Name: ________________________________ Date: __________________ Class: _____________

INTEGRATED PHYSICS & CHEMISTRY
METRIC SYSTEM MEASUREMENT

PROBLEM:
1. How are mass and length measure in the Metric System?
2. What are the two ways that we can measure the volume of an object?

HYPOTHESIS: ____

____

____

MATERIALS: Beaker, 100mL graduated cylinder, meter stick, balance, cup containing a marble, aluminum washer, metal cube, wooden block and a rubber stopper

PROCEDURE: **PART I – MEASURING MASS OF SOLIDS AND LIQUIDS**

1. Find the mass of all of the objects in the cup individually and record. Each team members must measure the mass of each object by themselves. Write both numbers in the observations chart.

2. Find the mass of the empty beaker and record.

3. Fill the graduated cylinder with 100mL of water and pour the water into the beaker. Now find the mass of the BEAKER PLUS THE 100mL OF WATER and record.

4. Calculate the mass of the 100mL of water alone and record.

5. Empty out the water. Fill the graduated cylinder with 50mL of water and pour this new water into the same empty beaker. Now measure the mass of the BEAKER PLUS THE 50mL OF WATER and record.

6. Calculate the mass of the 50mL of water alone and record.

7. Can you determine a mathematical way to figure out the mass of 1mL of water? Show how you do it in the observations chart.

PROCEDURE: **PART II – MEASURING LENGTH AND CALCULATING VOLUME**

1. Measure the length, width, and height of your metal cube in centimeters (cm) and record in the table.

2. Measure the length, width, and height of the wooden block in centimeters (cm) and record in the table.

3. Multiply the three dimensions together and calculate the volume of the cube and secondly the block of wood. Don’t forget to use the correct units.

PROCEDURE: **PART III – MEASURING VOLUME BY DISPLACEMENT**

1. Fill the graduated cylinder about halfway with water and record the volume.
2. Drop the rubber stopper gently into the water being careful not to splash any water. Measure the new water level.
3. By subtraction, calculate the volume of the rubber stopper alone and record in the data table.
4. Measure the volume of the stopper again by doing steps 1, 2 and 3 again for trial 2.
5. Repeat steps 1, 2, 3, and 4 ALL OVER AGAIN, but this time using the ALUMINUM WASHER, MARBLE and then the METAL CUBE.

OBSERVATIONS: **(Don't forget to use the correct units behind all numbers!)**

PART I - MEASURING MASS OF SOLIDS AND LIQUIDS

OBJECT	MASS #1	MASS #2	AVERAGE MASS
Wood Block			
Rubber Stopper			
Aluminum Washer			
Metal Cube			
Marble			

PART I CONTINUED

OBSERVATIONS	100mL OF WATER	50mL OF WATER
Mass of Beaker plus Water		
Mass of Empty Beaker		

The mass of 100mL of water is ___________________. The mass of 50mL of water is

__________________. The mass of 1mL of water must be _____________________. It can be

calculated by ____.

PART II VOLUME BY CALCULATION AND MEASURING LENGTHS

OBJECT	LENGTH	WIDTH	HEIGHT	VOLUME
Metal Cube				
Wood Block				

Show all work here. You may round off to the nearest tenth.

PART III VOLUME BY DISPLACEMENT

OBJECT	RUBBER STOPPER		MARBLE		METAL CUBE	
	Trial 1	Trial 2	Trial 1	Trial 2	Trial 1	Trial 2
Water level after object was added						
Water level before object was added						
Amount the water level rose (volume by displacement)						

QUESTIONS:

1. Why should you take more than one measurement of each length or each mass reading?

2. Draw and label an illustration of the correct way to read the level in a graduated cylinder and explain why it is read in this manner. Include correct terminology.

3. How can you calculate the volume of a rectangular object?

4. How can you find the volume of an object with an irregular shape?

5. Define the following terms:

   A. Volume

   B. Cubic Centimeter

   C. Displacement

   D. Meniscus

   E. Mass

6. Compare your volume answer in Part II for the metal cube with your volume answer for the SAME metal cube in Part III. Should your answers be the same? Explain why or why not.

CONCLUSION: Based on your observations in this lab, re-answer the original problem stated at the beginning of this experiment.