Physics 202
Homework assignment #5
Due Tuesday, February 12th

THERE ARE TWO PAGES TO THIS ASSIGNMENT! READ BOTH PAGES!

From the text (Serway and Jewett)

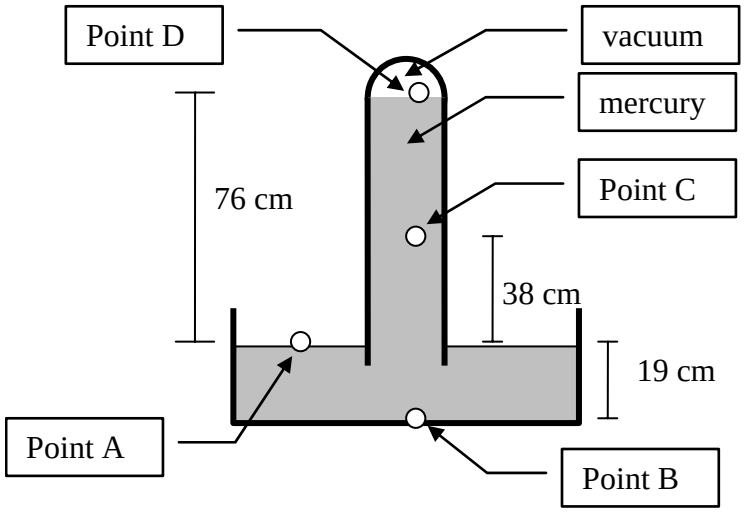
Reading:

Read all of Chapter 14
The *next* homework assignment will include fluids with friction (viscosity).

Problems:

Chapter 14: (Questions start on page 438, problems start on page 440)
Questions: #2, 9, 11, 31
Problems: #6, 9, 23, 27, 41, 43, 47

Keith's Problem #1: Fluid pressure and potential. The diagram below is a cartoon of the classic Torricelli barometer. The barometer is full of mercury and the mercury is not moving. Point A is at atmospheric pressure (exactly $1.00\times10^5\ Pa$ on this day). Point D is in a vacuum so the pressure there is 0.00 *Pa*.



a) Find the fluid pressure at point B.
b) Find the fluid pressure at point C.
c) The scientist playing with this barometer decides to ***define*** the fluid pressure at Point A to be $1.00\times10^5\ Pa$. Using that same convention, calculate the fluid pressure at point B.
d) Using the same convention, calculate the fluid pressure at point C.

Keith's Problem #2: (Fluids with friction.) Water is leaking out of a bucket with a narrow hole in it. When the water in the bucket is 0.3 m deep, water drains out of the hole at a rate of 6 ml per second (recall one ml = 10^{-6} m^3).

a) When the water is 0.2 m deep, what is the difference in pressure between the inside of the bottom of the bucket and the outside?
b) Assuming that the water is draining with "terminal velocity" (viscosity limited flow), what is the resistance of the narrow hole to water flow?
c) Assuming the water will still be flowing with viscosity dominated flow, what will the flow rate be when the water is only 0.2 m deep? 0.1 m deep?
d) Sketch a graph of flow rate (vertical axis) as a function of water depth (horizontal axis). What is the slope of the graph and what does it tell us?

Keith's Problem #3: Water is leaking out of the same bucket with the same narrow hole in it. Now a second identical hole is made in the bottom of the bucket. Again assume viscosity controlled flow.

a) If the water is again 0.3 m deep, now how fast will water flow out of the bucket?
b) Assuming that the water is draining with "terminal velocity", what is the resistance of the combination of the two narrow holes to water flow?
c) What is the relationship between resistance to the number of holes?