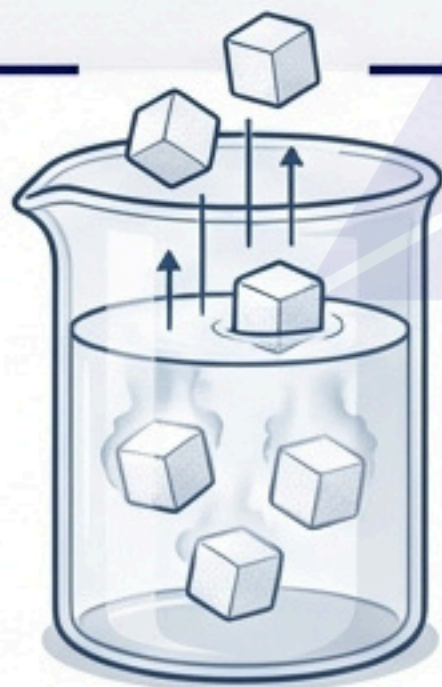


Dissolution Equilibria

Dynamic Equilibrium Involving Solids and Gases in Liquids



The Saturated Solution



Unsaturated

Solute continues to dissolve. System has not yet reached its limit.



STATUS: DISSOLVING



Saturated

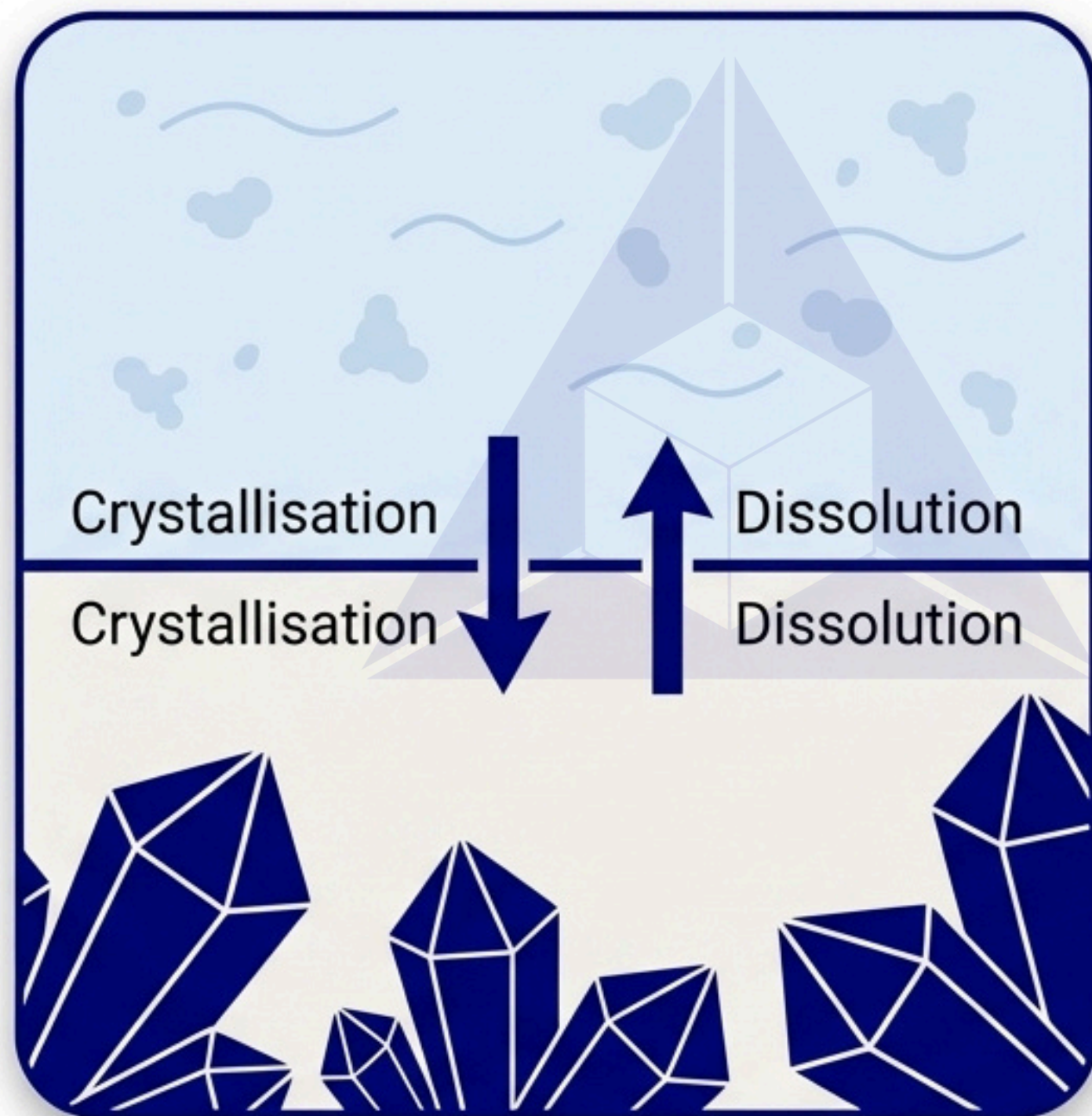
No more solute can dissolve at a given temperature. Excess solid separates out.



STATUS: EQUILIBRIUM

Saturation isn't the end of the reaction—it is the beginning of an equilibrium.

The Illusion of Stillness



Rate of Dissolution = Rate of Crystallisation



Key Takeaways

Mass of solid and liquid do not change.

Intense, continuous activity at the boundary.

Concentration of solute remains perfectly constant at a given temperature.



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$$E=mc^2$$



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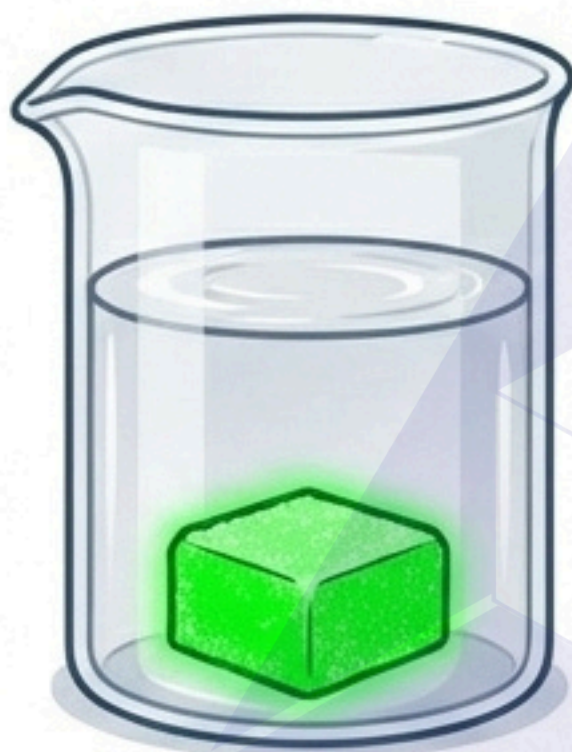
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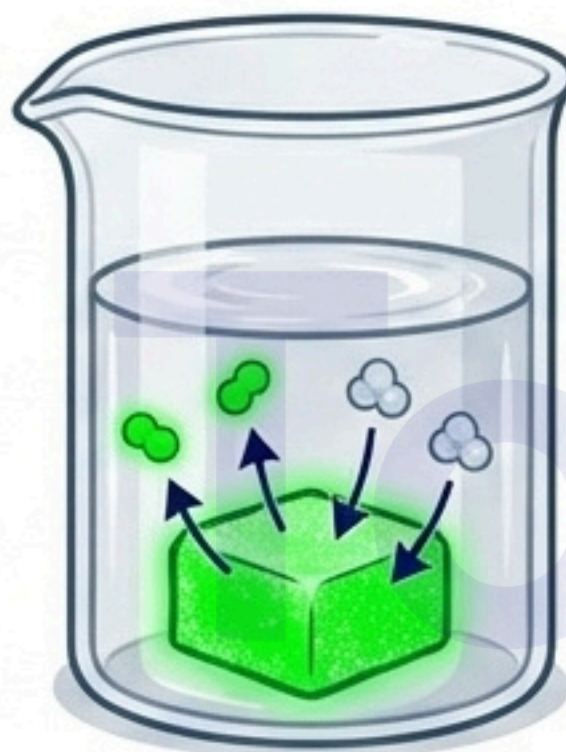


Tracing the Dynamic Exchange

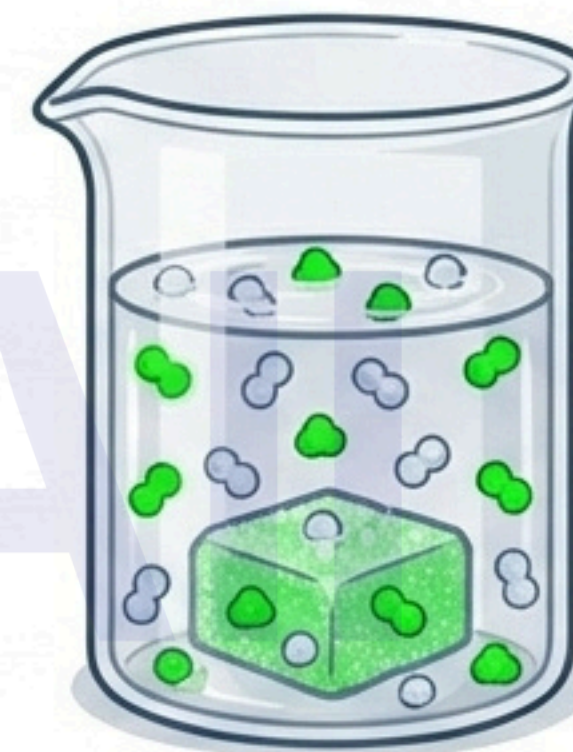
Initial



Exchange



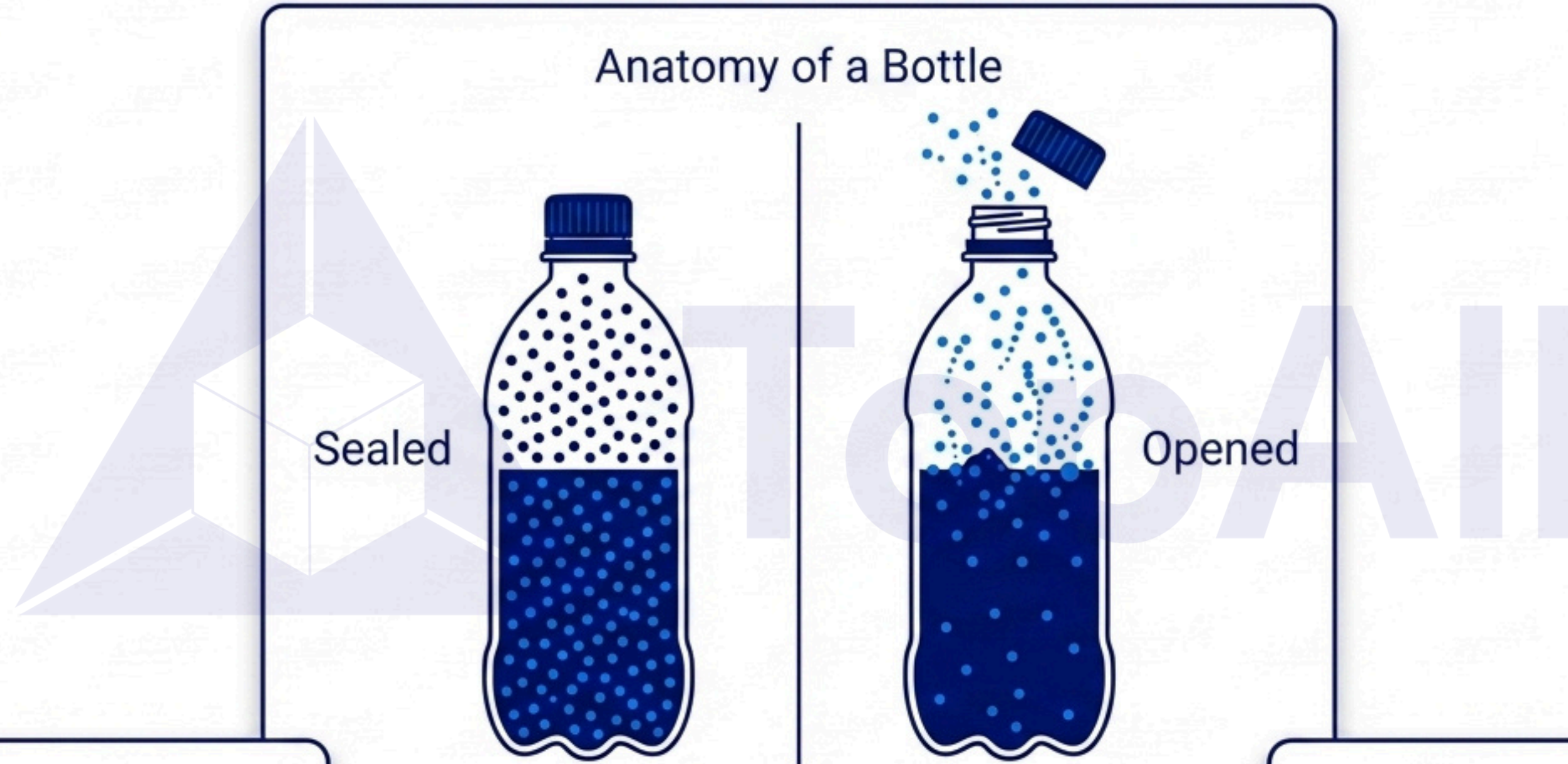
Equilibrium



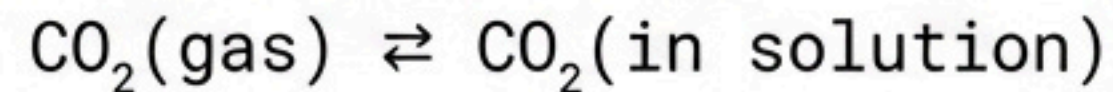
The Proof

If the system were static, the liquid would remain non-radioactive. The appearance of radioactivity in the liquid proves continuous molecular swapping between phases until a constant ratio is reached.

The Soda Water Effect



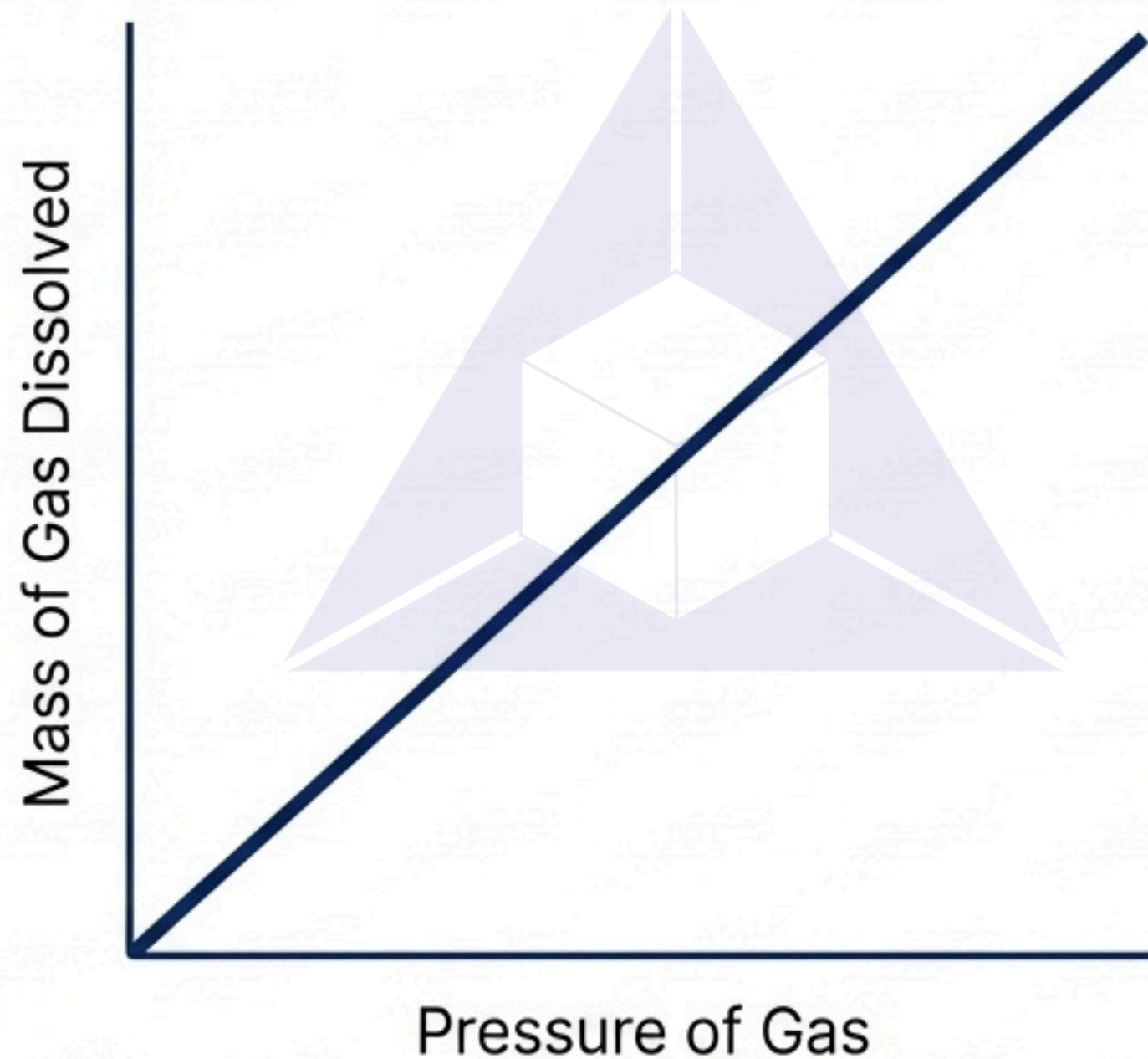
High pressure forces gas into solution. Equilibrium heavily favors dissolved CO_2 .



Pressure drops instantly. Gas escapes rapidly to reach a new equilibrium matching atmospheric partial pressure (soda goes 'flat').

GOVERNING PRINCIPLE

Henry's Law



Key Takeaways

The mass of a gas dissolved in a given mass of a solvent at any temperature is proportional to the pressure of the gas above the solvent.

Pressure

Solubility $\uparrow$ as
Pressure $\uparrow$

(Governs the sealed vs.
open bottle)

Temperature

Solubility $\downarrow$ as
Temp $\uparrow$

(Explains why warm soda
loses its fizz faster)

Solid vs. Gas Dissolution Equilibria

	Solids in Liquids	Gases in Liquids
Phase Equation	$\text{Solute(s)} \rightleftharpoons \text{Solute(aq)}$	$\text{Gas(g)} \rightleftharpoons \text{Gas(aq)}$
Constant at Equilibrium	Concentration of solute is constant at a given temp	Ratio of $[\text{gas(aq)}]/[\text{gas(g)}]$ is constant at a given temp
Governing Principle	Solubility limit defined by temperature	Henry's Law applies (Proportional to pressure)
Real-world Example	Sugar separating from cooling syrup	CO ₂ fizzing from an opened soda bottle



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