

LATEX PRACTICE

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(3) Isobaric Process

$$n = 0.475 \text{ mol}$$

$$T_i = 575 \text{ K}$$

$$T_f = 1150 \text{ K}$$

$$f_{\leq 1150 \text{ K}} = 5$$

$$f_{> 1150 \text{ K}} = 7$$

a. Total Q

$$Q = nC_p\Delta T$$

$$C_p = \left(\frac{f}{2} + 1\right) R$$

From 575 K to 1150 K

$$C_p = \left(\frac{5}{2} + 1\right) R = \frac{7}{2} R = \frac{7}{2} 8.314 \frac{\text{J}}{\text{K mol}} = 29.1 \frac{\text{J}}{\text{K mol}}$$

$$Q = 0.475 \text{ mol} \times 29.1 \frac{\text{J}}{\text{K mol}} \times (1150 \text{ K} - 575 \text{ K}) = 7948 \text{ J}$$

From 1151 K to 1575 K

$$C_p = \left(\frac{7}{2} + 1\right) R = \frac{9}{2} R = \frac{9}{2} 8.314 \frac{\text{J}}{\text{K mol}} = 37.41 \frac{\text{J}}{\text{K mol}}$$

$$Q = 0.475 \text{ mol} \times 37.41 \frac{\text{J}}{\text{K mol}} \times (1575 \text{ K} - 1151 \text{ K}) = 7534 \text{ J}$$

$$Q_{tot} = (7948 + 7534) \text{ J} = 15482 \text{ J}$$

b. Total W

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

$$W_{tot} = (15482 - 11539) \text{ J} = 3943 \text{ J}$$

c. Total ΔE_{int}

$$\Delta E_{int} = nC_v\Delta T$$

$$C_v = \frac{f}{2} R$$

From 575 K to 1150 K

$$C_v = \frac{5}{2} R = \frac{5}{2} 8.314 \frac{\text{J}}{\text{K mol}} = 20.79 \frac{\text{J}}{\text{K mol}}$$

$$\Delta E_{int} = 0.475 \text{ mol} \times 20.79 \frac{\text{J}}{\text{K mol}} \times (1150 \text{ K} - 575 \text{ K}) = 5678 \text{ J}$$

From 1151 K to 1575 K

$$C_v = \frac{7}{2}R = \frac{7}{2}8.314 \frac{\text{J}}{\text{K mol}} = 29.1 \frac{\text{J}}{\text{K mol}}$$

$$\Delta E_{int} = 0.475 \text{ mol} \times 29.1 \frac{\text{J}}{\text{K mol}} \times (1575 \text{ K} - 1151 \text{ K}) = 5861 \text{ J}$$

$$\Delta E_{inttot} = (5678 + 5861) \text{ J} = 11539 \text{ J}$$