PhysicsLab-008	Buoyancy	Class E	Date 10/24	Name Hidehiko Kono

Hypothesis	An object completely immersed in a fluid experiences an upward buoyant force equal to the weight of fluid displaced by the object. (Archimedes' Principle)

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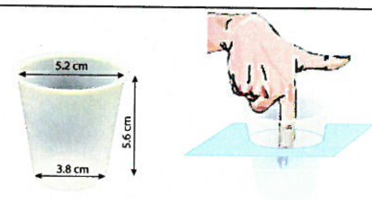
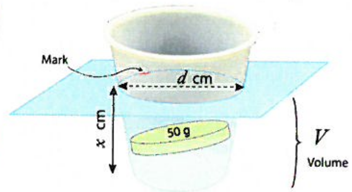
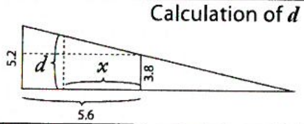
Experiment-A - A weight in a cup

1	Experience the buoyant force		
2	Measurement of the buoyant force A weight in a plastic cup on water		Measurement of x x = 4.2 cm
	 Calculation of d	$d = x \times \frac{5.2 - 3.8}{5.6} + 3.8$	d = 4.85 → 4.8 cm
	Calculation of V *(V: The volume of water that the abject displaces)*	$V = \frac{1}{2} \times (Upper\ Area + Lower\ Area) \times x$ $= \frac{1}{2} \times (18.1 + 11.3) \times 4.2$ $= 61.74.$	V = 61.7 cm^3 6.2 m × 10^{-5} m^3.
	Buoyant force	$f = \rho_{water} V g$ $= 1000 \times 6.2 \times 10^{-5} \times 9.8 = 0.608$	f = 0.61 N.
3	Gravity on the weight (and the cup)	$W = mg$ $52.67 \times 9.8 \div 1000 = 0.52$	W = 0.52 N.

OK

Discussion

In this lab. f = 0.61 N, W = 0.52 N. When it is in equilibrium, f is should be same as W, but there are different. Therefore, we made some mistake.

Very good.

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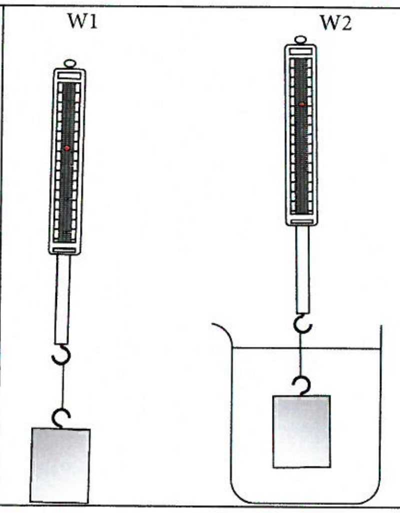
Experiment-B - Weight

1	Measurement (Zero adjustment of a spring scale)		Measurement W1 = 0.73 N W2 = 0.52 N Buoyant force $f = W1 - W2 =$ 0.21N
2	Calculation	Mass of the weight (m) $m = \frac{0.73}{9.8} = 0.07$	0.073kg
		Volume of the weight (V) $V = \frac{0.73-0.52}{1000 \cdot 9.8} = 0.00002$	2.1×10^{-5} m³
		Density of the weight (ρ) $\frac{m}{V} = \frac{0.073}{2.1 \times 10^{-5}} = 3476$	3476 kg/m³ OK

Discussion

In this lab. density of weight is 3476 kg/m³ and it is made of Alminium. But actually, density of Alminian is 2900 kg/m³, so I can guess the we made some mistake

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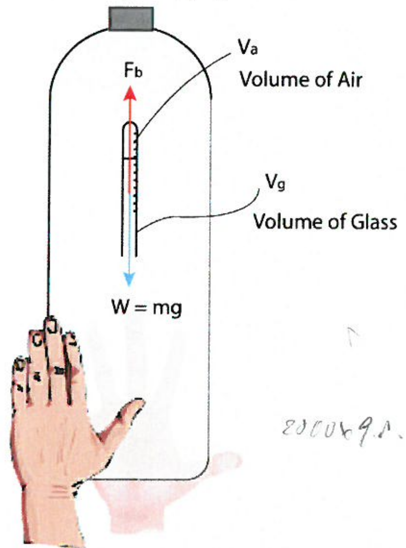
Experiment-C - Cartesian Diver

1	Set up and measurement	$F_b = (V_g + V_a)\rho_w g$ 	Measurement The <u>volume of air</u> inside the test tube (Va) when it is in the intermediate position of the bottle. V =
2	Data 14.77 = 0.01477	Mass of the test tube (m) = 14.77 g Density of glass (ρ glass) = 2500 kg/m³ Volume of the test tube(Vg)= 5.9×10^{-6}	
3	Calculation	Buoyant Force $Fb = (Vg + Va)\ \rho_w g$ $= (5.9 \times 10^{-6} + 8.32 \times 10^{-6}) \times 1000 \times 9.8$	0.1394 N
	14.77g = 0.01477 kg	Gravity = mg = 0.01477 × 9.8 = 0.1418	0.1499 N.

OK

Discussion and opinions

In this lab. Fb = 0.1394N, Gravity = 0.1499 N.

When it is in equilibrium, Fb and Gravity should be equal.

There numeral values are very similar, but different.

Therefore, it may be in equilibrium, but not perfectly.