

26 Rate equations and orders – Part 1

Name: _____ Class: _____ Date: _____

Vocabulary

*Write each word three times.***English****Write it 3 times** (English)

rate equation

order of reaction

overall order

rate constant

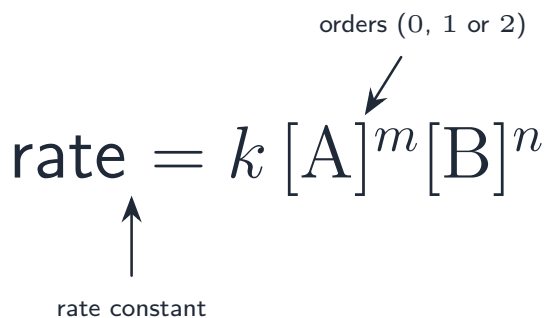
Recall

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

New ideas

Read these first, then do the Practice.

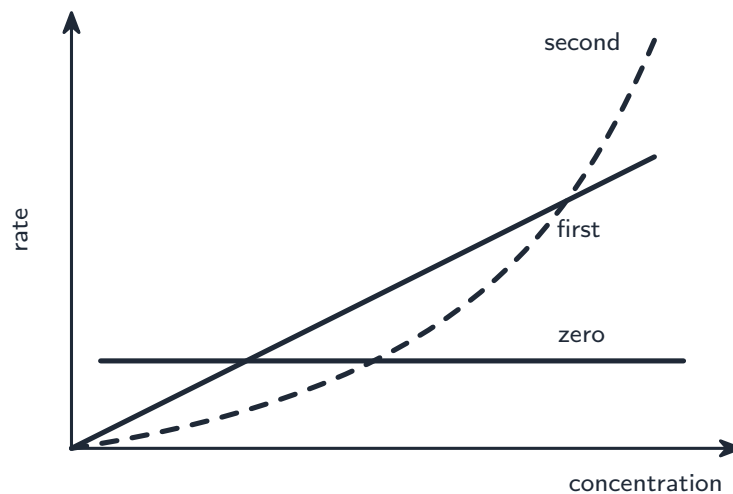
■ 1 Orders of reaction



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

Worked example. If $\text{rate} = k[\text{A}][\text{B}]^2$, 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

Try these in order.

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

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

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

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

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

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]
