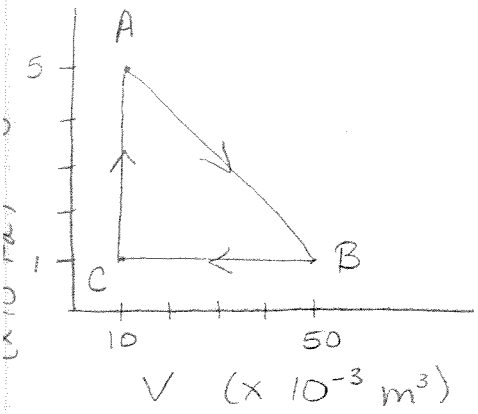
P #51

Ch 12 - pg 386



a) W = -area under the graph

$= (1\times10^5\ Pa)(40\times10^{-3}\ m^3) + \frac{1}{2}(4\times10^5\ Pa)(40\times10^{-3}\ m^3)$

rectangle region; triangle region

$\boxed{W_{AB} = -12{,}000\ J}$

b) $W = -p\cdot\Delta V$

$= -(1\times10^5\ Pa)(-40\times10^{-3}\ m^3)$

$\boxed{W_{BC} = +4000\ J}$

c) $W_{net} = W_{AB} + W_{BC} + W_{CA}$

$= -12000\ J + 4000\ J + 0$

$W_{net} = -8000\ J$

$\Delta U = 0$ (since gas returns to its original state)

$\Delta U = W + Q$ so $0 = -8000\ J + Q$

$\boxed{Q = +8000\ J}$