Physical Science

Chapters 1&2

Study of matter and energy

- **Matter - is anything that has mass and takes up space**
- **Energy - is the ability to do work**
  - **Kinetic**
  - **Potential**
- **Physical Science - is the study of the interactions between energy & matter**

Laboratory Safety

- **No horseplay**
- **Treat all chemicals as dangerous**
- **Only perform experiments that the teacher gives permission**
- **Electricity can be dangerous**
- **If you don't know what something in the lab is ask the teacher**

Science method

- Define the problem
- Suggest an answer (Hypothesis)
- Test the hypothesis
  - Experiment
    - A good experiment has a control and a variable
      - The control is the unchanging part of the experiment
      - The variable is the part of an experiment that is being tested
    - Gather data (record measurements and other observations)
    - Analyze data
- Make a conclusion based of experimental data
- Report Results

Science is about thinking critically

- **Critical thinking is a process that uses certain skills to solve a problem**
  - **What is the problem**
  - **Look to see there is repeating patterns**
  - **Plan a strategy to solve the problem**
    - **Develop a model if needed to help solve problem**
    - **Break problem down into smaller pieces**
  - **Experiment to see if the solution works**
- **Use of the scientific method (Read page 20 & 21)**

Theories & Scientific Law

- **A theory is an explanation based on many observations supported by experimental results.**
- **Scientific Law is a rule of nature that sums up related observations and experimental results to describe a pattern in nature.**

Difference between pure and applied science

- **Pure science- the original study of why and how something in nature works**
  - **Pure science gathers information of relationships or facts together for practical use**
- **Applied science takes pure science discoveries and put them together to make related products & inventions**
  - **Technology is the practical applied science use of information and facts**
  - **Example would be science discovering how the eye works, technology would be using that information to make a camera**

Science is Everywhere!

Measurement & SI System

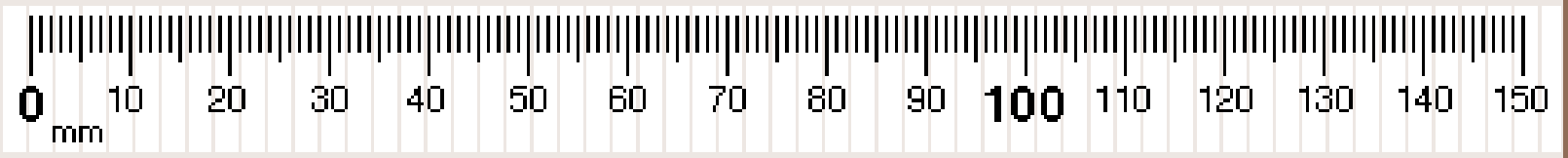
SI Measurement		
Quantity Measured	Unit	Symbol
Length	Meter	m
Mass	Kilogram	kg
Time	Second	s
Electric current	Ampere	A
Temperature	Kelvin	K
Amount of Substance	Mole	mol
Intensity of light	Candela	cd

- The SI System is based mainly on the metric system.
- Reasons to use the metric system
  - Based on 10 and multiples of 10
  - The Old English system is not based on any certain number or pattern

- The metric system has basic terms that are used each measurement
  - All length use the meter
  - All masses use the gram
  - Volume uses the Liter, or cubed length

- The metric system has six prefixes to these units that describe how much of or how many of the unit there is.
  1. milli – 1/1000 or 0.001
  2. centi – 1/100 or 0.01
  3. deci – 1/10 or 0.1
  4. deka – 10
  5. hecto – 100
  6. kilo – 1000

To do metric conversions all you do is multiply or divide by 10, or move the decimal point.



Metric Conversion Table

kilo	hecto	deka	unit	deci	centi	milli
1000	100	10	1	0.1	0.01	0.001

Move the decimal point the same direction as you count across the line. The unit is the gram, meter, or liter.

Abbreviations

Meter **– m,** ***Liter*** **– L,** ***Gram*** **– g,** ***Kilo*** **– k,** ***Hecto*** **– h,** ***Deka*** **– da,** ***Deci*** **– d,** ***Centi*** **– c,** ***Milli*** **– m**

Kelvin Temperature Scale

Kelvin	Celsius	Fahrenheit
0	-273	-459
273	0	32
373	100	212
293	20	70

Conversions

Precision vs Accuracy

- **Precision - exactness of measurement that is limited by the smallest unit or division on the scale**
- **Accuracy is how close the measurement is to the actual value**

Example 1:

- How old are you?
  - I am 16 years old
  - I am 15 years and 8 months old
  - I am 15years, 8 months, and 5 days old
  - I am 15 years, 8 months, 5 days, and 10 hours old

Accuracy vs. Precision for Example 1

- Each of these statements is more accurate and more precise than the one before it.
- Statement two is more accurate and more precise that statement one.
- Statement three is more accurate and more precise than statement two.

Example 2:

- How long is a piece of string?
  - Johnny measures the string at 2.63 cm.
  - Using the same ruler, Fred measures the string at 1.98 cm.
  - Who is most precise?
  - Who is most accurate?

Accuracy vs. Precision for Example 2

- The actual measurement is 2.65 cm.
- Johnny is fairly accurate and also very precise.
- Fred is very precise, however, he is not very accurate. His lack of accuracy is due to using the ruler incorrectly.

Example 3

- Using a centigram balance,
  - Mary measured a sample at 3 g.
  - Ashley measured the same sample at 3.00 g.
  - Who is most precise?
  - Who is most accurate?

Accuracy vs. Precision for Example 3

- The actual measurement is 3.01 g.
- Mary is reasonably accurate. She was not very precise because the balance was capable of measuring to two decimal places.
- Ashley is much more accurate because of the precision of her measurement *and* closeness of her value to the actual value.

ACCURACY/PRECISION

- You can tell the precision of a number simply by looking at it. The number of decimal places gives the precision.
- Accuracy on the other hand, depends on comparing a number to a known value. Therefore, you cannot simply look at a number and tell if it is accurate

In Conclusion

- In science we depend upon both the accuracy and precision of the numbers we use.
- The need for accuracy and precision varies with the circumstance and other measurements being used.

Derived Quantities

- **A quantity that is calculated from a measurement**
  - **A. Area - Length x Width**
  - **B. Volume - length x width x height**
  - **C. Density - mass/volume**

Significant Digits

- **Significant digits tell how precise the instrument is**

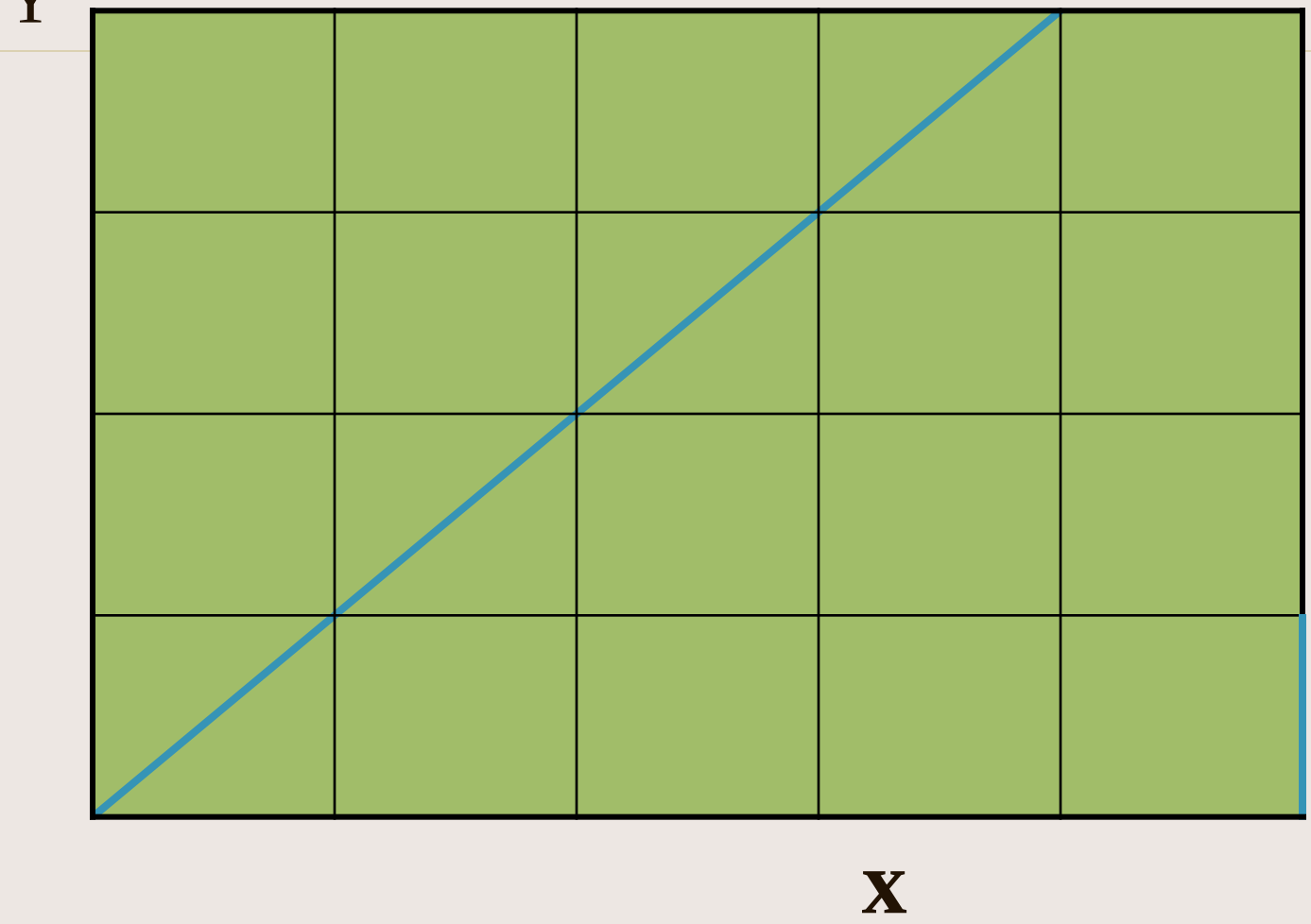
Rules for significant digits

Rule 1 - Write all measurements to one decimal place more than the markings on the instrument by estimating

Rule 2 - When combining measurements you write your results with only as many decimal places as the least precise measurement

Graphing data

- **Independent variable - the variable the experimenter can control**
  - **The X axis or horizontal**
- **Dependent variable - it changes do to the changes of the independent variable**
  - **The Y axis or vertical**


Y
X