**Quiz #8**

**Group Quiz**

Names:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

1. Explain in detail why your shower curtain sucks into the shower when the shower is on.

If you look at Bernoulli’s equation, *P1 + ½v12 + gh1 = P2 + ½v22 + gh2* which is simply conservation of energy for fluids, then you can see that having the air on the inside of the shower curtain moving at some velocity increases the KE term. If KE goes up then either potential energy or Pressure has to go down. Since the height of the shower remains the same, only the pressure can change. Basically the moving water, causes the air around it to flow which reduces the pressure on the inside of the shower so the curtain “sucks” in. More precisely the curtain is pushed harder from the air outside the shower than inside the shower so it moves into the shower.

1. How does a suction cup work. Draw and describe the forces acting on a suction cup attached to a window.

A suction cup is made of a flexible plastic that is formed with a hollow area on the suction side. When the cup is pressed against the window, the air is pushed out of the hollow area. The material of the cup makes an air tight seal between the cup and the window. When you stop pushing on the cup, it tries to reshape itself with the hollow. However, there is very little air in the hollow (since you pushed it out) so this air is less dense than the air in the room. That means the pressure inside the cup is less than in the room. The room air pushes harder on the cup than the air inside the cup so the cup stays on the window. The room air holds it up.

1. An empty rubber balloon has a mass of 0.0070 kg. The balloon is filled with helium at a density of 0.179 kg/m3. At this density the spherical balloon has a radius of 0.300 m. If the filled balloon is tied down by a vertical string, what is the tension in the string? Include a free body diagram. Volume of a sphere is 4/3 r3
2. If water flowing through a garden hose of diameter 2.74 cm fills a 25.0 L bucket in 1.5 minutes, what will the speed of the water leaving the nozzle be if it’s constricted to 1/3 the diameter of the hose?

= m/V P = F/A *A1v*1 = A2*v*2 *P1 + ½v12 + gh1 = P2 + ½v22 + gh2*

*Fb = mg = Vg* $\rightharpoonaccent{F}$= *m*$\rightharpoonaccent{a}$*g**= 9.8m/s2*

*1*atm = 1.013 x 105 Pa density of air = 1.29 kg/m3 density of water = 1000kg/m3