

Answer on Question 57107, Physics, Other

Question:

A heater, which provides thermal energy at the rate of 48 W , is placed in some crushed ice that has been placed in a funnel. The heater is switched on for 200 s and 32 g of ice are found to have melted during this time. The excessive water is drained out through the funnel. Calculate the specific latent heat of fusion for water.

Solution:

Let's write the formula for the latent heat required to change the state from ice at 0°C to water at 0°C :

$$Q = mL_f,$$

here, m is the mass and L_f is the specific latent heat of fusion for water.

From the other hand, we can write the formula for amount of heat that a heater provides at the rate of 48 W during 200 s :

$$Q = Pt.$$

Then, we can equate both expressions and find the specific latent heat of fusion for water:

$$mL_f = Pt,$$

$$L_f = \frac{Pt}{m} = \frac{48\text{W} \cdot 200\text{s}}{32 \cdot 10^{-3}\text{kg}} = 3.0 \cdot 10^5 \frac{\text{J}}{\text{kg}}.$$

Answer:

The specific latent heat of fusion for water is $L_f = 3.0 \cdot 10^5 \frac{\text{J}}{\text{kg}}$.