

Chapter Two: Analyzing Data

Section Three: Uncertainty in Data

Accuracy: refers to how close a measured value is to an accepted value

Precision: refers to how close a series of measurements are to one another

- Also can refer to the unit used to measure data

Error: defined as the difference between an experimental value and an accepted value

- $\text{Error} = \text{experimental value} - \text{accepted value}$

Percent error: expresses error as a percentage of the accepted value

- $\text{Percent error} = \frac{|\text{error}|}{\text{accepted value}} \times 100$
- Error uses the absolute value because just the size of the error matters

Significant figures: includes all known digits plus one **estimated digit**

- Rules to determining significant figures
 - All digits that are non-zeros are considered significant
 - Ex. 3.95g has 3 significant digits
 - Zeros appearing between non-zero digits are significant
 - 40.7 L has 3 significant digits
 - Zeros appearing in front of all nonzero digits are not significant

- 0.095897 m has 5 significant digits
- Zeros at the end of a number and to the right of a decimal point are significant
 - 85.00 g has 4 significant digits
- Zeros at the end of a number but to the left of a decimal point may or may not be significant. If a zero has not been measured or estimated but is just a placeholder, it is not significant. A decimal point placed after zeros indicates that they are significant.
 - Ex. 2000 m has 1 significant digit
 - Ex. 2000. m has 4 significant digits

Addition or Subtraction with Significant Figures

- The answer must have the same number of digits to the right of the decimal point as there are in the measurement having the fewest digits to the right of the decimal point.
- Ex. $25.1 \text{ g} + 2.03 \text{ g} = 27.1 \text{ g}$

Multiplication and Division with Significant Figures

- The answer can have no more significant figures than are in the measurement with the fewest number of significant figures
- Ex. $D = m/V = 3.05 \text{ g} / 8.47 \text{ mL} = 0.360 \text{ g/mL}$

Conversion Factors and Significant Figures

- A conversion factor is considered to be exact, therefore the answer should not be rounded