

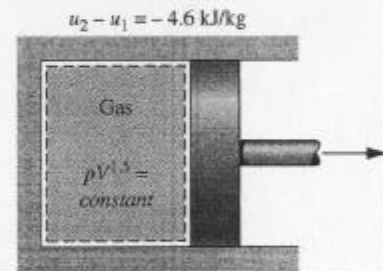
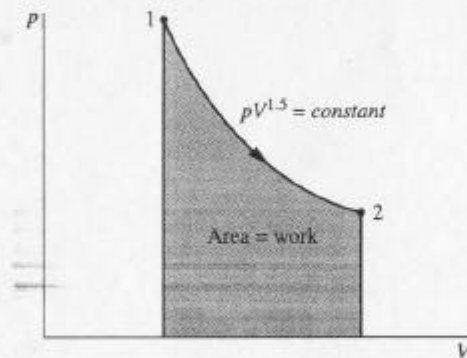
熱力学 2000.10.

PROBLEM COOLING A GAS IN A PISTON-CYLINDER

Four kilograms of a certain gas is contained within a piston-cylinder assembly. The gas undergoes a process which the pressure-volume relationship is

$$pV^{1.5} = \text{constant}$$

The initial pressure is 3 bar, the initial volume is 0.1 m^3 , and the final volume is 0.2 m^3 . The change in specific energy of the gas in the process is $u_2 - u_1 = -4.6 \text{ kJ/kg}$. There are no significant changes in kinetic energy. Determine the net heat transfer for the process, in kJ.



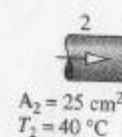
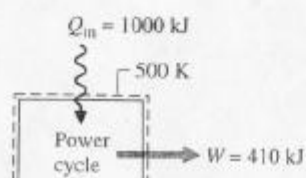
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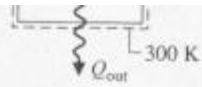
EVALUATING A POWER CYCLE PERFORMANCE CLAIM

An inventor claims to have developed a power cycle capable of delivering a net work output of 410 kJ for an input by heat transfer of 1000 kJ. The system undergoing the cycle receives the heat transfer from a reservoir at a temperature of 500 K and discharges energy by heat transfer to the atmosphere at 300 K. Evaluate the claim.

3.

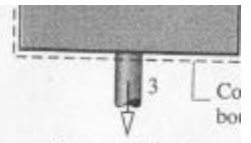
A feedwater heater operating at steady state has two inlets and one exit. At inlet 1, water vapor enters at $p_1 = 7 \text{ bar}$, $T_1 = 200^\circ\text{C}$ with a mass flow rate of 40 kg/s . At inlet 2, liquid water at $p_2 = 7 \text{ bar}$, $T_2 = 40^\circ\text{C}$ enters through an area $A_2 = 25 \text{ cm}^2$. Saturated liquid at 7 bar exits at 3 with a volumetric flow rate of $0.06 \text{ m}^3/\text{s}$. Determine the mass flow rates at inlet 2 and at the exit, in kg/s , and the velocity at inlet 2, in m/s .





(Problem 2)

$p_2 = 7\text{ bar}$



(Problem 3)