

Physics 102Rec
Quiz # 3
Chapter 19

Name: Key Id: _____ Sect: 2

1. A thermodynamic system undergoes a process in which its internal energy decreases by 600 J. If at the same time, 350 J of work is done on the system, (a) find the heat transfer during the process. (b) is heat lost or gained by the system? Why?

$$\Delta E_{\text{int}} = -600 \text{ J}$$

$$W = -350 \text{ J}$$

$$\Delta E_{\text{int}} = Q - W \Rightarrow Q = \Delta E_{\text{int}} + W = -600 - 350$$
$$\boxed{Q = -950 \text{ J}}$$

The system lost heat because $Q < 0$!

2. What is the amount of heat removed from 20 g of water at 10 °C to completely freeze it at 0 °C?
(For water: $L_f = 333 \text{ kJ/kg}$, $c = 4186 \text{ J/kg K}$)

$$Q = Q_1 + Q_2 = m c \Delta T - m L_f$$
$$= (0.02) (4186) (0 - 10) - (0.02) (333 \times 10^3)$$
$$= -837.2 - 6660 \approx -7497.2 \text{ J}$$

$Q < 0$ because heat is removed from the water !