8. (1) 若 b→c 为绝热过程，则 a→b 升温吸热增压（Q_1）

c→a 降温压缩放热（Q_2）

$$\text{有 } \eta = \frac{Q_1 - Q_2}{Q_1} = \frac{C_{V,m}(P_2V_1 - P_1V_1) - C_{p,m}P_1(V_2 - V_1)}{C_{V,m}(P_2V_1 - P_1V_1)}$$

$$= \frac{P_2V_1 - P_1V_1 - \left(\ln\left(\frac{P_1}{P_2}\right) / \ln\left(\frac{V_1}{V_2}\right)\right) P_1(V_2 - V_1)}{P_2V_1 - P_1V_1}$$

(2) 若 b→c 为等温过程，则

$$\eta = \frac{W}{Q_{吸}} = \frac{\nu RT \ln\frac{V_2}{V_1}}{\nu RT \ln\frac{V_2}{V_1} + C_{p,m}\frac{(P_2 - P_1)V_1}{R}}$$

$$= \frac{(\gamma - 1)\nu RT \ln\frac{V_2}{V_1}}{(\gamma - 1)\nu RT \ln\frac{V_2}{V_1} + \gamma(P_2 - P_1)V_1}$$

13. 声速有 $v^2 = \left(\frac{\partial p}{\partial \rho}\right)_S$，由绝热过程（单位质量）

$$\frac{dp}{p} + \gamma\frac{dV}{V} = 0 \quad \text{而 } d\rho = -\frac{dV}{V^2}$$

$$\text{有 } \frac{dp}{p} - \gamma V d\rho = 0$$

$$\text{故而 } v^2 = \frac{\partial p}{\partial \rho} = \gamma pV$$

$$\text{而 } u = \frac{i}{2}\frac{pT}{m_0} + u_0 \quad \text{而 } \gamma = \frac{i+2}{i}$$

$$\text{故而 } u = \frac{v^2}{\gamma(\gamma - 1)} + u_0 = \frac{\gamma pT}{m_0}\frac{i}{2}\cdot\frac{1}{\gamma} + u_0$$

$$= \frac{i}{2}\frac{RT}{m_0} + u_0$$

又因 $h = u + pV = u + \frac{RT}{m_0} = \frac{v^2}{\gamma(\gamma-1)} + \frac{v^2}{\gamma} + h_0$

$$h = \frac{v^2 + (\gamma-1)v^2}{\gamma(\gamma-1)} + h_0 = \frac{v^2}{\gamma-1} + h_0$$

14.解：

$$\eta = 1 - \frac{Q_0}{Q_2} = 1 - \frac{(1-\eta_1)(1-\eta_2)Q_2}{Q_2}$$

$$= 1 - 1 + \eta_1 + \eta_2 - \eta_1\eta_2$$

$$= \eta_1 + \eta_2 - \eta_1\eta_2$$