Chapter 2 Homework pages 62 – 65 – **Set 1**:64 - 68; **Set 2**: 78b, 78e, 79c, 79f, 80a, 80f, (in class 81-84);   **Set 3** : 91a, 91f, 92b, 92d, 93c, 94b; **Set 4**: 98, 104, 105, 112, 120; **Set 5** : 122, 128, 129, 130.

I. Measurement
    A. A unit of measurement is a _____ of defined size containing a number and _____
    B. When we measure something we are comparing an objects _____to a _____, which is an object(s) or natural phenomena of constant values, easy to preserve and reproduce and practical in size
    C. The accepted measurement system is the ____measurement (Le System International d'Unites)
    D. SI _____units - defined by a physical standard of measurement (overhead)

Physical (Fundamental) Quantity	Unit Name and Symbol
	kilogram , kg
length	
	second , s
amount , quantity	
	kelvin , K (non SI unit - Celsius, C^0
electric current	
	candela , cd

    E. SI derived units - obtained by combinations of fundamental unit (overhead)

Physical (Derived) Quantity	Unit Name and Symbol	Non SI units used
area $(l \, x \, w)$		
	cubic meter , m^3	liter , L
density *(mass per volume)*		grams per milliliter , g / mL
	kilograms per mole , kg / mol	grams per mole , g / mole
concentration(molarity)		
	newton , N (kg m / s^2)	
pressure *(force per area)*		atmosphere,atm or millimeters of mercury, mmHg
	joule , J	calories , cal
power		
	volt , V	
frequency		
	coulomb , C	

    F. _____measurements - deal with actual numbers of measurements
    G. _____measurements - deal with descriptive measurements
    H. Metric system
        1. Developed in _____in 1790

2. All units are _____
3. Length measured in _____
4. Volume measured in _____- a box that is 1 dm x 1 dm x 1 dm
5. Mass measured in _____ comes from a cubic centimeter box (1 cm x 1 cm x 1 cm) filled with water at 4^0C is designated as 1 gram thus the density of water is $1 \text{ g} / \text{cm}^3$ ($1 \text{ cm}^3 = 1 \text{ mL}$)
6. Based on 10 the hardest part is learning the prefixes (overhead)

Prefix	Symbol	Power of 10 (10^x)
	T	10^{12}
giga -		10^9
mega -	M	
kilo -		10^3
	h	10^2
deka -		10^1
		10^0
deci -	d	
centi -		10^{-2}
	m	10^{-3}
micro -		10^{-6}
nano -	n	
pico -		10^{-12}
	f	10^{-15}
atto -	a	

II. Uncertainty in measurement
  1. The measurement of any physical quantity is subject to some uncertainty
  2. _____denotes the nearness of a measurement to the accepted value
     a. Absolute error = observed value - accepted value
     b. % error = (absolute error / accepted value) x 100
  3. _____is the agreement between the numerical values of a set of measurements that have been made the same way. Also the ability to reproduce a measurement. Precision conveys nothing about accuracy!
     a. It is possible to have good precision yet poor accuracy; poor precision and poor accuracy; and good precision and good accuracy. Example of shooting at a bull's eye
     b. Absolute deviation = observed value - arithmetic mean
     c. Used for precision measurements of instruments; given as $\pm$ values
  4. _____figures are all the numbers in a measurement that are certain plus one that is estimated
     a. All non zero numbers are significant
     b. All zeros between two non zero numbers are sig..
     c. Zeros at the end of a number and to the right of a decimal are sig..
     d. In numbers < 1, zeros to the right of a decimal that are to the left of the first nonzero digit are never sig. figs. They are place holders.

e. Zeros at the end of a number but to the left of a decimal may or may not be sig.. If such a zero has been measured or is the first estimated digit, it is sig. and decimal is placed to right. On the other hand, if the zero has not been measured or estimated but is just a place holder, it is not sig..

f. It is easier to determine the number of sig. figs when the measurement is in scientific notation

   (1) the only rule for scientific notation is that there must be only one non zero number to left of the decimal and there must be a power of ten accompanying the measurement. Ex. 3.45×10^{12}

   (2) to determine the proper number of sig. figs when multiplying or dividing the measurement with the least number of sig. figs is boss

g. If all this is confusing, use the _____ – _____ rule.

   If the decimal point is _____ – start counting significant figures from the Atlantic side (right) side of the measurement, traveling left. The first non-zero number is significant and every digit passed that digit is also significant. 60500 m has 3 significant figures – the 5, 0, and 6.

   If the decimal is _____ – start counting significant figures from the Pacific side (left) of the measurement traveling right. The first non-zero digit is significant and every digit following that digit is also significant. 0.00605 m has 3 significant figures – the 6, 0, and 5.

5. Rounding rules

a. If the digit immediately to the right of the last sig. fig. you want to retain is > 5 then round up.

b. If the digit immediately to the right of the last sig. fig. you want to retain is < 5 then round down (doesn't change)

c. If the digit immediately to the right of the last sig. fig. you want to retain is 5 followed by a nonzero digit then round up

d. If the digit immediately to the right of the last sig. fig. you want to retain is 5 not followed by nonzero digit and preceded by an odd digit then round up

e. If the digit immediately to the right of the last sig. fig. you want to retain is 5 not followed by nonzero digit and preceded by an even digit then round down (doesn't change)

J. Measuring heat and temperature

1. _____ is the energy that is transferred between two systems, associated with a difference in temperature. Heat is transferred from _____ heat content to _____ heat content. There is no such thing as _____ just less heat

a. As heat is transferred to a material the temperature _____ and vice versa. Only true if neither heat transfer process is accompanied by a _____, measured in calories or joules

b. Measured in _____ or _____

c. A _____ is the quantity of heat required to raise the temperature of _____ of water _____. A kilocalorie or Calorie

(food) is the quantity of _____required to raise the temperature
of _____of water _____
d. A joule is related to a calorie as follows _____
2. Temperature is the measure of a systems ability to _____heat to or
_____heat from other systems. Also the measure of the average
_____ _____of the particles in a substance
   a. Determines the _____of heat transfer
   b. Measured as _____ _____
   c. Heat flows from _____heat intensity to _____heat
      intensity
   d. Measured in _____. A _____is an
      _____unit that was internationally agreed on
   e. _____scale was developed by a Swedish astronomer
      _____ _____
      (1) he established two fixed points 1 - freezing point of _____to
          be 0^0 and 2 - boiling point of _____to be 100^0
      (2) he marked these points on a blank thermometer and divided the
          thermometer into 100 equal parts (_____)
      (3) he then measured the distance between two degrees and extended his
          scale above and below his two fixed points
   f. The absolute scale for the SI is the _____scale. At 0 Kelvin all
      motion theoretically stops. (no degree just Kelvin)
      (1) _____= 273 K
3. _____ heat and heat _____
   a. Heat _____is the quantity of heat required to change an objects
      temperature by exactly $1C^0$. Depends partly on mass present
   b. _____heat _____or _____heat is more
      useful. It is the amount of heat required to raise the temperature of
      _____ of a substance _____
   c. Measured in cal/g C^0 or J/g C^0
   d. Water's specific heat $(C_p) = 1$ cal/g $C^0 = 4.18$ J/g C^0