**General Physics eJournal 9**

**Archimedes’ Principle**

**Instructions:**

Follow the Writeup and fill out the eJournal as you complete the lab activities. Submit your eJournal report by uploading the completed WORD or PDF document to our class Learninghub site. If the Learninghub site is down, email the completed report file directly to a lab TA.

**Preliminaries:**

* Title:
* Name(s):
* Date:
* Time In & Out:

**Plan:**

**Hypothesis**

Sketch a hypothetical graph of FB vs. W. What sort of trend do you expect the graph to take? Formulate a hypothesis regarding Archimedes’ Principle for this experiment.

*Insert image of your graph*

**Experiment Outline**

Briefly describe your plan for testing your hypothesis.

**Equipment List**

* List
* Equipment
* Here

**Action:**

Describe the techniques used to collect data by responding to the bullet point questions:

* How did you predict the density of your pennies?
* How did you vary the weight of the pennies?
* How did you measure the weight of the pennies in air? … in water?
* How did you determine the buoyant force, FB?
* Why was it important to remove the air bubbles from the submerged pennies?

*Insert labeled image of your apparatus*

**Results:**

Record the category of your selected pennies (pre-1982 or post-1982) and the corresponding predicted density.

**Table I: Predicted Penny Density**

|  |  |
| --- | --- |
| **Category of Pennies Selected** | **Predicted Penny Density, ρpred (g/cm3)** |
|  |  |

Measure and record the weight of the pennies in air and in water. Remember that when you measure the weight in water, you do it in the reverse order as you did in air.

**Table II: Weight of Pennies in Air and Water and Calculated Buoyant Force**

|  |  |  |  |
| --- | --- | --- | --- |
| **# of Pennies** | **Weight in Air, W (N)** | **Apparent Weight in Water (N)** | **Buoyant Force, FB (N)** |
| 0 | 0 | 0 | 0 |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**Analysis:**

Calculate the buoyant forces for each measurement (Eq. 7) and record them in Table II.

Generate a plot of buoyant force, FB, vs. weight in air, W and record the slope, m, and correlation coefficient, R.

*Insert graph of FB vs W*

Slope = \_\_\_\_\_\_\_\_\_\_\_\_

R = \_\_\_\_\_\_\_\_\_\_\_\_

Calculate the experimental penny density (Eq. 8) from the slope and the known density of water. Compare the experimental density to the predicted density using a percent difference.

**Table III: Comparison of Predicted and Experimental Penny Densities**

|  |  |  |
| --- | --- | --- |
| **Predicted Density, ρpred (g/cm3)** | **Experimental Density, ρexp (g/cm3)** | **%Diff** |
|  |  |  |

**Conclusion:**

Interpret your results in light of your hypothetical predictions. Discuss possible sources of error in your experimental density. Which effect do you think had the largest impact on your error? Was your experimental density greater or less than the predicted density? Does it make sense for your penny weights to have a greater/lesser density than predicted? Considering the correlation coefficient, R, comment on the linearity of your graph. What might this indicate about the precision of your experiment? How might you improve this experiment or explore it further? How could weighing a person while submerged underwater (hydrostatic weighing) yield a measurement of body fat?