

Living Environment

S.I. Units Lab

Name _____

Background:

Scientists use the *International System of Measurement* (S.I. units) when making measurements. This is a modern adaptation of the metric system (using meters, kilograms, and liters), and it is used by nearly all of the people in the world in their everyday lives. Because S.I. units are based on multiples of 10, it is much easier to convert between units than if you use the *English System* that people in the United States are more familiar with (using feet, pounds, and quarts). In this activity, you will practice changing units to larger or smaller units, and you will learn to use some common laboratory measuring equipment.

Part I. Reviewing S.I. units and prefixes:

The basic units for length, volume, and mass are *meter (m)*, *liter (L)*, and *gram (g)*. These units often have prefixes added to them to form units that are larger or smaller. Some of the prefixes are listed in the table below:

giga-	G	one billion	1,000,000,000
mega-	M	one million	1,000,000
kilo-	k	one thousand	1,000
hecto-	h	one hundred	100
deka-	da	ten	10
deci-	d	one tenth	0.1
centi-	c	one hundredth	0.01
milli-	m	one thousandth	0.001
micro-	μ	one millionth	0.000001
nano-	n	one billionth	0.000000001

Important Notes:

- * There is no prefix that means one. For example, a liter is simply L.
- * Capital letters make a difference. Make sure that you use the proper case.
- * The letter *m* is used often. Lower case *m* means meter or the prefix *milli-* (so that a *millimeter* is *mm*). The prefix micro- uses a μ that is the Greek letter equivalent to *m*.
- * Prefixes do not exist for every value. For example, there is no prefix that means 10,000 or 100,000.

1. Write the unit that is the equivalent to each value below. The first one has been done for you:

- 0.1 gram decigram (dg)
- 100 meters _____
- 0.000001 liter _____
- one billion liters _____
- 10 grams _____
- 0.001 meter _____

Part II. Converting S.I. Units:

To convert S.I. units, you simply need to move the decimal point the proper number of places. This is easiest done by writing out the units from largest to smallest. This is done below for you using mass units, with spaces left for values that have no prefix.

Gg			Mg			kg	hg	dag	g	dg	cg	mg			μg			ng
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When you wish to convert units, look at the direction and number of spaces moved on the grid above. This will tell you the direction and number of spaces that the decimal point should move. For example, to convert from Mg to dg the decimal would move to the right seven spaces. This procedure will work for any S.I. units, not only for grams.

2. Convert the S.I. units below. The first one has been done for you:

- a. 0.00028 mg = 0.28 μg
- b. 226 cg = _____ g
- c. 9.4 kg = _____ dag
- d. 5400 mL = _____ L
- e. 2.73 hL = _____ dL
- f. 436 mm = _____ m
- g. 32.8 Mm = _____ cm

Part III. Measuring Length in S.I. Units:

A. Use a meter stick to measure the items in Data Table 1 below. Record measurements to the nearest millimeter. Record your measurements in the column labeled *mm*.

B. Complete Data Table 1 by converting your measurements to the other units given. (Fractions are never used in S.I. Answers should use decimals.)

Data Table 1:

Item	l / w / h	mm	cm	m
Textbook				
	width	220 mm		
	height	283 mm		
Lab Table				
	length			
	width			
	height			
Lab Room				
	length			
	width			

Part IV. Measuring Volume with S.I. Units:

A. Find the volume of your textbook by multiplying the height, width, and length. Use cm for each distance and give your final answer in cm^3 (cubic centimeters, also called cc are equal to mL). Show your work.

Textbook volume:

B. A graduated cylinder is used to find the volume of a liquid accurately. Get a graduated cylinder and look at the scale.

3. What volume does each single line on the graduated cylinder represent?

4. What is the maximum volume that can be measured by this graduated cylinder?

C. Fill a small test tube completely to the top with water. Pour the water into the graduated cylinder to find the maximum volume that the small test tube can hold. Record your measurements in Data Table 2. Repeat with a large test tube and a small beaker.

D. Complete Data Table 2 by converting your measurements to the other units given.

Data Table 2:

Item	mL	L
small test tube		
large test tube		
small beaker		

Part V. Measuring Mass with S.I. Units:

A. Use a balance to find the mass of the objects listed in Data Table 3. Record the measurements in the Data Table in grams. Complete Data Table 3 by converting your measurements to the other units given.

Data Table 3:

Item	g	kg
coin		
10 ml of water		