Name: _____

Lab Instructor:_____

PREPARATION FOR CHEMISTRY LAB: MEASUREMENT (Part I)

Pre-lab questions need to be completed prior to your coming to lab. They will be collected at the beginning of the laboratory period.

In all labs, results and answers need to be reported using the correct number of significant figures. You must show all your work in order to receive credit on the pre-lab and post-lab questions throughout the semester. You won't be continually reminded of this.

1. What are the units of mass, length, and temperature in the International System of Units (Table 1-2 in your textbook)?

2. Perform the following calculation and report the answer to the correct number of significant figures (assume all numbers come from measurements):

   3.6 + 7.426 + 0.2403

3. Assuming all numbers come from measurements, perform the following calculation and report the answer to the correct number of significant figures

   $3.526 \times 7.53 \times (4.0842 \times 10^5)$

4. Calculate the number of mm that are in 356.4 inches. Use 2.54 cm = 1 inch (which is exact) and show your work.

5. If you have 28 cm^3 of water, how many liters of water do you have?

MEASUREMENT: PART I

INTRODUCTION

The first several laboratory periods this semester will be used to introduce you to the Vernier LabQuest, the instrument you will be using for most of your data collection. You will also begin to use some of the common measuring techniques used by chemists. It will be up to you to use these techniques correctly in subsequent lab work. There will be times in the laboratory when approximate measurements will be adequate and other times when precise measurements must be made…you will have to make the appropriate choice.

There are two kinds of measurements: quantitative measurements and qualitative measurements. *Quantitative measurements* tell the *amount* (numerical) of a substance or species that is present in a sample. For example, the mass of table salt (NaCl) that is in a slice of bread or the volume of a water sample. *Qualitative measurements* have to do with *identity*. For example, what contaminants are in an impure water sample?

In all labs, results and answers need to be reported using the correct number of significant figures. You must show all your work in order to receive credit on the pre-lab and post-lab questions throughout the semester. You won't be continually reminded of this.

Read and/or review Chapter 1 in your textbook.

The measurement of mass, length, and temperature will be explored this week in lab.

PROCEDURE

Throughout the semester, make written observations as you proceed with the experiments. Be aware that there may be questions at the end of the lab that depend on observations.

NOTE: There is a general understanding about reading a value from a graduated device such as is used to measure length, volume, and temperature. Estimate the value to one decimal place more than the level of graduation. For example, when reading a thermometer graduated in degrees, estimate to tenths of a degree. For a ruler that is graduated in cm, estimate to mm.

MASS

When making a mass determination, place a piece of weighing paper on the balance pan to protect it. Clean up spills immediately. Press the TARE bar to zero the balance, or to counterbalance the paper and/or weighing container. Place objects on the center of the pan. In the future, when you are told to use something that is **tared**, it means to zero out the mass of the weighing paper or weighing container before weighing out the sample.

a. Using one of the lab balances, determine the mass of a standard weight. Handle the standard weight only with tweezers or a tissue. Make four more independent mass determinations of the same standard weight on the same balance. Record all the digits that the balance displays.

b. Devise an **experiment** (don't just perform calculations) to determine the number of grams in a pound. Describe and perform the experiment. Use any object or material that's available in the lab.

LENGTH

Devise an experiment to find out how many centimeters are in an inch. Describe and perform the experiment. Use any object or material that's available in the lab.

TEMPERATURE

Boil some deionized water (DI) water (from the container in the lab) in a beaker on a hot plate. Measure the temperature of the boiling DI water using an alcohol thermometer and the LabQuest temperature probe. Be careful that the lead for the temperature probe does not contact the hot plate.

The LabQuest temperature probe is easy to use. Plug the probe into one of the sensor ports on the front edge of the instrument. If it is not already on, turn on the LabQuest with the power button which is located on the upper left corner of the instrument. The temperature shows up on the screen.

DATA AND ANALYSIS SHEET: MEASUREMENT (Part I)

Name: _____

Date _____ Lab Partner _____

MASS AND WEIGHT

a. Identification # of Standard weight _____ Balance # _____

Weighing	#1	#2	#3	#4	#5	Average
Mass (g)						

Given mass of the standard weight: _____

How does the experimentally determined average mass compare with the given mass of the standard mass? What could be responsible for any differences?

b. Brief description of experiment to find out the number of grams in a pound.

Results: How many grams are in a pound? _____

Compare with accepted value _____ from _____(reference)

LENGTH

a. Brief description of experiment to find out the number of cm in an inch.

Results: How many cm are in an inch? _____

Compare with accepted value _____ from _____(reference)

TEMPERATURE

Alcohol Thermometer:

Temperature of Boiling Water: _____^{o}C _____^{o}F _____K

LabQuest Temperature Probe:

Temperature of Boiling Water: _____^{o}C _____^{o}F _____K

Atmospheric Pressure in lab (Barometric Pressure on chalk board) _____

Standard Barometric Pressure (handbook) _____

Boiling point of water at standard pressure (handbook) _____

Name: _____

Lab Instructor:_____

QUESTIONS ABOUT THIS LAB: MEASUREMENT (Part I)

In all labs, results and answers need to be reported using the correct number of significant figures. You must show all your work in order to receive credit on the pre-lab and post-lab questions throughout the semester. You won't be continually reminded of this.

1. The microgram (micro- , 10^{-6}) is a unit that is used for mass. Is it bigger or smaller than a kg? How many micrograms are in 3.5 kg?

2. A student weighs a 5.0 pound bag of sugar and finds that it weighs 2.2 kg.

   Using this information, how many grams are in a pound?

   Using this information, what is the weight, in kg, of a 145 pound person?

3. An analyst is handed a sample of polluted water. Her lab director asks for a quantitative analysis. What kind of information would the analyst provide?

4. Using your experimental value for the number of grams in a pound, calculate the number of grams in 264 pounds.

5. Using your experimental value for the number of centimeters in an inch, calculate the number of inches in 618 cm.