



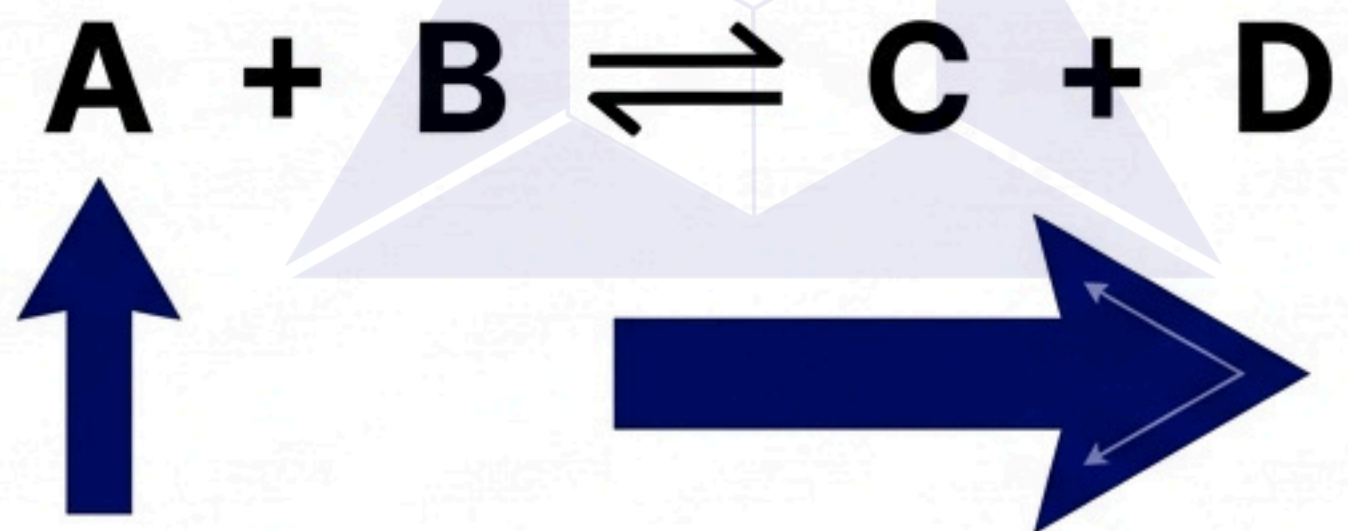
Effect of Concentration Change

Understanding Le Chatelier's Principle through spatial, graphical, and mathematical logic.

The Consumption Rule: Adding to the System

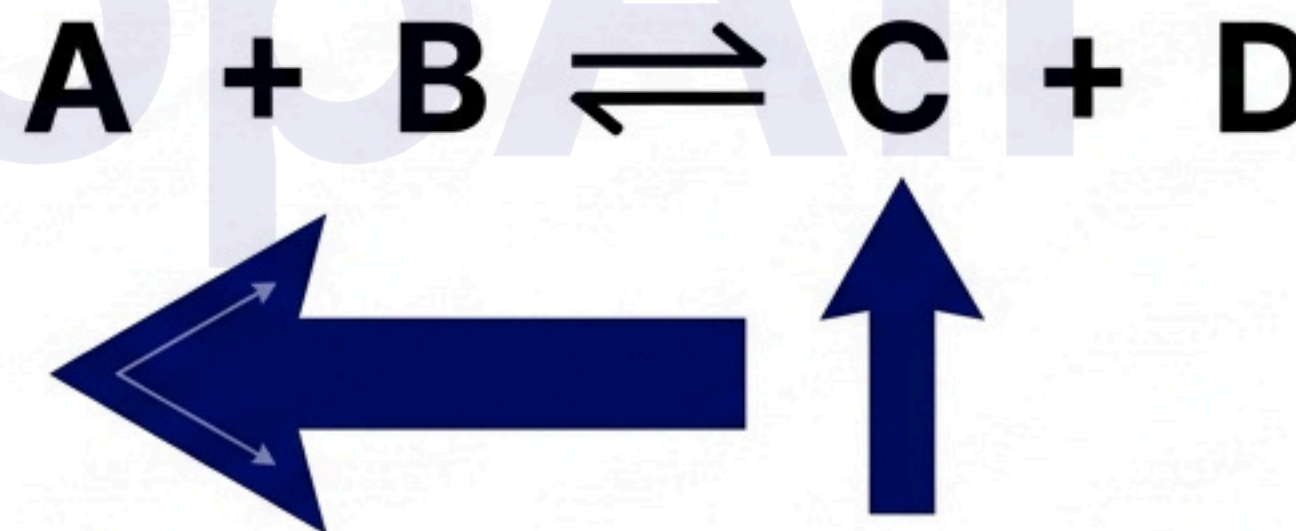
The concentration stress of an added substance is relieved by net reaction in the direction that **CONSUMES** it.

Mechanism Card A



System shifts **FORWARD** to consume the excess.

Mechanism Card B



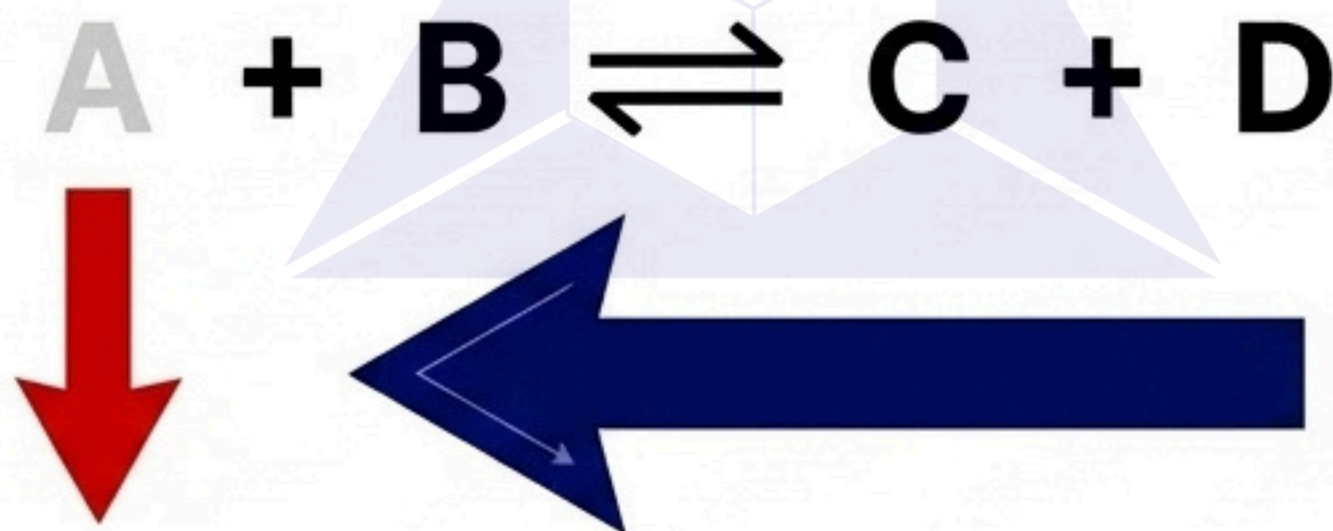
System shifts **REVERSE** to consume the excess.

DISTURBING EQUILIBRIUM

The Replacement Rule: Removing from the System

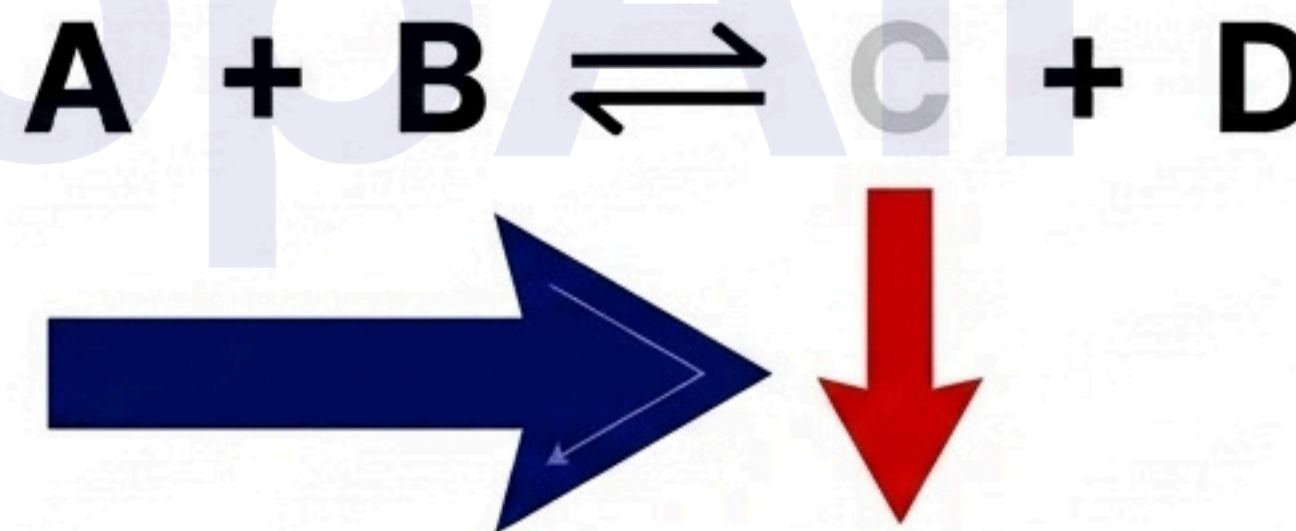
The concentration stress of a removed substance is relieved by net reaction in the direction that **REPLENISHES** it.

Mechanism Card A



System shifts **REVERSE** to replace the loss.

Mechanism Card B



System shifts **FORWARD** to replace the loss.

Industrial Application: Constant removal of CO_2 from kilns drives $\text{CaCO}_3 \rightarrow \text{CaO} + \text{CO}_2$ to completion.



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

$$E=mc^2$$



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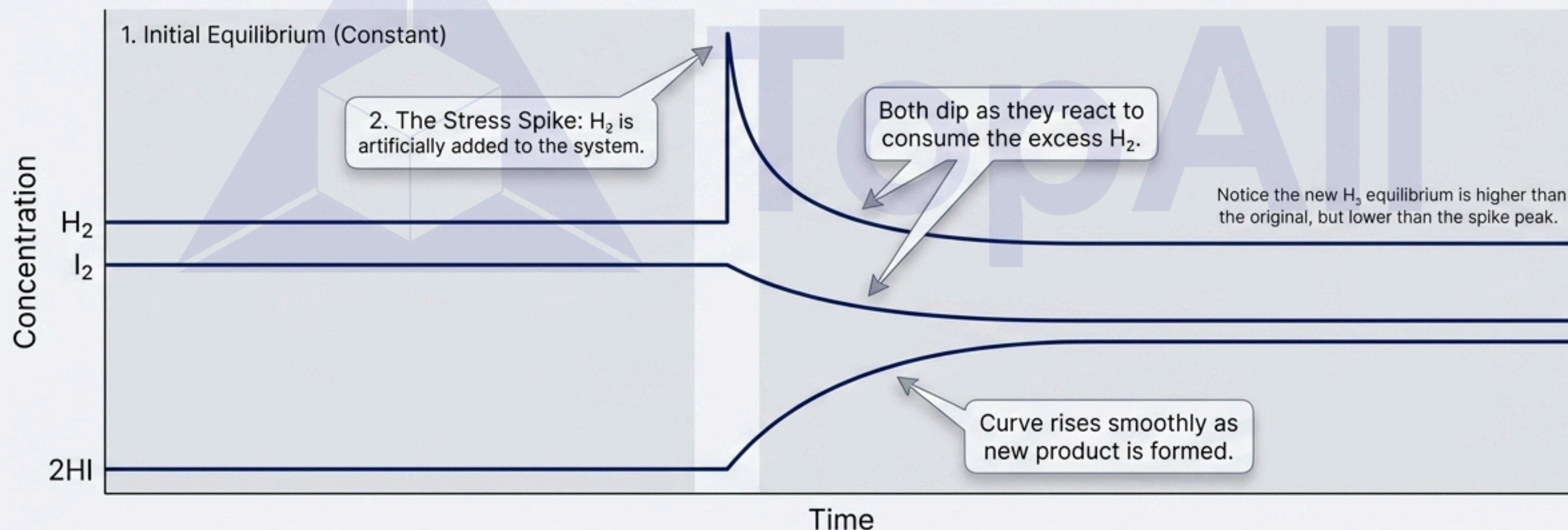
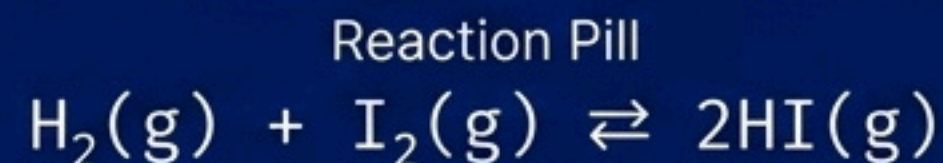
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Visualizing the Shift: $\text{H}_2 + \text{I}_2 \rightleftharpoons 2\text{HI}$



The Proof: Reaction Quotient (Q_c) vs. Constant (K_c)

$$Q_c = \frac{[HI]^2}{[H_2][I_2]}$$

The system is a math equation constantly trying to return Q_c to the value of K_c .

Scenario A: Add H_2



Step 1: Denominator ($[H_2]$) increases.



Step 2: Fraction value drops → $Q_c < K_c$.



Step 3: To restore balance, system must increase Numerator (shift RIGHT).

Scenario B:
Continuously Remove HI



Step 1: Numerator ($[HI]$) is artificially kept small.



Step 2: Fraction value is held down → $Q_c < K_c$.



Step 3: Reaction continuously moves forward. (Used to maximize industrial yields!)



The Golden Rule of Concentration Change

**System shifts to CONSUME
what is added and REPLENISH
what is removed.**

[+] ADD → Shift AWAY from the addition.

[-] REMOVE → Shift TOWARD the removal.

Le Chatelier's Principle always fights the change to restore the balance.



You've Learned the Theory.

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