

How far? The extent of chemical change · supported focus

Supported focus · HL

## Supported scope

- Supported HL focus. First assessment 2025; current brief acquired; full Chemistry guide not acquired. Remaining guide, assessment and practical requirements retain their recorded holds.
- State model conditions and distinguish fictional data from measurements.

## Equilibrium · 1.1

### Reasoning

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.

## Equilibrium · 2.1

### Reasoning

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.

## Equilibrium · 3.1

### Reasoning

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.

## Equilibrium · 4.1

### Reasoning

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  $K = 1$ .

## Equilibrium · 4.2

### Reasoning

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.

## Equilibrium · 5.1

### Reasoning

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.

## Equilibrium · 5.2

### Reasoning

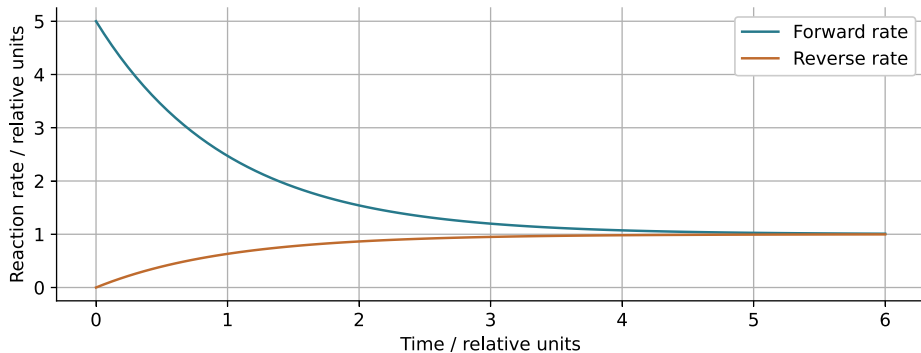
A catalyst changes the equilibrium constant at a fixed temperature. This claim is false: Do not use a catalyst to claim a larger equilibrium yield. For heterogeneous equilibria, pure solids are omitted from the usual equilibrium expression.

## Equilibrium · 5.3

### Reasoning

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.

## Equilibrium · diagram



- Original teaching diagram: Equilibrium and changing conditions
- Use the labels and the stated model together.

## Equilibrium · original transfer

### Your turn

$A \rightleftharpoons B$  has  $K=4$  at fixed temperature. Immediately after adding  $A$ , the ratio  $[B]/[A]=2$ . Predict the shift and distinguish reaction rates from equilibrium concentrations.

## Equilibrium · transfer reasoning

### Method and interpretation

$Q < K$ , so net forward change raises the ratio toward  $K$ . At equilibrium forward/reverse rates are equal; concentrations need not be equal. Temperature and the stated expression matter.

## Check yourself

- Explain reversible reaction using the stated model.
- Explain equilibrium using the stated model.
- Change one value in the original transfer; explain which assumption still matters.