Measurement Uncertainty

→ Overview

Example : $g = 9.82174$ uncertainty 0.02547

#1 9.82174 ± 0.02847

#2 9.82 ± 0.028

#3 9.821 ± 0.0284

#4 9.8 ± 0.03

} all of these have some issues

rec: 9.82 ± 0.03 m/s²

⇒ I) Reporting & Using Uncertainty

I.1 measurement is reported as:

BEST ESTIMATE ± UNCERTAINTY (δx)

I.2 Significant Figures

Rule #1: δx typically rounded to 1 sig fig

Rule #2: Last sig fig in best estimate is same order @ δx

exceptions: 26.6 & $\delta x \sim 1$

I.3 MEASUREMENT

- quantifying a physical property (numerical)
- Interpolated or extrapolated quantity

- Process of determining a quantity of something compared to a known or accepted reference
  - A measurement is meant to be compared
    a statement that some entity is $x_{best} \pm \delta x$ is in itself uninteresting & by itself useless

e.g. Hypothesis testing: are measurements & predictions in agreement or not?

II Sources & types of Uncertainty

- range over which a true value lies, given specific confidence interval
- measure of confidence in the error

⟹ hard not to be circular in definitions ⟹ see slides for an attempt.