THEN

$C_p = \frac{R\gamma}{\gamma - 1}$ ************

AND $C_v = \frac{R}{\gamma - 1}$ ************

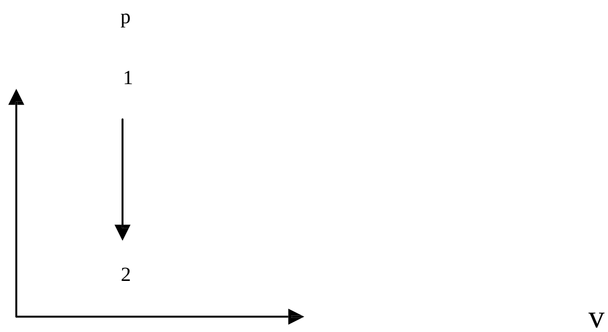
Change of state at constant volume process 2.3

$V_1 = V_2$

$P_1 V_1 = mRT_1$

$P_2 V_2 = mRT_2$

1st law $Q = \Delta u$ then from 0 = W & $Q_{add} = mC_v (T_2 - T_1)$



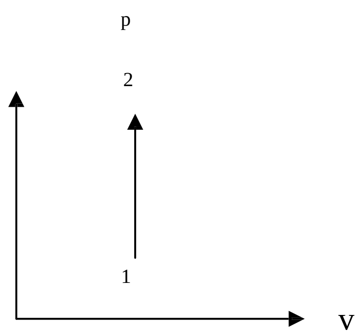
.Ex

2 kg of gas occupying 0.7 m3 had an original temperature of 15 C . it was then heated at constant volume process until its temperature becomes 135 C ,How much heat was transferred to the gas an what was its final pressure and change in specific internal energy Take Cv = 0.72 KJ/kg.K, R=0.29 KJ/Kg.K

.Sol

Q=mCv(T2-T1)

Q=2*0.72*1000{(135+273)-(15+273)}=172800 J



$P_1 V_1 = mRT_1$

$\therefore P_1 = \frac{mRT_1}{V_1} = \frac{2 * (1000 * 0.29 * (273 + 15)}{0.7} = 238628 \; N/m^2$

$\frac{P_1}{T_1} = \frac{P_2}{T_2}$

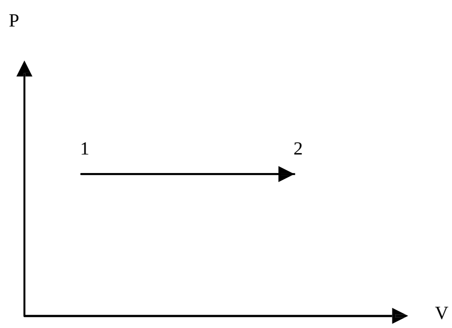
$\therefore P_2 = P_1 \frac{T_2}{T_1} = 238628 * \frac{(273 + 135)}{(273 + 15)} = 338057 \; N/m^2$

but W=0 then $Q - W = \Delta U$

$Q = \Delta U = 172800 \; J$

Δu=Q/m= 86400 J/kg

2.4 process at constant pressure change of state



$P_1 V_1 = mRT_1$ (1)

$P_2 V_2 = mRT_2$ (2)

divide eq1 by eq2 yields since $P_1 = P_2$

$\frac{V_1}{V_2} = \frac{T_1}{T_2}$

And $Q = mC_P(T_2 - T_1) = \Delta H$

$W = P(V_2 - V_1)$ but $V_1 = \frac{mRT_1}{P_1}$ and $V_2 = \frac{mRT_2}{p_2}$

Then $W = p\left(\frac{mRT_2}{p_2} - \frac{mRT_1}{p_1}\right) = mR(T_2 - T_1)$ its units is in J

2.5 process (Isothermal) Change of state at constant temperature

$P_1 V_1 = mRT_1$