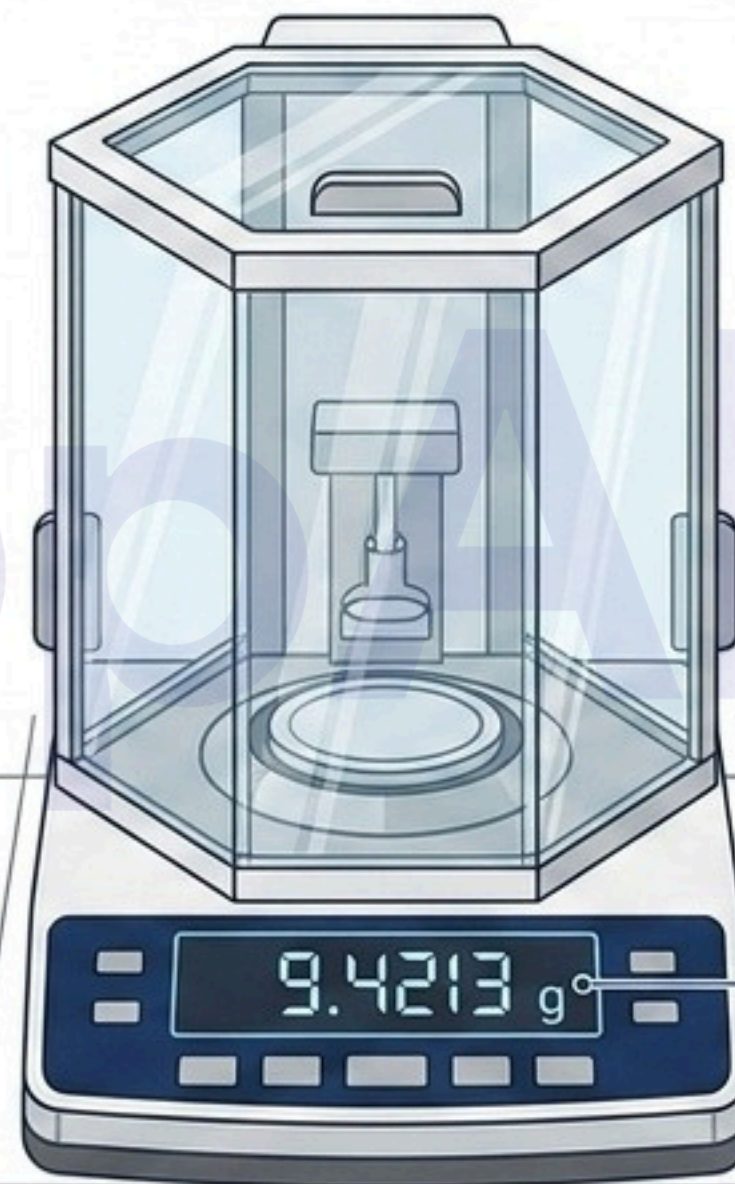


Significant Figures, Accuracy and Precision

The Precision Blueprint for JEE Chemistry



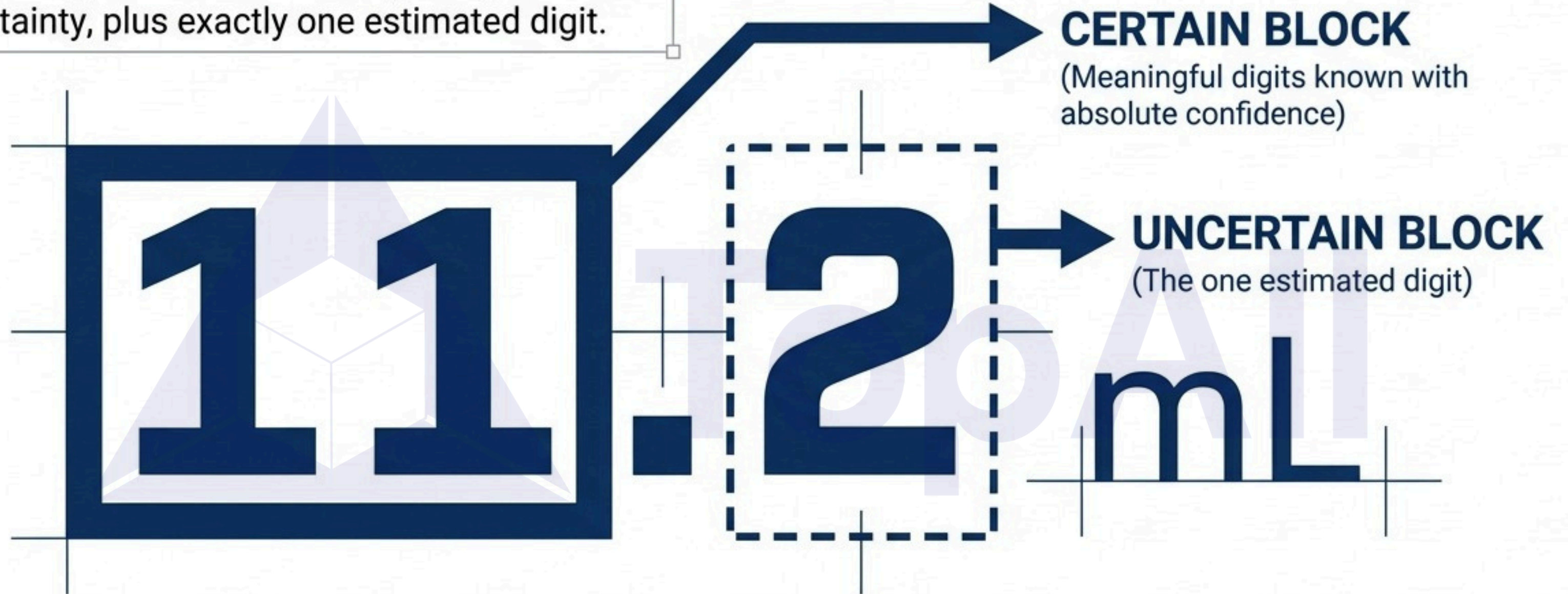
Uncertainty at 1 decimal place.



Uncertainty at 4 decimal places.

Defining Significant Figures

Significant figures are all meaningful digits known with certainty, plus exactly one estimated digit.



Sig Figs = Certainty + 1 Estimated Digit

Every experimental measurement has uncertainty based on the limitation of the measuring instrument. We only report what we can confidently measure.

Calibrating Quality: Precision vs. Accuracy

Target True Value = 2.00 g



Student A: 1.95 g, 1.93 g

HIGH PRECISION, LOW ACCURACY

(Measurements are close to each other,
but far from the true value)



Student B: 1.94 g, 2.05 g

LOW PRECISION, LOW ACCURACY

(Measurements are neither
consistent nor correct)



Student C: 2.01 g, 1.99 g

HIGH PRECISION, HIGH ACCURACY

(The JEE standard)



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The 5 Unbending Laws of Significant Figures



Digit Type	Rule	Example	Sig Fig Count
Non-Zero Digits	Always significant	285 cm	3
Leading Zeros	Never significant (just locators)	0.03	1
Trapped Zeros	Always significant	2.005	4
Trailing Zeros	Significant ONLY if there is a decimal point	0.200 g (Has decimal) vs 100 (No decimal)	3 vs 1
Exact Numbers	Infinite significant figures (counting objects)	2 balls	∞ (2.000000...)

The Math Paradox

JEE TRAP ALERT

WARNING: Addition/Subtraction logic differs ENTIRELY from Multiplication/Division logic.

Addition & Subtraction

Rule: Look at DECIMAL PLACES.

Action: Result cannot have more digits to the right of the decimal than the original number with the fewest.

Multiplication & Division

Rule: Look at total SIG FIG COUNT.

Action: Result must have no more significant figures than the measurement with the fewest significant figures.

$$2.5 \text{ (2 SF)} \times 1.25 \text{ (3 SF)} = 3.125$$

→ rounds to 3.1 (2 SF).

Mini Application: Test Your Mettle

$$\begin{array}{r} 12.11 \\ + 118.0 \\ + 1.012 \\ \hline 31.122 \end{array}$$

(2 decimal places)

THE LIMITING FACTOR

(3 decimal places)

Final Answer = 31.1

Rule Check: Because we added, we are restricted by the measurement with the least precision (18.0 has only 1 decimal place).

Revision Card: The Precision Blueprint



The Golden Rule:

We only report what we can meaningfully measure. Do not let calculators invent false precision.

Checklist for Exam Day:

- ☐ Does the number have a decimal? (Beware trailing zeros: 100 vs 100.0).
- ☐ Are you adding/subtracting? → Count Decimals.
- ☐ Are you multiplying/dividing? → Count Sig Figs.
- ☐ Is it an exact count (e.g., 20 eggs)? → Infinite precision.

Final Diagnostic:

Precise means tightly clustered. Accurate means hitting the bullseye.
They are not the same.



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