

JEE ADVANCED & MAINS TARGET

10 Mistakes That Cost Marks in Equilibrium

The ultimate rank-saver playbook.
Master the traps, secure the +4.

Mistake 1: Assuming Equilibrium Means the Reaction Stops

UNDERSTAND

Equilibrium is **dynamic**. The rate of the forward reaction exactly equals the rate of the reverse reaction.

$$R_f = R_b$$

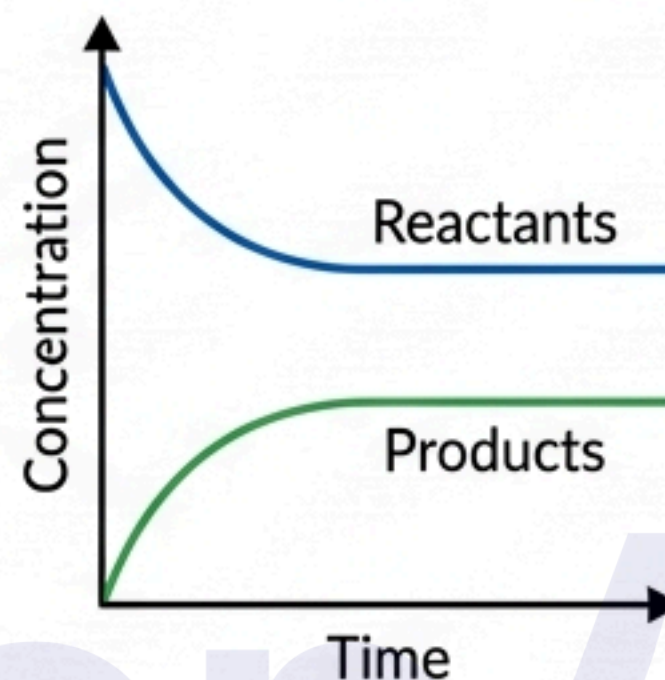
! THE TRAP

Exam questions ask if “reactant molecules stop converting.” Students see constant macroscopic properties (pressure, color) and falsely assume static stasis.

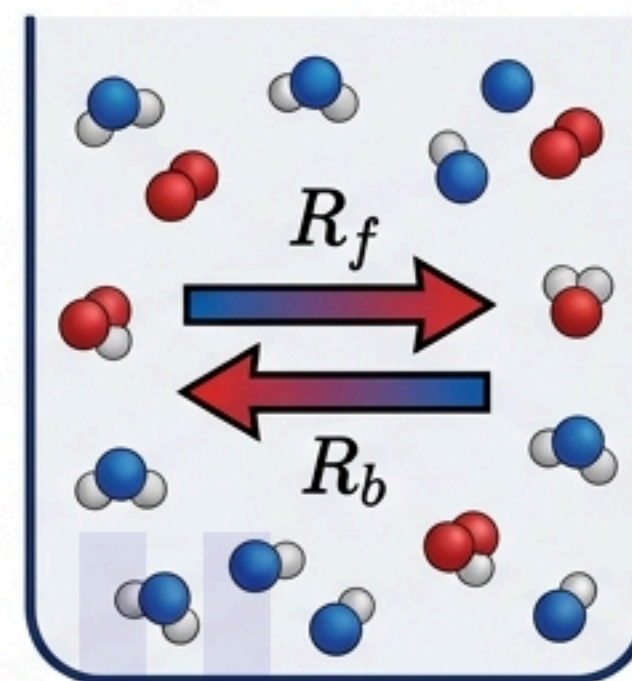
✓ VERIFY & FIX

Always check for “dynamic.” Macroscopic properties are constant, but microscopic activity never ceases.

Macroscopic: Constant



Microscopic: Dynamic



Exam Snapshot Panel

The Haber Isotope Proof

Adding D_2 to an equilibrated NH_3 mixture yields ND_3 . This proves reactions continue at the molecular level.

Mistake 2: Ignoring the Conditions of Formulas

Formula Bank

$$K_p = K_c(RT)^{\Delta n_g}$$

State is critical!

UNDERSTAND

The pressure-concentration relationship relies on the ideal gas law. Therefore, Δn represents only the change in gaseous moles.

THE TRAP

Calculating Δn by subtracting all reactant moles from all product moles, blindly including solids and liquids.

THE FIX

1. Circle only the (g) state symbols in the equation.
2. Calculate $\Delta n_g = \text{Moles of gaseous products} - \text{Moles of gaseous reactants}$.



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$$E=mc^2$$



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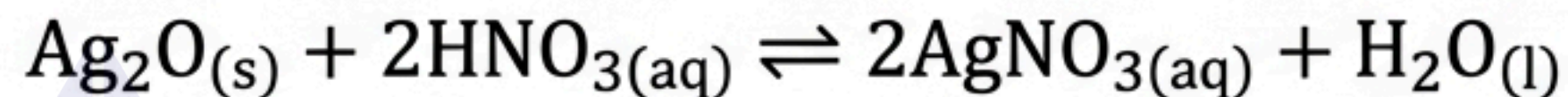
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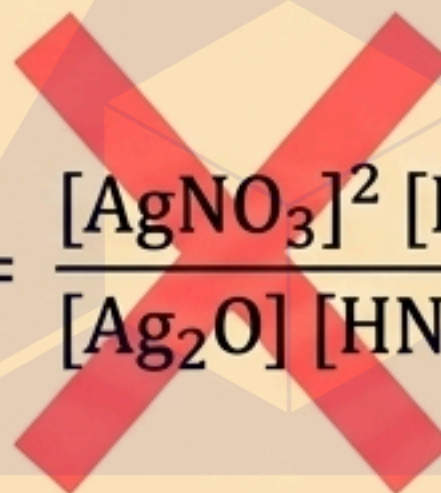


Mistake 3: Including Solids in Equilibrium Expressions

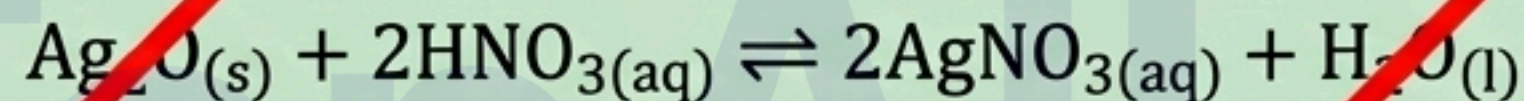
Before & After



THE TRAP


$$K_c = \frac{[\text{AgNO}_3]^2 [\text{H}_2\text{O}]}{[\text{Ag}_2\text{O}] [\text{HNO}_3]^2}$$

THE STRIKE RULE



$$K_c = \frac{[\text{AgNO}_3]^2}{[\text{HNO}_3]^2}$$

Understand: The active mass (molar concentration) of a pure solid or liquid is constant and independent of amount. They are taken as unity (1).

Execute: The moment you see a heterogeneous equilibrium question, physically strike through any pure (s) or (l) phases before writing the equation.

Mistake 4: Confusing the Catalyst Effect

UNDERSTAND

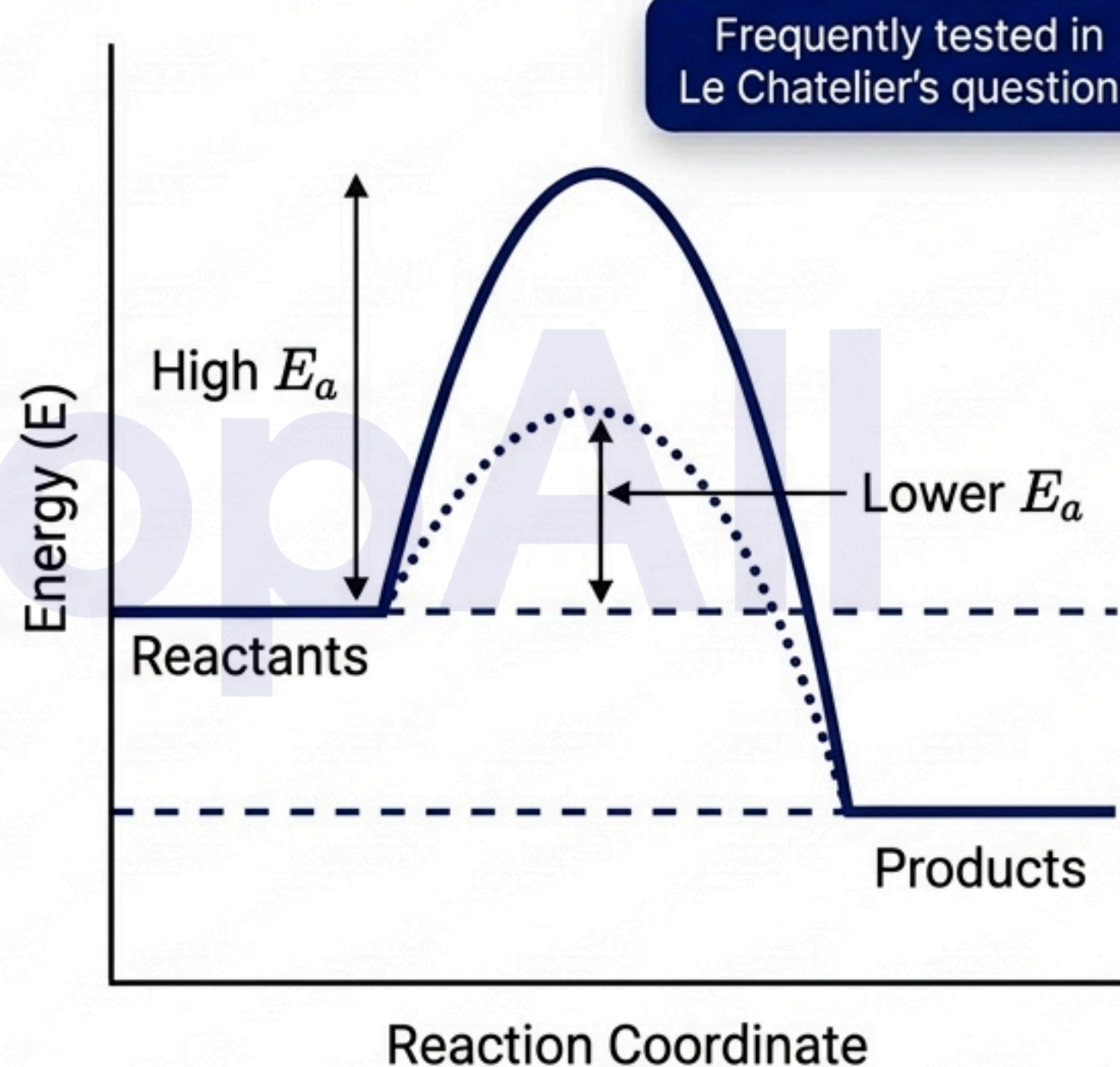
A catalyst provides a lower-energy pathway, lowering the activation energy (E_a) for both forward and reverse reactions equally.

THE TRAP

"Adding Iron to the Haber process increases the equilibrium yield of NH_3 ." Students conflate the speed of production with the amount of production.

VERIFY

Catalyst = Time Machine, not a Yield Booster. It helps you reach equilibrium faster, but it absolutely does not change the equilibrium composition (K_c) or the final yield.



The Diagnostic Cheat Sheet

[QUESTION SAYS]	[THE TRAP]	[VERIFY & EXECUTE]
Equilibrium is reached...	Reaction has stopped.	Set $R_{\text{forward}} = R_{\text{backward}}$. Macroscopic properties constant, micro is dynamic.
Calculate K_p for...	Using total moles for Δn .	Use ONLY gaseous moles. $\Delta n_g = n_{P(g)} - n_{R(g)}$.
Pure solid added...	Shifting the equilibrium.	Ignore it. Pure solids/liquids do not shift equilibrium or appear in K_c .
Catalyst is added...	Yield increases or K_c changes.	Mark 'No change in yield/composition.' Only time to equilibrium decreases.



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