

Name:
Period:

**LAB 6.1 - VOLUME AND THE SINKING BOX**

**BACKGROUND**

When a carton is put into the water, it pushes some of the water out of the way as it sinks. The water pushed away is *displaced*, so it is called *displaced water*. The water gets displaced by the object as it sinks below the surface. The volume of the object that is under the surface of the water is called the *submerged volume*.

**PROBLEM**

What is the relationship between an object's submerged volume and the amount of water it displaces?

**HYPOTHESIS**

independent variable	dependent variable
What relationship do you predict between the variables?	

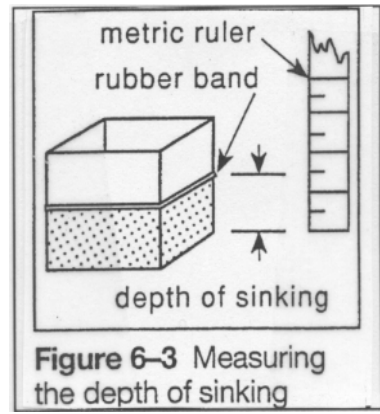
**MATERIALS**

- ◆ plastic box
- ◆ rubber band
- ◆ metric ruler
- ◆ marbles (as ballast)
- ◆ graduated cylinder
- ◆ overflow container
- ◆ water
- ◆ beakers (250mL & 600mL)
- ◆ apron & goggles

**PROCEDURE**

1. Fill the 600mL beaker with approximately 400mL of water. The precise amount is not important for this lab.
2. Place the box in the water and add ballast to float the box at a depth of your choosing. The **box must remain floating**.
3. Move the rubber band to the waterline to mark the depth of sinking.

4. Determine the *submerged volume* of the box. Submerged volume is the volume of an object that is under the water. Follow these steps to accomplish this:
  - a. Calculate the base area of the box, either by multiplying the two linear edges or by using a metric area grid.
  - b. Multiply the base area by the depth of sinking (see figure 6-3)
  - c. Record your results in Table 6.1-1



**Area of Base (cm<sup>2</sup>) x Depth of Sinking (cm) = Submerged Volume (cm<sup>3</sup>)**

5. Determine the amount of water displaced by the box and ballast using an overflow container. Record your results in table 6.1-1.
6. Verify your results with Mr. Koerger:

1 <sup>st</sup> time	2 <sup>nd</sup> time	3 <sup>rd</sup> time
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7. Change the ballast in the box and repeat steps 2 through 6.
8. Repeat step 7 with yet a different amount of ballast.
9. Clean up your lab station and record your data on the class data table.

★ **DATA**  
**Be sure to enter the units in the appropriate spaces**

Table 6-2: Data on the submerged volumes of boxes and displaced water					
Base Area of Box ( )	Depth of Sinking ( )	Calculated Submerged Volume ( )	Volume of Displaced Water ( )		Other Observations
			Predicted	Actual	
			X		

## RESULTS

Write 4 – 6 sentences about how the results of this lab answer the problem statement.

## SUMMARY

***Summary and Challenge Questions must be typed on a separate piece of paper.***

1. Graph the class data on the **submerged volume** of the boxes and the **volume of water displaced**. Remember to think about where the dependent and independent variables should be on the graph.
2. What are the relationships, if any, between the submerged volume of a box and the volume of water displaced? Try to describe the relationship using both *quantitative* and *qualitative* descriptions.

## CHALLENGE

2. Think about the box you floated. Compare the submerged volume of the box with the total volume of the box. What can you say about the two of these measurements?

# Square Centimeter Metric Area Grid

