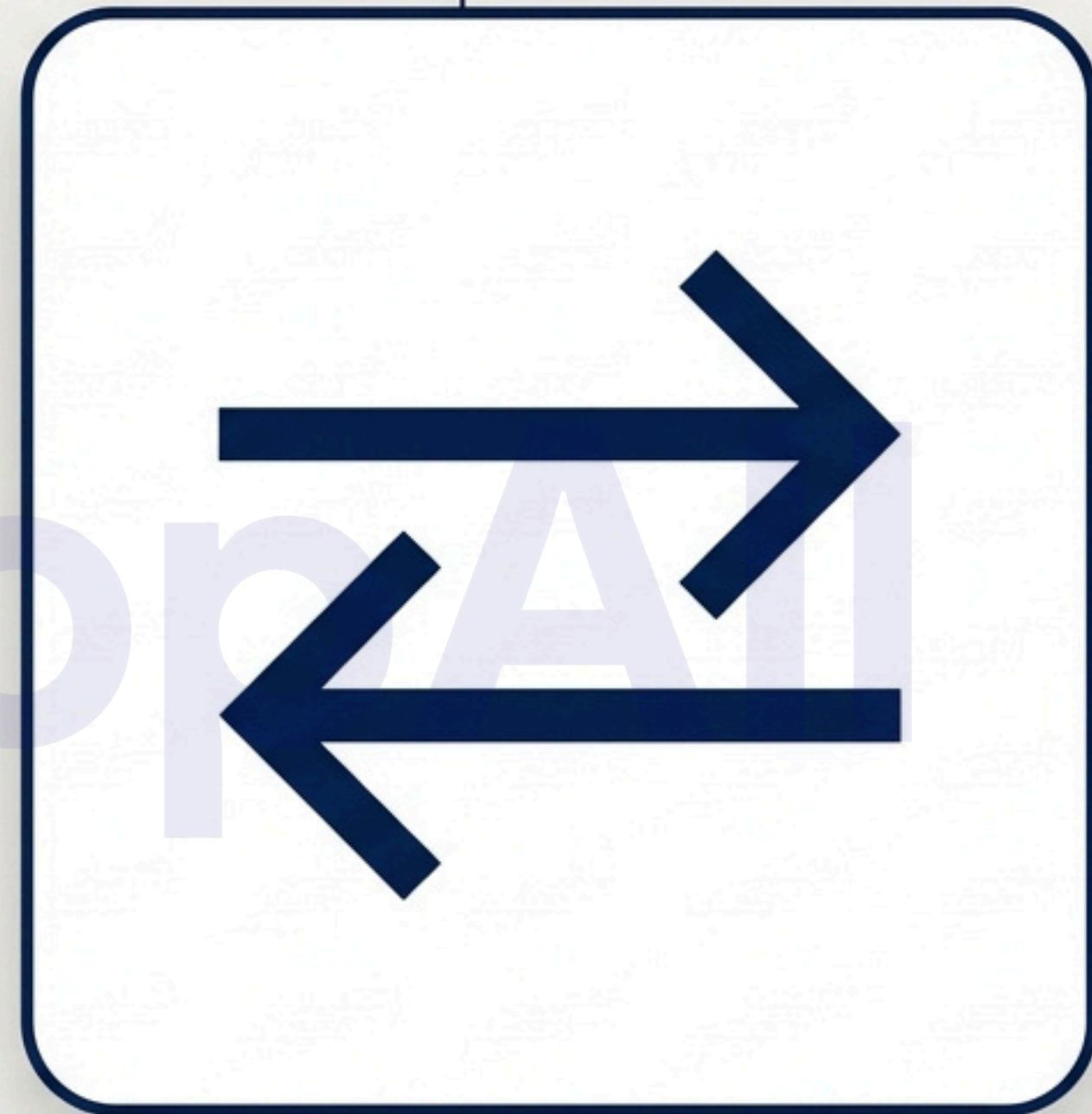
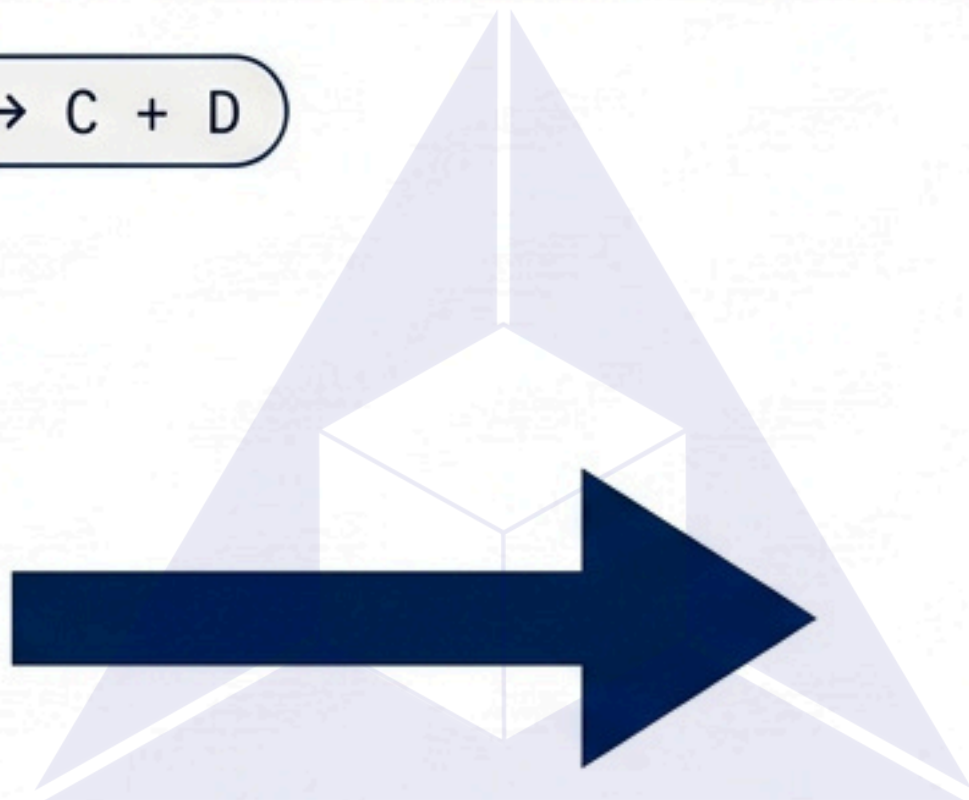
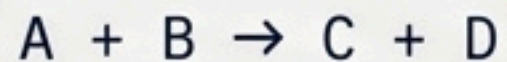


Chemical Equilibrium

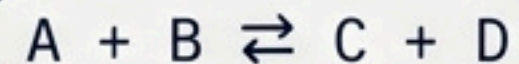
The fundamental mechanics of dynamic reactions and bidirectional chemical systems.



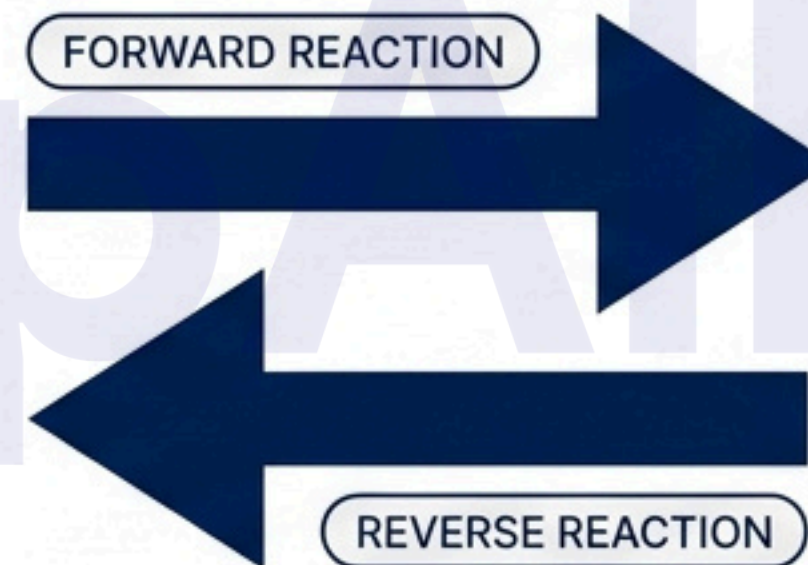
The Two-Way Street of Chemistry



Reactions that proceed nearly to completion.
Reactants are consumed, and the process stops.



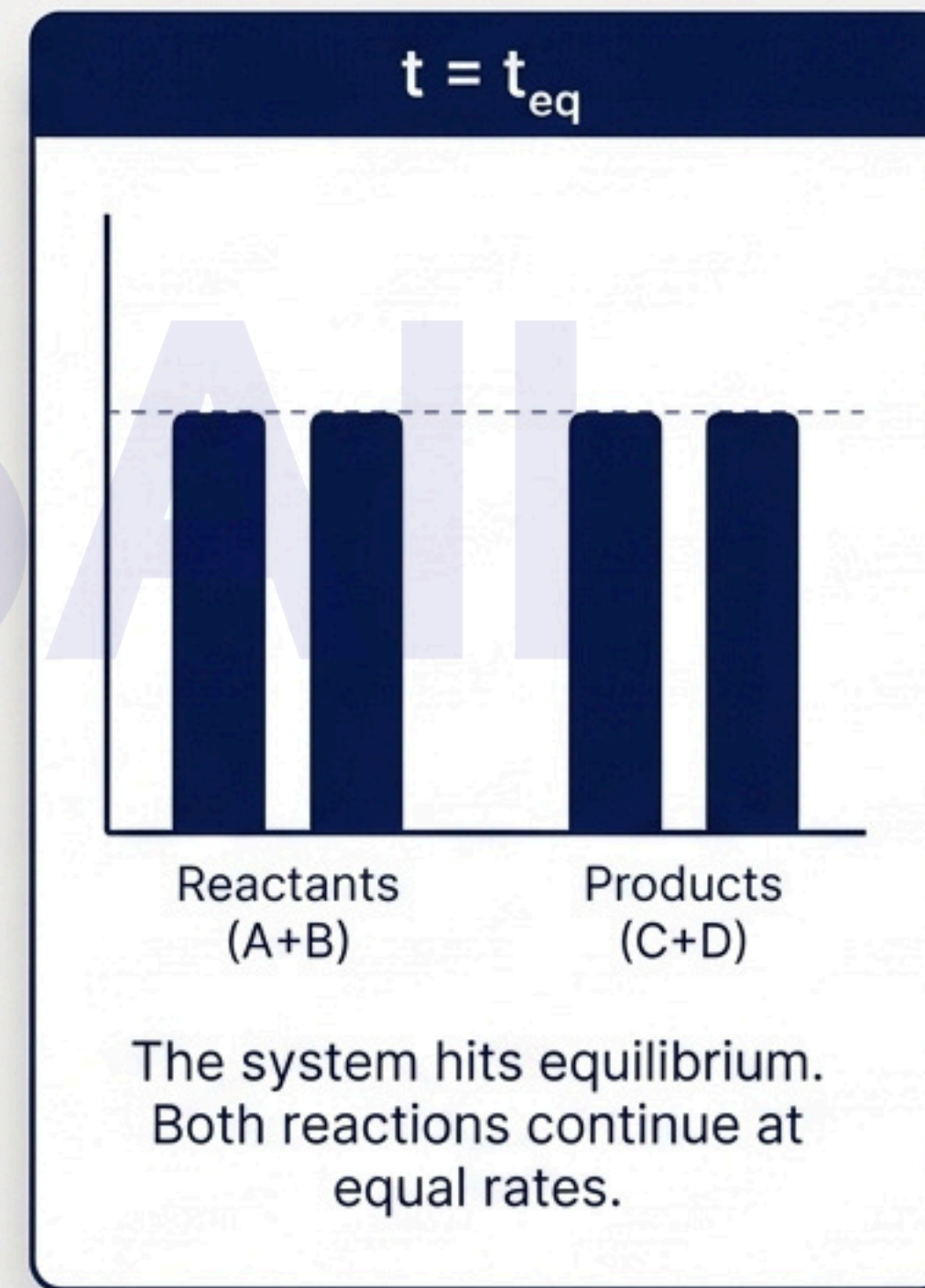
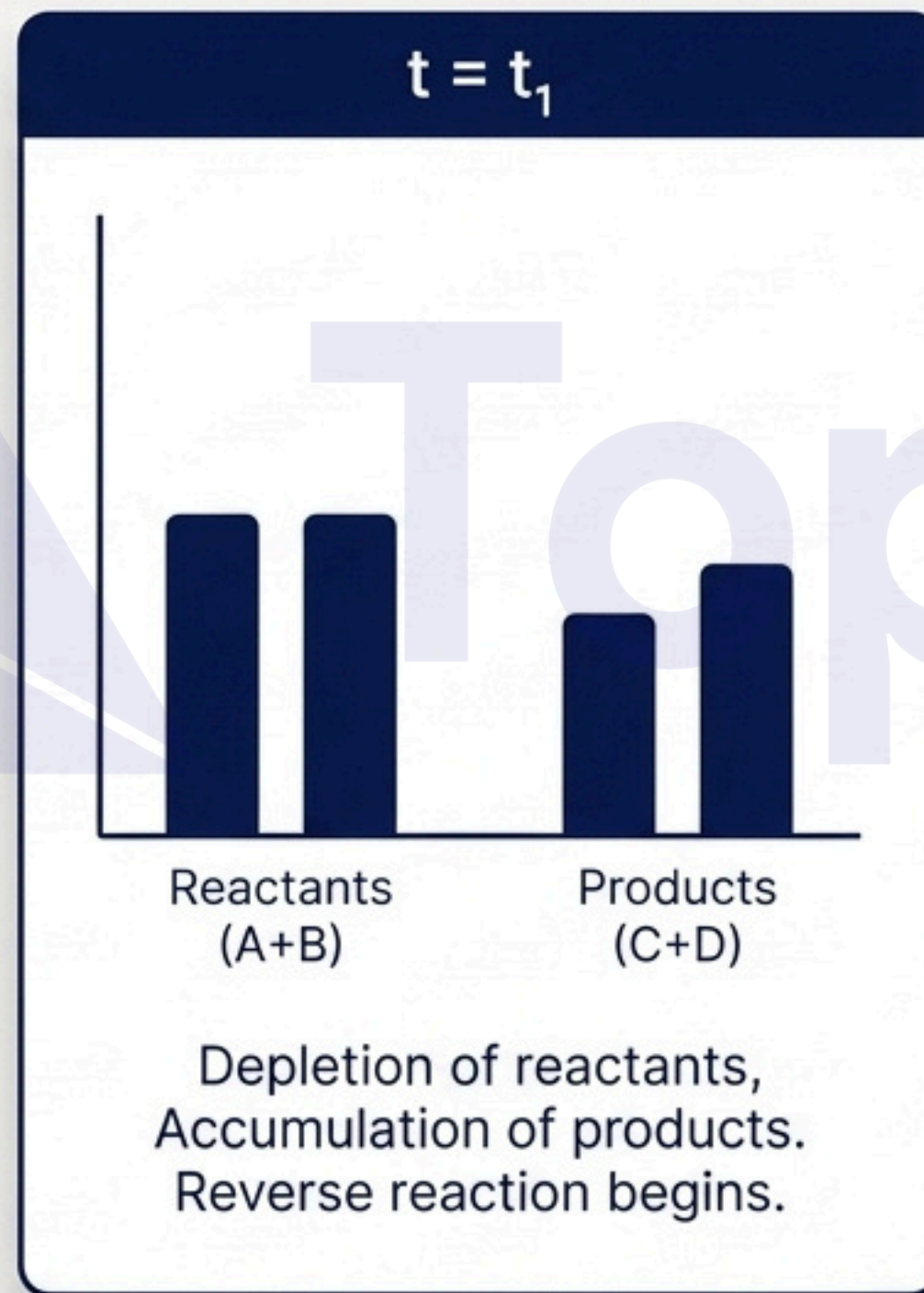
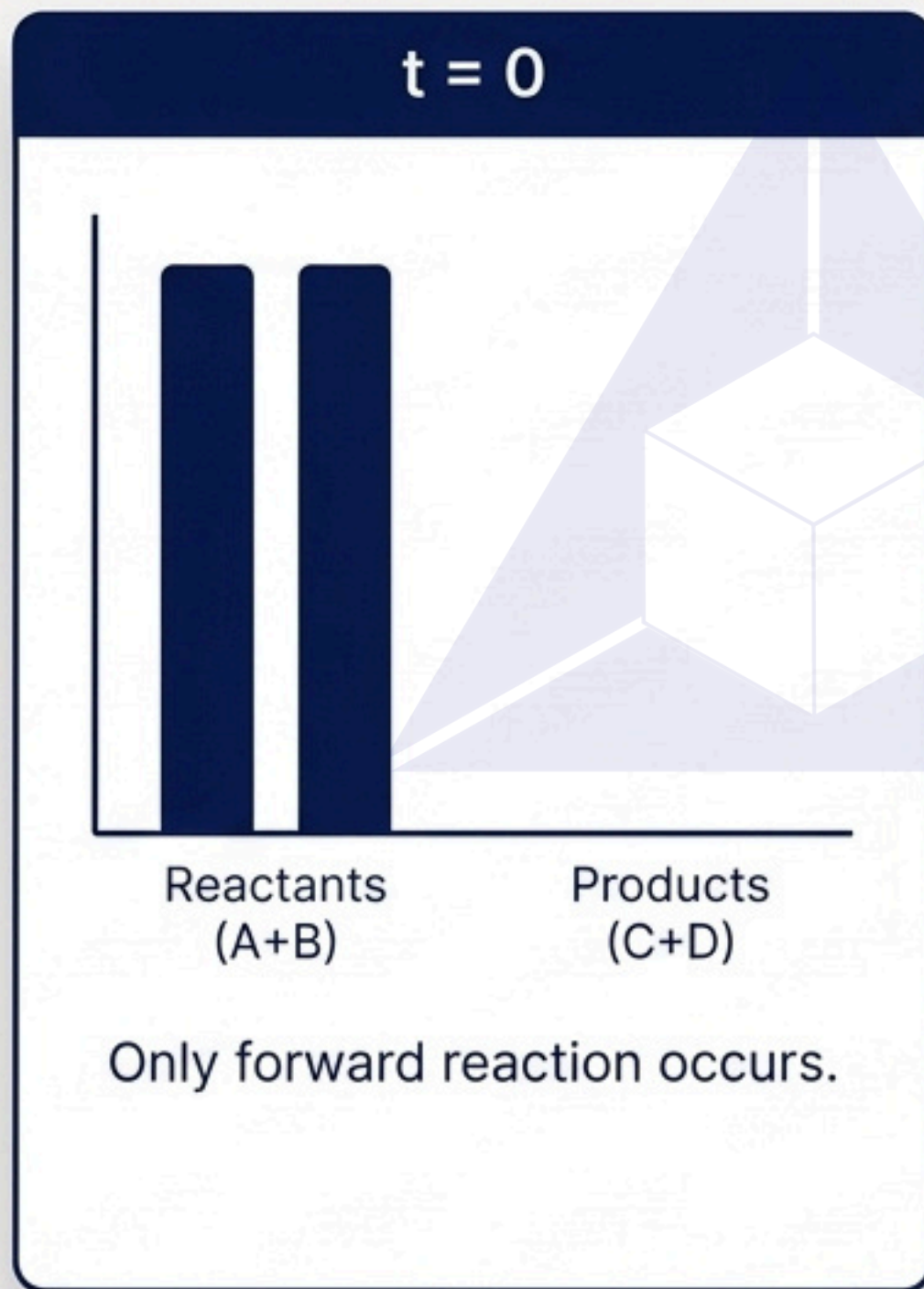
FORWARD REACTION



REVERSE REACTION

Reactions that proceed in both directions.
Products can react to reform the original reactants.

The Chronological Journey



Defining Dynamic Equilibrium

The Rates (Dynamic)

$$\text{Rate}(\text{forward}) = \text{Rate}(\text{reverse})$$



The system is highly active. Reactions do not stop; they precisely offset each other.

The Concentrations (Stable)

Constant $\neq$ Equal

The concentrations of reactants and products become perfectly constant, but they are rarely equal to each other. Macroscopic properties (like color and pressure) stop changing.



You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



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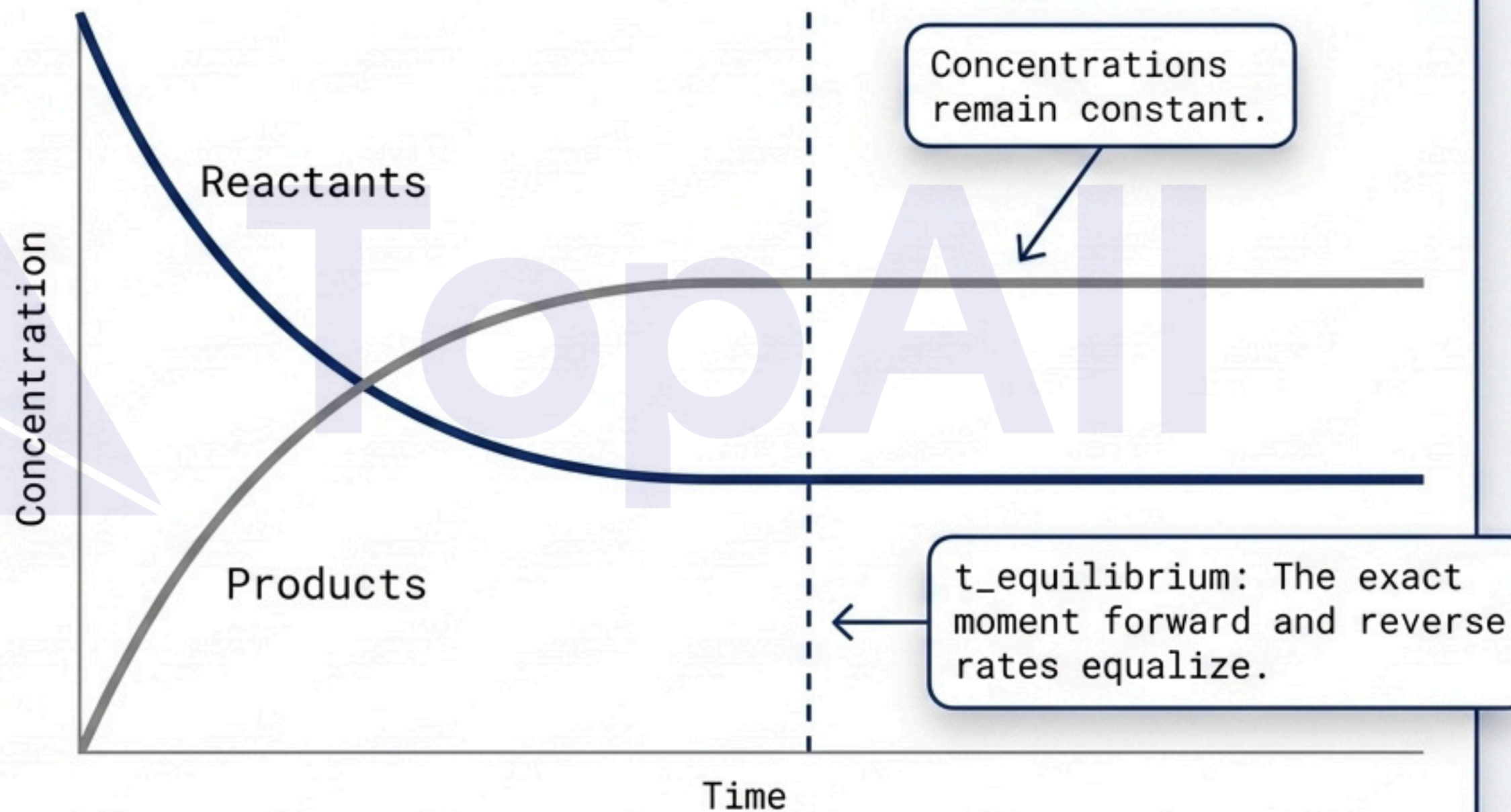
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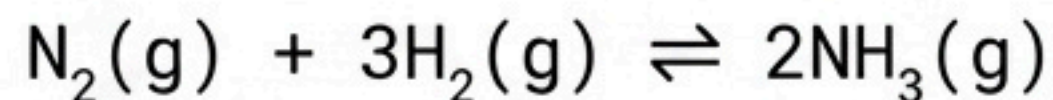
The Concentration Graph

Once equilibrium is achieved, no net change in composition occurs, creating flatlines on the concentration graph.



Proving it Never Stops: The Haber Process

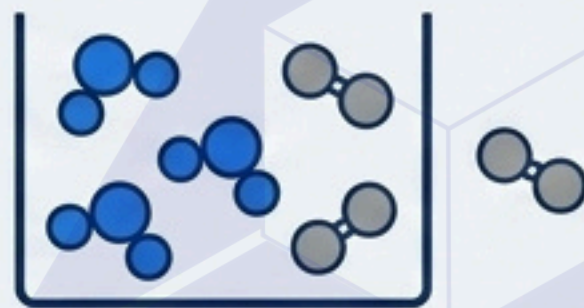
Application Strip



Isotope Experiment



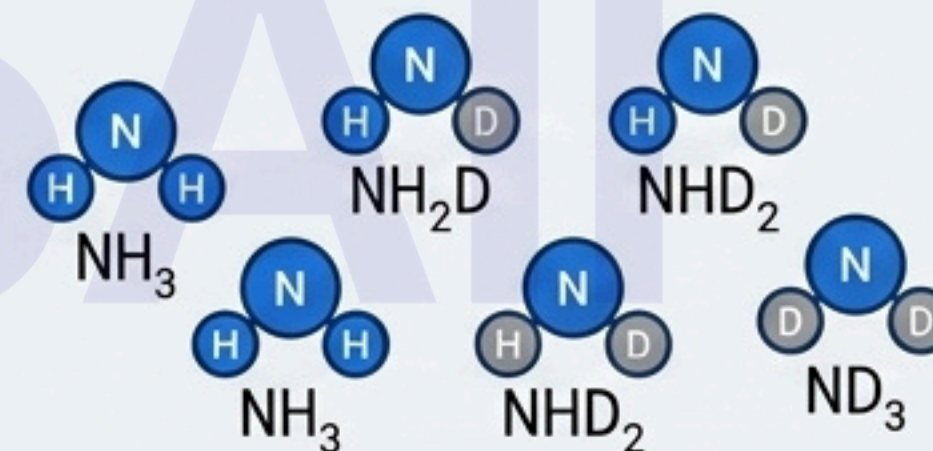
Input



Mixture of stable $\text{NH}_3(\text{g})$
+ Deuterium gas (D_2)



Time Passing /
Dynamic Scrambling



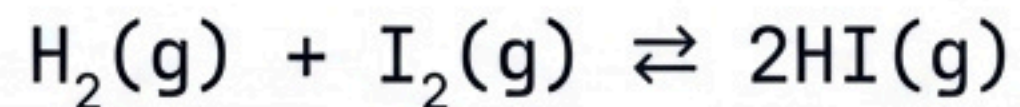
NH_3 , NH_2D , NHD_2 , ND_3

EXAM TIP

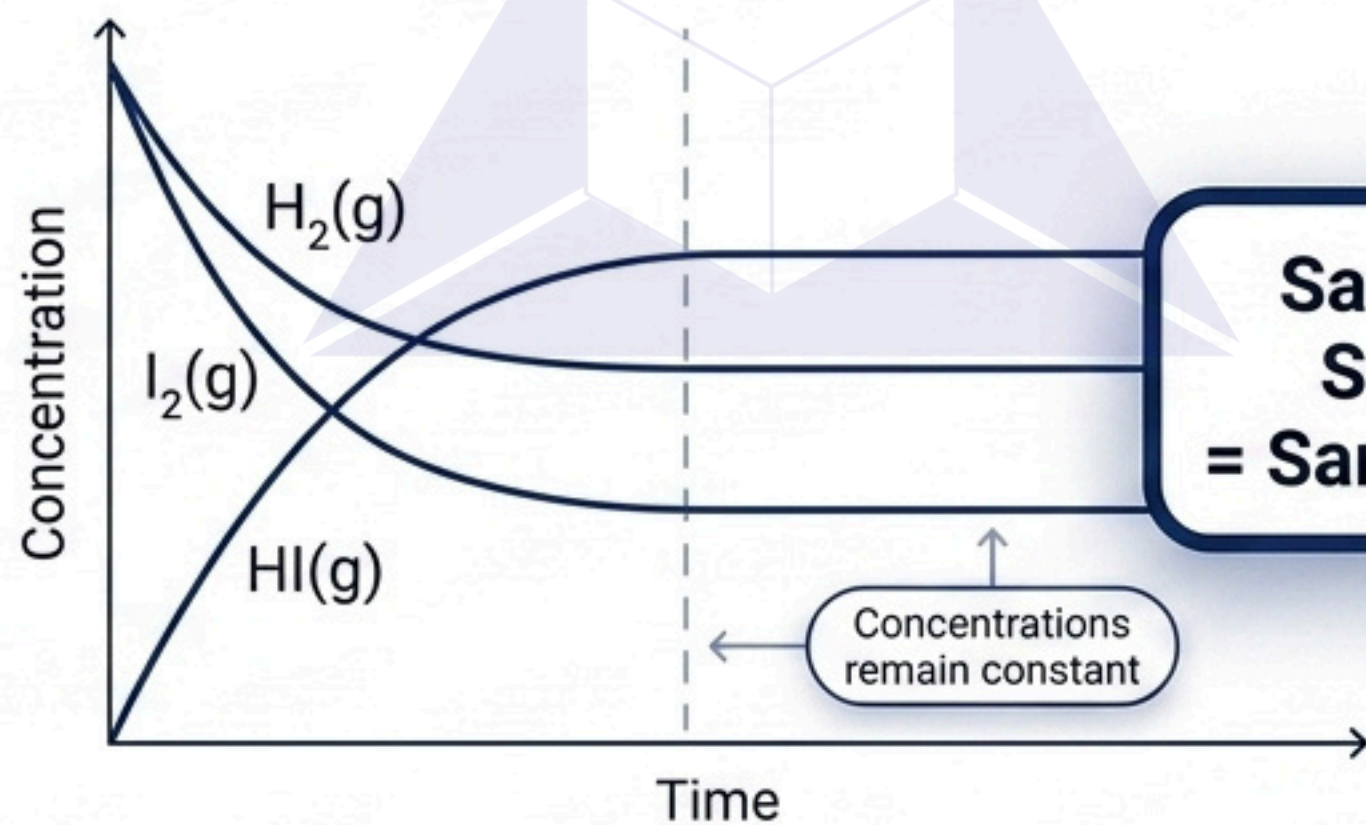
Because Deuterium mixes into the ammonia to form ND_3 , it proves the forward and reverse reactions are continuously happening. If equilibrium were static (stopped), no scrambling would occur.

Equilibrium is a Destination

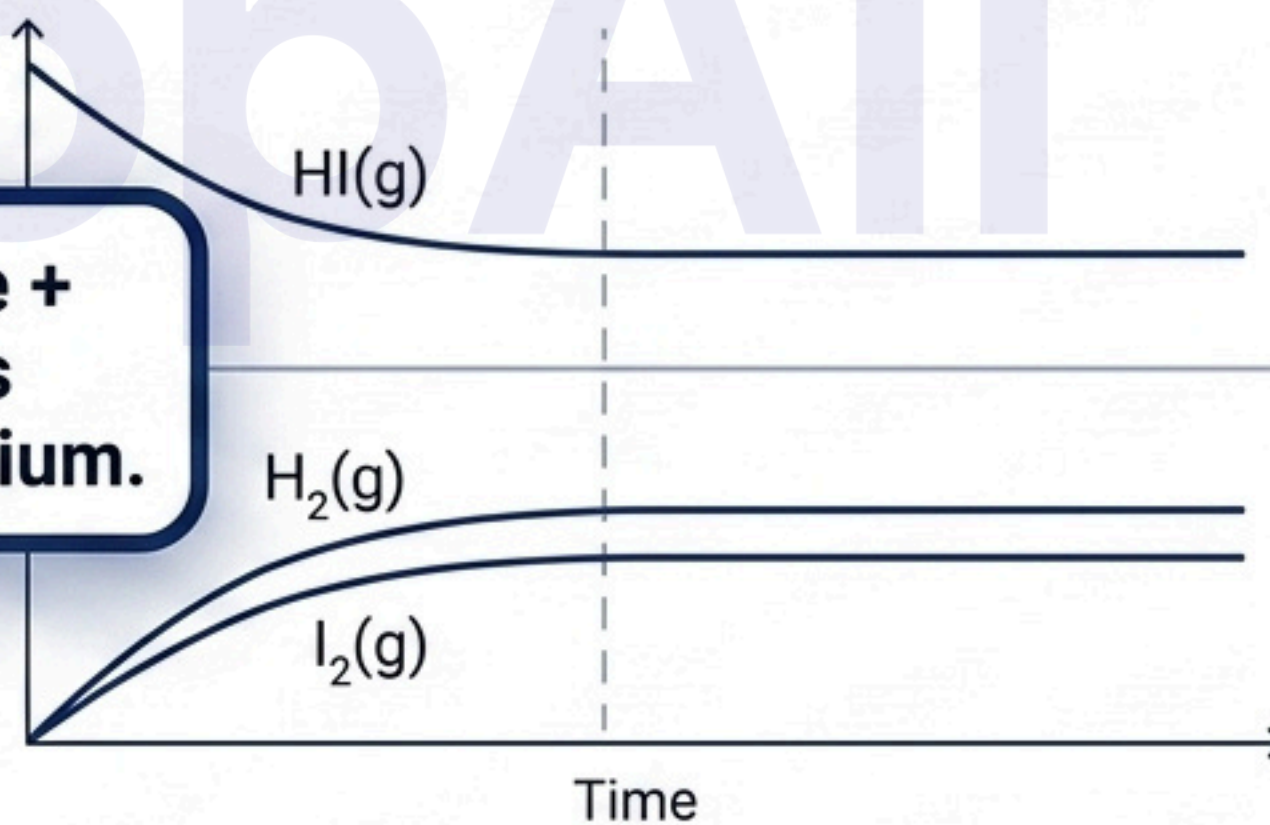
Formula Strip



Starting with Reactants



Starting with Products



**Same Volume +
Same Atoms
= Same Equilibrium.**

Unit 6.2 Key Takeaways

Static

Stopped. No activity.
(Not chemical equilibrium).

Dynamic

Active. Equal opposing rates.
(Chemical equilibrium).

✓ Requires a closed system at a given temperature.

✓ Forward Rate strictly equals Reverse Rate.

✓ Macroscopic properties (concentration, pressure, color) remain constant.



Reactions continue, but no net composition change occurs.



You've Learned the Theory.

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