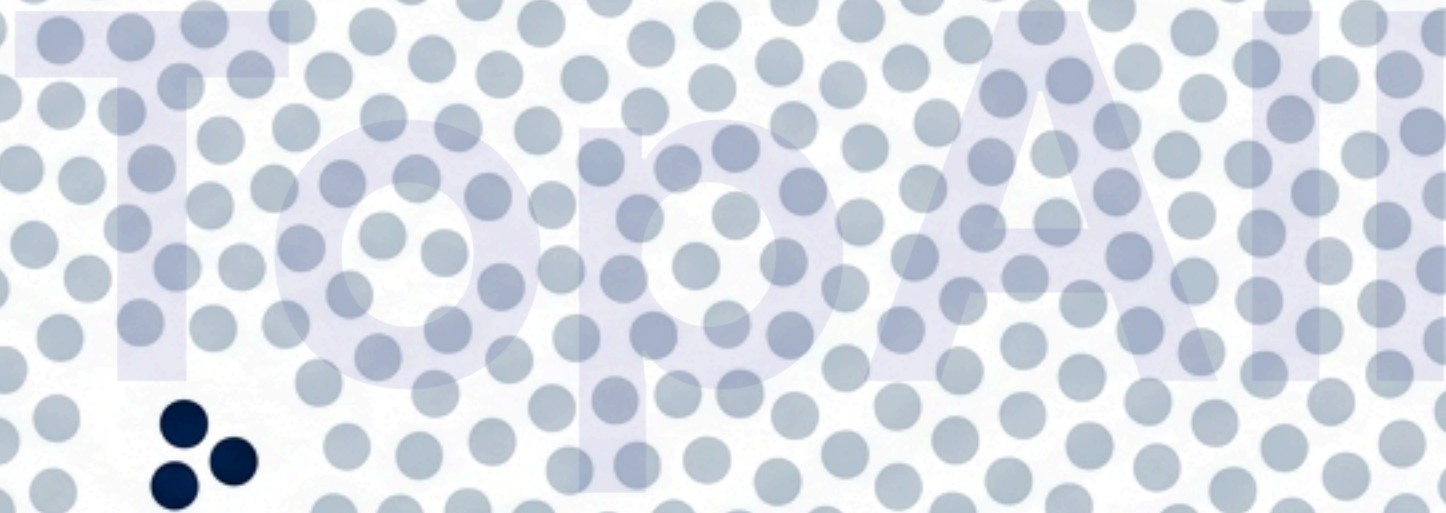
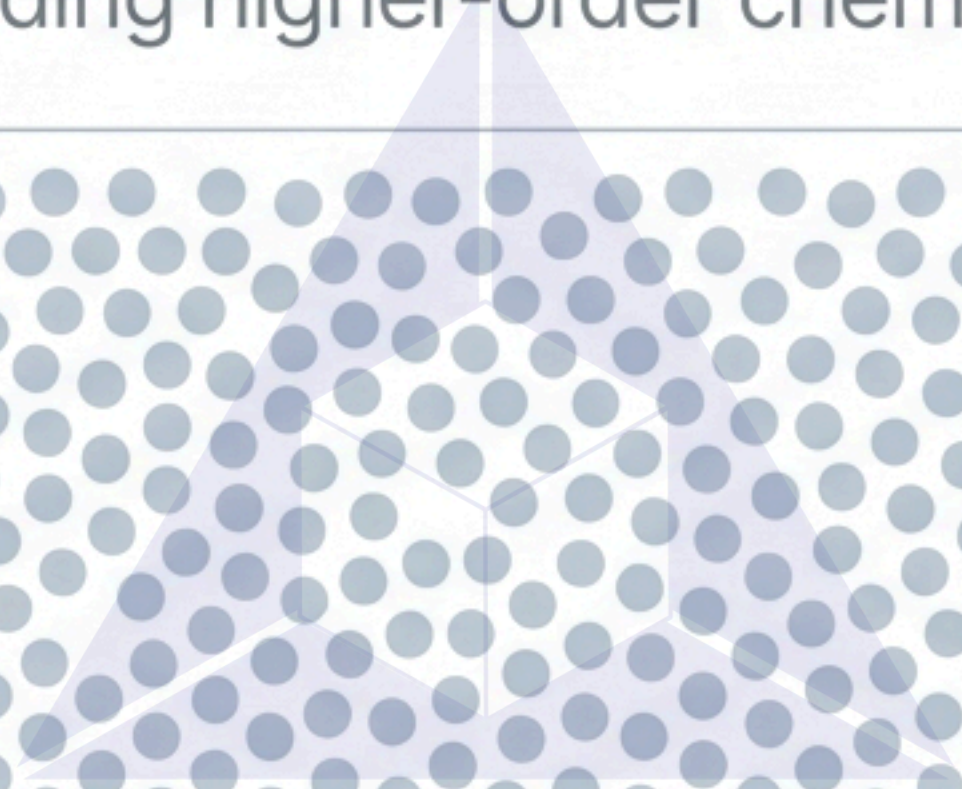


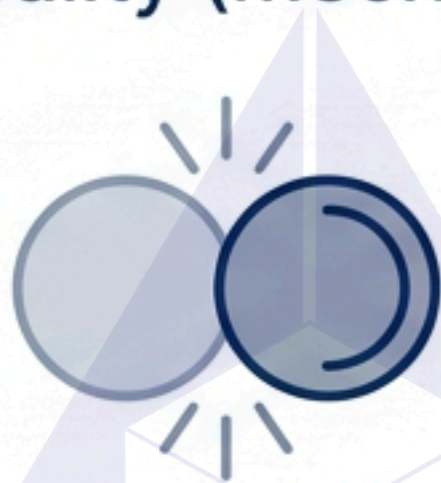
Pseudo First Order Reactions

Understanding higher-order chemistry that exhibits first-order behavior.



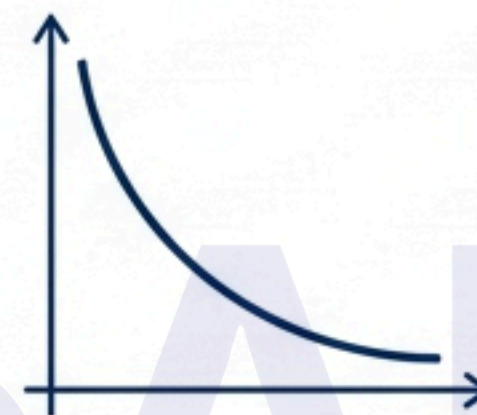
A Disguised Rate Law

The Reality (Mechanism)



The reaction is inherently higher-order (usually bimolecular or second-order). Two different molecules must collide to react.

The Behavior (Kinetics)



Under specific physical conditions, the reaction perfectly obeys a first-order rate law. The rate appears to depend on the concentration of only one reactant.

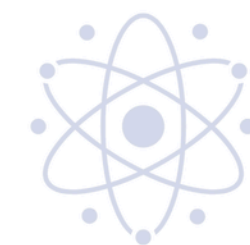
Key-Takeaway Box

Pseudo first-order reactions are not truly first-order by mechanism; they are forced into first-order behavior by the physical conditions of the experiment.



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Let's Test Them Now.**

$$E=mc^2$$



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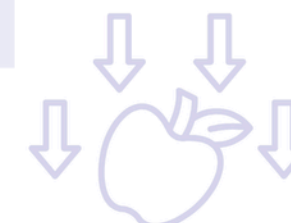
Practice Now



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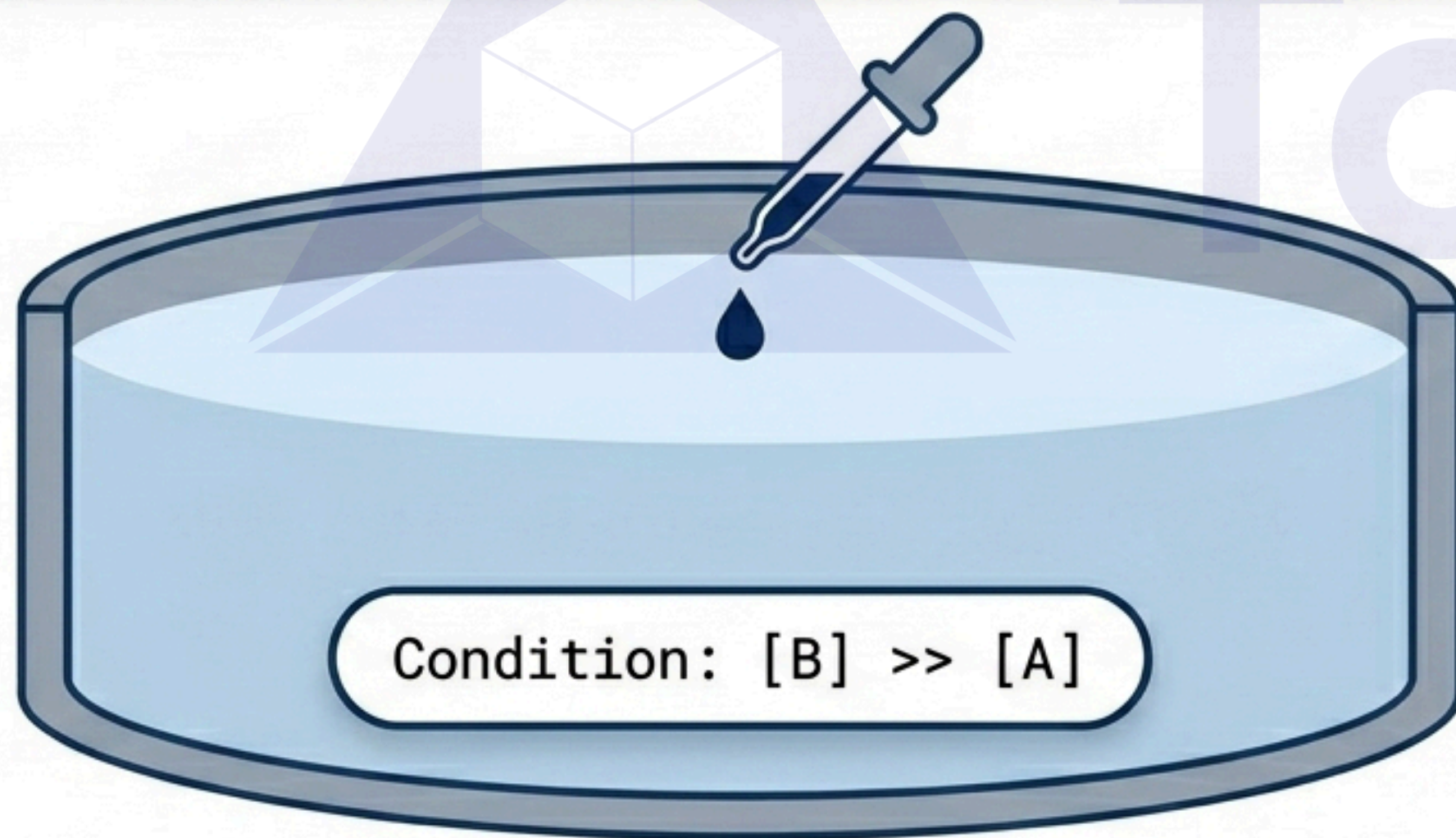
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The Mathematical Loophole of Excess

When one reactant is present in massive excess (often the solvent, like water), its concentration barely changes during the reaction. Because it remains effectively constant, it is mathematically absorbed into the rate constant.



Equation Evolution Strip

The true rate law

$$\text{Rate} = k [A]^1 [B]^1$$



The physical reality

$$[B] \approx \text{Constant}$$



The mathematical merge

$$k \times [B] = k'$$

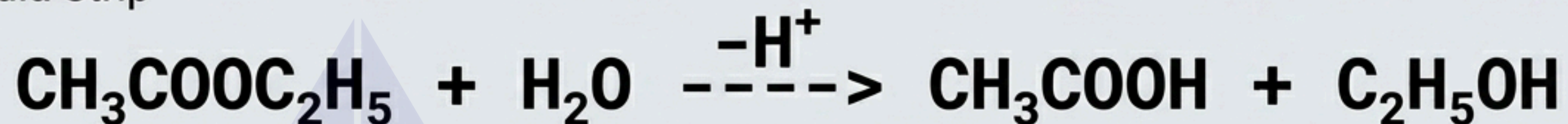


The observed rate law

$$\text{Rate} = k' [A]^1$$

Hydrolysis of Ethyl Acetate

Formula Strip



Negligible Change Visualizer

Time	Ester	Water	Products
t = 0	0.01 mol	10.00 mol	0 mol
t = end	0 mol	9.99 mol	0.01 mol

Recap Box

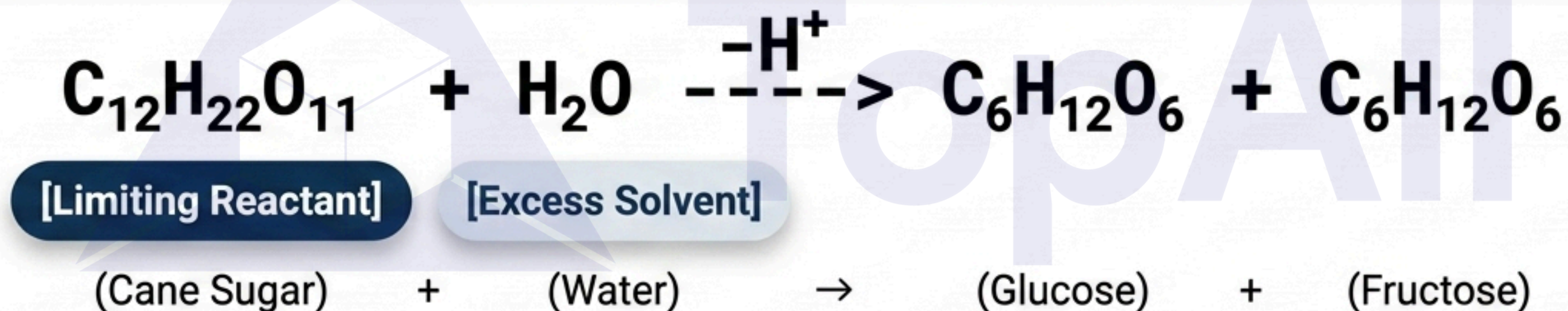
The water concentration goes from 10 mol to 9.99 mol—a mathematically negligible drop. Because $[\text{H}_2\text{O}]$ is effectively constant, the rate depends only on the ester.

$$\text{Rate} = k' [\text{CH}_3\text{COOC}_2\text{H}_5]$$

Inversion of Cane Sugar

Concept Card

Like the hydrolysis of an ester, the inversion of cane sugar utilizes water as a massive-excess solvent. The reaction rate is governed entirely by the available cane sugar.



Formula Strip

$$\text{Rate} = k [\text{C}_{12}\text{H}_{22}\text{O}_{11}]^1 [\text{H}_2\text{O}]^0 \longrightarrow \text{Rate} = k' [\text{C}_{12}\text{H}_{22}\text{O}_{11}]$$

Higher-Order Chemistry, First-Order Behavior

Dimension	True First Order	Pseudo First Order
Molecularity	1 (Unimolecular)	2 (Bimolecular)
Overall Order	1	1
Concentration Dependency	Depends entirely on the single reacting species	Depends on one reactant; the other is locked in massive excess

Exam Tip: Always check if water or a solvent is explicitly stated as being in 'excess' before assigning the reaction order. Molecularity will be ≥ 2 , but order will be 1.



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