Buoyancy Lab

Today you will be testing Archimedes’ Principle which states:

**Archimedes**' **principle** indicates that the upward buoyant force that is exerted on a body immersed in a fluid, whether fully or partially submerged, is equal to the weight of the fluid that the body displaces and it acts in the upward direction at the center of mass of the displaced fluid.

To do this, you will be placing a plastic container into water and seeing how far down into the water it goes. You will be varying the weight of the container and observing the change in submersion. From this you can calculate the density of the water and if Archimedes’ Principle is valid, then you should get close to the know value for the density of water.

Draw the force diagram of the plastic container below:

Raw Data:

Outer diameter of container: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

|  |  |
| --- | --- |
| Mass of container (g) | Immersion depth of container (mm) |
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Create an equation for the density of the water in terms of the mass of the container and the immersion depth with any other constants below:

Create a graph that will help you determine the density of the water. Print out the graph and attach it to this paper.

Experimental value for density: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The density of pure water is 1 g/mL (1 mL = 1 cubic cm) and slightly differs due to temperature and contaminants in the water. In your report, you should find a % error and indicate if the water you used is pure water.

% Error: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

THIS LAB REPORT IS OPTIONAL. WRITE THE LAB REPORT IF YOU NEED TO IMPROVE YOUR LAB REPORT CATEGORY.

Post Activity Problems:

1. Wood blocks that have different masses and different volumes are floating in water. On top of these blocks are additional masses as shown.



Rank the buoyant force exerted by the water on the wood blocks.



1. Four blocks are suspended from strings in water. Cubes A and C are at the same depth, as are B and D.



Rank the tensions in the strings.



1. Two cubes with identical dimensions are floating in water at different levels.



(i) Is the buoyant force on block A (a) *greater than*, (b) *less than*, or (c) *equal to* the buoyant force on block B?

Explain.

(ii) Is the weight of block A (a) *greater than*, (b) *less than*, or (c) *equal to* the weight of block B?

Explain.

(iii) Is the pressure exerted on the bottom surface of block A (a) *greater than*, (b) *less than*, or (c) *equal to* the pressure on the bottom surface of block B?

Explain.

(iv) Is the density of block A (a) *greater than*, (b) *less than*, or (c) *equal to* the density of block B?

Explain.