Michaelis–Menten Kinetics: Rate and Constants from Two Points

Enzyme reaction rate from Vmax and Km at a substrate concentration, and Vmax and Km found from two measured rate points (Lineweaver–Burk line through them).

Method: Michaelis–Menten kinetics and the Lineweaver–Burk reciprocal plot (Doran, Bioprocess Engineering Principles, 2nd ed., ch. 11)

Input parameters

Unit system: SI

Parameter	Value	Unit
Maximum rate (any rate unit)	10.000	
Michaelis constant	2.0000	g/L
Substrate concentration	5.0000	g/L
Test 1 substrate	1.0000	g/L
Test 1 rate	3.3333	
Test 2 substrate	10.000	g/L
Test 2 rate	8.3333	

Calculated results

Parameter	Value	Unit
Rate at S	7.1429	
Fraction of maximum rate	71.429	%
V_max from the two tests	10.000	
K_m from the two tests	2.0000	g/L

Notes for this case

• The rate at S uses the V_max and K_m you entered; the fitted constants from the two tests are shown separately and are not used for it. Two points give an exact fit; with more data use a non-linear fit, since the Lineweaver–Burk plot weights low-concentration points heavily.

Formula and method

$$v = \frac{V_{max} S}{K_m + S}, \quad \frac{1}{v} = \frac{K_m}{V_{max}} \frac{1}{S} + \frac{1}{V_{max}}$$

Variables

V_{max}	Maximum rate (any rate unit)	-
K_m	Michaelis constant	kg/m³
S	Substrate concentration	kg/m³
S_1	Test 1 substrate	kg/m³
v_1	Test 1 rate	-
S_2	Test 2 substrate	kg/m³
v_2	Test 2 rate	-
v	Rate at S	-
v/V_{max}	Fraction of maximum rate	-
$V_{max,fit}$	V_max from the two tests	-
$K_{m,fit}$	K_m from the two tests	kg/m³

Method and standards

Michaelis–Menten.

Assumptions and limits

- Initial rates; no inhibition.
- The two halves are independent: the rate at S uses the entered V_max and K_m, not the constants fitted from the two tests.

References

• Michaelis–Menten kinetics and the Lineweaver–Burk reciprocal plot (Doran, Bioprocess Engineering Principles, 2nd ed., ch. 11)

Report details

Report reference	FCC-75KN-51R2 (the same inputs always give the same reference)
Generated	17 November 2026, 19:46 UTC
Calculator	Michaelis–Menten Kinetics: Rate and Constants from Two Points
Method last reviewed	13 November 2026
Software release	FireCAD Calc, release of 17 November 2026
Release checks	2 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

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