

Phys102 (Sec # 41) Quiz # 3 (Ch.18)

Name: _____

Key

ID # _____

1- A person wants to cool 0.3-kg of water that is initially at 30° C by adding ice initially at -25° C. How much ice should he add so that the final temperature will be 0° C with all the ice melted? [For ice, use the specific heat = $2.1 \times 10^3 \text{ J/(kg}\cdot\text{K)}$, and heat of fusion = $3.3 \times 10^5 \text{ J/kg}$, specific heat of water = $4186 \text{ J/(kg}\cdot\text{K)}$].

<p>Water</p> <p>$T_i = 30^\circ\text{C}$</p> <p>$m_w = 0.3 \text{ kg}$</p> <p>$T_f = 0$</p>	<p>ice</p> <p>$T_i = -25^\circ\text{C}$</p> <p>$m_i = ?$</p> <p>$T_f = 0$ (all melted)</p>
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$$Q_{\text{lost}} + Q_{\text{gained}} = 0$$

$$m_w c_w (0 - 30) + m_i c_i (0 - (-25)) + m_i L_f = 0$$

$$-(0.3)(4186)(30) + m_i (2.1 \times 10^3)(25) + m_i (3.3 \times 10^5) = 0$$

$$- 3.8 \times 10^4 + 5.3 \times 10^4 m_i + 3.3 \times 10^5 m_i = 0$$

$$m_i = \frac{3.8 \times 10^4}{3.8 \times 10^5} = \boxed{0.1 \text{ kg}}$$

2- Gas within a closed chamber undergoes the cycle shown in the P-V diagram. Calculate the net energy added to the system as heat during one complete cycle.

Cyclic Process $\Rightarrow \Delta E_{\text{int}} = 0$

$$\Delta E_{\text{int}} = 0 = Q - W$$

$$Q = W = -(\text{area enclosed})$$

$$= -\frac{1}{2}(3)(20)$$

$$\boxed{Q = -30 \text{ J}}$$

