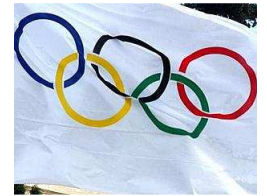


Name: _____ Block: _____



THE MEASUREMENT OLYMPICS LAB!

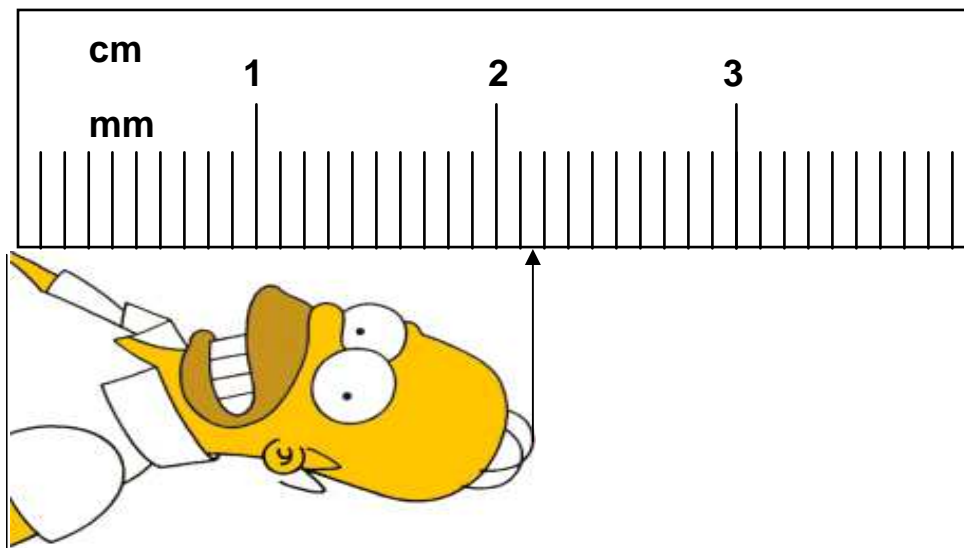
Purpose:

Students will measure various quantities using lab instruments and metric units. **ALWAYS MAKE SURE YOU GUESS ONE NUMBER PAST WHAT IS MARKED!**

Part I – Practice:

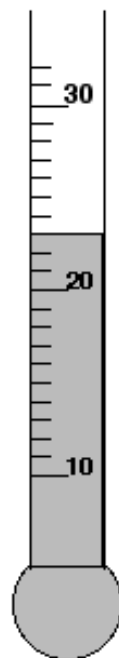
With a partner, make the measurements pictured below:

Length: How long is Homer, in cm? _____ in mm? _____



Temperature of coffee:

_____ °C



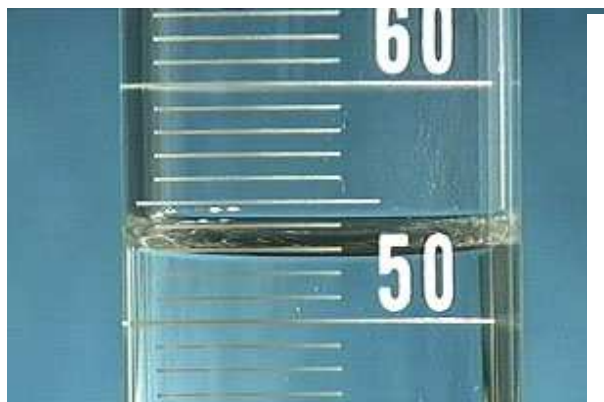
Mass of Jello: _____ g



Volume: What is the volume of the first graduated cylinder? _____ mL

What is the volume of the second graduated cylinder? _____ mL

What is the volume of the third graduated cylinder? _____ mL



Part II: Your group will rotate through each of the following stations. At each station follow the procedure exactly. Be sure to read your lab instruments correctly and record the proper units as you work in the data tables provided. Complete the calculations and questions that follow. MAKE SURE TO SHOW YOUR WORK, AND SHOW UNITS!

STATION #1:

1. In front of you are three beakers of colored water. (one red, yellow, and blue)
2. Label five graduated cylinders A, B, C, D, E, and F.
3. Into graduated cylinder C measure 8.0-mL of yellow water.
4. Into graduated cylinder B measure 4.0-mL of red water.
5. Into graduated cylinder A measure 6.0-mL of red water.
6. Into graduated cylinder E measure 8.0-mL of blue water.
7. Measure 6.0-mL of yellow water and pour this into graduated cylinder D.
8. From the beaker of blue water measure 6.0-mL and pour it into graduated cylinder F.
9. From the beaker of yellow water measure 8.0-mL and add it to graduated cylinder B. Mix.
10. From the beaker of red water, measure 6.0-mL and add it to graduated cylinder F. Mix.
11. Measure 6.0-mL of blue water and add it to graduated cylinder D. Mix.

CLEAN OUT ALL TEST TUBES AND GRADUATED CYLINDERS WITH WATER WHEN YOU ARE DONE AT THIS STATION!

Test Tube	Final Color of Water	Total Volume of Water (mL)
A		
B		
C		
D		
E		
F		

STATION #2:

Use a ruler to measure the dimensions of the box of Macaroni and Cheese in **centimeters**.



Length	
Width	
Height	
Volume	

Using your data **calculate the volume of the box of Macaroni and Cheese in the space below.** Record the volume in the data table above. Remember:

$$\text{Volume} = \text{length} \times \text{width} \times \text{height}$$

--

STATION #3:

Follow these steps to find the volume of a brass rod using water displacement.

1. Fill the graduated cylinder about half way with water.
2. Record this volume of water in the data table. This is the initial volume (V_i).
3. Drop the brass rod into the water (notice that the water level rises).
4. Record the new volume of the water in the data table. This is the final volume (V_f).

Initial volume of water in graduated cylinder (V_i)	
Final volume of water in graduated cylinder (V_f)	
Volume of brass rod	

Calculate in the space below the difference of the water level before and after adding the brass rod ($V_f - V_i$). This is the volume of the brass rod. **Record this value in the data table above.**

--

STATION #4:

Measure the volume of the given liquid using both the beaker and the graduated cylinder. When finished, pour the liquid back into the original container.

Volume using beaker	
Volume using graduated cylinder	



STATION #4 PART 2:

Pull a hair from your head or your partner's head. Measure the length of the same hair using each of the rulers provided in cm. Be sure to guess only one number when using each of the rulers.

Ruler	Length of Hair in cm
#1	
#2	
#3	

STATION #5:

Each person in your group should complete both of the Olympic events at this station.

Javelin Throw

1. Determine a starting line on the floor.
2. Hold a javelin (plastic straw) at shoulder-height, step to the line and throw your javelin as far as possible.
3. Measure the distance the javelin traveled from the starting line in cm.
4. Repeat steps #1-3 for your second trial.

Cotton Air Ball

1. Determine a starting line on the floor.
2. Place a cotton ball on the starting line.
3. Kneel down beside your cotton ball and with one strong breath, blow it as far as possible.
4. Measure the distance the cotton ball traveled from the starting line in cm.
5. Repeat steps #1-4 for your second trial.

Event	Distance Trial #1	Distance Trial #2	Average Distance
Javelin Throw			
Cotton Air Ball			

Average the distances for each event, **showing your calculations below**. Record the averages in the last column of the data table.

To find an average, simply add your measurements together, and then divide by the number of measurements you took. In this case, you would add together and divide by two!

STATION #6:



Measure the mass of each of the objects using both the triple-beam balance and the digital balance. **Make sure you tare or zero the digital balance first!**

Item	Mass with Triple Beam	Mass with Digital Balance
Snickers Bar		
Twix Bar		
Tootsie Roll		
Your Own Shoe		

STATION #7:

Determine the mass of the beaker. Determine the mass of the beaker and one marble (place the marble in the beaker). **WRITE THIS MASS IN THE SECOND COLUMN FOUR TIMES.** Determine the mass of two marbles and the beaker. Determine the mass of three marbles and the beaker. Determine the mass of four marbles and the beaker. **Make sure you tare or zero the digital balance first!**

Number of Marbles	Mass of Beaker Empty	Mass of Beaker + Marble(s)	Mass of Marble(s) (Column 3 – Column 2)
1			
2			
3			
4			

Calculate the mass of the marble(s) alone below. Record those masses in the last column of the data table.

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STATION #8:

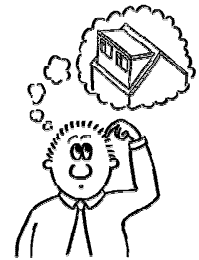


Record temperature of water ($^{\circ}\text{C}$) as it is heated/cooled.

1. Turn the hot plate on to the setting of 6-7.
2. Fill your beaker with water to about the 100-mL line.
3. Place the beaker on the hot plate, and begin timing.
4. Record the temperature of the water as it heats at 1 minute, 2 minutes, and 3 minutes.
5. Turn off the hot plate, add ice cubes to the beaker, and begin timing.
6. Record the temperature of the water as it cools at 1 minute, 2 minutes, and 3 minutes.
7. When cool to the touch pour the water down the drain.

Time	Temperature
Heating, at 1 minute	
Heating, at 2 minutes	
Heating, at 3 minutes	
Cooling, at 1 minute	
Cooling, at 2 minutes	
Cooling, at 3 minutes	

Conclusions: (Answer in complete sentences):



1. For what types of objects (think about shape, appearance) should we measure volume with a graduated cylinder? What type of objects should we measure volume using a ruler, measuring length, width, and height?
2. Why are beakers generally not used for measuring volumes? What lab device is the most accurate for measuring volume? **Use your data from station #4 to explain/support your answer.**
3. How did the masses of your objects compare at station #6 when using the triple beam balance versus the digital balance? Which is a more accurate device to measure volume? **Explain.**
4. Why was it important to conduct multiple measurements at station #4, when measuring the length of a hair? Why is it always a good idea to measure something more than once? **Write a detailed sentence explaining this!**
5. Who in your group was full of the most hot air in the cotton air ball Olympic event?