

1 Analyze TS rectangle

Consider a monatomic ideal gas that undergoes a 4-step cyclic process. On a T - S diagram, the four steps of the process trace out a rectangle. The cycle proceeds in the clockwise direction around the rectangular path. The four sides of the rectangle correspond to

- (A) Constant temperature, T_h
- (B) Constant entropy, S_h
- (C) Constant temperature, T_l
- (D) Constant entropy, S_l

- (a) Make a T - S diagram that represents this cyclic process. Label the axes, the four steps (A through D), the direction of each process, and the key values of S and T . The horizontal axis corresponds to which variable? Why?
- (b) Does a clockwise path in T - S space correspond to a heat engine or a heat pump?
- (c) Create a table, like the one below, and fill in all the values in terms of T_l , T_h , S_l and S_h :

Process	ΔU	Q	W
A			
B			
C			
D			

- (d) If this cycle corresponds to a heat engine, find the efficiency in terms of T_h and T_l . Alternatively, if this cycle corresponds to a heat pump, find the coefficient of performance in terms of T_h and T_l .