IB Physics
FA 10.2 - Fluid Dynamics

Name_____

Show your work, round to the correct significant figures, circle your answers, and label them with units.

When you have finished this, go to the website and check your answers. If you got a problem wrong, cross it off on the front, and do it correctly on the back.

1a. Water flows at 0.140 m/s down a pipe with an inner diameter of 1.27 cm. If the pipe widens to an inner diameter of 5.08 cm, what is its velocity?

1b. Water flows at 1.20 m/s down a 3.20 cm diameter hose. What time will it take to fill a cylindrical tank that is 6.10 m in diameter to a depth of 180. cm?

2a. How fast does air leak out of a small hole in a tire that is at 32.0 psi gauge? Ignore viscosity, and use 1.29 kgm^{-3} as the density of air.

2b. Water issues from hole in the side of a water tank at 18.0 m/s. What is the height of the water in the tank above the hole? (ρ = 1000. kgm^{-3}) Assume atmospheric pressure above the water in the tank and at the hole.

2c. The air (ρ = 1.29 kgm^{-3}) is traveling at 63.0 m/s over the top of a wing, and 61.0 m/s over the bottom of a wing. What is the pressure difference from one side to the other?

3. Water (ρ = 1000. kgm^{-3}) is moving at 2.35 m/s down a pipe with an inner diameter of 3.40 cm and is at a pressure of 9830 Pa at a height of 1.17 m. It changes elevation and the pipe narrows to 2.95 cm inner diameter and the pressure changes to 12,400 Pa. What is the new elevation? (Assume laminar flow. haha)

4a. A tiny drop of water (ρ = 1000. kgm^{-3}) has a terminal velocity of 0.00315 m/s through air with a viscosity of 1.81×10^{-5} Pa s. What is its radius? (Ignore the buoyant force of the air)

4b. A tiny grain of bapepper (ρ = 2130 kgm^{-3}) is 1.20 microns in diameter. What speed does it settle in water?
(ρ = 1000. kgm^{-3}, $\eta = 1.002 \times 10^{-3}$ Pa s) (Don't ignore the buoyant force of water)

5. What is the maximum speed water can move down a 5.08 cm diameter pipe if it is to have a Re_r (what our equation calculates) that is less than 1000? (use ρ = 1000. kgm^{-3}, $\eta = 1.10 \times 10^{-3}$ Pa s)