

Lab: Archimedes Principle

Background

Archimedes stated that the buoyant force pushing up on an object is equal to the weight of the fluid displaced by that object. In this lab we will measure the buoyant force for several objects in water.

Calculating Weight

$$\begin{aligned}\text{Weight} &= \text{Force of Gravity} \\ \text{Force} &= (\text{mass})(\text{acceleration})\end{aligned}$$

$$\text{Weight} = (\text{mass in kg})(9.8\text{m/s}^2)$$

$$1\text{ N} = \frac{1\text{kg} \cdot \text{m}}{\text{s}^2}$$

Questions

1. How can we determine whether an object will float or sink by using Archimedes principle?
2. How can we determine by how much a floating object will be submerged by using Archimedes principle?

Hypothesis (2 pts)

Objects with a weight greater than the weight of the water displaced will _____.

For a floating object, the volume submerged will _____ the volume of water displaced that is _____ to the weight of the _____.

Procedure

1. Measure the volume of cubes and record as the volume of displaced water.
2. Since the density of water is approximately 1 g/ml or 1 g/cm³, calculate the mass of the displaced water if the entire cube was submerged. Show your work including the equation and units in the space below.
3. To calculate the weight of the displaced water you will need to convert your mass from grams into kilograms. Hint: There are 1000 g in a kilogram.
4. Convert your mass in kg into newtons (N).
5. You will now need to measure the mass and calculate the weight of each of the blocks.
6. Predict whether the object will float or sink.
7. After you make your predictions about whether the object will float or sink you may test your prediction.

Step 1 & 2 (4 pts)

Volume of displaced water (cm³):

Calculation of the mass of the displaced water (g):

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Step 3-7 (5 pts)

Substance	Mass (g)	Mass (kg)	Weight (N)	Sink or Float?
Displaced Water				NA
Iron (Fe)				
Copper (Cu)				
PVC				
Wood				

Conclusions (9 pts)

1. Explain how Archimedes Principle can be used to predict whether an object will sink or float.

2. Explain how Archimedes principle is related to predicting whether objects will float or sink based on their densities?

3. How could we use Archimedes Principle to predict how far a floating object (e.g. cork, block of ice) would be submerged below the water level? Draw a diagram to support your idea.