EngineeringRise

Rate of reaction, rate law and order

Formulas and units, JEE Main. Status: Reviewed on 2026-11-20.

Result	Formula	Units or note
Rate of reaction	rate = -(1/a) d[A]/dt = (1/c) d[C]/dt (for aA giving cC) Valid when: constant volume; a, c are balanced-equation coefficients	mol L^-1 s^-1
Rate law	rate = k[A]^m[B]^n Valid when: exponents m, n found by experiment at fixed temperature	mol L^-1 s^-1
Overall order	order = m + n (experimental; may be 0 or a fraction) Valid when: m, n from experiment; equals molecularity only for elementary steps	dimensionless
Unit of k	(mol L^-1)^(1 - n) s^-1 Valid when: order n for a single reactant; concentrations in mol L^-1	zero: mol L^-1 s^-1; first: s^-1; second: L mol^-1 s^-1; third: L^2 mol^-2 s^-1
Order from two runs	order in A = ln(rate2 / rate1) / ln([A]2 / [A]1) Valid when: only [A] changes between the runs, temperature fixed	dimensionless
Volume change for gases	rate(new) = rate(old) x f^n when volume is divided by f, order n Valid when: gases, constant T; all concentrations scale by f, overall order n	mol L^-1 s^-1
Molecularity	number of species colliding in an elementary step: 1, 2 or rarely 3	dimensionless
Gas pressure units	k has units atm^(1 - n) s^-1 when pressures replace concentrations Valid when: rate measured in atm s^-1, pressures used as concentrations	atm^(1 - n) s^-1

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/chemistry/chemical-kinetics/rate-of-reaction-rate-law-and-order

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