

# 26 Rate equations and orders – Part 1

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) |
|-------------------|-------|----------------------------|
| rate equation     | 速率方程  | _____                      |
| order of reaction | 反应级数  | _____                      |
| overall order     | 总反应级数 | _____                      |
| rate constant     | 速率常数  | _____                      |

## Recall

A **rate equation** 速率方程 shows how the rate of a reaction depends on the concentrations of the reactants.

## New ideas

Read these first, then do the Practice.

### ■ 1 Orders of reaction

$$\text{rate} = k [A]^m [B]^n$$

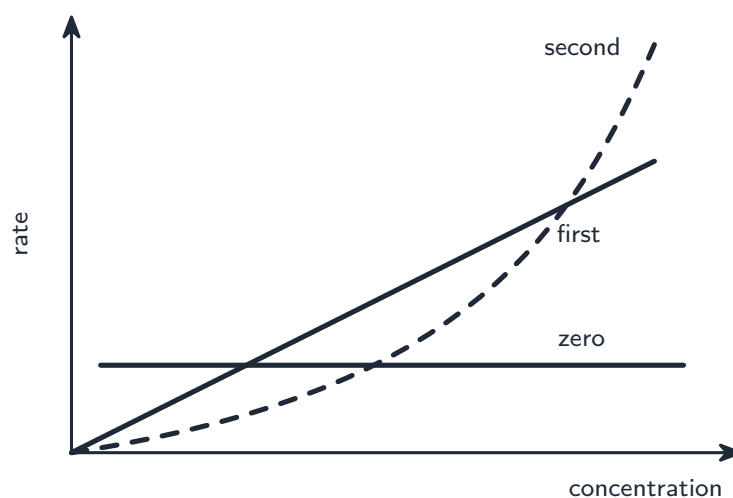
↑  
rate constant

orders (0, 1 or 2)  
↙

In  $\text{rate} = k[A]^m[B]^n$ , the power  $m$  is the **order of reaction** 反应级数 in A (each is 0, 1 or 2). The **overall order** 总反应级数 is  $m + n$ , and  $k$  is the **rate constant** 速率常数. You can only find it by experiment.

*Worked example.* If  $\text{rate} = k[A][B]^2$ , the order in A is 1, the order in B is 2, and the overall order is  $1 + 2 = 3$ .

## ■ 2 Reading the order off a graph



On a rate–concentration graph: zero order is flat, first order is a straight line through the origin, second order is an upward curve.

**Watch out:** the orders come *only* from experiment — never read them off the balanced equation. A reactant of order 0 has *no* effect on the rate: changing its concentration leaves the rate unchanged.

## Practice

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Try these in order.

**26.1** What does a *rate equation* show? [1]

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**26.2** In  $\text{rate} = k[\text{A}]^m[\text{B}]^n$ , what is  $m$  called? [1]

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**26.3** What is the *overall order*? [1]

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**26.4** How can you find a rate equation — from the balanced equation or by experiment? [1]

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**26.5** What order gives a *flat* rate–concentration line? [1]

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**26.6 Challenge.** A reaction has  $\text{rate} = k[\text{A}][\text{B}]^2$ . State the order with respect to B, and what happens to the rate if [B] is doubled (with [A] kept constant). [2]

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