

Scientific Measurement

Qualitative vs. Quantitative Measurements:

Qualitative measurement-

Quantitative measurement-

Accuracy vs. Precision:

Accuracy-

Precision-

Percent Error:

$$\% \text{ error} = \frac{|Theoretical - Experimental|}{Theoretical} \times 100$$

Significant Figures

Rules:

1. All non-zero numbers are significant
2. Leading zeros are never significant (EVEN IF THERE IS A DECIMAL)
3. Zeros at the end of a number are only significant if there is a decimal
4. Zero "sandwiches" are always significant
5. Numbers before the "x" in scientific notation are always significant

Rounding reminder: ≥ 5 : Round UP < 5 : Don't change

Ex: 201 _____ 3100 _____ 300 _____ 30. _____
 0.031 _____ 0.03021040 _____ 5.8×10^4 _____ 60080 _____

Exact numbers and conversions are not used in determining sig figs.

Adding and Subtracting:

Look BEHIND the decimal of all numbers involved. The one with the fewest digits behind the decimal determines how digits will be behind the decimal in the final answer.

$$4.01 + 6.8 + 127.318 =$$

Multiplying and Dividing:

Look at the ENTIRE of sig figs in each number involved. The one with the fewest sig figs TOTAL determines how many sig figs will be in the final answer.

$$120 \times 6.01 \times 0.020 =$$

Measurement in Lab:

In lab, when writing down your measurement, always go one digit past what is marked on the equipment you are using.

International System of Units: (SI Units)

This is what all scientists around the world report their data in.

Meter (m) – SI unit for length

Liter (L) – SI unit for volume

Gram (g) – SI unit for mass (it is actually kg, but for our purposes, we will focus on the g)

Temperature: A numerical measure of how hot and cold something is. (Average kinetic energy of a system)

Temperature Scales

Celsius

Sets the freezing point of water at 0°C and the boiling point at 100°C.

Kelvin

Absolute zero is set as the zero on the Kelvin scale. It is the temperature at which all motion theoretically ceases.

$$\text{Conversion: } K = 273 + ^\circ\text{C}$$