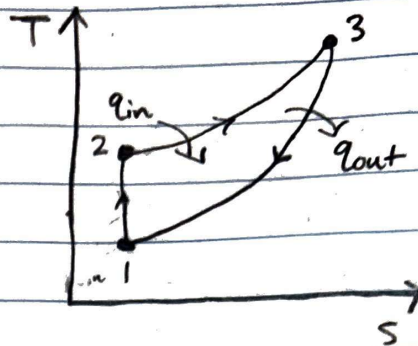
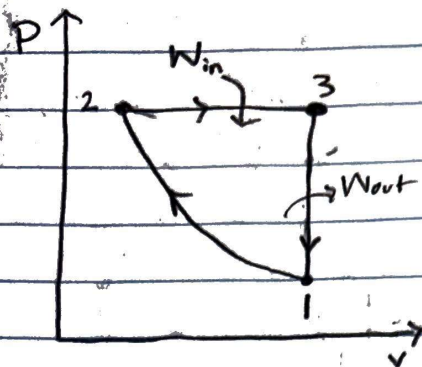


1-18

(a)



(b)

$$C_v = 0.7 \frac{\text{kJ}}{\text{kg} \cdot \text{K}} \quad R = 0.3 \frac{\text{kJ}}{\text{kg} \cdot \text{K}} \quad r = 5$$

①

$$T_1 = 20^\circ\text{C} + 273 = 293 \text{ K}$$

$$P_1 = 100 \text{ kPa}$$

$$C_p = 0.7 + 0.3 = 1.0 \frac{\text{kJ}}{\text{kg}} \quad k = \frac{1.0}{0.7} = 1.43$$

②

$$\frac{T_2}{T_1} = r^{k-1} \Rightarrow \frac{T_2}{293} = 5^{1.43-1} \Rightarrow 293 \cdot \frac{T_2}{293} = 1.99 \cdot 293$$

$$T_2 = 583.07 \text{ K}$$

$$P_2 = 100 \text{ kPa}$$

③

$$\frac{T_1}{T_3} = r^{-k} \Rightarrow \frac{293}{T_3} = 5^{-1.43} \Rightarrow T_3 = 2926.8 \text{ K}$$

$$W_{in} = (0.3) \frac{293 - 583.07}{1.43} - 1 = -61.85 \frac{\text{kJ}}{\text{kg}}$$

$$W_{in} = (0.3) \frac{583.07 - 2926.8}{1.43} - 1 = -439.4 \frac{\text{kJ}}{\text{kg}}$$

$$W_{out} = (0.3) \frac{2926.8 - 293}{1.43} - 1 = 552.5 \frac{\text{kJ}}{\text{kg}}$$

$$q_{in} = 1(2926.8 - 583.07) = 2343.73 \frac{\text{kJ}}{\text{kg}}$$

$$q_{out} = (-0.7)(2926.8 - 293) = -3762.6 \frac{\text{kJ}}{\text{kg}}$$