SMS-204: Integrative marine sciences.

Lab 3, Buoyancy lab.

For homework- remember to provide uncertainties in graphs and display only significant figures for all your results.

Station 1: Archimedes ball (Note: data will be used in homework).

a. Obtain the approximate weight and volume of the dry ball. What is its density? How does it compare with that of water?

b. Empty all the air from the syringe. Place the ball in the water and slowly evacuate air out of the ball using the syringe until the ball starts sinking. Note how much air volume was displaced (about equals to the air in the syringe).

Station 2: A hydrometer is a device to obtain the densities of fluid.

a. Speculate on how it works. Why does it have a limited range of densities for which it provides a useful reading? Estimate the density of the hydrometer itself. Why does the scale mention a specific temperature?

b. In a graduated cylinder measure the density of water. How does it compare with a?

c. Suppose you added salt or ice into the water. Would the hydrometer float higher or lower? Try it. Hydrometers are used in the beer industry. Can you speculate why?

Station 3: Cartesian diver

a. Squeeze the bottle. Why is the half closed pipe inside the bottle sinking?

b. How is it related to Archimedes’s principle and to last week Pascal’s press?
Station 4: Weight in and outside water (Note: data will be used in homework).

a. Measure/compute the box’s volume and weight, and the weight of the metal pieces used as weights.

b. For a series of 4 different amounts of internal weights (making sure in all cases that the box floats), measure: a. the weight outside water using the spring. b. the weight of the box in water, and c. the depth to which the box is immersed in water (each mark on the box is 1cm).

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<th># and type of weights</th>
<th>Weight in air</th>
<th>Weight in water</th>
<th>Immersion depth</th>
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c. Now add enough weights so that the box sinks in water.

d. What is the weight of the box when immersed in water and outside water? b. What is the difference between the weights?

Station 5: Floating disks.

a. Can you make foil float on water? Can you make it sink?

b. What is the physics involved?

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