PhysicsLab-008	Buoyancy	Class	Date	Name Moe Oshima

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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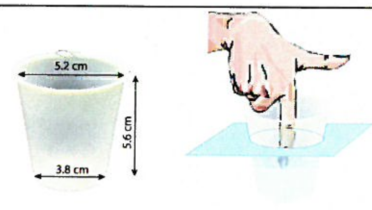
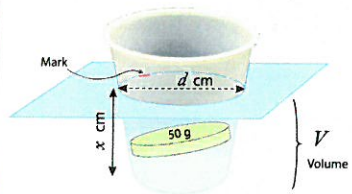
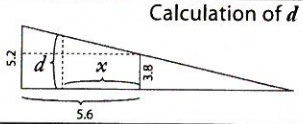
Experiment-A - A weight in a cup

1	Experience the buoyant force		
2	Measurement of the buoyant force A weight in a plastic cup on water		Measurement of x x = 3.40 cm
	Calculation of *d* 	$d = x \times \frac{5.2 - 3.8}{5.6} + 3.8$	d = 4.65 cm
	Calculation of *V* *(V: The volume of water that the abject displaces)*	$V = \frac{1}{2} \times (Upper\ Area + Lower\ Area) \times x$ $= \frac{1}{2} \times \left(\left(\frac{5.2}{2}\right)^2 \pi + \left(\frac{3.8}{2}\right)^2 \pi \right) \times 3.40$ $= 55.4$	V = 55.4 cm^3
	Buoyant force	$f = \rho_{water} V g$ $= 1000 \cdot 55.4 \times 10^{-6} \times 9.80 = 0.54$	f = 0.54 N
3	Gravity on the weight (and the cup)	$W = mg$ $= 52.67 \times 10^{-3} \times 9.80 = 0.52$	W = 0.52 N

OK

Discussion

I calculated the buoyant force and the gravity of the cup + 50g weight, which was about the same, resulting in a cup floating. When a cup was floating without weight and pushed it down with my finger, I was able to feel the buoyant force pushing the cup upward.

Very good

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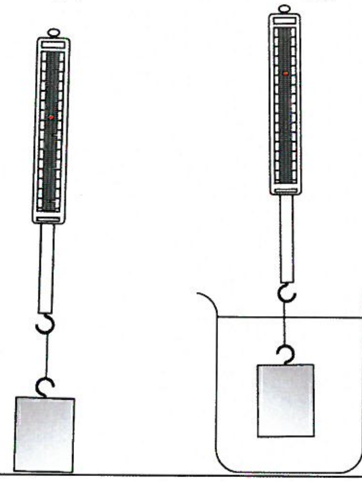
Experiment-B - Weight

1	Measurement (Zero adjustment of a spring scale)		Measurement W1 = 0.70 N W2 = 0.50 N Buoyant force $f = W1 - W2 = 0.20$ N
2	Calculation	Mass of the weight (m)	$W = mg$ $m = \frac{W}{g}$ $= \frac{0.70}{9.80} = 0.071$ kg //
		Volume of the weight (V)	$F = \rho_f V g$ $V = \frac{F}{\rho_f g} = \frac{0.20}{1000 \cdot 9.80}$ $= 2.04 \times 10^{-5}$ m^3 //
		Density of the weight (ρ)	$\rho = \frac{m}{V}$ $\frac{7.1 g}{20.4 cm^3}$ $= \frac{7.1 g}{20.4 cm^3}$ $= 3.50$ g/cm^3 //

OK

3500 kg/m^3

Discussion
I learned that the difference between the normal gravity and the gravity under water equals the buoyant force. Because the buoyant force is making the weight go upward, the gravity in the water becomes less than the gravity outside of water. From this experiment, I learned how to calculate the density of an object.

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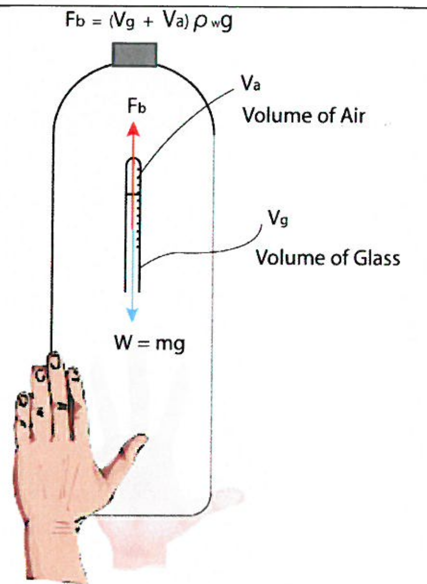
Experiment-C - Cartesian Diver

1	Set up and measurement		Measurement The volume of air inside the test tube (Va) when it is in the intermediate position of the bottle.
2	Data	Mass of the test tube (m) = 0.01477 kg Density of glass (ρ glass) = 2500 kg/m^3 Volume of the test tube(Vg)= 5.91×10^{-6} m^3	$\rho = \frac{m}{V}$ $2500 = \frac{0.01477}{V}$ $V = 5.91 \times 10^{-6}$
3	Calculation	Buoyant Force Fb = (Vg +Va) ρ_w g = 0.144N	$Fb = (5.91 \times 10^{-6} + 8.80 \times 10^{-6}) \cdot 1000 \cdot 9.80$ $= 14.71 \times 10^{-6} \cdot 1000 \cdot 9.80$ $= 0.144$
		Gravity = mg = 0.145N	0.01477×9.80 $= 0.145$ OK

Discussion and opinions

The tube was floating inside the bottle and when I pushed the bottle, the tube went down because the volume of water decreased as I pushed the bottle, The tube is floating because the buoyant force and the gravity is about the same.

Opinion:

I think this experiment was good because it helped me how the buoyant force works and how to calculate some variables like density and buoyant force.

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