Problem 13

An ideal gas undergoes the cyclic process $A \to B \to C \to A$ as shown in the diagram.

a) Rank the temperature of the gas at states A, B, and C from highest to lowest. If two or more states have the same temperature, state that in your ranking. Justify your answer.

b) For each of the thermodynamic variables ΔU, Q, and W, indicate whether the variable is positive, negative, or zero for the process $A \to B$ only. Justify your answer.

c) Determine how much work, if any, was done on the process $A \to B$.

d) Determine how much heat, if any, was added to the gas in the process $A \to B$.

e) In the entire process $A \to B \to C \to A$, was heat added or removed from the gas, or neither?

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$$\boxed{T_A = T_B > T_C}$$

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b) For each of the thermodynamic variables ΔU, Q, and W, indicate whether the variable is positive, negative, or zero for the process $A \rightarrow B$ only. Justify your answer.

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- Since $U = 0$ and W is negative, $\boxed{Q \text{ must be positive}}$ in order to balance out work

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$$\boxed{W = -12\,000\,\text{J}}$$

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