

Physics 102
Quiz # 4
Chapter 20

Name : Solution

Id :

Sec. # :

A cylinder contains 4 moles of a diatomic ideal gas at a temperature of 27 degrees-C and a pressure of 1.5 atm. The gas is heated under constant pressure until its temperature reaches 127 degrees-C. How much work is done by the gas in this process?

From the 1st law of thermodynamics

$$\Delta E_{int} = Q - W$$

But

$$Q = n C_p \Delta T \quad ; \quad \Delta E_{int} = n C_v \Delta T$$

$$\begin{aligned} \Rightarrow W &= n (C_p - C_v) \Delta T \\ &= n R \Delta T \end{aligned}$$

$$\Rightarrow W = 4 \times 8.31 \times (127 - 27)$$

$$\Rightarrow \boxed{W = 3324 \text{ J}}$$