Vapour Pressure and Boiling Point by the Antoine Equation

Vapour pressure of a liquid at a temperature, and its boiling point at a pressure, from Antoine constants in bar and K, mmHg and °C, or kPa and °C.

Method: C. Antoine (1888); NIST Chemistry WebBook Antoine parameters

Input parameters

Unit system: SI

Parameter	Value	Unit
Units of the constants	p in bar, T in K (NIST WebBook form)	
Antoine constant A Defaults: water, 255.9–373 K, NIST Chemistry WebBook (Stull, 1947).	4.6543	
Antoine constant B	1,435.3	
Antoine constant C	-64.848	
Temperature	50.000	°C
Pressure for the boiling point	1.0132	bar

Calculated results

Parameter	Value	Unit
Vapour pressure at T	0.12525	bar
Boiling point at p	100.45	°C

Notes for this case

- Antoine constants hold only over the temperature range they were fitted to; outside it the result can be far off.

Formula and method

$$\log_{10} p_v = A - \frac{B}{T + C}$$

$$T_b = \frac{B}{A - \log_{10} p} - C$$

Variables

units	Units of the constants	-
A	Antoine constant A	-
B	Antoine constant B	-
C	Antoine constant C	-
T	Temperature	K
p	Pressure for the boiling point	Pa
p_v	Vapour pressure at T	Pa
T_b	Boiling point at p	K

Method and standards

Antoine's three-constant fit of vapour pressure against temperature; the constants carry units, so the unit option sets how T and p enter.

Assumptions and limits

- Within the constants' temperature range. Even at the end of the range the inverted boiling point can be off: the water set gives 100.45 °C at 1 atm against 99.97 °C from IAPWS-IF97.
- A boiling point at or below absolute zero is not shown.

References

• C. Antoine (1888); NIST Chemistry WebBook Antoine parameters

Report details

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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/separation/antoine-vapour-pressure

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.