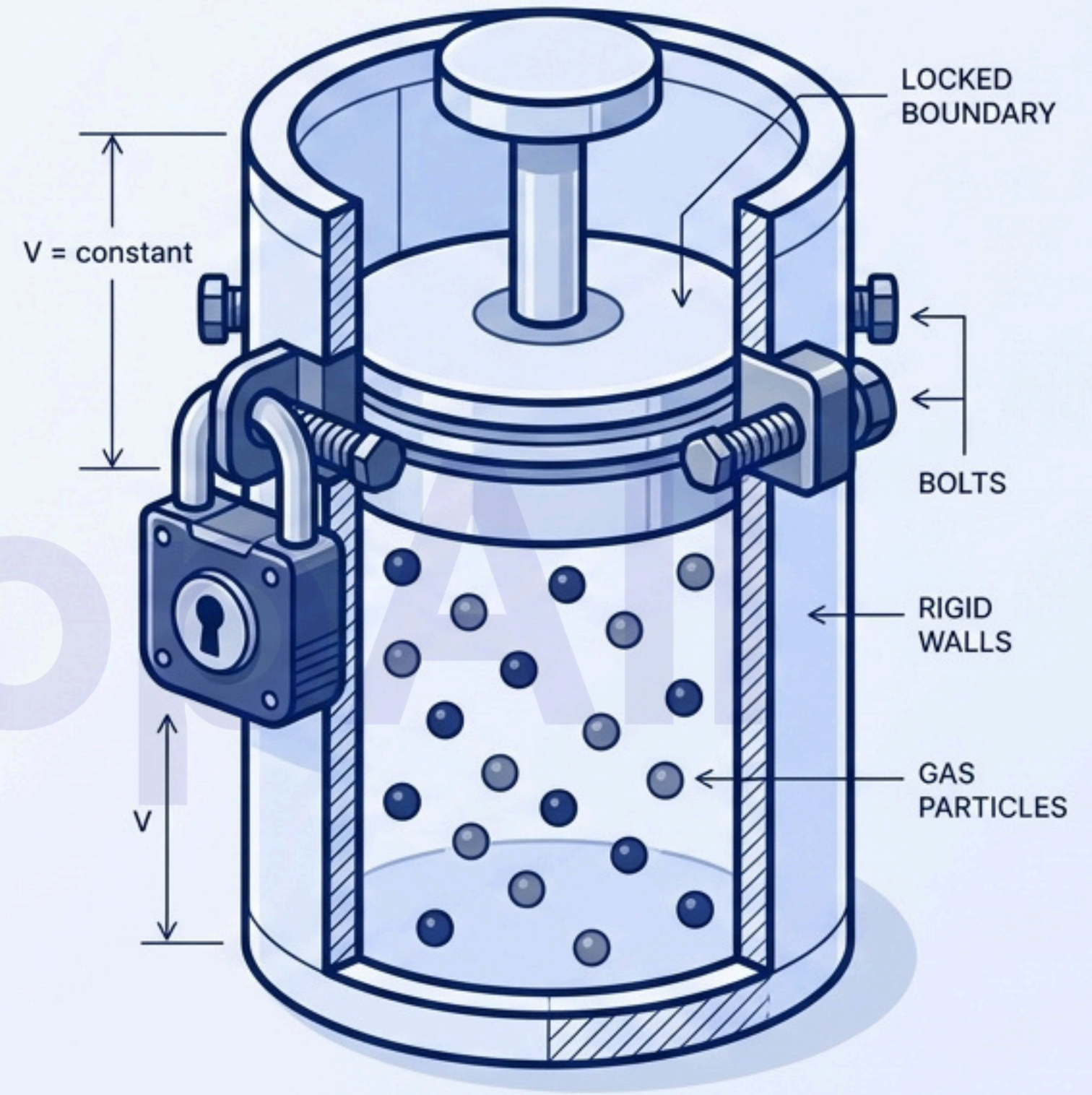


THERMODYNAMICS SECTION 11.8.4

Mastering the Isochoric Process

A visual guide to constant-volume thermodynamics for Class 11 Physics.

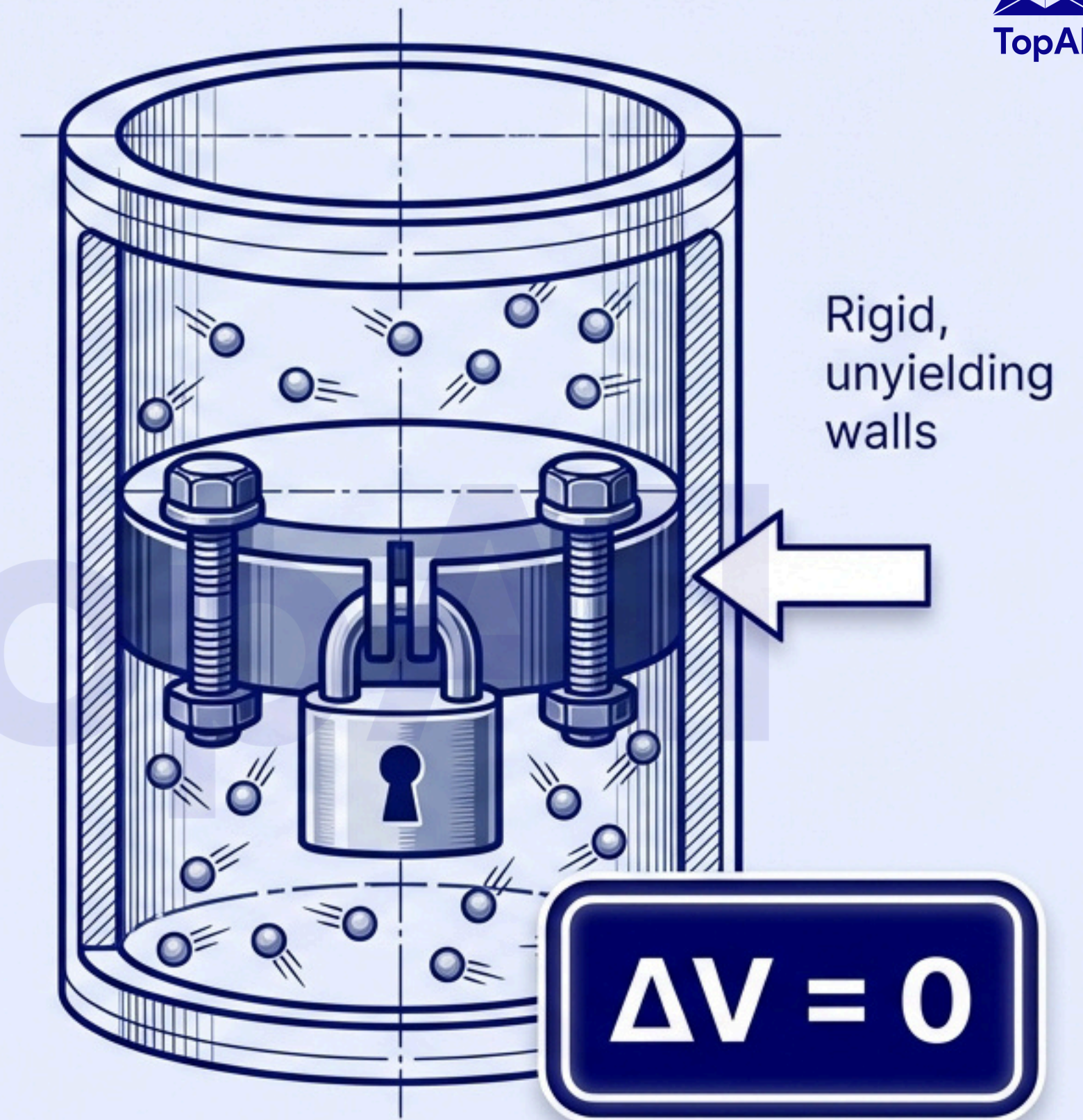


PROCESS DEFINITION

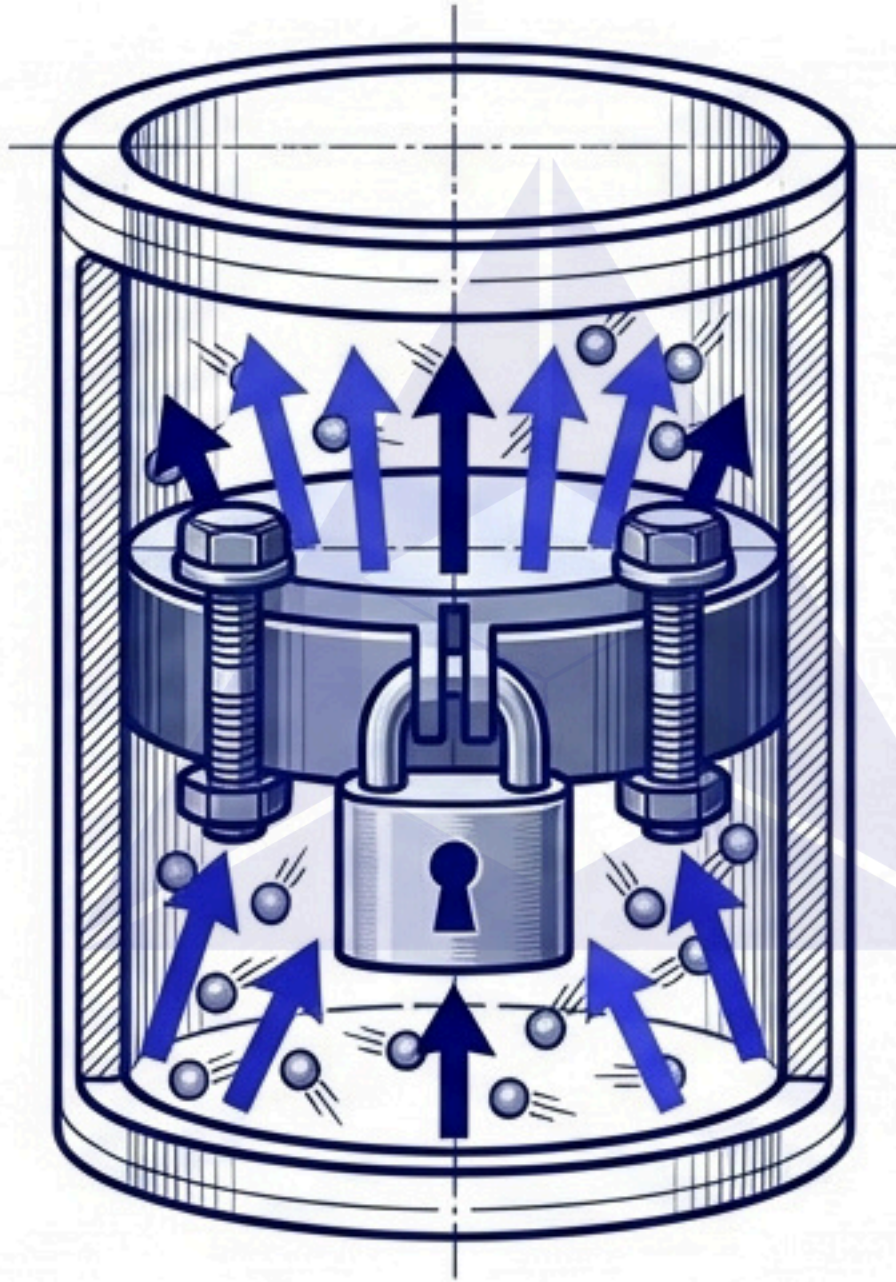
Volume Remains Strictly Constant

No matter how much the system interacts with its surroundings, the physical boundaries of the container cannot move.

**Iso (Same) +
Choric (Space/Volume)
= Constant Volume**



Immovable Boundaries Mean Zero Work



Force without displacement yields no work.

$$W = 0$$

$$W = P \times \Delta V$$

Since $\Delta V = 0$, the gas cannot do work on its surroundings.



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Let's Test Them Now.**

$$E=mc^2$$



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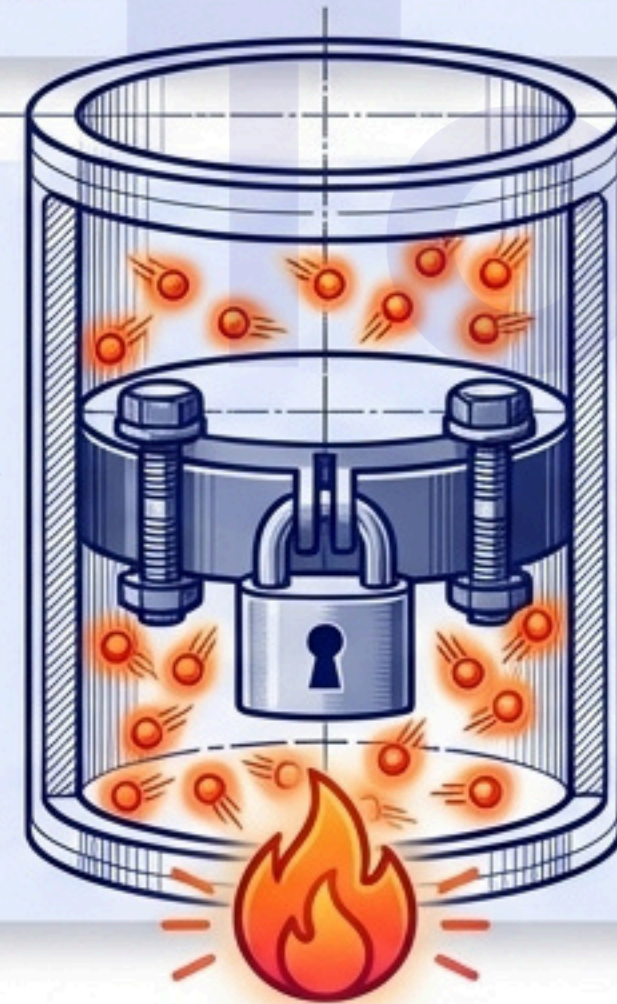


Heat Transfer Exclusively Increases Internal Energy

With work eliminated, 100% of the absorbed heat is trapped inside the gas.

$$\Delta Q = \Delta U + \cancel{\Delta W} \rightarrow \Delta Q = \Delta U$$

Heat Added
(ΔQ)



Internal Energy
Spikes (ΔU)

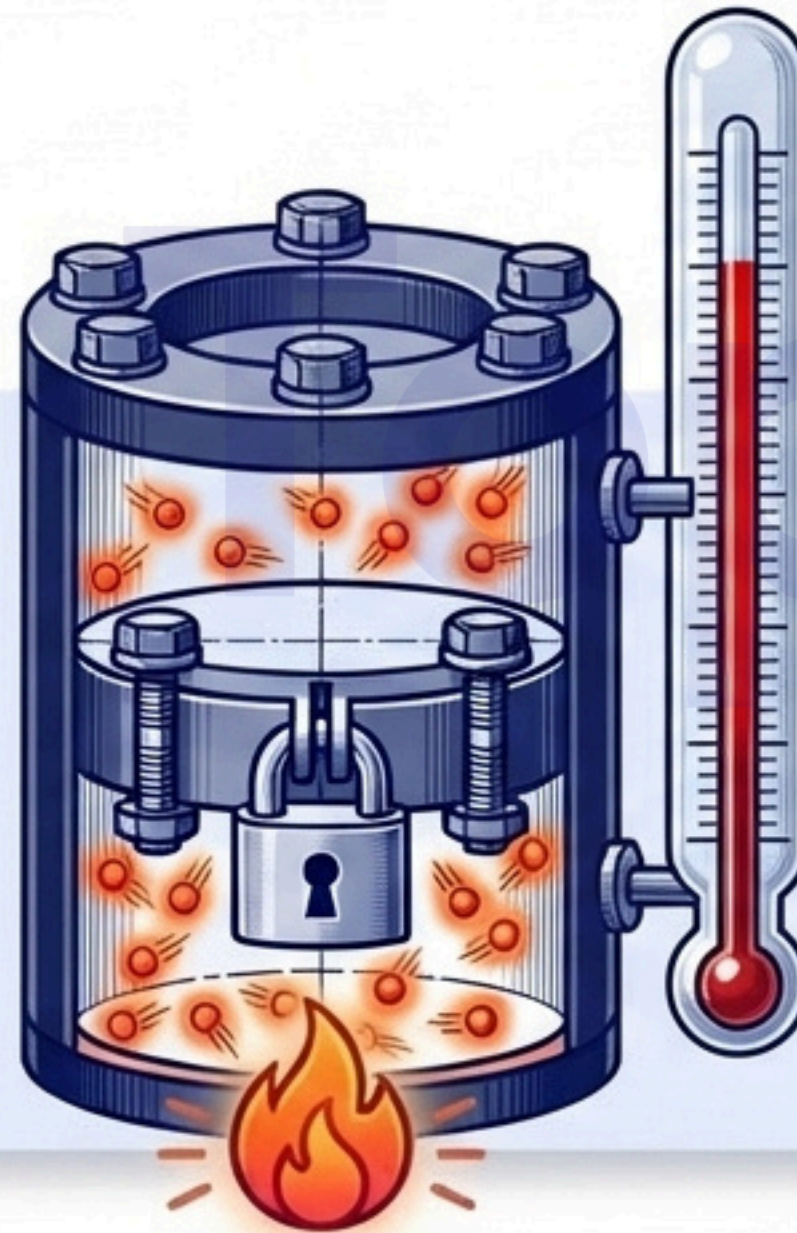
Internal Energy Manifests as a Temperature Rise

An increase in trapped internal energy directly causes the gas molecules to move faster, which we measure macroscopically as an increase in temperature.

EXAM TIP

For an ideal gas, internal energy (U) depends solely on temperature.

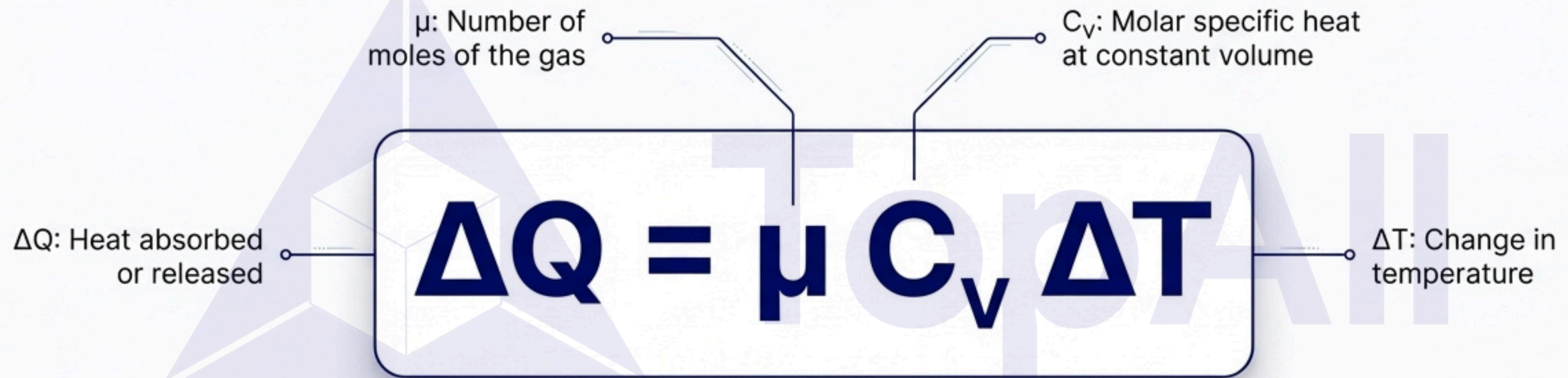
Heat in = Temperature up.



**Macroscopic
Result: $\Delta T > 0$**

KEY FORMULA

Calculating Heat at Constant Volume



The diagram shows the formula $\Delta Q = \mu C_v \Delta T$ inside a rounded rectangle. Four labels with leader lines point to the variables: ΔQ is labeled 'Heat absorbed or released', μ is labeled 'Number of moles of the gas', C_v is labeled 'Molar specific heat at constant volume', and ΔT is labeled 'Change in temperature'.

$$\Delta Q = \mu C_v \Delta T$$

ΔQ : Heat absorbed or released

μ : Number of moles of the gas

C_v : Molar specific heat at constant volume

ΔT : Change in temperature

C_v is the specific constant determining exactly how much heat is needed to raise the temperature when the volume is locked.

The Isochoric Process Cheat Sheet

Volume:

Locked and
unmoving

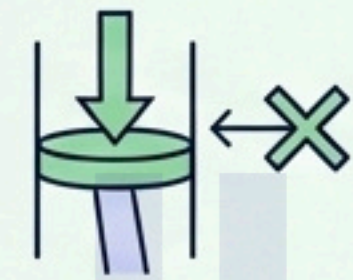
$$(\Delta V = 0)$$



Work:

Zero work is done
by or on the gas

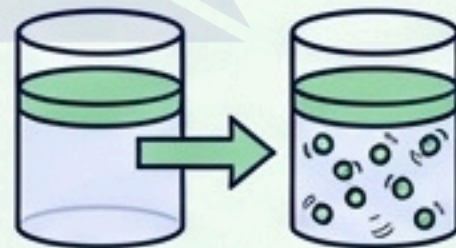
$$(W = 0)$$



Energy:

All heat transfers into
internal energy

$$(\Delta Q = \Delta U)$$



Specific Heat:

Specific Heat:
Calculated using C_v

$$(\Delta Q = \mu C_v \Delta T)$$

$$(\Delta Q = \mu C_v \Delta T)$$

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