

$$= 288 \left(\frac{1}{2}\right)^2 = 288 \times \frac{1}{4}$$

$$\boxed{T_f = 72 \text{ K}}$$

$$W_{\text{adia}} = \frac{\mu R}{(\gamma-1)} (T_i - T_f) = \frac{3 \times 8.31}{\left(\frac{5}{3}-1\right)} (288 - 72)$$

$$\begin{aligned} W_{\text{adia}} &= \frac{3 \times 8.31}{2/3} \times 216 \text{ J} \\ &= 9 \times 8.31 \times 108 \text{ J} \\ &= 8077.32 \text{ J} \end{aligned}$$

Note : $W_{\text{adia}} = +\text{ive} \Rightarrow$ work is done by the system.

Also $T_f < T_i \Rightarrow$ Temp. of the system has decreased

$$W_{\text{adia}} = \frac{\mu R}{(\gamma-1)} (T_i - T_f)$$

In case $W_{\text{adia}} = +\text{ive} \Rightarrow T_i - T_f = +\text{ive}$