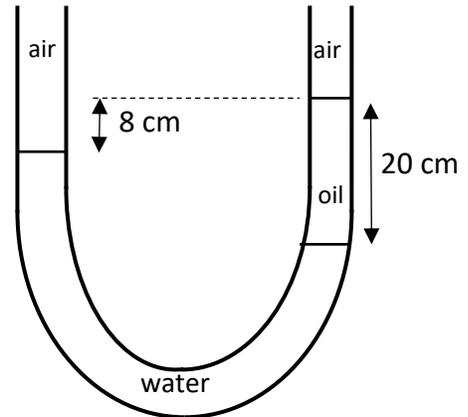


Physics 1135: Homework for Recitation #15: Static Fluids

1. A U-shaped tube open to the air at both ends contains water. A quantity of oil of unknown density is slowly poured into the right arm of the tube until the vertical height of the oil column is 20cm. The top of the oil is 8cm higher than the top of the water. Find the density of the oil.



2. A rubber duck of volume $2,500\text{cm}^3$ floats in water with 20% of its volume submerged. You want to hold the duck under water so it is at rest and completely submerged. How much force do you have to apply? If you release the duck, what will be its acceleration at that instant?

3. In a lecture demonstration, an object is suspended from a spring scale which reads 8N when the object is in air. The object is then lowered into a beaker of water, and when the object is fully submerged in the water, the scale reads 6N.

a) Find the density of the object.

b) During the entire demonstration, the beaker is standing on a kitchen scale which reads 20N before the object is lowered into the water. What does this scale read when the object is fully submerged?

c) Compare the sum of the two scale readings before and after the object is submerged.

4. A cylinder of radius R and height H is floating upright in water and a portion remains above the waterline. The density of water is ρ . The cylinder is made of two different materials; its upper half has density ρ_A ; its lower half has density ρ_B . Derive an expression for the difference between the pressure at the cylinder's lower (submerged) surface and atmospheric pressure, in terms of system parameters.

