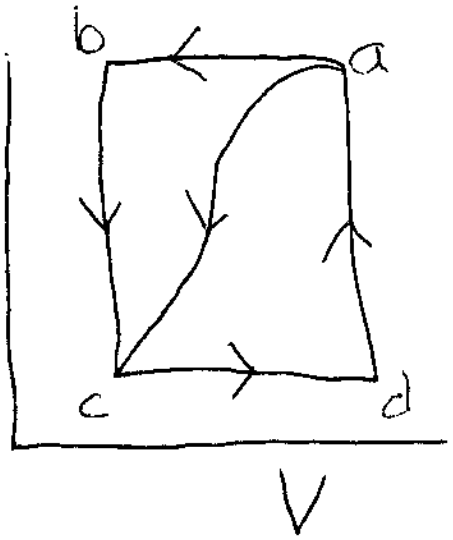
19-44)



$P_c = \frac{1}{2} P_b$

$U_d - U_c = 5J$

$W_{ac} = -35J$

$Q_{ac} = -63J$

$W_{abc} = -48J$

a) $Q_{abc} = \Delta U_{abc} + W_{abc}$ and $\Delta U_{abc} = \Delta U_{ac}$ (ind. of path)

so $\Delta U_{ac} = Q_{ac} - W_{ac} = -63J - -35J = -28J$

so $Q_{abc} = -28J + -48J = \boxed{-76J}$

b) W_{cda} $W_{ab} = P_b \Delta V_{ab}$ $W_{cd} = P_c \Delta V_{cd}$

$W_{da} = W_{bc} = 0$; $P_c = \frac{1}{2} P_b$; $\Delta V_{ab} = -\Delta V_{cd}$

so $W_{ab} = -2 W_{cd}$ $W_{cd} = -\frac{W_{ab}}{2} = \boxed{+24J}$

c) $Q_{cda} = \Delta U_{cda} + W_{cda} = -\Delta U_{abc} + 24J$

$= +28J + 24J = \boxed{+52J}$

d) $U_a - U_c = \Delta U_{ca} = \Delta U_{cda} = \boxed{+28J}$

e) $U_d - U_c = 5J$ so $U_{da} = 23J$, $W_{da} = 0J$

$Q_{da} = \boxed{+23J}$

19-49) $Q = nC_v\Delta T$

assume diatomic: $C_v = 5/2\,R$

$$n = \frac{(6.5\,m)(4.6\,m)(3\,m)}{22.4\,L\ (at\ STP)} = \frac{89.7\,m^3}{22.4\,L}\left(\frac{1\,L}{1\times10^{-3}\,m^3}\right)$$

$n \simeq 4000$ moles

so $\frac{1.8\times10^6\,J}{hr} = (4000\,mol)(5/2)\left(\frac{8.315\,J}{mol\,K}\right)\Delta T$

$\Delta T = 21.6\,K = 21.6^\circ C$

j 19.7)

1) $T_{EQ} \simeq 365\,K$ largest
2) $T_{EQ} \simeq 331\,K$ medium
3) $T_{EQ} \simeq 319\,K$ smallest

small c - quickly gain, lose heat

j 21.6) Animation 3 is wrong
TS shows temp const, PV does not

$$\frac{P_0V_0}{T_0} = \frac{P_fV_f}{T_f}$$

Animation 1 follows Ratio ✓
Animation 2 Not ✗