Group: (table) # 1
Name: Nickolas Diaz
11881 PHYS 221 C General Physics

Title: Archimedes' Principle: Buoyancy and Density

Due: 12/05/2023 at 2:00 PM

Partners: Min Jong, Vecharungsri Brendan D, Kim1 James

Archimedes' Principle
Questions

1. The metal that was experimented on is zinc. The accepted value of zinc is 7.1 g/cm^3 and the experimental value is very close to 7.325 g/cm^3. Which is a three percent difference. It may be possible that the zinc metal is impure or not. All the purity test states is that the block has the same density of a pure block of zinc. The block could still have a combination of impurities that make it the same density. An error source may also be at fault, as there may be some human errors when measuring the mass.
2. The string in the experiment was ignored as it is too light. The string that was used was very thin and short and probably weighed a hundredth of a gram which is nonexistent compared to 60 grams measured. The string may lead to a significant substantial error when the string at least comes to a gram. As the density will be affected by the 100th.

3. If an object with the same density when it is submerged, it will not float or sink. The pendulum that weighs the object will read zero as its mass. This is because there is no movement pushing it down.

4. (a) A submarine is able to submerge by increasing its density. A way of doing this is by letting water fill in some of its tanks. If it wants to go up then it needs to release the water in its tanks to become lighter than the surrounding water. (b) Normally when an object gets colder it becomes more dense, however when water freezes it expands and becomes less dense than water.

5. The beaker and the block weighted individually will weigh more than when it is weighed together. This is because the block of wood will displace some of the water and subtract it from the total. The difference between the two methods is how much water the block of wood displaces.

6. The specific gravity of zinc was 7.325 g/cm^3. Since the density of air is 0.001225 g/cm3. In order to get the actual weight we have to divide 45 by the sum of the density of zinc and air. This gives us 6.144 cubic centimeters of zinc. Then we multiply this number by the density of zinc to get the actual weight which is 45.0075 kg. The same process is used to get the weight in water and water has a density of 1 g/cm^3. And the actual weight is 52.1kg.

7. The principle of a hydrometer is to be able to measure the density of a liquid, when it is submerged the density is determined by how much the buoyancy is. The specific gravity of radiator coolant is between 1.070 - 1.072 g / cm3 and battery electrolyte has a specific gravity of lead-acid battery electrolytes are between 1-2 - 1.265

Archimedes' Principle
Advance Study Assignment

1. **Describe the physical reason for the buoyant force in terms of pressure.**

The buoyant force is equal to the weight of the fluid it displaces. When an object is submerged it is lighter than water, the water above wants to go where the object is thus the buoyant force is pushing it up.

2. **Give the conditions on densities that determine whether an object will sink or float in a fluid.**

An object will sink if the density of the object is greater than that fluid. If the density of the object is less than that the fluid will float and if both the object and the fluid is the same then the fluid will remain the same.

3. **Distinguish between density and specific gravity, and why is it convenient to express these quantities in cgs units?**

The density of the object is how mass it is in a certain volume of space. While the specific gravity is the weight of a substance divided by an equal volume of water. It is convenient because the specific gravity has no units and follows the magnitude in cgs units. So it is convenient to compare it with density and specific gravity.

4. **Describe how the density of an object less dense than water can be determined using Archimedes' principle. How about the density of a liquid?**

An object that floats cannot be used in the specific gravity test by itself. It needs a heavier object to push it down. The equation is (w-w`) of the object divided by the (w-w`). Where w is the mass in air and w` is mass submerged in water.

5. **Why is it important to make certain that no air bubbles adhere to objects during the submerged weighting procedures? How would the experimental results be affected if bubbles were present?**

If all bubbles adhere to the object then the amount displaced will increase by the amount of bubbles. The experimental results will be affected because the volume that is perceived is bigger and because of this the density of the object will be less than the true value.