Specific Growth Rate and Doubling Time from Two Readings

Specific growth rate, doubling time and number of generations from biomass or optical density at two times, and the time to reach a target reading.

Method: Exponential growth law

Input parameters

Unit system: SI

Parameter	Value	Unit
First reading (biomass or OD)	0.20000	
Second reading	1.6000	
Time between readings	6.0000	h
Target reading	5.0000	

Calculated results

Parameter	Value	Unit
Specific growth rate	0.34657	1/h
Doubling time	2.0000	h
Generations between readings	3.0000	
Time from second reading to target	3.2877	h

Notes for this case

• μ = ln(X₂/X₁)/Δt, t_d = ln 2/μ. Valid for exponential growth only; take both readings in the straight part of a ln X against time plot. OD is proportional to biomass only in its linear range (dilute samples to OD < 0.5 or so).

Formula and method

$$\mu = \frac{\ln(X_2/X_1)}{\Delta t}, \quad t_d = \frac{\ln 2}{\mu}, \quad n = \log_2 \frac{X_2}{X_1}$$

Variables

X_1	First reading (biomass or OD)	-
X_2	Second reading	-
Δt	Time between readings	s
X_3	Target reading	-
μ	Specific growth rate	1/s
t_d	Doubling time	s
n	Generations between readings	-
t_3	Time from second reading to target	s

Method and standards

Growth rate.

Assumptions and limits

- Exponential growth between the readings.

References

Exponential growth law

Report details

Report reference	FCC-Z6ZM-199F (the same inputs always give the same reference)
Generated	23 November 2026, 17:51 UTC
Calculator	Specific Growth Rate and Doubling Time from Two Readings
Method last reviewed	17 November 2026
Software release	FireCAD Calc, release of 22 November 2026
Release checks	3 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

https://calc.firecad.com/chemical/bioprocess/growth-rate-doubling-time

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.