Measurement of the Specific Latent Heat of Fusion of Ice

Your lab report will be assessed for CPAC5: Referencing standard values.

N.B. This sheet is for reference only – DO NOT remove it from the laboratory.

Apparatus

Polystyrene cup	Thermometer	Paper towel
Heatproof mat	Hammer	Balance
Water	Plastic bag	

Theory

Assuming that the transfer of energy is 100% efficient and neglecting the heat capacity of the polystyrene cup as it is negligible:

Energy lost by the 'warm' water = energy gained by the ice melting + energy gained by the ice as water

$$m_{water}\, c_{water}\, (T_{initial} - T_{final}) = m_{ice}\, l_{ice} + m_{ice}\, c_{water}\, (T_{final} - 0)$$

So:
$$l_{ice} = \frac{m_{water}\, c_{water}\, (T_{initial} - T_{final}) \; - \; m_{ice}\, c_{water}\, (T_{final} - 0)}{m_{ice}}$$

Method

Determine the mass of the polystyrene cup using a balance. Place sufficient warm water in the cup to half fill it. Determine the mass of the cup and water using a balance. Determine the temperature of the water. (It should be about 5°C above room temperature). Calculate the mass of water used. Crush some ice in a plastic bag. (N.B. Do this on the floor). Dry the ice on a paper towel. Add a small quantity of ice to the water at a time with stirring until the temperature is about 5°C below room temperature. Record this temperature. Determine the mass of the cup, water and ice. Calculate the mass of ice used. Repeat this several times. Record your measurements in a logical way.

Analysis

Using the equation above calculate a value for the specific latent heat of fusion of ice for each of your sets of readings. Now find an average value from all of these results.

The value obtained should be compared with the standard value – look in a data book. Calculate the percentage error.

Both the variation in the values you obtained and the percentage uncertainties for each of the measurements of temperature and mass should be considered to discuss their relative importance in contributing to the percentage error.

Why do you think you were told to start the experiment at about 5°C above room temperature and end at about 5°C below room temperature?