Q- The initial state of 1.00 mol of a gas is $P_{1}=6.00 \mathrm{~atm}, V_{1}=5.00 \mathrm{~L}$, and $E_{\text {int } 1}=790 \mathrm{~J}$, The gas is allowed to expand at constant pressure to a volume of 9.00 L . It is then cooled at constant volume until its pressure is 4.00 atm and its final state becomes $P_{2}=4.00 \mathrm{~atm}, V_{2}$ $=9.00 \mathrm{~L}$, and $E_{\text {int } 2}=890 \mathrm{~J}$.
(a) Calculate the work done by the gas.
(a) The work done by the gas in first process at constant pressure is given by

$$
\mathrm{W}_{1}=\mathrm{P} \Delta \mathrm{~V}=(6.00 \mathrm{~atm}) *(9.00-5.00 \mathrm{~L})
$$

Or $\quad W_{1}=\left(6.00 * 1.013 * 10^{5} \mathrm{~Pa}\right)\left(4.00 * 10^{-3} \mathrm{~m}^{3}\right)$
Or $\quad W_{1}=24.31 \mathrm{~J}$
The work done by the gas at constant volume is zero hence

$$
W_{2}=0
$$

Hence the total work done by the gas will be

$$
W=W_{1}+W_{2}=24.31 \mathrm{~J}
$$

(b) Find the heat absorbed by the gas during this process.

According to first law of thermodynamics the heat absorbed by the gas is equal to the sum of increase in internal energy and the work done by the gas and thus

$$
\Delta Q=\Delta U+W
$$

Thus we get

$$
\Delta Q=(890-790)+24.31=124.31 \mathrm{~J}
$$

