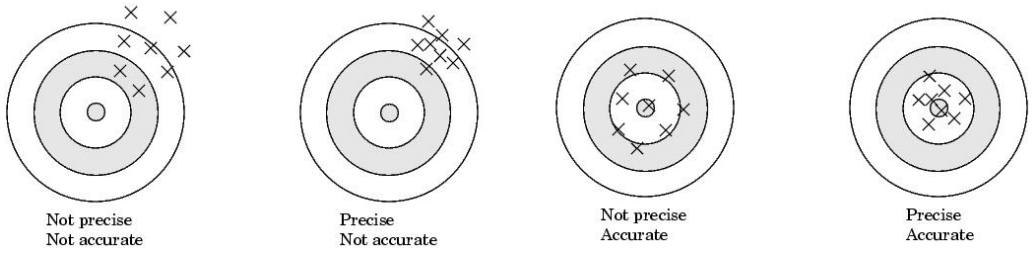
CHE 101 - Chapter 3 - Study Guide

Terms: Mass, Weight

1. Precision, Accuracy, and Uncertainty
    a. Precision: How reproducible the measurement is
    b. Accuracy: How close to the true value the measurement is



    c. Uncertainty: The estimated digit in any measurement. (Figure 2.1)

2. Identify the number of Significant Figures (SF) in measurements.
    a. All non-zero numbers are significant figures. Ex: 1.23 = 3 SF, 123.4 = 4 SF
    b. Zero is Significant when:
        i. Between non-zero numbers. Ex: 101 = 3 SF, 10101 = 5 SF, 1.01 = 3 SF
        ii. At the <u>end</u> of a number that includes a <u>decimal point</u>. Ex: 1.0 = 2 SF, 1.230 = 4 SF
    c. Zero is **not** Significant when:
        i. Before the first non-zero digit. Ex: 0.012 = 2 SF, 0.0034 = 2 SF
        ii. At the end of a number <u>without</u> a <u>decimal point</u>. Ex: 200 = 1 SF, 120 = 2 SF
    d. Exact Numbers
        i. Anything you count. Ex: 10 people, 12 ball, 549 ants
        ii. Conversion factors
        iii. Metric = Infinite number of SF
        iv. English ←→ Metric: Assume infinite for purposes of this class.

3. Rules for Rounding: If the last number before the Significant Figure you want to keep is:
    a. 0-4 Leave the last Significant Figure alone and drop the non-SF's.
    b. 5-9 Increment the last Significant figure by one and drop the non-SF's.

4. Scientific Notation: Convert measurements from decimal to SN format and from SN format to decimals, including proper number of SF's and rounding. Numbers written in proper SN have the form:

$N \times 10^n$ where
N = number $1 < N < 10$
n = number of decimal points moved
(left/big numbers = +, right/small numbers = -)

Ex: 56.789 written in SN with 3 SF = 5.68×10^1.

5. Significant Figures in Calculations:
    a. Multiplication/Division: Same number of SF as measurement with the least number of SF.
    Ex: (1.2)(1.234) = 1.5 (2 SF), (1.234)/(1.2) = 1.0 (2 SF)

    b. Addition/Subtraction: Same number of decimal places as the value with the fewest decimal places (or the least precise value).
    Ex: 1.1 1.0056
    +1.123 -0.03
    2.323 2.3 (1 decimal place) 0.9756 = 0.98 (2 decimal places)

6. Metric System: (Table 2.1 and 2.2) - Standard SI Units:
    a. Length = Meter (m)
    b. Mass = Kilogram (kg)
    c. Volume = Liter (L)
    d. Temperature = Kelvin (K)
    e. Time = Seconds (s)

7. Conversions: You should be proficient in converting between metric units (Table 2.1) and English units (conversions generally given). Remember to show **all** work and to use the proper number of SF and to include the units in your answers.
    a. English ←→ Metric
    b. Metric → Metric (Use of Table 2.1)
    c. Powers (Remember to raise the number **and** the unit both for the conversion factor only).
    d. 2 Conversion – Problems that involve converting two separate units at the same time, for instance mi/hr → cm/sec
    e. Constructed beginnings – Problems that involve creating the initial values, for instance calculating volume. Write your starting and ending points and perform the conversion.
    f. Word Problems
    g. Density
    h. Specific Heat

8. Temperature: Be familiar with the three temperature scales (°C, °F, K) and converting between them. Know the value for the freezing point and boiling point of water in each scale. Remember for significant figures, use the same number as in the initial temperature measurement.

9. Density: Master the equation (D = M/V) and be able to solve problems using the equation including converting mass to volume and calculating the density of compounds. You should memorize the density of water which is 1.000 g/mL at normal temperatures.

10. Heat vs. Temperature
    a. Heat = Measure of the amount of energy in an object (Unit = Joules or calories) - Extrinsic
    b. Temperature = Measure of the intensity of energy in an object (Unit = ºC, ºF, or K) – Intrinsic
    c.
11. Problems involving heat transfer.
    a. Heat = mass × specific heat × change in temperature
    b. $q=ms\Delta t$
    c. Units!
    d. 4.184 J = 1 cal
    e. Specific heat of water (4.184 J/g °C = 1.00 cal/g °C).
    f. Be able to solve problems involving heat like those assigned as homework. Do not memorize the specific heat of any compounds other than water.
    g. Lab questions