Chapter 1A

- Scientific Method
- Metric System & SI Units
- Precision and Accuracy
- Significant Figures
- Scientific Notation
- Hydrologic Cycle
- States of Matter and Phase Changes

Scientific Method

The scientific method is a procedure that is designed to solve a problem. The typical problem solving method is...

1) Define the problem - make observations and decide what needs to be solved.
2) Hypothesis - Form an "educated guess" as to how to solve the problem.
3) Experiment - Design and conduct a procedure on how to test hypothesis.
4) Observations - Anything that you notice about experimental results.

Scientific Method

5) Data Collecting - Results are documented.
6) Conclusion - Decision on whether hypothesis is good or bad.

Theory - explanation of a result that is based on many observations and experiments. A theory can be proven incorrect.

Law - a "rule of nature", or something in nature that is always true or present.

Metric System & SI Units

The SI units are somewhat different from what you are used to. They are as follows:

Measurement	Base
Length	meter
Mass	gram
Time	second
Temperature	Kelvin
Volume	liter
Memory	bytes

The metric system is used to increase or decrease the size of these base units. The metric system is a base 10 system, where prefixes change the base unit by a factor of 10.

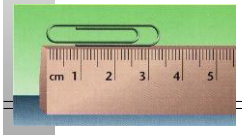
Changing American to Metric

Occasionally you will need to change American to Metric units and vice versa.

Changing from one unit to another:

1) Write down what you start with.
2) Set -up a conversion factor
3) In conversion factor, place unit you want in the numerator
4) Place unit you have in denominator
5) Fill in conversion factor numbers (place numbers so they're equal)
6) Multiply/Divide out, canceling out units as you go.

Uncertainty in Measurements



- All measurement instruments have a certain degree of uncertainty in them. When you take measurements, you will need to estimate one digit beyond the lowest mark on the measuring device. All measurements have one estimated number
- Sometimes, in addition, numbers are written like this:

  31.7 ± 0.1

Significant Figures

- When writing numbers, some zeros are not significant, and are used simply as place holders, to make the number smaller or bigger.

Rules for Significance:

1) All non-zero numbers are significant
2) Any zero between non-zero numbers is significant
3) Any zeros preceding a non-zero number are not significant
4) Zeros following a non-zero number are significant only when a decimal is present

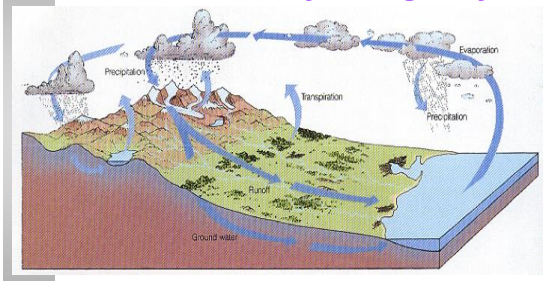
Scientific Notation

- When we attempt to write very large and very small numbers, it becomes difficult to write out all the zeros present.
- By using scientific notation we can omit the zeros before or after the significant numbers by multiplying by a power of 10.
- PROCESS
  - write the first significant number, followed by a decimal point, then the rest of the sig figs. Then, multiply by the appropriate power of ten.

Functions w/ Sig Figs

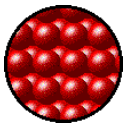
- When adding and subtracting with sig figs, the answer is expressed according to the least exact factor
  - expressed same # of number places as factor farthest to the left
- When multiplying & dividing, answer is expressed with same # of sig figs as factor with least sig figs

Hydrologic Cycle



States of Matter

1) Solid - high density
   - non-compressible
   - has definite shape

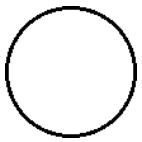


2) Liquid - high density
   - non-compressible
   - takes shape of container

States of Matter

3) Gas- low density
- compressible
- expands to fill container

4) Plasma - low density
- compressible
- expands to fill container
- exists only at high temp.



Phase Changes

Solid to Liquid ---> Melting
Liquid to Solid ---> Freezing
Liquid to Gas ---> Vaporization
Gas to Liquid ---> Condensation
Solid to Gas ---> Sublimation
Gas to Solid ---> Deposition

Water Uses and Amounts

Activity	Liters	Activity	Liters
Bathing (per bath)	130	Watering Lawn (per hr)	1130
Showering (per min)		Washing Clothes (per load)	170
Regular showerhead	19		
Efficient showerhead	9		
Flushing Toilet		Washing Dishes	
Conventional	19	By hand (w/water running)	114
"Water Saver"	13	By machine (full cycle)	61
"Low Flow	6	By machine (short cycle)	26
Cooking and Drinking		Running Water in Sink (per min)	9
Per 10 cups of water	2		
Washing car (running hose)	680		