

Equilibrium

Quick Review

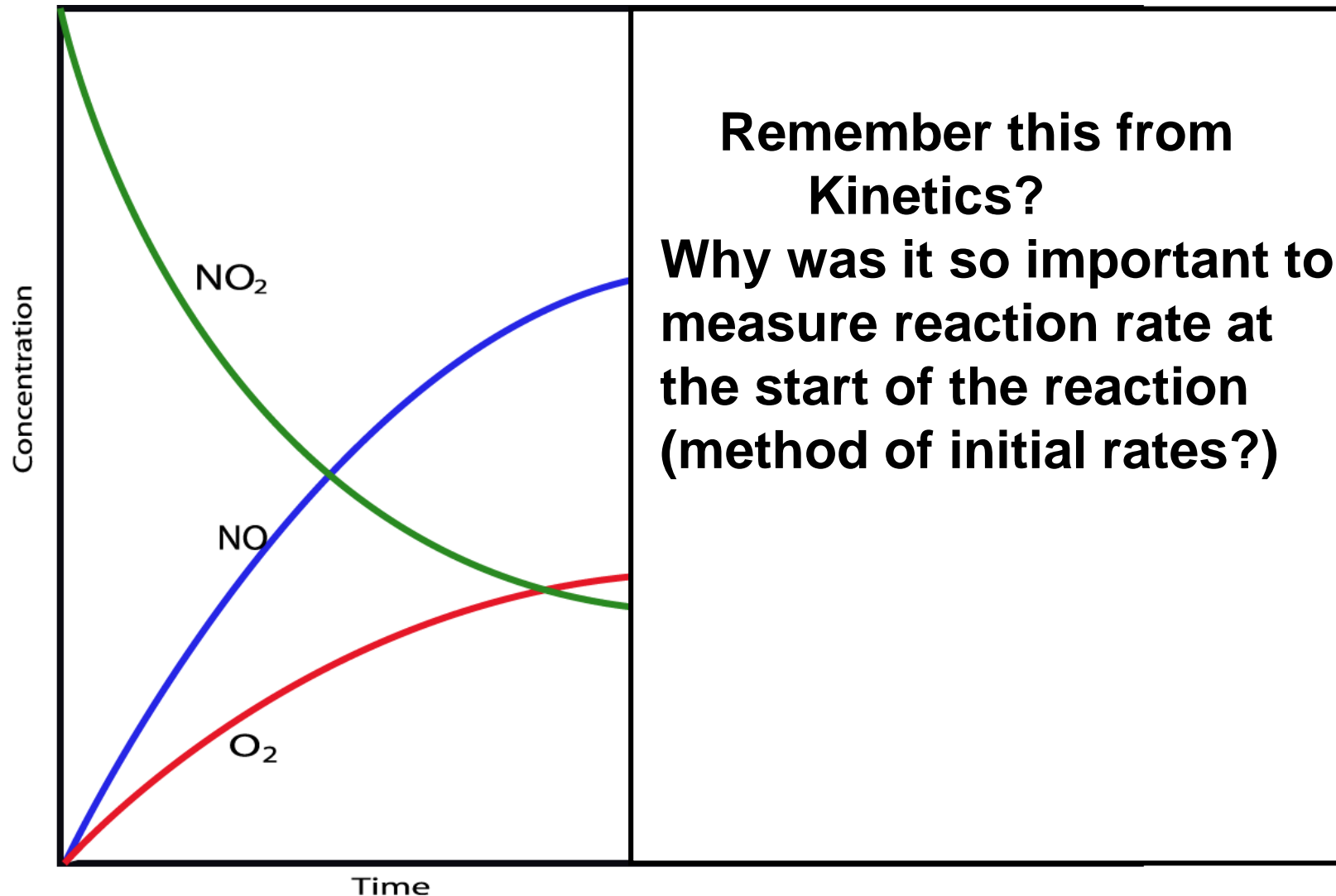
Chemical Equilibrium

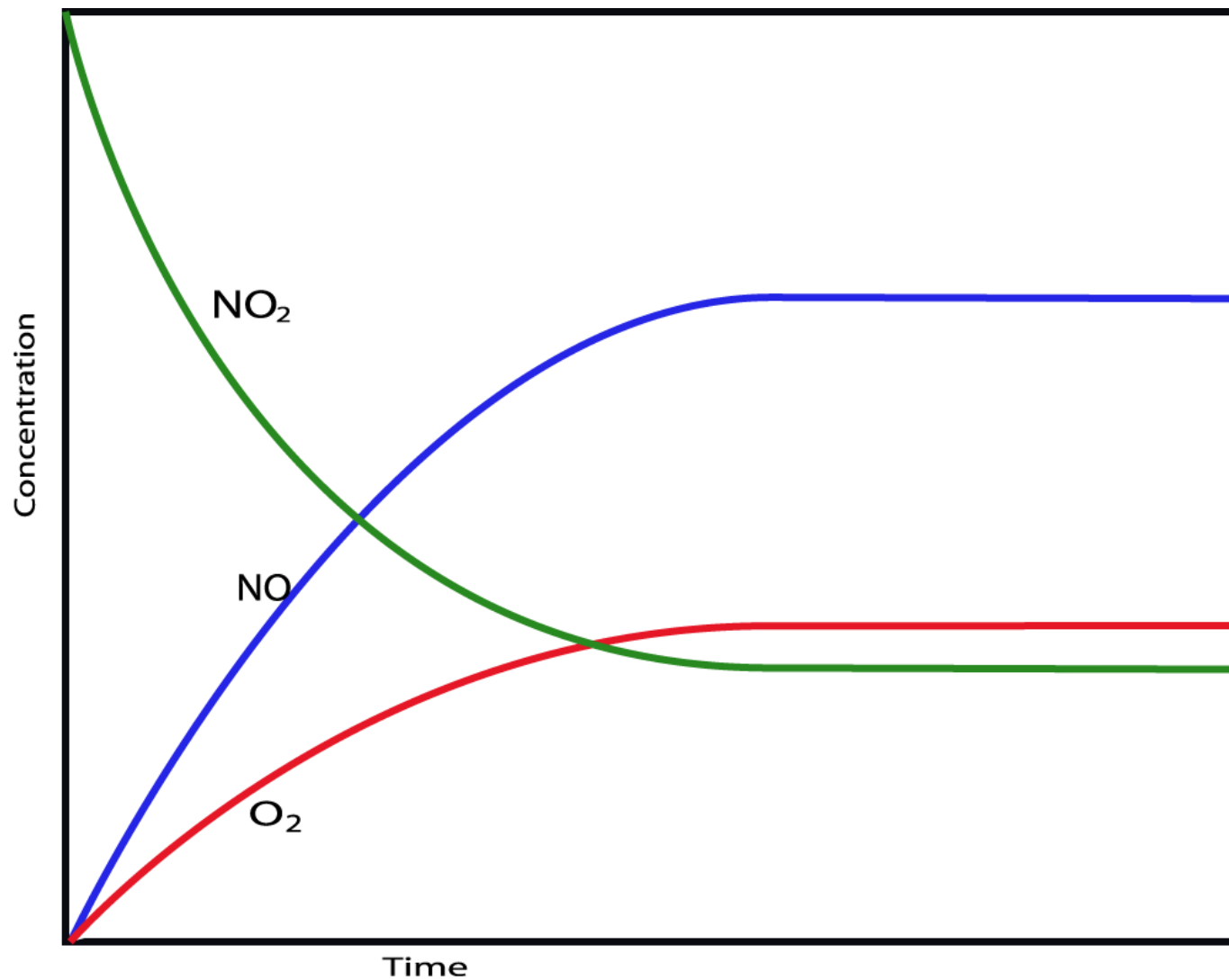
Reversible Reactions - A chemical reaction in which the products can react to re-form the reactants

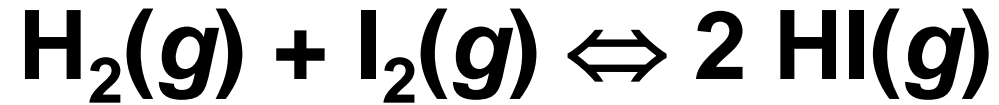
Chemical Equilibrium - When the rate of the forward reaction equals the rate of the reverse reaction and the concentration of products and reactants remains unchanged



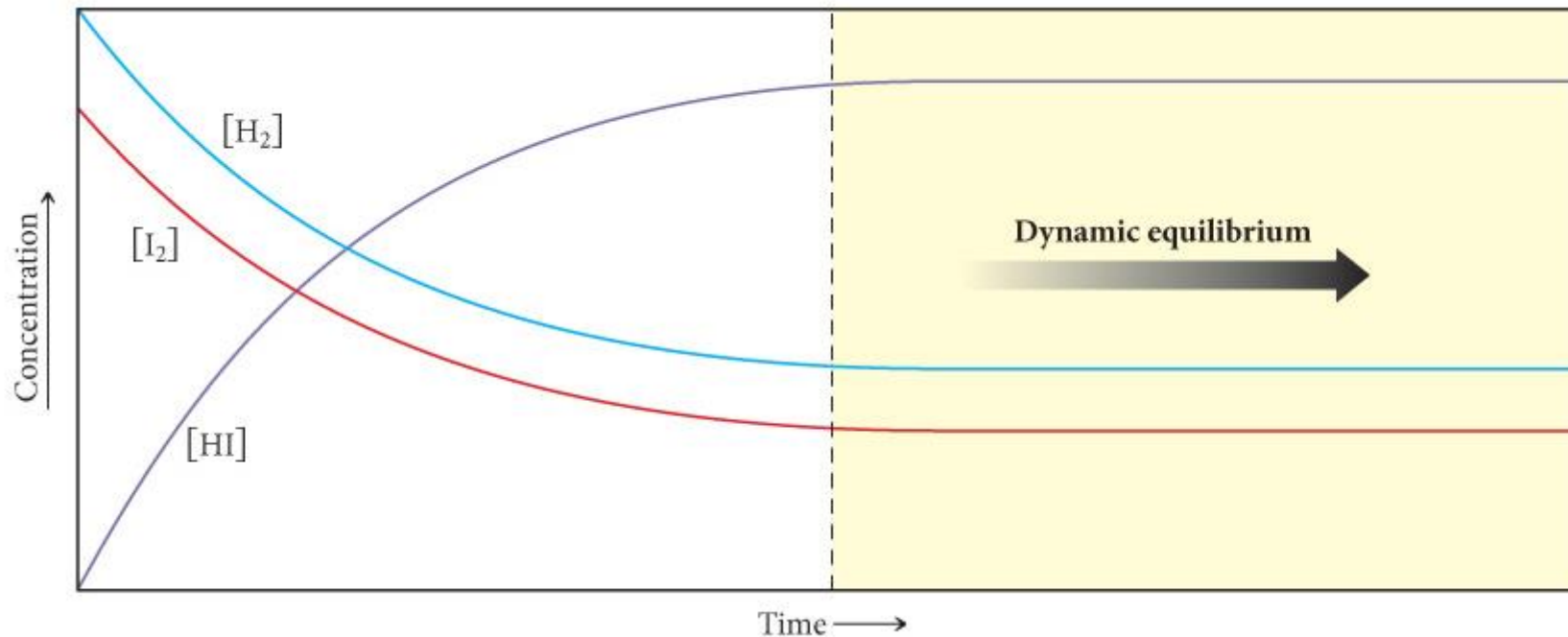
(\rightleftharpoons) indicates equilibrium in a chemical equation

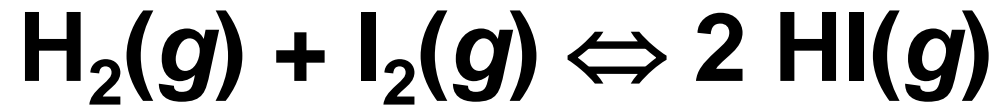






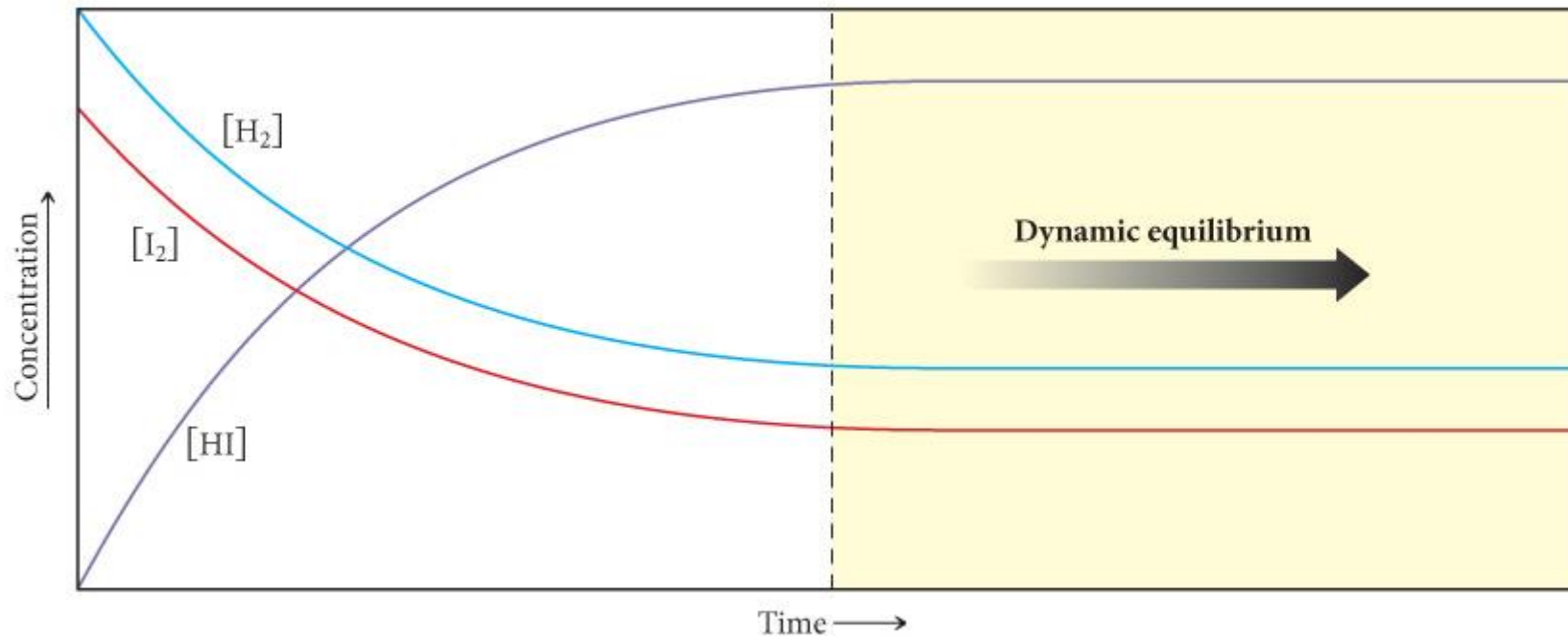
As the concentration of product increases and the concentrations of reactants decrease, the rate of the forward reaction slows down, and the rate of the reverse reaction speeds up.





At **dynamic equilibrium**, the rate of the forward reaction is equal to the rate of the reverse reaction.

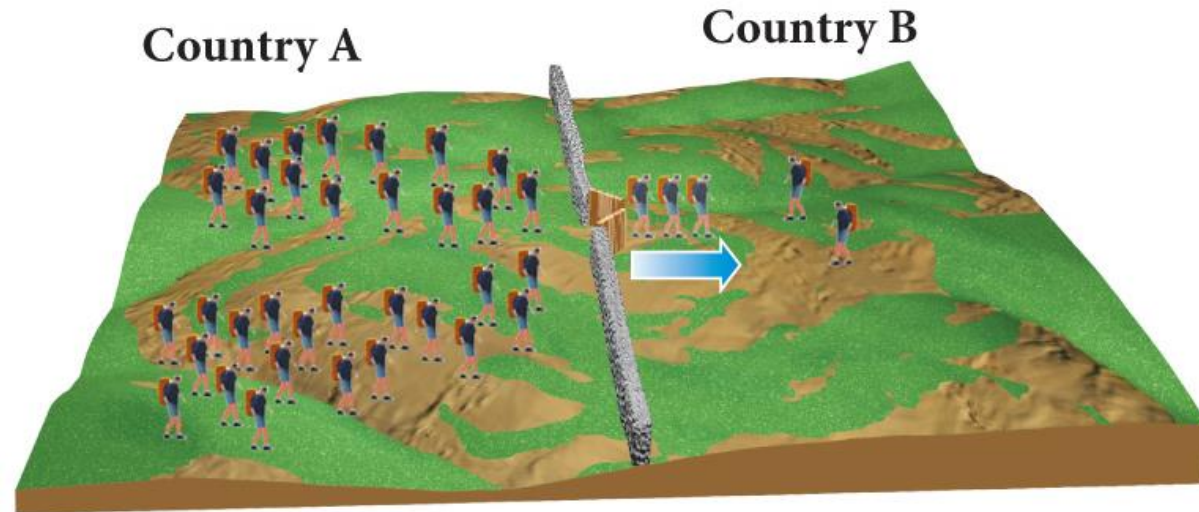
The concentrations of reactants and products no longer change.



Equilibrium \neq Equal Concentrations!

- The rates of the forward and reverse rxns are equal at equilibrium.
- But that does **NOT** mean the concentrations of reactants and products are equal.
- **Product Favored** - Some reactions reach equilibrium only after almost all the reactant molecules are consumed; we say the position of equilibrium favors the products.
- **Reactant Favored** - Other reactions reach equilibrium when only a small percentage of the reactant molecules are consumed; we say the position of equilibrium favors the reactants.

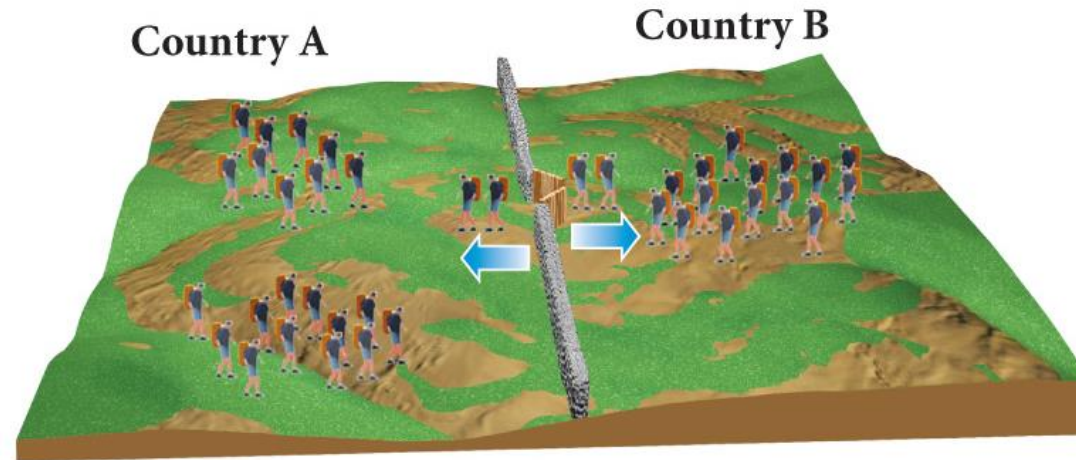
An Analogy: Population Changes



Initial
Net movement from A to B

**When Country A citizens feel overcrowded,
some will emigrate to Country B .**

An Analogy: Population Changes



Equilibrium
Equal movement in both directions

However, after a time, emigration will occur in both directions at the same rate, leading to populations in Country A and Country B that are constant, but not necessarily equal.