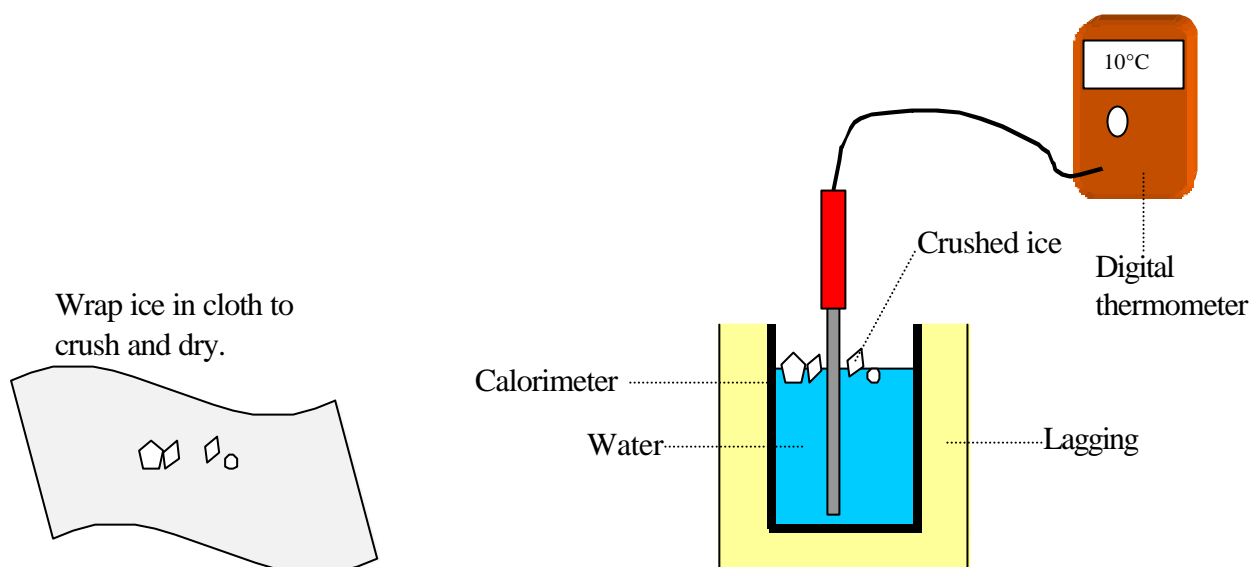


# MEASUREMENT OF THE SPECIFIC LATENT HEAT OF FUSION OF ICE

## 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  $m_{\text{cal}}$ .
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  $m_2 - m_{\text{cal}}$ .
4. Record the initial temperature  $\theta_1$  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  $\theta_2$  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	$m_{\text{cal}}$	=	
Mass of the calorimeter plus water	$m_2$	=	
Mass of the water	$m_w$	=	$m_2 - m_{\text{cal}} =$
Initial temperature of the calorimeter plus water	$\theta_1$	=	
Final temperature of the calorimeter plus water plus melted ice	$\theta_2$	=	
Rise in temperature of the ice	$\Delta\theta_1$	=	$\theta_2 - 0^\circ\text{C} =$
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.

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

## 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.