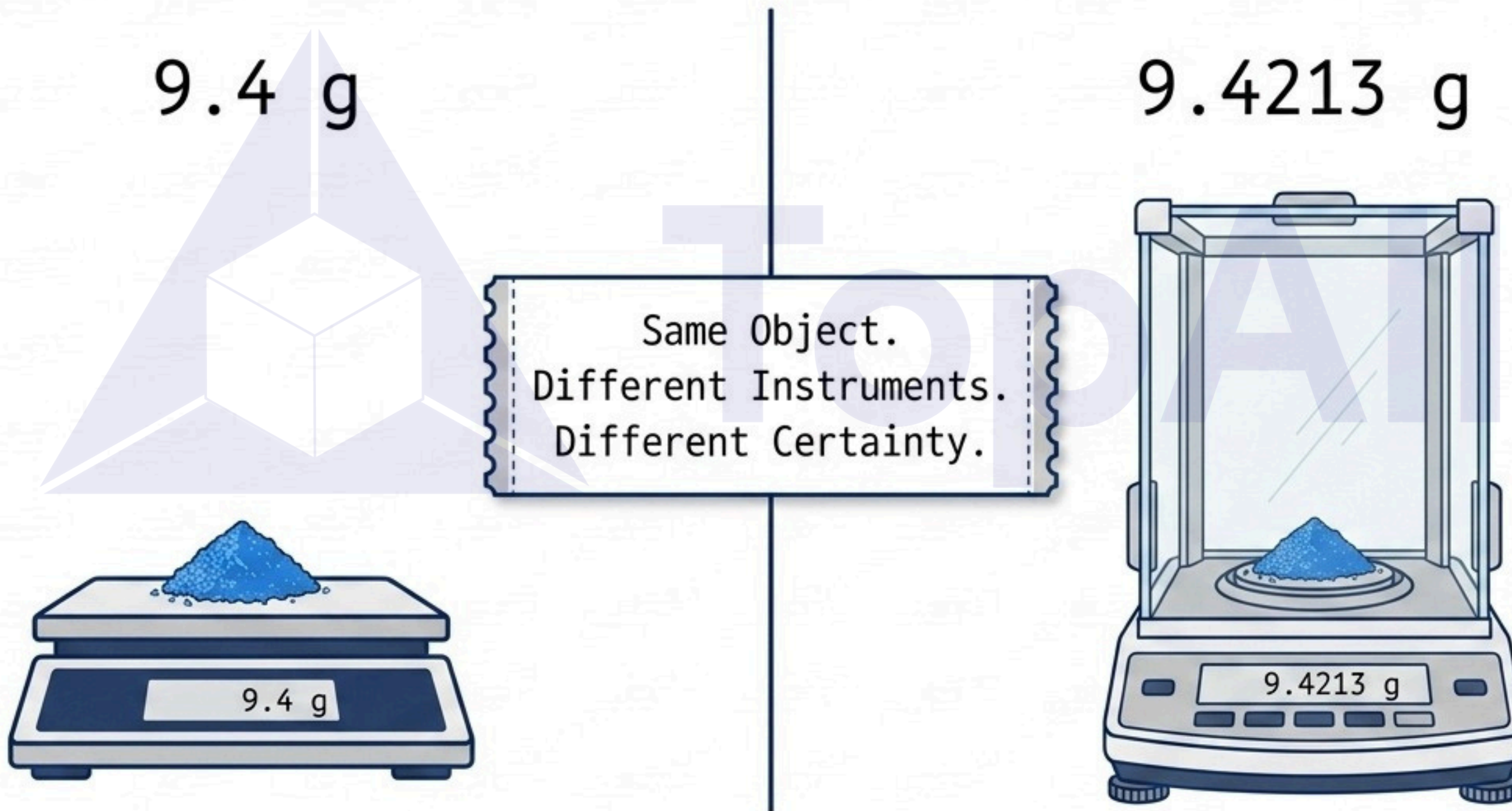


Uncertainty in Measurement

1.4 Some Basic Concepts of Chemistry | JEE Prep Module



What is Experimental Uncertainty?

Every measurement is an approximation.
Perfection in physical measurement is impossible.

Instrument Limitation



Smallest readable unit dictates limits.

Human Skill



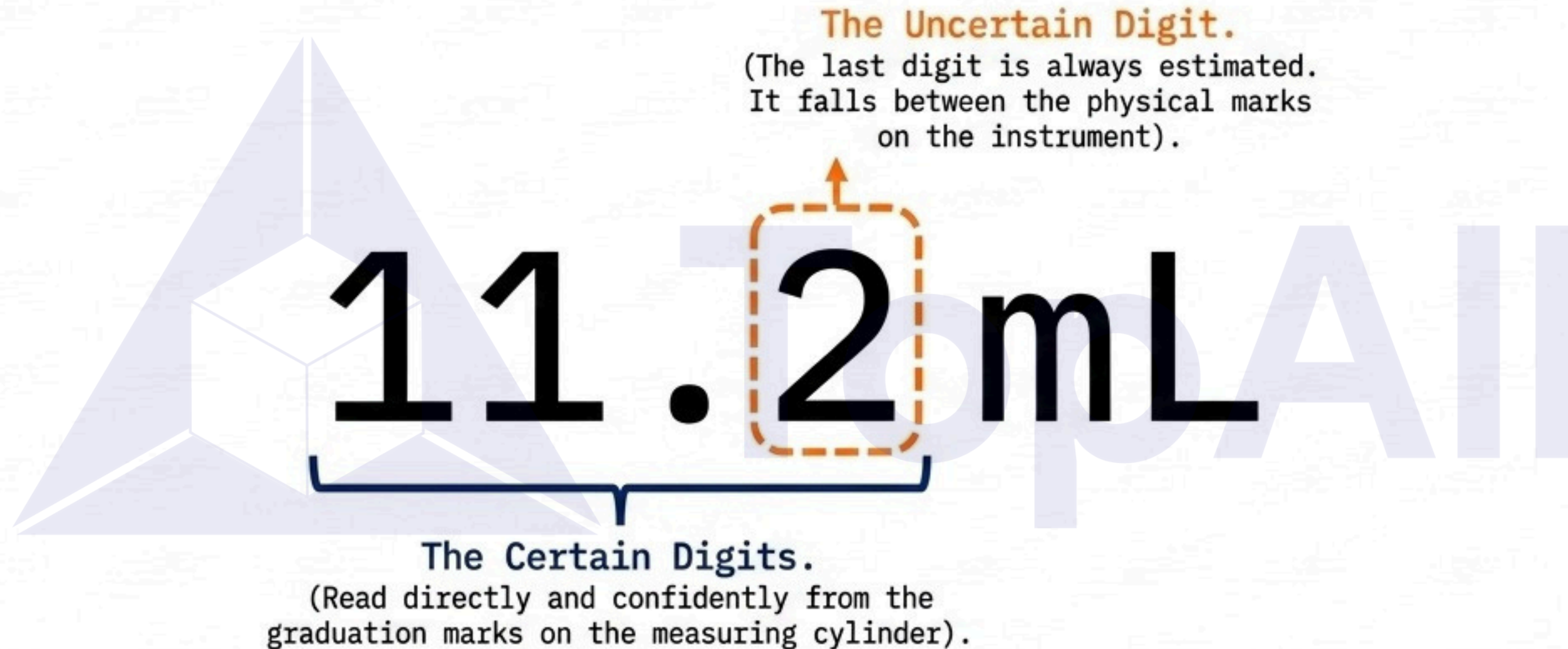
Parallax error, reaction time, physical technique.

The Measured Value: Always contains a margin of error

Measurement = Meaningful Digits (Known with Certainty) + 1 Estimated Digit (Uncertain)

The Anatomy of Significant Figures

Visualizing the boundary between certainty and uncertainty.



Rule Bank

Unless specified, default uncertainty = ± 1 in the last digit.
11.2 mL actually means: [11.1 mL $\leftrightarrow$ 11.3 mL]



You've Learned the Theory. Let's Test Them Now.

$$E=mc^2$$



Turn theory into marks with **unlimited MCQs, smart analysis, and focused revision.**

Practice Now



At prep.topall.app

Key Highlights

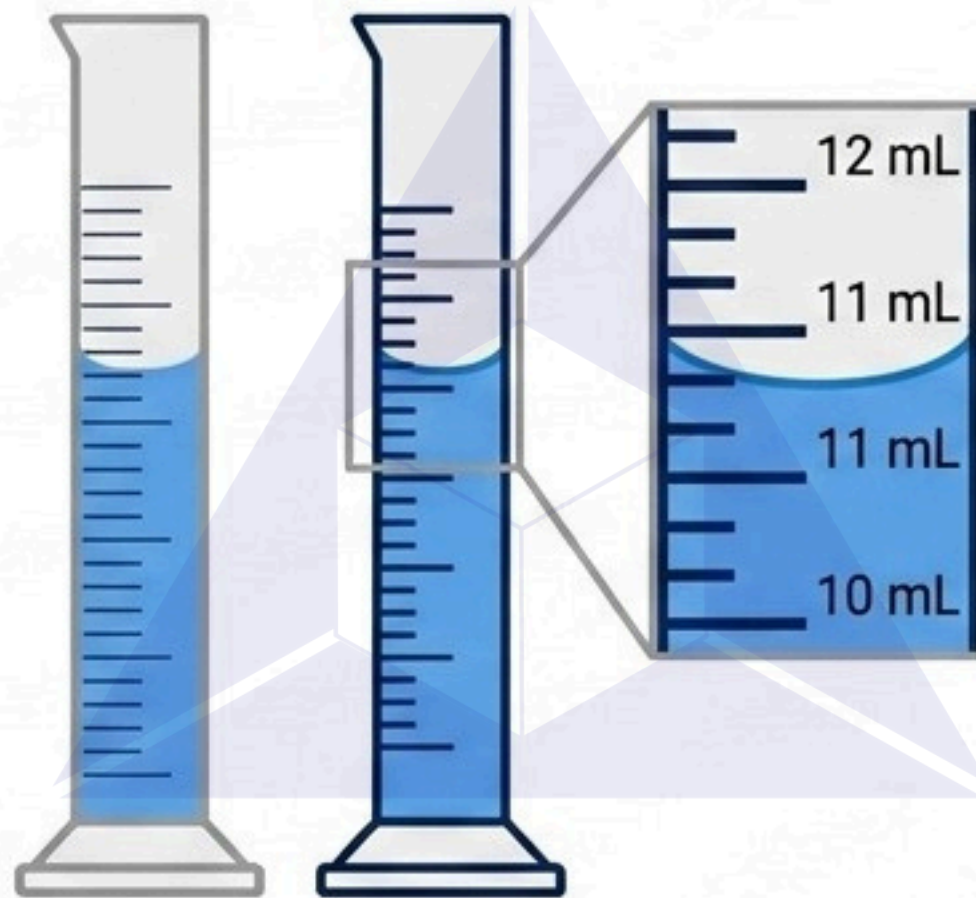
- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter



Instrument Limits Dictate Meaningful Reporting

You cannot claim precision your instrument didn't provide.

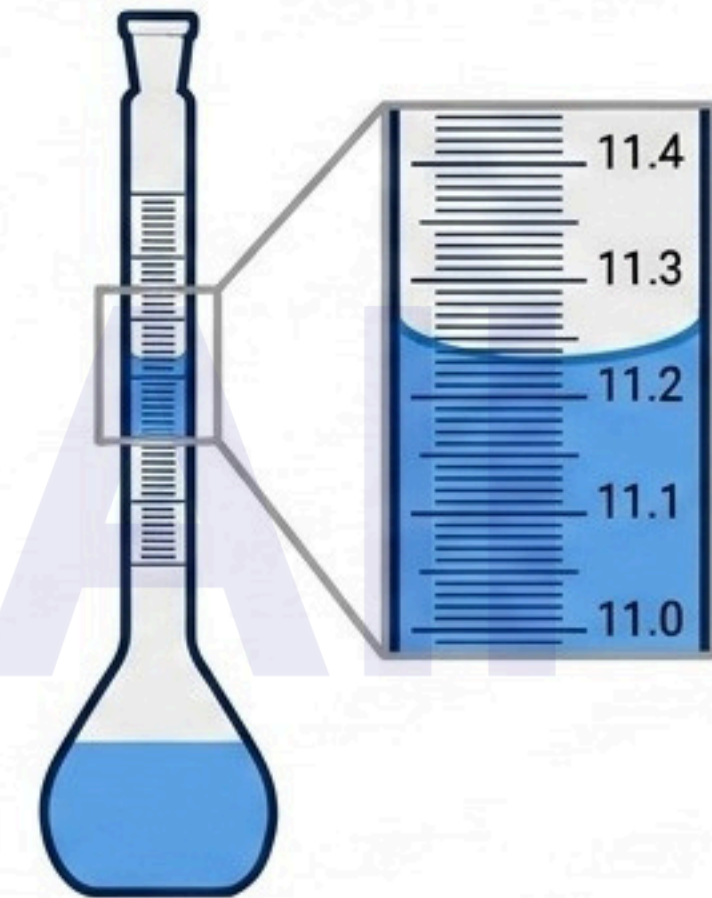
Panel A



Graduated Cylinder

Reported Value: 11.2 mL (3 Significant Figures)

Panel B



Volumetric Burette

Reported Value: 11.25 mL (4 Significant Figures)

RULE: The number of significant figures reported **MUST match the precision of the instrument** used. Adding arbitrary zeros (e.g., writing 11.200 mL for Panel A) is scientifically false. It implies a better instrument was used.

Math vs. Chemistry

A calculator does not understand experimental uncertainty.



JEE TRAP ALERT: The Calculator Mirage

The Trap: Assuming that because your calculator gives you 8 decimal places, your answer is more accurate.

The Reality: A mathematical operation cannot magically create physical precision that wasn't there in the raw data.

2.5 (two sig figs) $\times$ 1.25 (three sig figs)

~~3.12500000~~

Multiplication/Division Rule:

Result MUST be capped at the lowest number of significant figures from the original data.

Correct Answer = 3.1

(Two sig figs, matching the limitation of 2.5).

Mini Application

Choose the realistic reported value.

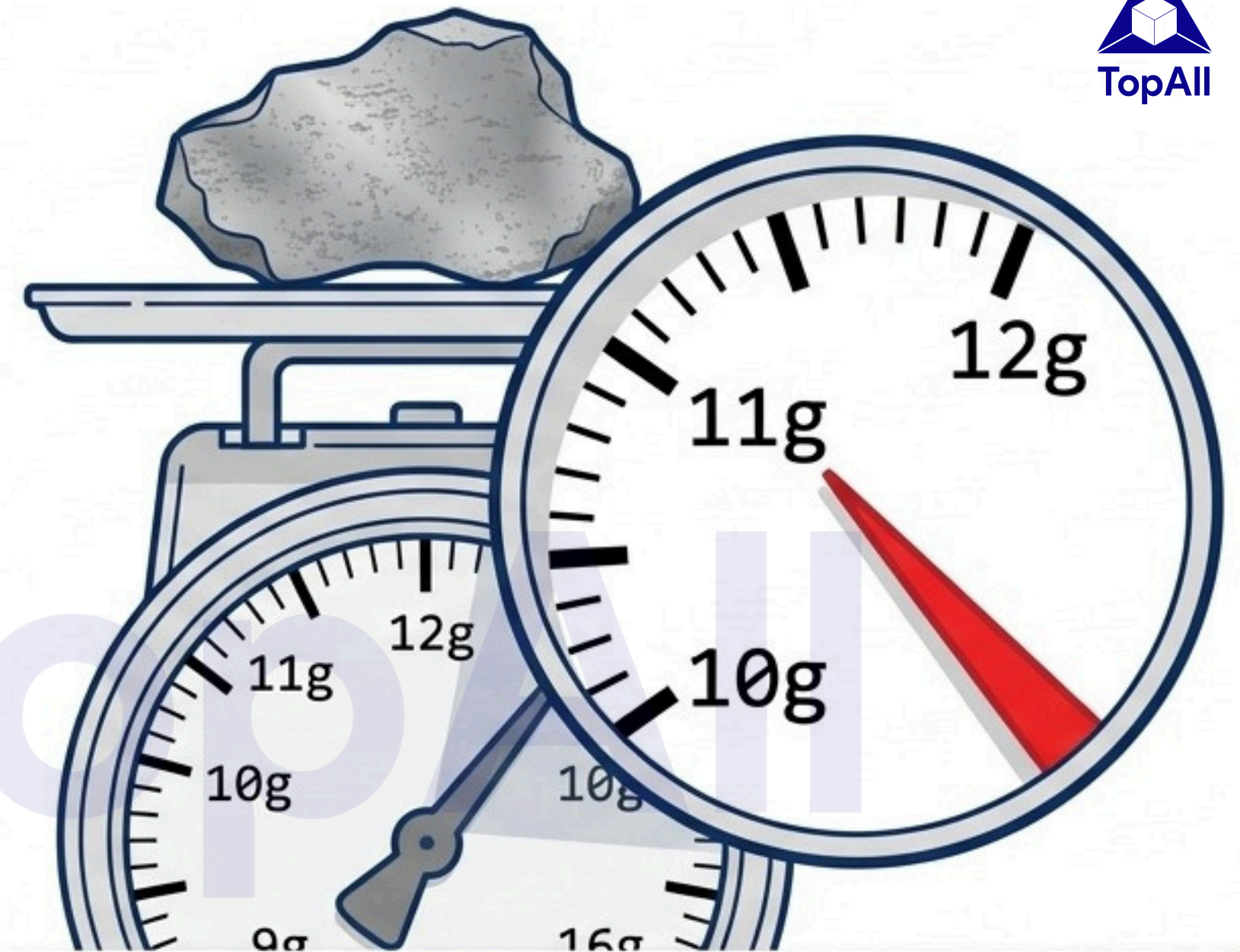
You are logging this measurement in your lab notebook. Which value do you write?

[A] 10 g

[B] 10.4 g

[C] 10.42 g

[D] 10.4213 g



Correct Answer: [B] 10.4 g

Why? 10 is certain (we clearly passed the 10 mark). We are allowed one estimated digit (.4). Writing 10.42 implies we have physical markings for tenths of a gram, which we don't!

Revision Summary

Consolidate your understanding of measurement uncertainty.



1. **Every Measurement has Uncertainty:** Perfection is a math concept, not a chemistry one. Limits arise from instruments and humans.
2. **Anatomy of a Value:** A reported measurement = All Certain Digits + ONE Uncertain Digit.
3. **The Instrument is Boss:** You can never report more significant figures than your measuring tool allows.
4. **Calculators Lie:** Do not copy all digits from a calculator screen. Apply significant figure rules to cap the precision.
5. **The ± 1 Rule:** Unless stated otherwise, the uncertainty is assumed to be ± 1 in the last reported digit.

Terminal Zeros Trap:

100 = 1 sig fig (Scientific: 1×10^2)

100.0 = 4 sig figs (Scientific: 1.000×10^2)



You've Learned the Theory.

Now Let's Test It.

Reading notes gets you knowledge.

Practicing MCQs gets you marks.

That's exactly what TopAll Pro is built for.

Try TopAll Pro Now

What TopAll Pro Does Differently

-  **Stuck? Snap it. Solve it. — Doubts AI**
Photo → step-by-step solution in seconds, 24/7
-  **Your AI Coach finds your blind spots**
Concept-level weakness detection — not just chapter-level
-  **4.5 Lakh+ questions. Never run out.**
13× more content than any other prep app in India
-  **Build your own test in 60 seconds**
Pick a chapter, set difficulty — AI does the rest instantly.
-  **AI Recommendation that helps you improve**
AI Recommendation Analysis your Tests and tell you where you need to improve.



Practice the moment you finish studying
Jump in while the concept is still fresh in your head

4.5L+
MCQs

1.5L+
Students

AI Powered
In-Depth Analysis