

Question #62693, Chemistry / Physical Chemistry

Calculate the entropy for the melting of 25g of ice, initially stored at -15 degree celcius, then brought to 25 degree celcius. Consider the specific heat of melting for water to be 79.7 cal g⁻¹, the heat capacity of ice is 0.5 cal g⁻¹, and that of liquid water is 1.0 cal g⁻¹

Answer:

$$Q = cm\Delta T$$

We have three stages:

1) Ice heat from -15 °C to 0 °C:

$$Q_1 = 0.5 \frac{\text{cal}}{\text{g}} \times 25 \text{ g} \times (0 - (-15)) = \mathbf{187.5 \text{ cal}}$$

2) Ice melting at 0 °C:

$$Q_2 = 79.7 \frac{\text{cal}}{\text{g}} \times 25 \text{ g} = \mathbf{1992.5 \text{ cal}}$$

3) Water heat from 0 °C to 25 °C:

$$Q_3 = 1.0 \frac{\text{cal}}{\text{g}} \times 25 \text{ g} \times (25 - 0) = \mathbf{625.0 \text{ cal}}$$

Summary:

$$Q = Q_1 + Q_2 + Q_3 = 187.5 + 1992.5 + 625.0 = 2805 \text{ cal}$$

2805 cal