P #K

Ch 12 Worksheet

Find T_A, T_B, T_C, T_D:

$n = 1$ mole

$P_A \cdot V_A = n \cdot R \cdot T_A$

$(1.8 \times 10^5 \text{ Pa} \times 24 \times 10^{-3} \text{ m}^3) = (1 \text{ mol} \times 8.31 \text{ J/mol K}) \cdot T_A$

$T_A = 520 \text{ K}$ $T_B = 520 \text{ K}$ (AB is isotherma

$P_C \cdot V_C = n \cdot R \cdot T_C$

$(.3 \times 10^5 \text{ Pa} \times 96 \times 10^{-3} \text{ m}^3) = (1 \text{ mol} \times 8.31 \text{ J/mol K}) \cdot T_C$

$T_C = 347 \text{ K}$ $T_D = 347 \text{ K}$ (CD is isotherm

a) $T_H = 520$ K (highest temp of cycle)
$T_C = 347$ K (lowest temp of cycle)

$$e_C = \frac{T_H - T_C}{T_H} = \frac{520 \text{ K} - 347 \text{ K}}{520 \text{ K}}$$

$$\boxed{e_C = 33\%}$$

b) $W_{net} = -1000$ J (found in Question J)

$Q_{AB} = +3000$ J
$Q_{CD} = -2000$ J
$Q_{BC} = Q_{DA} = 0$ (adiabatic)

$Q_H = +3000$ J (only process of + Q)

$$e = \left| \frac{W}{Q_H} \right| = \left| \frac{-1000 \text{ J}}{3000 \text{ J}} \right| \qquad \boxed{e_A = 33\%}$$

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