Date of Lab 10/6 Date of Submission 10/17

Physics Laboratory Report

Title Buoyancy

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Date	Summary	Teacher
10/14	We were able to find out the nature of buoyancy using copper and aluminum weights. Also, by using water in a graduated cylinder. Moreover, we were find out the difference with water & salt water.	Tohei 10/18

* レポートは、日本語あるいは英語で記載すること。 * この用紙をレポートの表紙として使うこと。
* 実験日から一週間目にあたる日までにレポートを提出すること。ただし、その後内容を付け加えて行っても良い。付け加えたときは、上に日付と内容を書くこと。

Buoyancy

Introduction

Objectives

Measure buoyant force on a body by changing its shape, size and location in water.

Hypothesis

An object completely immersed in a fluid experiences an upward buoyant force equal to the weight of fluid displaced by the object.

Safety

Pay attention not to break the graduated cylinder, and place it tightly to the stand.

References

三省堂「物理 I」p245 水の浮力を測定する

Experiment

Apparatus

- Stand
- Graduated Cylinder
- Weight – 100g copper and aluminum
- String
- Spring measure
- Water
- Salt water (30%)

Procedures

1. Connect the weight to the spring measure with a 30cm string.
2. Make the weight hang off the string measure, and find out the elasticity of energy that works on the weight.
3. Connect the graduated cylinder to the stand.
4. Pour a suitable amount of water into the graduated cylinder.
5. Find out the volume of the weight by putting the weight completely into the water.
6. Find out the elasticity of:
   a) The weight that is standstill near the surface of the water

b) The weight that is standstill on the bottom of the graduated cylinder

7. Enforce the same procedure with different types of weights.
8. If you have time, enforce the same procedure with 30% salt water.

Results

※ SW = surface of water B = Bottom of Cylinder

Type of Weight	Volume (m^3)	Elasticity (F1)(N) Weight in Air	Elasticity (F2)(N) Weight in Water	Buoyancy (F1-F2)(N) Actual Measurement	Buoyancy (Vρg) (N) Prediction
Copper	8 × 10^-6	0.8	SW = 0.72 B = 0.71	SW = 0.08 B = 0.09	0.0784
Aluminum	1.1 × 10^-5	0.4	SW = 0.31 B = 0.3	SW = 0.09 B = 0.10	0.1078

Formula for Buoyancy

$F = V\rho g$

V = volume

ρ = density of water (kg/m^3)

g = 9.8

Copper : 8 × 10^-6 × 8 × 10^-6/ 100 × 1000 × 9.8 = 0.0784

Aluminum: 1.1 × 10^-5 × 1.1 × 10^-5/100 × 1000 × 9.8 = 0.1078

Discussion

The measurement of the spring measure is less when it is hanged up in the water rather than when it is hanged up in the air. This is because the energy of buoyancy is working, and it inevitably makes the weight "float" and makes the measurement of the light. Moreover, buoyancy is not directly related to the shape of the weight, but the density and the volume affect it. Also, the depth of the water does not affect greatly; however, water pressure increases as the depth goes below. Furthermore, although the number was not as accurate enough, I think it can be defined that Archimedes' law is proven here with this experiment by predicting the number using the appropriate formula, and actually using water and material with the graduated cylinder and all the apparatus that is listed above. From this, it can be said that the hypothesis is true. Moreover, when a weight is put into salt water, it will naturally float. This is proven because materials that are put into water sink because they have a greater volume than the water that surrounds them. However, by adding salt to the water, the volume increases. When the volume of the water is greater than the volume of the material that is inserted into the water, the material will float. When the volume of each other is exactly equal, it will stop and not move in the middle of the water.

Conclusion and Impressions

From this experiment, we were able to prove and learn the law that Archimedes found out many years ago. Moreover, we were able to find out the nature of buoyancy, how it is proportional and not proportional to a number of qualities, and the difference between the surroundings of them; such as being placed into pure water or salt water.

My partner and I had a fun time experimenting with a quality that anyone knows, although it was probably a difficult quality to find out many centuries ago. In my opinion, in order to improve the next experiment is to do things a lot quicker, because it was close to the end of the period when we started with our experiment with salt water.

Toki

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