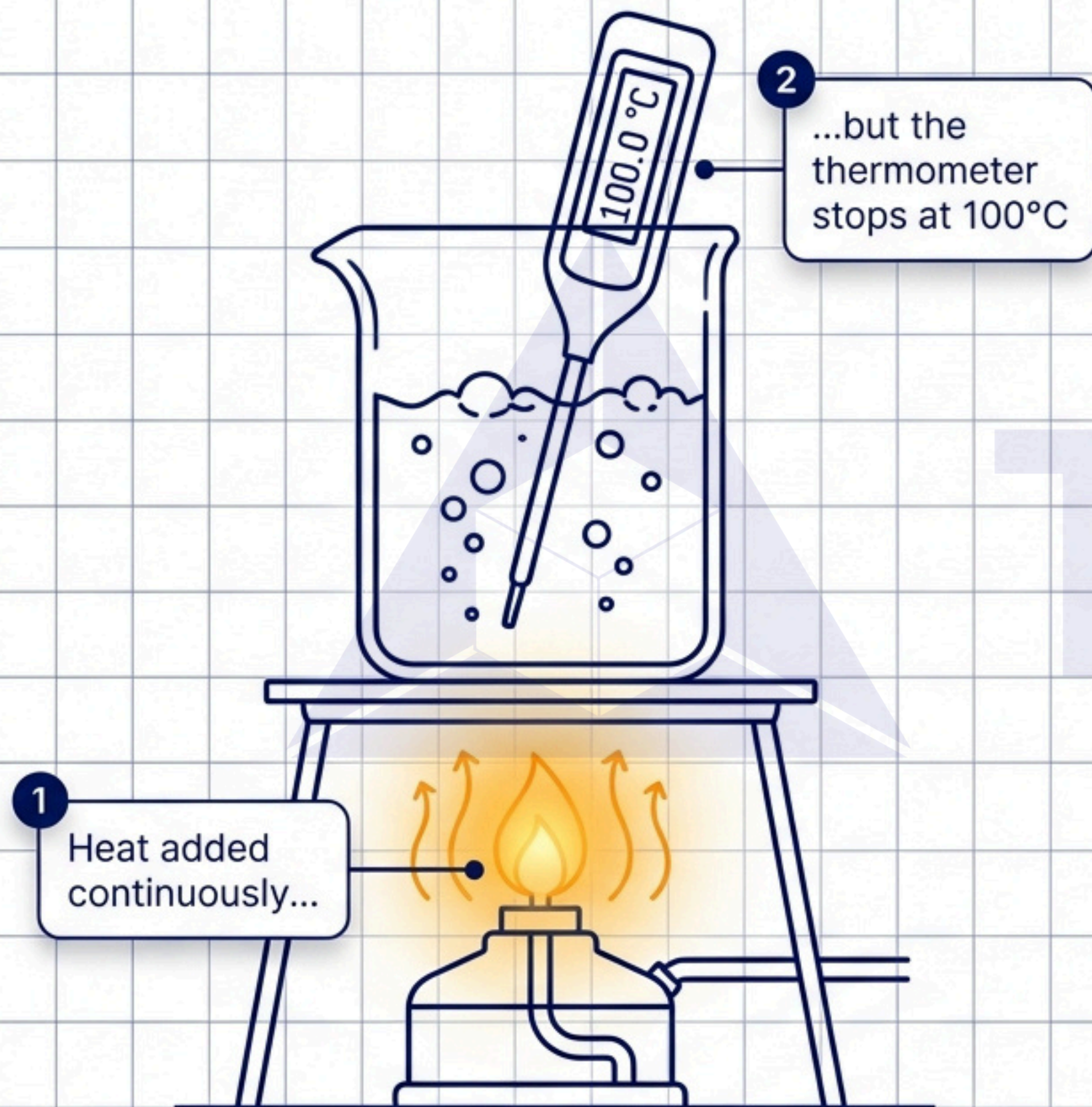




Where Does the Heat Go If Temperature Doesn't Rise?

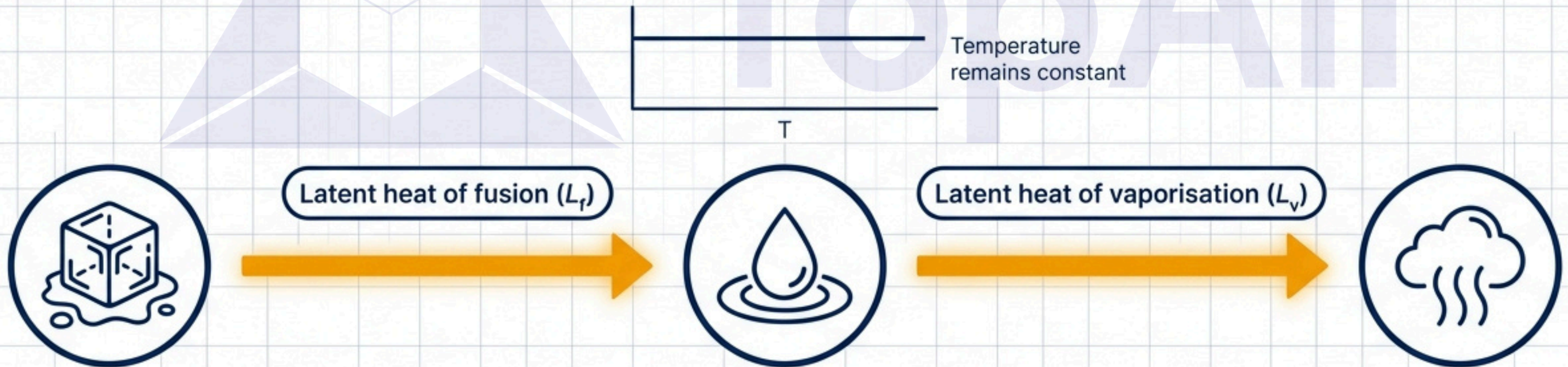
Everyday logic says adding heat raises temperature. But during a phase change, the temperature remains perfectly flat. The energy is hiding.

Latent Heat: The 'Hidden' Energy of Phase Change

Latent Heat

The amount of heat per unit mass transferred during a change of state.

- ✓ Addition of heat causes the state to change, without an increase in temperature.



Quantifying the Hidden Energy: $Q = mL$

$$Q = mL$$

(and $L = Q/m$)

Q (Heat)

Total quantity of heat required (Joules, J).

m (Mass)

Mass of the substance undergoing state change (kg).

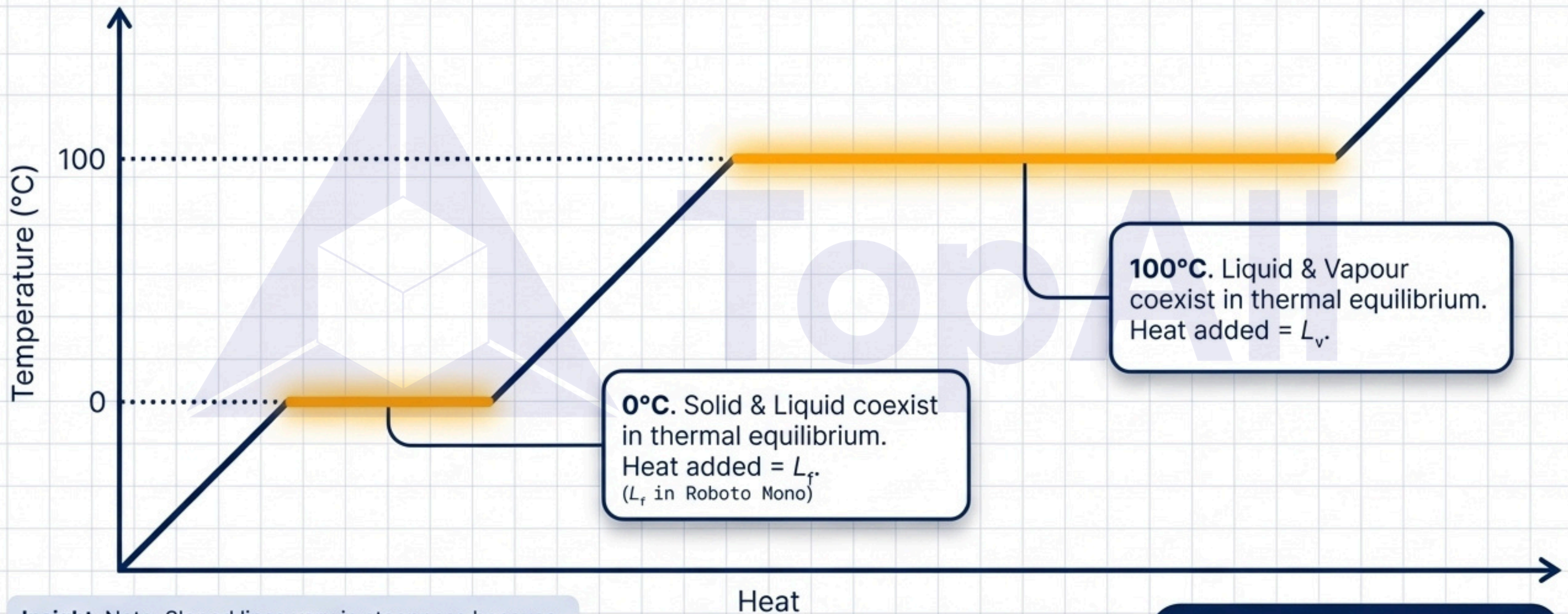
L (Latent Heat)

The characteristic constant of the material.

SI Unit: J kg^{-1}

Notice the absence of ΔT . The value of L depends strictly on the nature of the substance and its pressure.

Mapping the Plateaus: Temperature vs. Heat



Insight Chip Note: Sloped lines vary in steepness because specific heats of different states vary.

Practice more, score more

Fusion vs. Vaporisation: The Energy Gap



Melting (0°C)

$$L_f = 3.33 \times 10^5 \text{ J kg}^{-1}$$



Boiling (100°C)

$$L_v = 22.6 \times 10^5 \text{ J kg}^{-1}$$



WARNING: Steam Burns are More Serious!

Steam at 100°C carries exactly **$22.6 \times 10^5 \text{ J kg}^{-1}$ MORE** heat energy than boiling water at exactly the same temperature. The hidden energy releases rapidly upon condensing on skin.

Practice more, score more

Key Takeaways

- ✓ **Concept:** Latent heat is energy supplied that changes state, not temperature. Both states coexist in equilibrium during the transition.
- ✓ **Formula:** $Q = mL$. There is no ΔT involved in this calculation! SI unit is J kg^{-1} .
- ✓ **Graph:** On a Temperature vs. Heat graph, flat horizontal lines actively indicate phase changes happening.
- ✓ **Values:** For water, the latent heat of vaporisation (L_v) is massively larger than fusion (L_f).
- ✓ **Application:** Steam at 100°C contains exactly L_v more energy than water at exactly 100°C , making steam burns extremely dangerous.