

Exercise walk-through

Magnitude of the Equilibrium Constant ■ 7.5

eXercise

You must be able to

- interpret a **large** K (products favored) and a **small** K (reactants favored)
- relate $K \approx 1$ to comparable amounts
- reason about the position of equilibrium

Method — What the size of K tells you

- $K \gg 1$: at equilibrium there are **mostly products** — the reaction “goes nearly to completion”.
- $K \ll 1$: mostly **reactants** — the reaction “barely proceeds”.
- $K \approx 1$: comparable amounts of reactants and products.

Method — A worked interpretation

$K = 1 \times 10^8 \rightarrow$ very large $\rightarrow$ products strongly favored. $K = 1 \times 10^{-6} \rightarrow$ very small $\rightarrow$ reactants favored.

Method — K is not the rate

A large K says the **position** favors products, **not** that the reaction is fast. Speed (kinetics) and extent (equilibrium) are separate ideas.

Method — Comparing two reactions

The one with the **larger** K has the equilibrium lying further toward products under the same conditions.

Practice 2.1 ■ 1 mark

A reaction has $K = 1 \times 10^{10}$. Are products or reactants favored?

Solution 2.1

Method: A worked interpretation

Worked steps

Products **B1**.

Practice 2.2 ■ 1 mark

A reaction has $K = 1 \times 10^{-5}$. Are products or reactants favored?

Solution 2.2

Method: A worked interpretation

Worked steps

Reactants **B1**.

Practice 2.3 ■ 1 mark

Does a large K mean the reaction is fast?

Solution 2.3

Method: K is not the rate

Worked steps

No **B1**.

Exam-style 3.1 ■ 1 mark

A very large equilibrium constant means at equilibrium there are mostly

A reactants

B products

C equal amounts

D no molecules

Solution 3.1

Method: What the size of K tells you

A reactants

B products



C equal amounts

D no molecules

Worked steps

B — mostly products.

Exam-style 3.2 ■ 1 mark

Two reactions have $K_1 = 5 \times 10^3$ and $K_2 = 2 \times 10^{-2}$.

- (a) State which favors products more.
- (b) Describe the equilibrium mixture for reaction 2.

Solution 3.2

Method: K is not the rate

Worked steps

(a) Reaction 1 (larger K) **B1**. (b) Reaction 2 has a small K , so at equilibrium it is mostly reactants with little product **M1** **A1**.

Exam-style 3.3 ■ 2 marks

Explain why a large K does not tell you how quickly equilibrium is reached.

Solution 3.3

Method: K is not the rate

Worked steps

K describes the extent (position) of equilibrium, which is thermodynamic; the speed of reaching it depends on kinetics (activation energy), a separate factor **M1** **A1**.