

## MEASUREMENT: PART I

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### 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?

**Read and/or review Chapter 1 and Appendix A.1 in your textbook. In all labs, results and answers need to be reported using the correct number of significant figures.**

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.

You want the temperature of the water, not the container, so be sure the probe is not touching the sides or bottom of the beaker.

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: \_\_\_\_\_ °C \_\_\_\_\_ °F \_\_\_\_\_ K

LabQuest Temperature Probe:

Temperature of Boiling Water: \_\_\_\_\_ °C \_\_\_\_\_ °F \_\_\_\_\_ K

Atmospheric Pressure in lab (Barometric Pressure on chalk board) \_\_\_\_\_

Standard Barometric Pressure (handbook) \_\_\_\_\_

Boiling point of water at standard pressure (handbook) \_\_\_\_\_