

75. Since ΔE_{int} does not depend on the type of process,

$$(\Delta E_{\text{int}})_{\text{path 2}} = (\Delta E_{\text{int}})_{\text{path 1}} \quad .$$

Also, since (for an ideal gas) it only depends on the temperature variable (so $\Delta E_{\text{int}} = 0$ for isotherms), then

$$(\Delta E_{\text{int}})_{\text{path 1}} = \sum (\Delta E_{\text{int}})_{\text{adiabat}} \quad .$$

Finally, since $Q = 0$ for adiabatic processes, then (for path 1)

$$\begin{aligned} (\Delta E_{\text{int}})_{\text{adiabatic expansion}} &= -W = -40 \text{ J} && \text{and} \\ (\Delta E_{\text{int}})_{\text{adiabatic compression}} &= -W = -(-25) = 25 \text{ J} \quad . \end{aligned}$$

Therefore,

$$(\Delta E_{\text{int}})_{\text{path 2}} = -40 \text{ J} + 25 \text{ J} = -15 \text{ J} \quad .$$