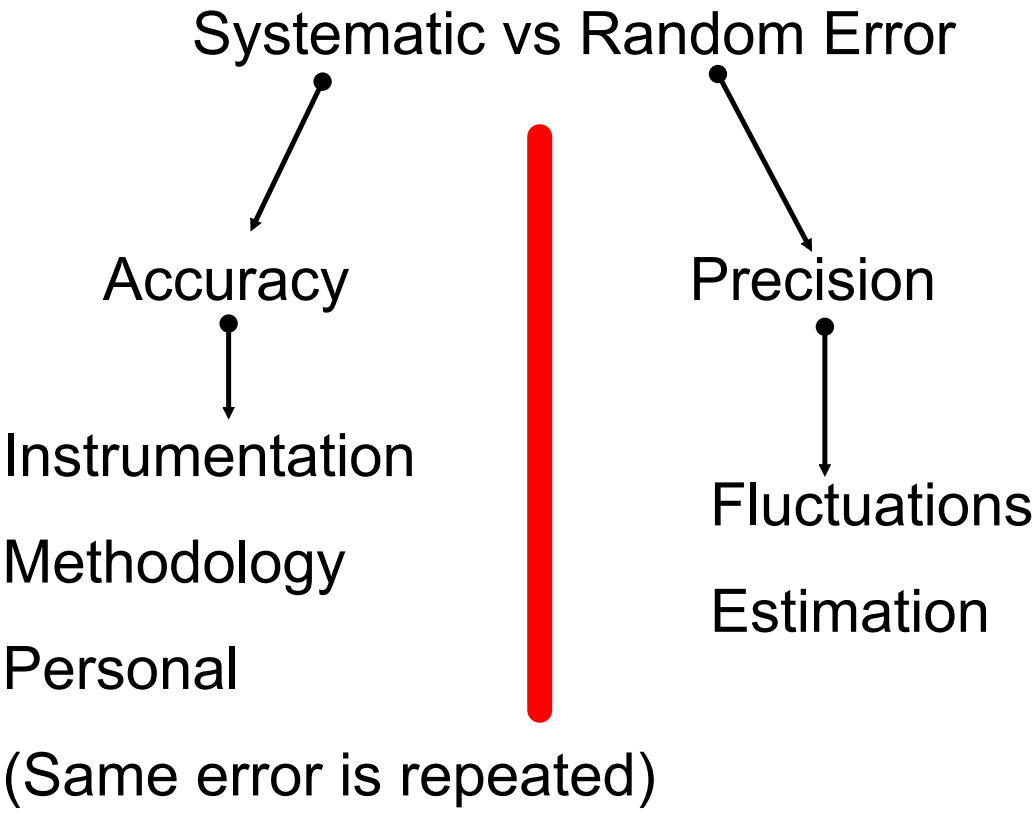
Systematic vs Random Error
Accuracy
Precision
Instrumentation
Methodology
Personal
(Same error is repeated)
Fluctuations
Estimation

Absolute vs Relative Uncertainty

Margin of uncertainty ΔA

$(A \pm \Delta A)$ $(1.30 \pm 0.01)g$

Relative size of uncertainty $\frac{\Delta A}{A} \times 100\%$

$0.01/1.3 \times 100 = 0.77\%$

Propagation of uncertainty

$(A \pm \Delta A)$

Initial titre = $(5.00 \pm 0.02)\,cm^3$

final titre = $(21.35 \pm 0.02)\,cm^3$

Volume delivered = $21.35 - 5 = 16.35\,cm^3$

(for adding & subtracting) $\sqrt{\Sigma \Delta A^2}$

Uncertainty = $\sqrt{0.02^2 + 0.02^2} = 0.03$

Report volume $(16.35 \pm 0.03)\,cm^3$

What is the concentration of a solution with 13.3 g dissolved in 2.0 dm^3 of solution

A ΔA

Mass = $(13.3 \pm 0.1)\,g$

Volume = $(2.0 \pm 0.1)\,dm^3$

$C = \frac{13.3\,g}{2.0\,dm^3} = 6.7\,\frac{g}{dm^3}$

For multiplying & dividing → relative uncertainty

$\sqrt{\left(\frac{0.1 \times 100}{13.3}\right)^2 + \left(\frac{0.01 \times 100}{2.0}\right)^2} \pm \sqrt{\sum \left(\frac{\Delta A}{A} \times 100\right)^2}$

$= 5\%$ to Absolute

$\frac{\%U \cdot Calc}{100\%} = \frac{5\% \times 6.7\,g\,dm^3}{100\%}$

$= \pm 0.3\,g\,dm^3$

$C = (6.7 \pm 0.3)\,g\,dm^{-3}$