

Heat

# Graph Skills

## Changes in Temperature and Phase

A 20.0 kg ice block is removed from a freezer whose temperature is  $-25.0^{\circ}\text{C}$  and placed in an ice box with freshly caught fish. After a few hours, all the ice was melted. The final temperature of the water and the fish was  $5^{\circ}\text{C}$ .

The melting point of ice is  $0.00^{\circ}\text{C}$ . The heat capacities and latent heats are given as  $c_p(\text{ice}) = 2.09 \times 10^3 \text{ J/kg}\cdot^{\circ}\text{C}$ ;  $L_f(\text{ice}) = 3.33 \times 10^5 \text{ J/kg}$ ;  $c_p(\text{water}) = 4.19 \times 10^3 \text{ J/kg}\cdot^{\circ}\text{C}$ . Use this information to answer the questions below.

1. How much energy did the solid ice absorb to reach its melting point and remain solid?  
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2. How much energy was absorbed to turn the ice into water?  
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3. How much energy was absorbed to bring the temperature of that water to  $5^{\circ}\text{C}$ ?  
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4. Draw a graph showing all of the process. (Let each box on the grid represent  $0.4 \times 10^6 \text{ J}$  or  $0.5 \times 10^6 \text{ J}$ .)

