Scientific Notation

Used to express a very large or very small number.
Move the decimal place to the right or to the left to produce a number between 1 and 10.
If you move the decimal to the right, your exponent will be negative.
If you move the decimal to the left, your exponent will be positive.
Adding and Subtracting numbers that are expressed in scientific notation require you to change the numbers so that they have the same exponents, you can do this by moving the decimal around a bit.
You can also just use your calculator to add or subtract these numbers.
Multiplying numbers in scientific notation requires you to multiply the first factors then add the exponents.
Dividing numbers in scientific notation requires you to divide the first factors then subtract the exponents.

Dimensional Analysis

Dimensional analysis is a problem solving method that uses conversion factors.
A conversion factor is a ratio of equivalent values. For example; 1000m/1km
In solving dimensional analysis problems you always set the value you want over the value you already have. (What you want over what you got!)
You will cancel units and multiply to achieve your final value.

Accuracy and Precision

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.
Percent error is the ratio of an error to an accepted value.
Percent error = error/accepted value x 100 and should be expressed as a percentage.
It is irrelevant if the experimental value is larger or smaller than the accepted value.

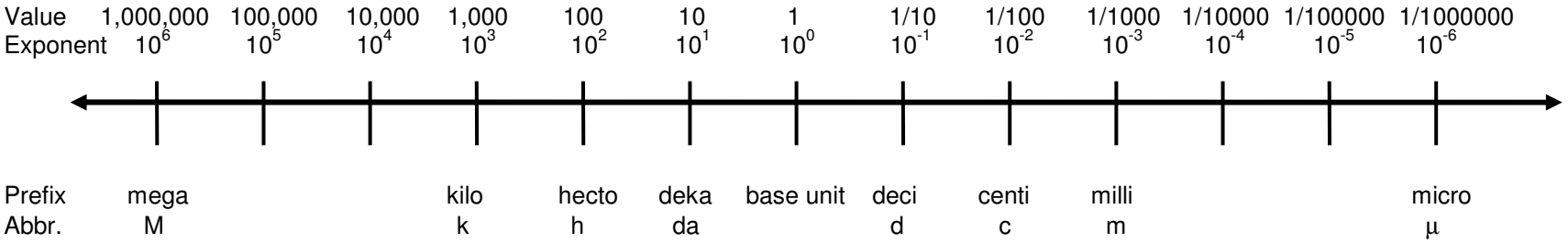
Significant Figures

Significant figures include all known digits plus one estimated digit.
Non-zero numbers are always significant.
Zeros between non-zero numbers are always significant.
All final zeros to the right of the decimal place are significant.
Zeros that act, as placeholders are not significant.
Counting numbers and defined constants have an infinite number of significant figures.

Rounding Numbers

If the remainder *beyond the last digit* to be reported is less than 5, drop the last digit.
Rounding to one decimal place, the number 5.3467 becomes 5.3.
If the remainder is greater than 5, increase the final digit by 1. The number 5.798 becomes 5.8 if rounding to 1 digit.
To prevent rounding bias, if the remainder is exactly 5, then round the last digit to the closest even number. Thus the number 3.55 (rounded to 1 digit) would be 3.6 (rounding up) and the number 6.450 would round to 6.4 (rounding down) *if rounding to 1 decimal*.

Metric Units and Conversions



Working with quantities that are not in Scientific Notation

1. Find the prefix with which you are beginning. If the unit has no prefix attached, you are beginning with the "base unit" at 10^0.
2. Find the prefix for the answer you are seeking. If the unit has no prefix attached, you are converting to the "base unit" at 10^0.
3. Count the number of places on the number line to get from where you are starting to where you are finishing.
4. Now, move the decimal in the number you are converting that same number of places, and in the same direction that you moved on the number line above (if you moved left three spaces, you move the decimal left three spaces to complete the conversion).

Example: Convert 0.035 decimeters (dm) to millimeters (mm)

Solution: The prefix "milli" is two places (two powers of ten) to the right of the prefix "deci." Move the decimal two places to the right.

Answer: 0.035 dm = 3.5 mm

Working with numbers that are in Scientific Notation

1. Find the prefix with which you are beginning. If the unit has no prefix attached, you are beginning with the "base unit" at 10^0.
2. Find the prefix for the answer you are seeking. If the unit has no prefix attached, you are converting to the "base unit" at 10^0.
3. Count the number of places on the number line to get from where you are starting to where you are finishing.
4. If you moved to the right on the line, add the number of spaces to the exponent on 10.
5. If you moved to the left, subtract the number of spaces from the exponent on 10.

Example: Convert 1.35×10^2 centigrams (cg) to kilograms (kg)

Solution: The prefix "kilo" is five places (five powers of ten) to the left of the prefix "centi." Subtract five from the exponent.

Answer: 1.35×10^2 centigrams = $1.35 \times 10^{2-5}$ kilograms = 1.35×10^{-3} kg