Introduction to Science Study Guide

Science = the study of the world around us. Knowledge of the physical or material world gained through observation and experimentation.

Scientific law vs. theory:
Scientific law-

Scientific theory-

THE WAY SCIENCE WORKS
Science involves critical thinking, or applying logic and reason to observations and conclusions.

Observation vs. Inference:
Observation-

Inference-

Variables and Controls: A **variable** is anything that can _____ in an experiment.
    Independent variable: The variable being _____ or _____ by the scientist.
    Dependent variable: The variable being _____ or _____ by the scientist.
A _____ tests only one variable at a time.

The Scientific Method: A series of logical steps to follow in order to solve problems.
- ✓ _____
- ✓ FORMULATE A _____
- ✓ FORM A _____
- ✓ DESIGN AND CONDUCT AN _____
- ✓ MAKE _____
- ✓ _____ AND _____ DATA
- ✓ DRAW _____
- ✓ FORMULATE _____ and _____

Making Measurements: measurements are made in this class using SI units.
_____: distance between 2 points
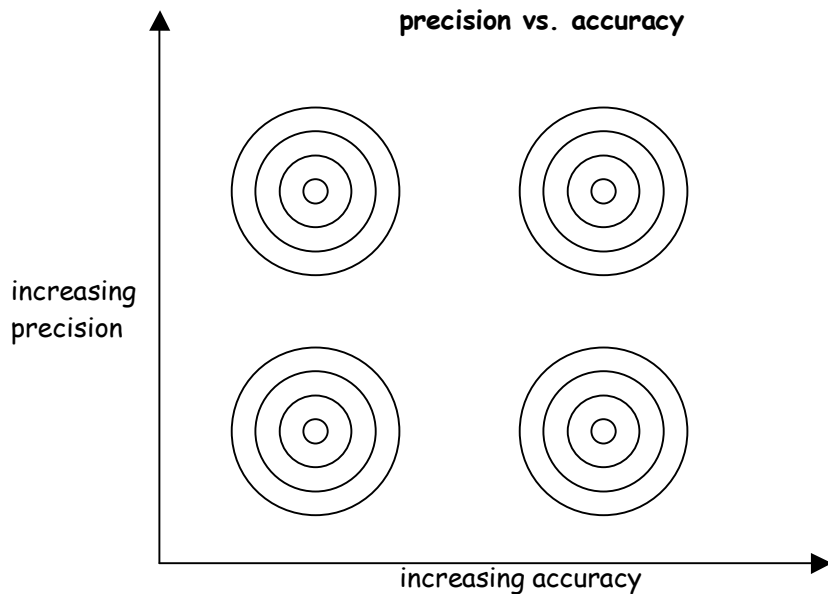_____: space occupied.
_____: the amount of matter in an object.
_____: the force with which gravity pulls on a quantity of matter.

Accuracy vs. Precision:
Accuracy-

Precision-

(ex: a scale may be precise to the nearest 100th of a gram, or +/- 0.01g)

precision vs. accuracy

increasing
precision

increasing accuracy

<u>**Density**</u> =

Example: What is the mass of 10 mL of a liquid that has a density of 3.76 g/mL?

<u>**Temperature Conversions**</u>
Temperature is a measure of the average kinetic energy in a system.

Water freezes at_____°F   Water freezes at_____°C

Water Boils at_____°F   Water Boils at_____°C

Human Body Temperature is_____ °F   Human Body Temperature is_____ °C

<u>**Percentage Error:**</u> Calculate this value in labs where the accepted value is given.

    % error =

<u>**ORGANIZING DATA**</u>: Data is organized and presented in tables, charts, and graphs.
   Graph - visual representation of data
   1) _____
   2) _____ and _____ axis labeled
   3) _____ for both the x and y axis
   4) _____ is evenly and correctly spaced for data
   5) _____ when appropriate

LINE GRAPH: best for displaying data that _____.
   – **Independent Variable:** _____
   – **Dependent variable:** _____

BAR GRAPH: useful when you want to _____ data for several individual items.

PIE CHART: ideal for displaying data that are _____.

Significant Figures

_____ IS THE LANGUAGE OF _____!

Scientific Notation: scientist use special notation to express VERY LARGE or *very small* numbers.

Ex: 300,000,000 m/sec =   Ex: 1,007,000,000 sec =

Ex: 0.000 000 000 004 76 m =

Significant Figures
Atlantic - Pacific Rule:
- –Decimal <u>P</u>resent: Count from the <u>P</u>acific side
- –Decimal <u>A</u>bsent: Count from the <u>A</u>tlantic side

Start counting at the first non-zero number and count until you reach the end of the number

Ex. I: 3.00700

Ex. II: 300,700

Significant Figures in Calculations
When multiplying and dividing, limit and round to the least number of significant figures in any of the factors.

Example:
23.0 x 432 x 19 =

When adding and subtracting, limit and round your answer to the least number of decimal places in any of the numbers involved in the calculation.

Example:
123.25 + 46.0 +86.257 =

Determine how many significant figures are in each of the following measurements:

1.   0.0034050 L_____

2.   33.600 m_____

3.   7500.0 g_____

4.   47,900 mm_____

5.   7,000,000,001 miles_____

6.   8.07 Hz_____

Round each of the following measurements off so that they each contain <u>3 significant figures</u> (you may use scientific notation if you prefer):

7.   366.2 L_____

8.   9,047,022 mg_____

9.   12.76 g_____

10.   999.9 J_____

Perform the prescribed operations. Round your answers to the proper number of significant figures. Include the appropriate units in your answer.

11.   36.57 m / 3.21 s =_____

12.   41.37 g + 13.3 g + 42.9 g =_____

13.   5.67 m x 13.44 m =_____

14.   (5.83 m / 2.67 s) / 2.1 s =_____

15.   9.374 V x 6 =_____

Dimensional Analysis

Given information:

Unit conversion map:

Convert 14 gallons to kildurkins:

Convert 14 barrels to hogsheads:

Convert 3.00 bushels to farkins: