

Materials

- The Divers: the plastic droppers with attached metal nuts. **BRING THEM BACK TO SCHOOL on MONDAY** (1)
- A glass or jar $\frac{3}{4}$ filled with water to prepare the divers before putting them into the 2 L bottle.

Procedure

1. Use a glass jar with water to “prepare” the divers.
 - To be effective, you must squeeze some water into the dropper so that the diver will just barely float at the very surface of the liquid.
 - If the diver is bobbing too far above the surface of the water, it will be extremely difficult to get it to dive when you put it into the 2 L bottle.
2. Put a single diver into the 2 L bottle. Close the cap tightly and squeeze the bottle. Observe the diver carefully as you are squeezing.
3. Test the single diver with no air in the 2L bottle and then test it with 4 or more inches of “head space” (air space at the top of the liquid water). Comment in question below.

Take the challenge: (1 bonus pt, as needed not to exceed 10 points total)

Using all of the divers you got in class, see if you can arrange the divers so that you can squeeze the bottle with **ONLY ONE HAND** and get them to sink **ONE** diver at a time. Bring your set-up into class or email a video from home to demonstrate and to earn your bonus point.

Yes, I know the diver and bottle are not proportioned correctly. I made the diver larger, so you could focus on changes to the diver.

Post LAD Questions - This paper will be turned in.

1. Metal sinks in water. It seems to me a plastic eye dropper with metal attached should sink in water, what causes the diver to float? (1)
2. Use a colored pencil to add to the diagrams to the right to help **EXPLAIN WHY** the Cartesian Divers are diving. (1)
 - When squeezing on the bottle observe the bubble inside the dropper and explain what causes the diver to sink? (In your explanation, you must use the words: mass, volume, density, pressure, compressible, not compressible and more in your explanation.) (3)
3. Does having no “head space” (no air space, all water) in the 2 L bottle make submerging the diver easier or harder. Suggest an explanation. (1)
4. Do a search on the web asking: “How do submarines work?” and make a **comparison** between how submarines and the Cartesian Divers work. Briefly explain how a submarine submerges, and how the submarine rises back up again. Sketches would be a good idea. Use the back to answer. (2)
5. Frank was explaining how a submarine sinks and floats, and said “ When the submarine wants to dive, the captain opens a valve and lets the air out into the ocean, which lets water flow in, making the submarine have more mass, causing the sub to sink.” Sally told Frank that she didn’t think the captain lets the air out into the ocean, because the sub would never get back to the surface. Do you agree with Sally or Frank. Justify your response on the back. (1)

