HONORS PHYSICAL SCIENCE LAB  
**DENSITY**

**INTRODUCTION:**

The density of a substance is defined as the mass divided by the volume: **d=m / v**. Density is a physical property of a substance that does not depend on the amount of material present and is therefore called an **intensive property**.

In this experiment, you will find the density of water for three different volumes and the density of an irregular object.

**MATERIALS:**

graduated cylinder, Balance, dropper, irregular objects (frogs), water

**PROCEDURE:**

*Part 1—Density of water*

1. Find the mass of an empty, dry **100 - mL** graduated cylinder to the nearest 0.1 g and record the mass on the **data table**.

2. Add exactly **10.0 mL** of water to the cylinder. **Remember**, the **bottom** of the meniscus should just be touching the 10.0 mL line. **[ Hint: Add water up to about the 9 mL mark and use a dropper to reach the 10.0 mL mark.]**

3. Find the mass of the cylinder and 10 mL of water to the nearest 0.1 mL. Record the mass on the **data table** .

4. Repeat steps 2 and 3 with **30.0 mL** of water.

5. Repeat steps 2 and 3 with **50.0 mL** of water.

|  |
| --- |
| **DATA TABLE:** http://www.geocities.com/CapeCanaveral/Hall/1410/space.gif |
| Mass of empty graduated cylinder. \_\_\_\_\_\_\_\_\_\_\_\_ g http://www.geocities.com/CapeCanaveral/Hall/1410/space.gif |
| Mass of graduated cylinder and 10.0 mL of water. \_\_\_\_\_\_\_\_\_\_\_\_ g http://www.geocities.com/CapeCanaveral/Hall/1410/space.gif |
| Mass of graduated cylinder and 30.0 mL of water. \_\_\_\_\_\_\_\_\_\_\_\_ g http://www.geocities.com/CapeCanaveral/Hall/1410/space.gif |
| Mass of graduated cylinder and 50.0 mL of water. \_\_\_\_\_\_\_\_\_\_\_\_ g http://www.geocities.com/CapeCanaveral/Hall/1410/space.gif |

**CALCULATIONS:**

6. Find the mass of the 10.0 mL sample of water.

**Mass of the 10.0 mL sample = \_\_\_\_\_\_\_\_ g**

7. Calculate the density of the 10.0 mL sample. Remember: density = mass / volume.  
The unit for density will be **g / mL**.

**Density for 10.0 mL sample = \_\_\_\_\_\_\_\_ g / mL**

8. Now repeat steps 6 and 7 for the 30.0 mL and 50.0 ml samples.

**Mass of the 30.0 mL sample = \_\_\_\_\_\_\_\_ g** **Density for 30.0 mL sample = \_\_\_\_\_\_\_\_ g / mL**

**Mass of the 50.0 mL sample = \_\_\_\_\_\_\_\_ g** **Density for 50.0 mL sample = \_\_\_\_\_\_\_\_ g / mL**

The accepted value of the density of water is **1.0 g / mL**.

How do your three answers compare to the accepted value?

*Part 2—Density of an irregular object*

1. Find the mass of a 1 plastic frog to the nearest 0.1 g and record the mass on the **data table**.

2. Repeat step one for 2 plastic frogs, 3 plastic frogs, 4 plastic frogs, 5 plastic frogs, 6 plastic frogs. Record in the data table.

3. Add exactly **500.0 mL** of water to the **1000 mL** cylinder. Add **1 frog** to the graduated cylinder and record the new **volume** in the **data table**.

4. Add a **second frog** to graduated cyclinder **WITHOUT** taking the 1st frog out. Record new **volume** in your data table.

5. Continuing adding frogs one a time, recording the new volume in your data table each time.

|  |  |  |
| --- | --- | --- |
| **# of frogs** | **Mass of frog(g)** | **Volume of Graduated cylinder with frogs(ml)** |
| 1 |  |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |

**CALCULATIONS:**

6. Find the volume of the frog. Record in data table below.

|  |  |
| --- | --- |
| **# of frogs** | **Volume of the frogs only(ml)** |
| 1 |  |
| 2 |  |
| 3 |  |
| 4 |  |
| 5 |  |
| 6 |  |

7. Using the data collected for the volume of the frogs only as the independent variable and the mass of the frogs as the dependent variable, plot your data points and draw a best fit line on the graph paper provided. Use good graphing techniques – always include titles, titles for axes, and appropriate scale labels including units.

8. Calculate the slope of your best fit line in the space below.

9. What does the slope of the line tell you about the frogs?