

A diatomic ideal gas with all possible degrees of freedom realized goes through an isobaric process at $P=1 \times 10^5$ Pa and changes volume from 1 m^3 to 2 m^3 .

(a) Calculate c_v .

(b) Calculate C_p .

(c) Calculate γ .

(d) Calculate W

1 mole of the same gas with all possible degrees of freedom realized goes through an isovolumetric process and changes temperature from 0°C to 100°C .

(e) Calculate W

(f) Calculate Q

(g) Calculate ΔU

A diatomic ideal gas with all possible degrees of freedom realized goes through an isobaric process at $P=1 \times 10^5$ Pa and changes volume from 1 m^3 to 2 m^3 .

(a) Calculate c_v .

$$c_v = \frac{3}{2}R + \frac{2}{2}R + \frac{2}{2}R = \frac{7}{2}R = 29 \frac{\text{J}}{\text{mole K}}$$

(b) Calculate C_p .

$$C_p = C_v + R = \frac{7}{2}R + \frac{2}{2}R = \frac{9}{2}R = 37.413 \frac{\text{J}}{\text{mole K}}$$

(c) Calculate γ .

$$\gamma = \frac{c_p}{c_v} = \frac{\frac{9}{2}}{\frac{7}{2}} = \frac{9}{7} = 1.29$$

(d) Calculate W

$$W = P \Delta V = 1 \times 10^5 (1) = 1 \times 10^5 \text{ J}$$

1 mole of the same gas with all possible degrees of freedom realized goes through an isovolumetric process and changes temperature from 0°C to 100°C .

(e) Calculate W $W = P \Delta V = 0$

(f) Calculate Q $Q = n c_v \Delta T = 1 \times \frac{7}{2} \times 8.314 \times 100 = 2909.9 \text{ J}$

(g) Calculate ΔU $\Delta U = Q - W = Q = 2909.9 \text{ J}$