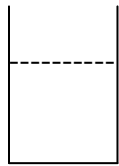
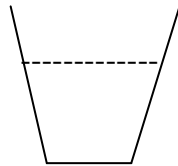


MODULE 9: Fluids

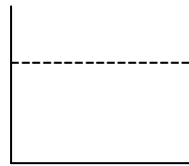
1. Each flask below contains the same fluid to the same height (same level). Rank the pressure exerted on the bottom wall of the flask. Explain your answer.



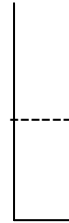
A



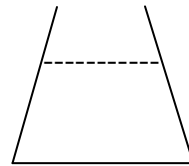
B



C



D



E

2. In the 2009 Pixar movie “Up”, Carl Frederikson flies his house and its contents with the help of hundreds of thousands of helium balloons. In 2008, balloonist Kent Couch actually flew himself on a lawn chair with helium balloons from Bend, Oregon to Cambridge, Idaho, a distance of approximately 200 miles. Estimate the number of helium balloons Kent Couch would have needed to use. Make the following assumptions.

Assume that the mass of Couch and his lawn chair including any ballast is 100 kg. Assume that the balloons have a radius of 0.5 m and are perfectly spherical. The density of Helium is 0.18 kg/m^3 , while the density of air is 1.2 kg/m^3 . You may ignore the mass of the balloon skin. Show all calculations.



3. Brian and his dog Rufus, both wearing life vests, are floating on an inflatable raft in a shallow swimming pool. Rufus is playing with an inflatable ball on the raft. For each of the events that follow, determine whether the level of water in the pool rises, falls or stays the same *relative to the level at the very beginning*. Explain your reasoning.

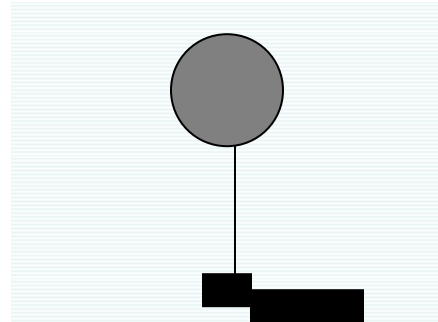
A. Rufus knocks the ball into the pool, where it floats in the water.

B. Brian drops a hardcover book he was reading, and it sinks to the bottom of the pool.

C. Brian gets into the pool and walks to the side of the pool towing the raft and dog.

D. Brian deposits Rufus on the side of the pool and gets back on the raft.

4. A spherical buoy of radius 0.4 m and a density half that of water ($\rho_{\text{water}}=1000 \text{ kg/m}^3$), gets snagged on an obstruction at the bottom of a freshwater lake and gets tethered as shown. Find the tension in the wire.



5. The 1903 *Wright Flyer* (also variously called *Kitty Hawk*, *1903 Flyer*) was 6.43 m in length (21' 1"), with a wing span of 12.3 m (40' 4"). The wing area was 47 m² (510 sq ft). Under Bernoulli's principle, what is the maximum lift off weight that this plane could accommodate if the air passes over the top and bottom surfaces with wind speeds of 15 m/s and 10 m/s respectively?

