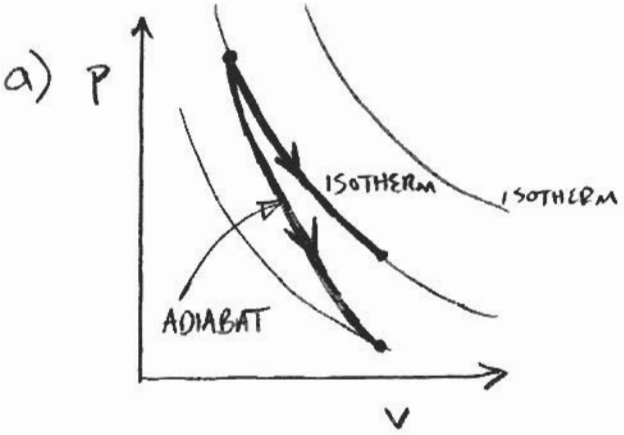
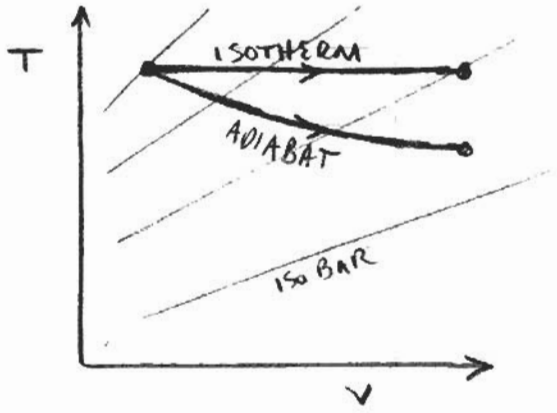
SOLUTIONS TO UNFIED T3 (WAITZ)

a)




b) Q-S ISOTHERMAL

$T_1 = 300K$, $v_1 = 1\ m^3/kg$

$T_2 = 300K$, $v_2 = 10\ m^3/kg$

$\therefore\ P_2 = \frac{287 \cdot 300}{10}$

$\boxed{P_2 = 8610\ Pa}$

c) $w = RT \ln\left(\frac{V_2}{V_1}\right)$

$= 287 \cdot 300 \cdot \ln(10)$

$\boxed{w = 198\ kJ/kg}$

$\Delta u = q - w = C_v \Delta T = 0$

$\therefore\ \boxed{q = w = 198\ kJ/kg}$

Q-S ADIABATIC

$PV^\gamma = CONST.$ $\gamma = 1.4$

$P_1 = \frac{287 \cdot 300}{1} = 86100\ Pa$

$\frac{P_2}{P_1} = \left(\frac{V_1}{V_2}\right)^\gamma$ $\therefore$

$\boxed{P_2 = 3428\ Pa}$

$T_2 = \frac{P_2 V_2}{R}$

$\boxed{T_2 = 119\ K}$

$\Delta u = \cancel{q}^{\,0} - w$

$\boxed{q = 0}$

$w = -\Delta u = -C_v (T_2 - T_1)$

$= -716.5(119 - 300)$

$\boxed{w = 129\ kJ/kg}$

Q-5 ISOTHERMAL

d) $h = u + pv$

$dh = C_p dT$

$\Delta h = 1003.5 (T_2 - T_1)$

$\Delta h = 0$

Q-5 ADIABATIC

$h = u + pv$

$dh = C_p dT$

$\Delta h = 1003.5 (T_2 - T_1)$

$= 1003.5 (119 - 300)$

$\boxed{\Delta h = -181.6 \text{ kJ}}$

e) HEAT IS A TRANSFER OF ~~ENERGY~~ ACROSS A SYSTEM BOUNDARY BY VIRTUE OF A TEMPERATURE DIFFERENCE ONLY. IT IS MEASURED IN JOULES

TEMPERATURE IS A THERMODYNAMIC PROPERTY AND A FUNCTION OF THE STATE OF A SYSTEM. IT IS MEASURED IN KELVIN.

* IT IS POSSIBLE TO HAVE AN ISOTHERMAL PROCESS WITH HEAT TRANSFER
* IT IS POSSIBLE TO HAVE AN ADIABATIC PROCESS WITH A TEMPERATURE CHANGE

AS DEMONSTRATED IN THIS PROBLEM