

Thermodynamics: Isolated System Explanation

<https://gemini.google.com/app/09975e015e596593>

Response: **First Statement Analysis**

- A "closed" container means matter cannot enter or leave ($\Delta n = 0$).
- A "rigid" container means the volume is fixed ($\Delta V = 0$), so no expansion or compression work is done ($W = 0$).
- "Thermally insulated walls" means no heat flow occurs ($Q = 0$).
- By the First Law of Thermodynamics, $\Delta U = Q + W$. Since $Q = 0$ and $W = 0$, we have $\Delta U = 0$, meaning the internal energy remains constant.
- Therefore, statement 1 is **true**.

Second Statement Analysis

- By definition, an isolated system cannot exchange energy (heat or work) or matter with its surroundings.
- Therefore, statement 2 is **true**.

Relationship Between Statements A closed, rigid container with thermally insulated walls is a practical implementation of an isolated system. Because energy and matter do not exchange with the surroundings in an isolated system, the total energy of the gas inside must remain constant. Thus, the second statement serves as the correct explanation for the first statement.

Both statements are **true**, and the second statement is the correct explanation of the first statement.
