Metric Conversions and Scientific Notation
Essential Academic Skill Enhancement (EASE) workshop series

This workshop reviews the basics of conversions between measurement systems and proper scientific notation that is fundamental to accurate problem solving in STEM fields.

Science is often conducted in a number of different measurement systems depending on discipline or geographic region. In order to effectively communicate scientific findings, scientists often must convert between different systems of measurement using conversion factors. This workshop will give an overview of common conversion factors between the English and metric systems, and will go over the method behind accurate conversions in the biological sciences. Scientific notation is the way of writing and manipulating numbers that are too large or small to be written in the decimal form. We will discuss normalized notation or exponential notation (e.g., $ax10^b$) and how to use scientific notation effectively without losing precision, how to estimate ending digits in calculations, and *briefly discuss common bases (e.g., base 10 is normally used in scientific notation, can also use base 2).*

We will discuss:

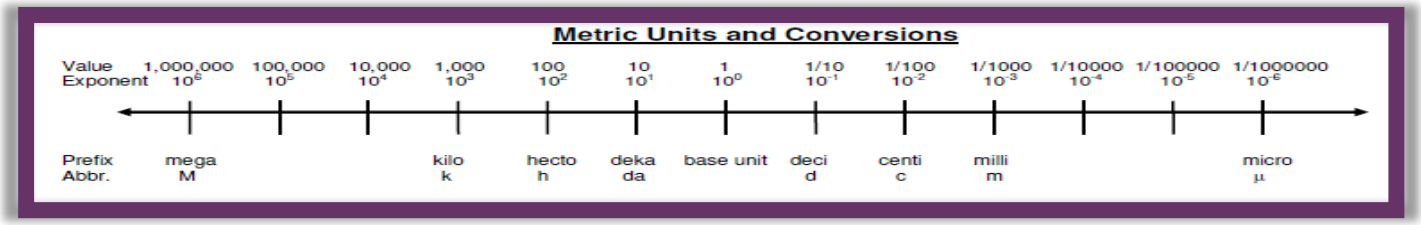
- fundamental units of the two measuring systems
- use of integers in scientific notation
- significant figures
- estimation of final digits
- precision, accuracy, and uncertainty

Conversions

VOLUME (APPROXIMATE)	VOLUME (APPROXIMATE)
1 teaspoon (tsp) = 5 milliliters (ml)	1 milliliter (ml) = 0.03 fluid ounce (fl oz)
1 tablespoon (tbsp) = 15 milliliters (ml)	1 liter (l) = 2.1 pints (pt)
1 fluid ounce (fl oz) = 30 milliliters (ml)	1 liter (l) = 1.06 quarts (qt)
1 cup (c) = 0.24 liter (l)	1 liter (l) = 0.26 gallon (gal)
1 pint (pt) = 0.47 liter (l)	
1 quart (qt) = 0.96 liter (l)	
1 gallon (gal) = 3.8 liters (l)	
1 cubic foot (cu ft, ft^3) = 0.03 cubic meter (m^3)	1 cubic meter (m^3) = 36 cubic feet (cu ft, ft^3)
1 cubic yard (cu yd, yd^3) = 0.76 cubic meter (m^3)	1 cubic meter (m^3) = 1.3 cubic yards (cu yd, yd^3)

Given value | wanted

given unit



Average Uncertainty

$$\frac{\sum_{i=1}^{n} |x_i - \bar{x}|}{n}$$

Range of Uncertainty

$$(x_{max} - x_{min})/2$$

Significant Figures, Uncertain digits, and Rounding

- x and ÷: based on least significant figures; Unless the result has 1 as its leading sig. fig. and none of the original #'s had a leading 1, keep the extra digit.
- + and -: Round based on only 1 uncertain figure
- x and ÷ AND + and -: After EACH operation, DO NOT round if the same, round if different
- Rounding exception: when the 1st digit dropped is 5 AND there are no (non-zero) digits following, round off to the nearest even digit.