

Physics 102Rec  
Quiz#4  
Chapter 21

Name: Key Id#: \_\_\_\_\_ Sect#: \_\_\_\_\_

1. An ideal engine operates between two heat reservoirs at temperatures of 300 °C and 20 °C. If the engine receives 1200 cal of heat from the hot reservoir, what is the heat rejected to the cold reservoir?

$$\text{Ideal engine} \Rightarrow \frac{T_c}{T_h} = \frac{Q_c}{Q_h}$$

$$\Rightarrow Q_c = Q_h \frac{T_c}{T_h} = 1200 \frac{293}{573} = \underline{614 \text{ cal}}$$

2. A 100 g of ice at 0 °C is heated to 80 °C. Calculate the change in entropy of ice. The specific heat of water is = 4186 J/Kg K, and the heat of fusion = 333 kJ/K

$$0^\circ\text{C ice} \xrightarrow{\Delta S_1} 0^\circ\text{C water} \xrightarrow{\Delta S_2} 80^\circ\text{C water}$$

$$\begin{aligned} \Delta S &= \Delta S_1 + \Delta S_2 = \frac{m L_f}{T} + m c_w \ln\left(\frac{T_f}{T_i}\right) \\ &= \frac{(0.1)(333 \times 10^3)}{273} + (0.1)(4186) \ln\left(\frac{353}{273}\right) \end{aligned}$$

$$\boxed{\Delta S \approx 230 \text{ J/K}}$$