

How far? The extent of chemical change · supported focus

International Baccalaureate · IB Diploma · Chemistry · HL

Scope and prerequisites

Supported HL focus. First assessment 2025; current brief acquired; full Chemistry guide not acquired. Remaining guide, assessment and practical requirements retain their recorded holds.

Prerequisites: read the stated quantities and units, use arithmetic and the model conditions below. Each lesson develops its own method before independent transfer.

These are original or explicitly fictional teaching examples, not actual measurements or completed assessed learner investigations.

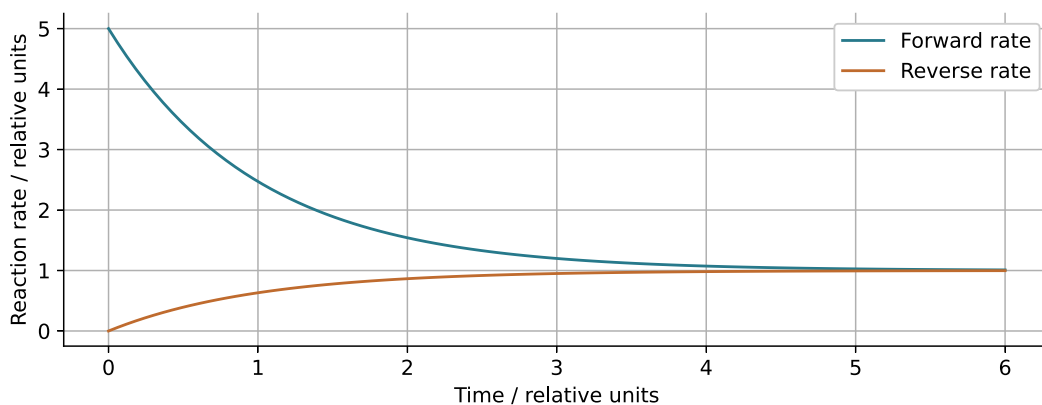
Equilibrium and changing conditions

■ What would explain this observation?

- A **reversible reaction** can continue in a closed vessel while measured concentrations stay constant. Constant composition does not mean particles have stopped reacting.
- Start with a prediction. State the quantities or features you would compare, then decide what evidence could distinguish two explanations.

■ Build the model

- Dynamic **equilibrium** occurs in a closed system when forward and reverse rates are equal. Reactant and product concentrations are constant, but they need not be equal.
- equilibrium: A state with equal forward and reverse reaction rates; reversible reaction: A reaction that can proceed in both directions.



■ Choose evidence that can test it

- A concentration or pressure change disturbs the balance. The system responds toward a new equilibrium. Temperature changes can also change the equilibrium constant; a catalyst changes how quickly equilibrium is reached.
- State the balanced equation and whether the forward reaction is exothermic before predicting a temperature effect. Count gas coefficients when considering pressure; pressure has no composition effect when gaseous amounts are equal on both sides.

■ Work from known quantities

- State the known values and their units. Choose the relation because its assumptions fit this case, then rearrange before substitution.
- Known: in $A \rightleftharpoons B$, equilibrium concentrations are $[A] = 0.20$ and $[B] = 0.60$ in the same concentration unit. For this stated expression, $K = [B]/[A]$. $K = 0.60/0.20 = 3.0$. Equal rates do not imply $K = 1$.

Example:

For $A \rightleftharpoons B$, calculate $[B]/[A]$ when $[B]=0.8$ and $[A]=0.2$. Use the same sequence: known quantities $\rightarrow$ model $\rightarrow$ relation $\rightarrow$ substitution $\rightarrow$ unit and interpretation.

■ Check the conclusion and its limits

- Do not use a catalyst to claim a larger equilibrium yield. For heterogeneous equilibria, pure solids are omitted from the usual equilibrium expression.
- Return to the original observation. Explain what the result supports, which conditions it assumes, and one way to test a competing explanation.

Warn:

A catalyst changes the equilibrium constant at a fixed temperature. This claim is false: Do not use a catalyst to claim a larger equilibrium yield. For heterogeneous equilibria, pure solids are omitted from the usual equilibrium expression.

Key:

Equilibrium and changing conditions: A concentration or pressure change disturbs the balance. The system responds toward a new equilibrium. Temperature changes can also change the equilibrium constant; a catalyst changes how quickly equilibrium is reached.