

Solutions

2.1 Answer: C. Reversibility produces no total entropy; individual system quantities may change.

Compare the rejected options: The system entropy is constant; Temperature is constant; Work is zero; Internal energy is constant. Use the stated model and conditions.

2.2 Answer: D. $QC/W=270/(300-270)=9$.

Compare the rejected options: 0.1; 0.9; 1; 10. Use the stated model and conditions.

2.3 8. Positive clockwise work is $\Delta P\Delta V=8$ J.

2.4 True. $\Delta U=0$ because internal energy is a state function and the initial state returns.

3.1 Energy requires 50 J work input. Reservoir entropy change is $650/300 - 600/280 = +0.02381$ J/K > 0 , so the complete cycle does not violate the second law. Reversible minimum work is $Q_c(T_h/T_c - 1) = 600(300/280 - 1) = 42.86$ J. The proposed cycle is possible thermodynamically and uses more than minimum work. Award work, correct entropy arithmetic, sign/possibility, reversible bound and comparison.