Virtual Laboratory

Topic 01 – Measurement

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Name	Section # Date	Topic #

I. Use the method of Unit Cancellation. or the Stair Step method to make the following metric conversions. (dkL = dekaliter and dL = deciliter)

a)   4 dm = _____m

b) 3 mL = _____L

c) 5 g = _____ mg

d)   5 cm = _____ dm

e)   7dL = _____ dkL

f) 15 g = _____ kg

g) 12 cm = _____ m

h) 9 L = _____ hL

i) 20 dg = _____ hg

j) 30 dm = _____ m

k) 29 kL = _____ cL

l) 63 cg = _____ g

m) 0.30 cm = _____ mm

n) 0.09 hL _____L

o) 0.39 hg = _____ mg

p) 1523 mm = _____ m

q) 5.432 mL = _____ L

r) 920 g = _____ kg

II. Use the method of unit cancellation to convert the following quantities.

a) 75.6 in = _____ cm   b) 29.7 cm = _____ in   c) How many inches in 1 cm? _____

d) 6.54 mi = _____ km   e) 32.9 km = _____ mi   f) How many miles in 2.2 km? _____

g) 1.398 N = _____ lbs   h) 154 lbs = _____N   i) How many Newtons in 4.3 lbs? _____

j) 2.6 gal = _____ L   k) 92.3 L = _____ gal   l) How many gal in 2.0 L? _____

III. Convert the following temperatures.

a)   75°F = _____ °C

b) 75°C = _____ °F

c) 200°C = _____ °F

d) 200°F = _____°C

IV. Calculate the percent error for the following situations.

a)   During an experiment a scientist finds the density of a rock to be 3.29 g/cm^3. The accepted value for this type of rock is 3.39 g/cm^3. Calculate the percent error. _____

b)   A brick has a mass of 500 grams written on it. When the mass is measured it is found to be 489 grams. Calculate the percent error. _____

c)   A student performing an experiment about the melting point of an object. After 5 trials he found the melting point to be 192 °C. 206 °C. 197 °C. 199 °C. and 202 °C. The accepted melting value temperature is 200 °C.

Calculate the percent error. _____

V. For each pair of units circle or highlight the smallest quantity.

a)   decimeter and dekameter

b)   centimeter and millimeter

c)   kilogram and gram

VI. Answer the following questions.

a)   How many years in a decade? _____

b)   How many years in a century? _____

c)   How many years in a millennium? _____

VII. Density calculation

a)   Calculate the density of a 495 cm^3 and 1235 gram substance.

b)   From your textbook. what does "No naked numbers" mean?

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MEASUREMENT

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Name   Section #   Kit #   Topic #

Part A - Length

Section 1 - Linear Measurement (measure the object in centimeters and convert)

Object	Kilometer	Meters	Centimeters	Millimeters
Length of this data table				
Block length				
Block width				
Block height (or depth)				

1. How many centimeters in a 1 inch line? _____

2. What measuring instrument would be best to use to measure the chalkboard at the front of the classroom? Explain why.

3. Which is longer? Circle or highlight correct answer for each pair.
   a. 1000 millimeters or 1 kilometer
   b. 1 centimeter or 1 millimeter
   c. 1 inch or 1 centimeter

Part B – Volume
(Measure volume of bolt and marble using the 250 ml beaker and the wood block using the 1000 ml beaker, and convert measurement to the other three columns. Retake the measurements using a graduated cylinder for everything but the block. Remember to apply the measurement rule. (Don't convert the graduated cylinder measurements.)

Smallest division on 250 ml beaker =_____ Smallest division graduated cylinder =_____ Smallest division 1000ml beaker =_____

Object	Kiloliters	Liters	Centiliters	Milliliters beaker	Milliliters graduated cylinder
Bolt					
Marble					
Wood block					

1. Compare the graduated cylinder measurements to the beaker measurements? Which one provides a more accurate or precise measurement? Explain. _____

2. Calculate the volume of the block (L x w x h) using your measurements from part A. Show your work and include units. Remember 1 cm^3 = 1 mL.

3. Did your calculation for determining the volume of the block agree with your beaker volume measurement? Explain your results.

4. Calculate the percent error between the volume you calculated and the volume found using the beaker.

Error = |Experimental value – Theoretical value| = | Beaker value – Calculated value from #2 | =_____

$$\% Error = \frac{100.x.Error}{theoreticalvalue} =$$

Part C - Mass (measure the masses in grams and convert to the other two columns)

Object	Mass		
	Kilogram	Gram	Milligram
Mass of 250 ml beaker			
Mass of beaker + 200-ml water			
Mass of 200-ml water			
Mass of One milliliter of water			
Mass of wood block			

Density = mass in grams / volume in milliliters.

1. Calculate the density of water, Include units with your final answer.

2. Calculate the density of the block. **Use the volume from Part B question 2**. Include units with your final answer.

3. When the block is placed in water it floats. Based upon your density data what can you infer about the density of objects that float on water? What about objects that sink?

Part D - Time (measure the time in seconds for each person in your group to run approximately 10 meters and average the findings.)
Include units with your numbers!!

1	2	3	4	5	Average

Part E - Temperature

1. Temperature of tap water   °C convert to   °F

2. Temperature of boiling water   C   convert to   °F
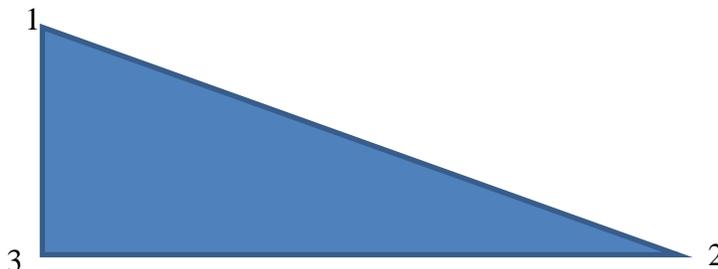
Part F – Angles

Measure the angle between the two lines at the three points using a protractor. (All 3 angles should add to 180°.) **(Don't forget to apply the measurement rule and include units!)**

Angle 1: _____

Angle 2: _____

Angle 3: _____

Part G – Average. Error. Percent of Error (Solve the following before the lab meeting):

x_1 = 61.4 x_2 = 62.8 x_3 = 67.3   theoretical value = 61.0

1. Average value _____

2. Error _____

3. Percentage of Error _____

Part H - Problems: Solve each of the following before the lab meeting:

Problem	Solution
1. How many cm are 3.6 in?	
2. 6.1 L are how many ml?	
3. 7.2 m are how many cm?	
4. 2.6 ft are how many cm?	
5. 5.6 m are how many mm?	
6. 2.4 hp are how many W?	
7. 10.1 lbs are how many N?	
8. 488 mi are how many km?	
9. How many kg are in 29 slugs?	

Part I – Design an experiment to measure the volume of a human. The human must survive the measurement! Be detailed. What equipment will be needed and how will the measurement be accomplished? In what units will the volume be measured? How will you ensure the human survives?