BOD Exerted over Time and Ultimate BOD (First Order)

Ultimate BOD from a BOD_5 value and rate constant, and the BOD exerted after any number of days, by first-order kinetics (base e).

Method: BOD_t = L_0(1 − e^(−kt)) (first-order BOD kinetics, Metcalf & Eddy)

Input parameters

Unit system: SI

Parameter	Value	Unit
BOD_5 (mg/L)	200.00	
Rate constant (base e)	0.23000	1/d
Time of interest	10.000	d

Calculated results

Parameter	Value	Unit
Ultimate BOD (mg/L)	292.67	
BOD exerted at t (mg/L)	263.33	
BOD_5 share of ultimate	68.336	%

Formula and method

$$BOD_t = L_0\left(1 - e^{-kt}\right), \quad L_0 = \frac{BOD_5}{1 - e^{-5k}}$$

Variables

BOD_5	BOD_5 (mg/L)	-
k	Rate constant (base e)	1/s
t	Time of interest	s
L_0	Ultimate BOD (mg/L)	-
BOD_t	BOD exerted at t (mg/L)	-
BOD_5/L_0	BOD_5 share of ultimate	-

Method and standards

First order.

Assumptions and limits

- Carbonaceous BOD only.
- BOD_5 is the 5-day test at 20 °C. Do not enter the Indian 3-day, 27 °C BOD (IS 3025) as BOD_5: its incubation time and rate constant differ.

References

- BOD_t = L_0(1 − e^(−kt)) (first-order BOD kinetics, Metcalf & Eddy)

Report details

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

This calculator online

https://calc.firecad.com/environmental/wastewater/bod-ultimate-kinetics

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.