26 Half-life and the rate constant – Part 2

Name: _____ Class: _____ Date: _____

Vocabulary 词汇

Write each word three times. 把每个单词抄写三遍。

English	中文	Write it 3 times (English)
half-life	半衰期	

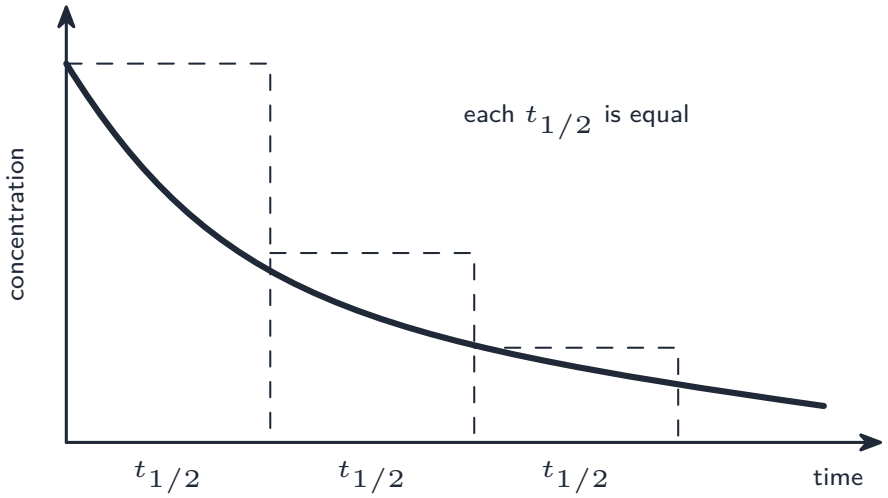
Recall

The **half-life** 半衰期 is the time for a reactant's concentration to halve. For a first-order reaction it is special.

New ideas

Read these first, then do the Practice.

- **1 A constant half-life**



For a **first-order** reaction the half-life is *constant* — it does not depend on the concentration. Each successive halving takes the same time.

2 Finding the rate constant

From the half-life you can find the rate constant: $k = 0.693/t_{1/2}$.

Worked example. A first-order reaction has a half-life of 50 s, so $k = 0.693/50 = 0.014\ \text{s}^{-1}$.

Watch out: a *constant* half-life is the signature of a *first-order* reaction. If the half-life changes as the concentration falls, the reaction is *not* first order.

Practice

Try these in order.

26.6 What is the *half-life* of a reaction? [1]

26.7 For a *first-order* reaction, does the half-life depend on the concentration? [1]

26.8 What is special about successive half-lives in a first-order reaction? [1]

26.9 Write the formula linking k and the half-life. [1]

26.10 A first-order reaction has a half-life of 0.693 s. What is k? [1]

26.11 Challenge. A reactant falls from 0.80 to 0.40 mol dm^{-3} in 30 s, then from 0.40 to 0.20 mol dm^{-3} in another 30 s. What does this tell you about the order, and find the rate constant k. [3]