SMS-204: Integrative marine sciences.

Lab 3, Buoyancy lab.

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

a. Measure the diameter ______ (cm) of the ball. Measure in several places and estimate the uncertainty in diameter _______ (cm).
b. Measure the mass of the ball _____(g) with the cork in place but the hose removed.
c. Calculate the ball's volume _________ (cubic cm). Volume of a sphere = pi/6 *D^3
d. Calculate the empty ball's density ________ (g/cubic cm).
e. Empty the air from the syringe and attach the hose. Place the ball in water and pull water into the ball using the syringe until the ball starts sinking. Note the volume of water brought into the ball (= volume of air pulled into the syringe) _____ (cubic cm).

Station 2: A hydrometer is a device used to obtain the densities of fluids compared to a standard.

a. Speculate on how it works.
b. Suppose you add ice or salt to the water. Will if float higher or lower? Why?
c. Why does the scale mention a temperature?
d. 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 the box's length _____ (cm) width _____ (cm) and height_____(cm). Note the box is marked with lines 1 cm apart.
b. Calculate the cross section area of the box (length x width) _________(square cm).
c. Using the spring scale measure the weight of the empty box in air, then lower the box into the water until it floats and record the weight showing on the spring scale.

d. Remove the box from the scale and note the depth to which the box is immersed while floating. Record your answers in the table.

e. Add 25 grams of weight to the box, and use the spring scale to measure: a. the box weight outside water b. the box weight in water, and c. the depth to which the box is immersed in water (each mark on the box is 1cm). Repeat this four times.

Weight added to box	Box weight in air	Weight in water	Immersion depth
0 grams			
25 g			
50 g			
75 g			
100 g			

f. What is the difference between the final box weight inside and outside water, and what is a formula from which you could get the difference?

Station 5: Rocking boat.

You have a large anchor on a boat floating in a pond. When you throw the anchor overboard and it sinks, will the level of the pond rise, drop, or remain the same? What about an object that floats in water (e.g. a life jacket)?

1. Reach a consensus in your group based on what you know about buoyancy.
2. Find an instructor and tell her/him your conclusion.
3. Test your prediction with the setup provided.

Station 6: Can a can float?

1. Examine the two cans. List similarities and differences between them.
2. What do you think the floating/sinking behavior of each can will be when placed in room-temperature tap water? Discuss the reasoning for your prediction.
3. Place the two cans in the tank. Be sure no bubbles cling to the cans. Does your observation agree with your prediction? How would you explain this observation?
4. Why might there be a difference in density between the cans?